Program Kejuruteraan & Komunikasi Media Baharu /
Engineering & New Media Communication Programmes

UniMAP Universiti Malaysia Perlis

Ilmu • Keikhlasan • Kecemerlangan
Knowledge • Sincerity • Excellence

Buku Panduan AKADEMIK
Academic Guide Book

Program Sarjana Muda / Bachelor Degree Programmes

Sidang Akademik / Academic Session

2015/2016

Buku Panduan
AKADEMIK
Academic Guide Book
Program Sarjana Muda / Bachelor Degree Programmes
Program Kejuruteraan & Komunikasi Media Baharu / *Engineering & New Media Communication Programmes*
Sidang Akademik / *Academic Sessions* 2015-2016

Disediakan oleh / *Prepared by*:
Pejabat Timbalan Naib Canselor (Akademik & Antarabangsa)
Deputy Vice-Chancellor's Office (Academic & International)

Penasihat / *Advisors*:
YBhg. Brig. Jeneral Datuk Prof. Dr. Kamarudin Hussin
YBhg. Dato' Prof. Dr. Zul Azhar Zahid Jamal

Ketua Penulis & Penyelaras Projek / *Head of Writer & Project Coordinator*:
Prof. Ir. Dr. Rezuwan Kamaruddin
Dr. Haziah Abdul Hamid

Anggota Penulis / *Author Members*:
Dr. Mohd Najib Mohd Yasin
Dr. Shahrul Nizam Yaakob
Dr. Shafriza Nisha Basah
Dr. Rosnazri Ali
Dr. Muhamad Saifuldin Abdul Manan
Dr. Muhammad Asri Idris
Dr. Akmal Hadi Ma'Radzi
Dr. Abdul Haqi Ibrahim
Dr. Tunku Salha Tunku Ahmad
Dr. Hanum Hassan
Dr. Shuhairimi Abdullah
Dr. Nik Noriman Zulkepli
Dr. Muhammad Zaini Ahmad
Cik Liew Khe Li
Dr. Vithyacharan A/L Retnasamy
En. Ahmad Nasir Che Rosli
En. Sharulnizam Mohd Mukhtar
Dr. Abdul Hafiizh Ismail
Dr. Azwan Iskandar Azmi
En. Shuhaimi Zakaria @ Abdullah
Prof. Madya Dr. Zainab Hamzah
Dr. Shazlina Johari
Dr. Ong Siok Lan
Dr. Nurul Izza Mohd Nor
Dr. Rozmie Razif Othman
Pn. Noor Syazana Arshad
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Dr. Nuriziani Hussin
Dr. Mohd Azrik Roslan
En. Fijay Fauzi
Dr. Suhaila Hussain
Dr. Mohammad Taufiq Mustaffa
Dr. Sharifah Shahnaz Syed Bakar
Dr. Mohd Fitri Mohamad Wahid
Dr. Zunaida Zakaria
Dr. Nora Jullok
Pn. Rashidah Ruslan
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En. Ahmad Fairuz Mansor
Pn. Rozaini Abdullah
En. Emi Izhanizam Azmi
En. Muhamad Hafiz Ab Aziz
En. Zulkapli Abdullah
Dr. Mohammad Harith Amlus
Pn. Intan Maizura Abdul Rashid
Pn. Bibi Noraini Moh Yusuf
Pn. Adila Ismail
En. Hassad Hassan
Dr. Zainor Ridzuan Yahya
Pn. Wan Safuraa Wan Othman
Pn. Ina Suryani Ab Rahim
En. Lokman Hakim Ibrahim
Cik Norsyahiza Hamzah
Tn. Syed Amir Fatir Syed Akhir
En. Irma Azqrai Nin Sey Muhamad
Pn. Nor Innar Md Noor
Pn. Rahaida Abdul Rahim
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Cik Norren Shariza Mohamed Mokhtar
Pn. Ruhaida Ismail
En. Zakaria Othman @ Ismail
Pn. Hizatul Diana Hamzah
Pn. Siti Masliana Bohari
Pn. Noor Zeita Othman
Cik Afifah Azmi
Pn. Alma Azizah Abdul Rahim
Pn. Azilah Abidin
Pn. Isma Irini Shafie

Setiausaha / *Secretary*:
Pn. Nur Shafissa Shabudin
En. Syarizal Ishar

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dan/and

semua Dekan-dekan Pusat Pengajian dan Pengarah Pusat / Unit di Universiti Malaysia Perlis.
all Deans and Directors of Centres / Units in Universiti Malaysia Perlis.

serta / and

kepada semua staf di Bahagian Pengurusan Akademik, Pejabat Timbalan Naib Canselor (Akademik & Antarabangsa), Universiti Malaysia Perlis.
all the staff at Academic Management Division, Deputy Vice-Chancellor (Academic & International) Office, Universiti Malaysia Perlis.

Isi Kandungan / *Contents*

Muka Surat / *Page No.*

Pengenalan / *Introduction*		4
Misi, Visi, Lagu UniMAP / *Mission, Vision and UniMAP Anthem*		7
Canselor UniMAP / *Chancellor of UniMAP*		8
Pro Canselor / *Pro Chancellor of UniMAP*		9
Kata Aluan Naib Canselor / *Vice Chancellor's Message*		10
Pegawai Utama Universiti / *Principal Officers*		12
Bahasa Malaysia (Malay)	: Kalendar Akademik	13
	: Syarat Kemasukan Pelajar Tempatan	15
	: Sistem Akademik	41
	: Pusat Pemantapan Akademik	55
	: Bahagian Pengurusan Akademik, Jabatan Pendaftar	55
Bahasa Inggeris (*English*)	: *Academic Calendar*	59
	: *Admission Requirements*	61
	: *Academic System*	78
	: *Academic Support Centres*	90
	: *Academic Management Division, Department of Registry*	91
P. Pengajian Kejuruteraan Mikrolektronik / *School of Microelectronic Engineering*		95
P. Pengajian Kejuruteraan Komputer & Perhubungan / *School of Computer & Communication Engineering*		123
P. Pengajian Kejuruteraan Mekatronik / *School of Mechatronic Engineering*		151
P. Pengajian Kejuruteraan Sistem Elektrik / *School of Electrical Systems Engineering*		201
P. Pengajian Kejuruteraan Pembuatan / *School of Manufacturing Engineering*		231
P. Pengajian Kejuruteraan Bahan / *School of Materials Engineering*		259
P. Pengajian Kejuruteraan Bioproses / *School of Bioprocess Engineering*		293
P. Pengajian Kejuruteraan Alam Sekitar / *School of Environmental Engineering*		327
Pusat Pengajian Pembangunan Insan dan Teknokomunikasi / *School of Human Development and Techonocommunication (iKOM)*		363
Pusat Bahasa Antarabangsa / *Centre for International Languages (CIL)*		385
Pusat Kejuruteraan / *Engineering Centre (PK)*		403
Institut Matematik Kejuruteraan / *Institute of Engineering Mathematics (IMK)*		411
Pusat Kerjasama Industri / *Centre for Industrial and Governmental Collaboration (CIGC)*		425
Pusat Ko-kurikulum / *Centre for Co-Curriculum*		431

* Dari semasa ke semasa, universiti mungkin melakukan perubahan kepada beberapa aspek kurikulum dan sistem akademik tertentu bagi memenuhi keperluan semasa. Semua pelajar akan dimaklumkan dan tertakluk kepada perubahan tersebut.

* *From time to time, the university may amend certain aspects of curriculum and academic system in order to fulfil current needs and requirements. All students shall be informed of and are subject to the change.*

PENGENALAN / *INTRODUCTION:*

Buku Panduan Program Ijazah Sarjana Muda ini disediakan untuk membantu pelajar baru dalam memahami proses dan prosedur yang berkaitan dengan pengajian mereka di UniMAP. Pelajar perlu menggunakan buku ini sebagai panduan utama dalam merancang dan membuat keputusan mengenai kursus yang akan diambil dari semester pertama sehingga semester akhir pengajian. Buku panduan ini juga memberikan beberapa maklumat asas mengenai sistem akademik, struktur program, senarai kursus yang ditawarkan bersama-sama dengan sinopsis, sumber rujukan, senarai kakitangan dan maklumat berkaitan yang lain. Diharapkan pelajar akan mendapat manfaat daripada maklumat yang diberikan dalam buku panduan untuk merancang pengajian mereka di UniMAP.

The Academic Guidebook for Bachelor Degree Programme is prepared to assist new UniMAP students in understanding processes and procedures that are related to their study in UniMAP. Students should use this book as their major guidence in planning and deciding on courses to be taken from their first until final semester of their studies. This guidebook also gives some basic information on the academic system, program structures, list of courses offered together with the synopsis, references, list of staff and other related information. It is hoped that students will benefit from the information given in this guidebook and use the information to plan their studies in UniMAP.

Senarai Pusat Pengajian / *List of Schools*:

1. Pusat Pengajian Kejuruteraan Mikrolektronik / *School of Microelectronic Engineering*
2. Pusat Pengajian Kejuruteraan Komputer & Perhubungan / *School of Computer & Communication Engineering*
3. Pusat Pengajian Kejuruteraan Mekatronik / *School of Mechatronic Engineering*
4. Pusat Pengajian Kejuruteraan Sistem Elektrik / *School of Electrical Systems Engineering*
5. Pusat Pengajian Kejuruteraan Pembuatan / *School of Manufacturing Engineering*
6. Pusat Pengajian Kejuruteraan Bahan / *School of Materials Engineering*
7. Pusat Pengajian Kejuruteraan Bioproses / *School of Bioprocess Engineering*
8. Pusat Pengajian Kejuruteraan Alam Sekitar / *School of Environmental Engineering*
9. Pusat Pengajian Inovasi Perniagaan & Teknousahawan / *School of Business Innovation and Technopreneurship*
10. Pusat Pengajian Pembangunan Insan dan Teknokomunikasi / *School of Human Development and Technocommunication* (iKOM)
11. Fakulti Teknologi Kejuruteraan / *Faculty of Engineering Technology*

Pusat-Pusat Pemantapan Akademik / *Academic Support Centres*:

1. Institut Matematik Kejuruteraan / *Institute of Engineering Mathematics* (IMK)
2. Pusat Kejuruteraan / *Engineering Centre*
3. Pusat Bahasa Antarabangsa / *Centre for International Languages*
4. Pusat Ko-kurikulum / *Centre for Co-Curriculum*
5. Pusat Kerjasama Industri dan Agensi Kerajaan / *Centre for Industrial and Governmental Collaboration* (CIGC)

Senarai Program Pengajian Sarjana Muda / *List of Degree Programmes*:

1. Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Mikroelektronik) /
Bachelor of Engineering (Honours) (Microelectronic Engineering)
2. Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Elektronik) /
Bachelor of Engineering (Honours) (Electronic Engineering)
3. Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Fotonik) /
Bachelor of Engineering (Honours) (Photonic Engineering)
4. Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Komputer) /
Bachelor of Engineering (Honours) (Computer Engineering)
5. Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Perhubungan) /
Bachelor of Engineering (Honours) (Communication Engineering)
6. Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Rangkaian Komputer) /
Bachelor of Engineering (Honours) (Computer Network Engineering)
7. Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Mekatronik) /
Bachelor of Engineering (Honours) (Mechatronic Engineering)
8. Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Mekanikal) /
Bachelor of Engineering (Honours) (Mechanical Engineering)
9. Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Elektronik Bioperubatan) /
Bachelor of Engineering (Honours) (Biomedical Electronic Engineering)
10. Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Sistem Elektrik) /
Bachelor of Engineering (Honours) (Electrical System Engineering)
11. Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Elektronik Industri) /
Bachelor of Engineering (Honours) (Industrial Electronic Engineering)
12. Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Elektrik Sistem Tenaga) /
Bachelor of Engineering (Honours) (Electrical Energy System Engineering)
13. Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Pembuatan) /
Bachelor of Engineering (Honours) (Manufacturing Engineering)
14. Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Rekabentuk Produk) /
Bachelor of Engineering (Honours) (Product Design Engineering)
15. Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Bahan) /
Bachelor of Engineering (Honours) (Materials Engineering)
16. Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Metalurgi) /
Bachelor of Engineering (Honours) (Metallurgical Engineering)
17. Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Polimer) /
Bachelor of Engineering (Honours) (Polymer Engineering)
18. Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Bioproses) /
Bachelor of Engineering (Honours) (Bioprocess Engineering)
19. Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Biosistem) /
Bachelor of Engineering (Honours) (Biosystems Engineering)
20. Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Alam Sekitar) /
Bachelor of Engineering (Honours) (Environmental Engineering)

21. Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Awam) /
    Bachelor of Engineering (Honours) (Civil Engineering)
22. Sarjana Muda Perniagaan (Kepujian) (Keusahawanan Kejuruteraan) /
    Bachelor of Business (Honours) (Engineering Entrepreneurship)
23. Sarjana Muda Perniagaan (Kepujian) (Perniagaan Antarabangsa) /
    Bachelor of Business (Honours) (International Business)
24. Sarjana Muda Teknologi Kejuruteraan Kimia (Kepujian) (Bioteknologi Industri) /
    Bachelor of Chemical Engineering Technology (Honours) (Industrial Biotechnology)
25. Sarjana Muda Teknologi Kejuruteraan Elektronik (Kepujian) (Rekabentuk Rangkaian Elektronik) /
    Bachelor of Electronic Engineering Technology (Honours) (Electronic Network Design)
26. Sarjana Muda Teknologi Kejuruteraan Elektrik (Kepujian) (Kuasa Industri) /
    Bachelor of Electrical Engineering Technology (Honours) (Industrial Power)
27. Sarjana Muda Teknologi Kejuruteraan Mekanikal (Kepujian) (Pemesinan) /
    Bachelor of Mechanical Engineering Technology (Honours) (Machining)
28. Sarjana Muda Teknologi Kejuruteraan Mekanikal (Kepujian) (Sistem Pertanian) /
    Bachelor of Mechanical Engineering Technology (Honours) (Agricultural System)
29. Sarjana Muda Teknologi Kejuruteraan Awam (Kepujian) (Pembinaan) /
    Bachelor of Civil Engineering Technology (Honours) (Construction)
30. Sarjana Muda Teknologi Kejuruteraan Mekanikal (Kepujian) (Pembangunan Produk) /
    Bachelor of Mechanical Engineering Technology (Honours) (Product Development)
31. Sarjana Muda Teknologi Kejuruteraan Mekanikal (Kepujian) (Pemprosesan Bahan) /
    Bachelor of Mechanical Engineering Technology (Honours) (Material Processing)
32. Sarjana Muda Teknologi Kejuruteraan Elektrik (Kepujian) (Teknologi Robotik dan Automasi) /
    Bachelor of Electrical Engineering Technology (Honours) (Robotic and Automation Technology)
33. Sarjana Muda Teknologi Kejuruteraan Elektronik (Kepujian) (Sistem Elektronik) /
    Bachelor of Electronic Engineering Technology (Honours) (Electronic System)
34. Sarjana Muda Teknologi Kejuruteraan Elektronik (Kepujian) (Elektronik Bersepadu) /
    Bachelor of Electronic Engineering Technology (Honours) (Integrated Electronic)
35. Sarjana Muda Teknologi Kejuruteraan Elektronik (Kepujian) (Rekabentuk Telekomunikasi Elektronik) /
    Bachelor of Electronic Engineering Technology (Honours) (Electronic Telecommunication Design)
36. Sarjana Muda Teknologi Kejuruteraan Kimia (Kepujian) (Proses Kimia Industri) /
    Bachelor of Chemical Engineering Technology (Honours) (Industrial Chemical Process)
37. Sarjana Muda Teknologi Kejuruteraan Kimia (Kepujian) (Agromakanan) /
    Bachelor of Chemical Engineering Technology (Honours) (Agrofood)
38. Sarjana Muda Teknologi Kejuruteraan Mekanikal (Kepujian) (Teknologi Sukan) /
    Bachelor of Mechanical Engineering Technology (Honours) (Sport Technology)
39. Sarjana Muda Teknologi Kejuruteraan Awam (Kepujian) (Bangunan) /
    Bachelor of Engineering Technology in Civil Engineering (Honours) (Building)
40. Sarjana Muda Komunikasi Media Baharu (Kepujian) /
    Bachelor of New Media Communication (Honours)

MISI / *MISSION*:

Melahirkan Modal insan kamil yang menyumbang kepada agenda pembangunan dan daya saing industri negara.
To produce holistic human capital that contributes to the nation's development and industrial competitiveness agenda.

VISI / *VISION*:

Institusi akademik dan penyelidikan yang berdaya saing di persada antarabangsa.
An internationally competitive academic and research institution.

LAGU UniMAP / *UniMAP ANTHEM*:

WAWASANKU

Universiti Malaysia Perlis
Alam Kejuruteraan
Ilmu Keikhlasan Kecemerlangan
Wawasan Jiwa Kita

Berdikari rohaniah
Berteknologi
Pemimpin Berbestari
Untuk Bangsa Insan Dan Umat dunia
Negara Yang Tercinta

Universiti Malaysia Perlis
Alam Kejuruteraan
Ilmu Keikhlasan Kecemerlangan
Wawasan Jiwa Kita

DULI YANG TERAMAT MULIA
TUANKU SYED FAIZUDDIN PUTRA IBNI TUANKU SYED SIRAJUDDIN JAMALULLAIL
D.K., S.P.M.P., P.A.T., Doctor of Education (Honoris Causa) La Trobe University Melbourne, Australia

RAJA MUDA PERLIS

(CANSELOR UNIVERSITI MALAYSIA PERLIS)

DULI YANG TERAMAT MULIA
TUANKU HAJAH LAILATUL SHAHREEN AKASHAH KHALIL
S.P.M.P., Honoris Causa in Health Sciences (Universidad Nacional Pedro Henriquez Urena, DR)

RAJA PUAN MUDA PERLIS
(PRO-CANSELOR UNIVERSITI MALAYSIA PERLIS)

KATA ALUAN NAIB CANSELOR

Bismillahirahmanirrahim

Assalamualaikum Warahmatullahi Wabarakatuh dan Salam Sejahtera.

Salam Ilmu, Keikhlasan, Kecemerlangan UniMAP,

Syukur ke hadrat Allah SWT kerana dengan limpah dan kurniaNya, Buku Panduan Akademik Program Pengajian Ijazah Sarjana Muda Sidang Akademik 2015/2016 dapat diterbitkan untuk membantu pelajar-pelajar baharu dalam memahami proses dan prosedur yang berkaitan dengan pengajian mereka.

Sekalung tahniah diucapkan kepada anak-anak pelajar yang telah berjaya menempatkan diri ke Universiti Malaysia Perlis, sebuah ‘Universiti Pilihan yang Berdaya Saing dan merupakan Universiti Awam Malaysia pertama yang dianugerahkan QS Star.

Menuntut ilmu merupakan suatu proses yang berterusan untuk membentuk diri kita menjadi lebih baik dari sebelumnya. Keberadaan anak-anak pelajar sekalian di universiti ini, adalah menjadi tanggungjawab anda mempersiapkan diri untuk mengaut ilmu sebanyak mungkin bagi memperolehi pengalaman yang berganda untuk bergelar seorang siswazah yang cemerlang duniawi dan ukhrawi serta dapat memberi sumbangan dan manfaat kepada bukan hanya universiti ini malah kepada agama, negara dan juga masyarakat.

Di samping itu, saya dan seluruh warga UniMAP juga mengharapkan agar anak-anak pelajar sekalian akan bergerak seiringan, membantu UniMAP bagi merealisasikan misi untuk Melahirkan Modal Insan Kamil yang dapat menyumbang kepada Agenda Pembangunan dan Daya Saing Industri Negara bukan sahaja di peringkat kebangsaan malah di arena antarabangsa.

Akhir kata, selamat maju jaya diucapkan kepada anak-anak pelajar sekalian yang kini sudah melangkah alam menara gading yang bakal menjanjikan pelbagai cabaran dan keseronokan dalam usaha mendaki puncak kejayaan. Semoga peluang yang diperolehi ini tidak akan dipersiakan, sebaliknya menjadi pembakar semangat untuk mencatatkan kejayaan yang lebih cemerlang, gemilang dan terbilang selaras dengan Visi UniMAP.

Sekian, Wassalam.

Brig. Jen. Datuk Prof. Dr.
Kamarudin Hussin
Naib Canselor

VICE CHANCELLOR’S MESSAGE

Bismillahirrahmanirrahim

Assalamualaikum Warahmatullahi Wabarakatuh and Salam Sejahtera.

Salam Ilmu, Keikhlasan, Kecemerlangan UniMAP,

All Praise to the Almighty for His blessings that we are able to produce the UniMAP Academic Guide Book for the 2015/2016 Academic Session to assist our new students in understanding the processes and procedures related to their studies.

Congratulations to the new students who have successfully earned their positions in Universiti Malaysia Perlis, a ‘Competitive University of Choice’ and the first QS Star awarded Malaysian Public University.

Seeking knowledge is a continuous process in establishing our attitude in order to be better in the future. With your presence in this university, it is your responsibility to prepare yourself in earning as much experience as you can in order to become the outstanding graduates not just in this world, but as well as in the hereafter, and at the same time positively contributing not only towards the university but also towards the religion, nation and society.

In addition, the entire staff of UniMAP and I are also hoping that you will be moving in tandem with us in helping UniMAP to objectify the mission which is Producing a Holistic Human Capital who are able to Contribute to the Nation’s Development and Industrial Competitiveness Agenda, not only at national level but also at the international arena.

Finally, best wishes to all of you, who have stepped into the higher level of education that would promise a variety of challenges and excitements in the attempt to achieve pure success. Hopefully this opportunity will not be wasted, but rather become the ignition to achieve a whole new level of excellence, in line with UniMAP’s vision.

Thank you, Wassalam.

Brig. Jen. Datuk Prof. Dr.
Kamarudin Hussin
Vice Chancellor

Pegawai Utama UniMAP
UniMAP Principal Officers

Brig. Jen. Datuk Prof. Dr. Kamarudin Hussin
Naib Canselor / *Vice Chancellor*

Dato' Prof. Dr.
Zul Azhar Zahid Jamal
Timbalan Naib Canselor
(Akademik & Antarabangsa) /
Deputy Vice Chancellor
(Academic & International)

Prof. Dr. Abdul Hamid Adom
Timbalan Naib Canselor
(Penyelidikan & Inovasi) /
Deputy Vice Chancellor
(Research & Innovation)

Prof. Madya Dr.
Mohd Fo'ad Sakdan
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Deputy Vice Chancellor
(Students Affairs & Alumni)

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Pn. Saodah Hassan
Bendahari / *Bursar*

Pn. Mazmin Mat Akhir
Pustakawan Kanan /
Chief Librarian

KALENDAR AKADEMIK IJAZAH SARJANA MUDA
SEMESTER PERTAMA, SIDANG AKADEMIK 2015/2016

SEMESTER 1 7 September 2015 hingga 17 Januari 2016 (19 minggu)				
AKTIVITI	**JANGKA MASA**		**TEMPOH**	**CATATAN**
Pendaftaran Pelajar Baru / Minggu Suai Kenal	1 September 2015	6 September 2015	6 hari	**Hari Kebangsaan** 31 Ogos 2015 (Isnin)
Kuliah	7 September 2015	8 November 2015	9 minggu	**Hari Malaysia** 16 September 2015 [Rabu] **Hari Raya Qurban** 24 & 25 September 2015 [Khamis & Jumaat] **Awal Muharam** 14 Oktober 2015 [Rabu]
Cuti Pertengahan Semester	9 November 2015	15 November 2015	1 minggu	**Hari Deepavali** 10 November 2015 [Selasa]
Kuliah	16 November 2015	20 Disember 2015	5 minggu	-
Minggu Ulangkaji	21 Disember 2015	27 Disember 2015	1 minggu	**Maulidur Rasul** 24 Disember 2015 [Khamis] **Hari Krismas** 25 Disember 2015 [Jumaat]
Peperiksaan	28 Disember 2016	17 Januari 2016	3 minggu	
Cuti Antara Semester	18 Januari 2016	14 Februari 2016	4 minggu	**Tahun Baru Cina** 8 & 9 Februari 2016 [Isnin & Selasa]

BAHASA MELAYU

KALENDAR AKADEMIK IJAZAH SARJANA MUDA
SEMESTER PERTAMA, SIDANG AKADEMIK 2015/2016

SEMESTER 2 15 Februari hingga 26 Jun 2016 (19 minggu)				
AKTIVITI	**JANGKA MASA**		**TEMPOH**	**CATATAN**
Kuliah	15 Februari 2016	10 April 2016	8 minggu	-
Cuti Pertengahan Semester	11 April 2016	17 April 2016	1 minggu	-
Kuliah	18 April 2016	29 Mei 2016	6 minggu	**Hari Pekerja** 1 Mei 2016 [Ahad] **Israk Mikraj** 5 Mei 2016 [Khamis] **Hari Keputeraan DYMM Tuanku Raja Perlis** 17 Mei 2016 [Selasa] **Cuti Hari Wesak** 21 Mei 2016 [Sabtu]
Minggu Ulangkaji	30 Mei 2016	5 Jun 2016	1 minggu	**Hari Keputeraan SPB Yang Di-Pertuan Agung** 4 Jun 2016 [Sabtu]
Peperiksaan	6 Jun 2016	26 Jun 2016	3 minggu	**Nuzul Al-Quran** 22 Jun 2016 [Rabu]
Cuti Panjang / Latihan Industri	27 Jun 2016	4 September 2016	10 minggu *Latihan Industri	**Hari Raya Aidilfitri** 7 & 8 Julai 2016 [Khamis & Jumaat] **Hari Kebangsaan** 31 Ogos 2016 [Rabu]

**Latihan Industri (LI) bagi pelajar tahun 3 Ijazah Sarjana Muda Kejuruteraan dan pelajar tahun 2 Ijazah Sarjana Muda Perniagaan (Keusahawanan Kejuruteraan) bagi Semester II Sidang Akademik 2015/2016 akan bermula pada 27 Jun sehingga 4 September 2016 selama 10 minggu*

SYARAT KEMASUKAN BAGI PROGRAM PENGAJIAN IJAZAH SIDANG AKADEMIK 2015/2016
CALON LEPASAN MATRIKULASI

BIL	(i) Program Pengajian (ii) Kod (iii) Tempoh Pengajian	Kelayakan Minimum Matrikulasi / Asasi
		Syarat Am Universiti Lulus Sijil Pelajaran Malaysia (SPM)/Setaraf dengan mendapat kepujian dalam mata pelajaran **Bahasa Melayu / Bahasa Malaysia** atau kepujian **Bahasa Melayu / Bahasa Malaysia** Kertas Julai; **dan** Lulus **Matrikulasi KPM / Asasi Sains UM / Asasi UiTM** dengan mendapat sekurang-kurangnya **PNGK 2.00**; **dan** Mendapat sekurang-kurangnya **Tahap 1 (Band 1)** dalam **Malaysian University English Test (MUET)**.
Program Kejuruteraan		
1.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Awam) **RK01** (8 Semester)	**Memenuhi Syarat Am Universiti** **serta** **Syarat Khas Program** **Syarat Khas Program:** Mendapat sekurang-kurangnya **Gred C (2.00)** pada peringkat Matrikulasi / Asasi dalam mana-mana mata pelajaran berikut:- **(i) Physics / Engineering Physics / Chemistry / Engineering Chemistry;** **dan** **(ii) Mathematics** Calon yang menggunakan kelayakan mata pelajaran **Chemistry / Engineering Chemistry** pada peringkat Matrikulasi / Asasi perlu mendapat sekurang-kurangnya **kepujian (Gred C)** pada peringkat SPM dalam mata pelajaran **Physics.** **dan** Calon tidak buta warna dan tidak cacat anggota sehingga menyukarkan kerja amali.
2.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Mikroelektronik) **RK05** (8 Semester)	
3.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Mekanikal) **RK08** (8 Semester)	
4.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Pembuatan) **RK13** (8 Semester)	

BAHASA MELAYU

BIL	(i) Program Pengajian (ii) Kod (iii) Tempoh Pengajian	Kelayakan Minimum Matrikulasi / Asasi
5.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Komputer) **RK20** (8 Semester)	**Memenuhi Syarat Am Universiti** **serta** **Syarat Khas Program** **Syarat Khas Program:** Mendapat sekurang-kurangnya **Gred C (2.00)** pada peringkat Matrikulasi / Asasi dalam mana-mana mata pelajaran berikut:- **(i) Physics / Engineering Physics / Chemistry / Engineering Chemistry;** **dan** **(ii) Mathematics** Calon yang menggunakan kelayakan mata pelajaran **Chemistry / Engineering Chemistry** pada peringkat Matrikulasi / Asasi perlu mendapat sekurang-kurangnya **kepujian (Gred C)** pada peringkat SPM dalam mata pelajaran **Physics.** **dan** Calon tidak buta warna dan tidak cacat anggota sehingga menyukarkan kerja amali.
6.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Sistem Elektrik) **RK23** (8 Semester)	
7.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Mekatronik) **RK24** (8 Semester)	
8.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Elektronik Industri) **RK45** (8 Semester)	
9.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Perhubungan) **RK53** (8 Semester)	
10.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Metalurgi) **RK56** (8 Semester)	
11.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Rekabentuk Produk) **RK84** (8 Semester)	

BIL	(i) Program Pengajian (ii) Kod (iii) Tempoh Pengajian	Kelayakan Minimum Matrikulasi / Asasi
12.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Elektronik) **RK86** (8 Semester)	**Memenuhi Syarat Am Universiti** **serta** **Syarat Khas Program** **Syarat Khas Program:** Mendapat sekurang-kurangnya **Gred C (2.00)** pada peringkat Matrikulasi / Asasi dalam mana-mana mata pelajaran berikut:- **(i) Physics / Engineering Physics / Chemistry / Engineering Chemistry;** **dan** **(ii) Mathematics** Calon yang menggunakan kelayakan mata pelajaran **Chemistry / Engineering Chemistry** pada peringkat Matrikulasi / Asasi perlu mendapat sekurang-kurangnya **kepujian (Gred C)** pada peringkat SPM dalam mata pelajaran **Physics.** **dan** Calon tidak buta warna dan tidak cacat anggota sehingga menyukarkan kerja amali.
13.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Fotonik) **RK89** (8 Semester)	
14.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Rangkaian Komputer) **RK93** (8 Semester)	
15.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Elektrik Sistem Tenaga) **RK96** (8 Semester)	

<table>
<tr><th>BIL</th><th>(i) Program Pengajian
(ii) Kod
(iii) Tempoh Pengajian</th><th>Kelayakan Minimum Matrikulasi / Asasi</th></tr>
<tr><td>16.</td><td>Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Alam Sekitar)
RK07
(8 Semester)</td><td rowspan="6">Memenuhi Syarat Am Universiti
serta
Syarat Khas Program

Syarat Khas Program:

Mendapat sekurang-kurangnya Gred C (2.00) pada peringkat Matrikulasi / Asasi dalam mana-mana mata pelajaran berikut :-

(i) Physics / Engineering Physics / Chemistry / Engineering Chemistry / Biology;

dan

(ii) Mathematics

Calon yang menggunakan kelayakan mata pelajaran Chemistry / Engineering Chemistry / Biology pada peringkat Matrikulasi / Asasi perlu mendapat sekurang-kurangnya kepujian (Gred C) pada peringkat SPM dalam mata pelajaran Physics.

dan

Calon tidak buta warna dan tidak cacat anggota sehingga menyukarkan kerja amali.</td></tr>
<tr><td>17.</td><td>Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Bahan)
RK12
(8 Semester)</td></tr>
<tr><td>18.</td><td>Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Bioproses)
RK28
(8 Semester)</td></tr>
<tr><td>19.</td><td>Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Polimer)
RK32
(8 Semester)</td></tr>
<tr><td>20.</td><td>Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Elektronik Bioperubatan)
RK85
(8 Semester)</td></tr>
<tr><td>21.</td><td>Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Biosistem)
RK90
(8 Semester)</td></tr>
</table>

BIL	(i) Program Pengajian (ii) Kod (iii) Tempoh Pengajian	Kelayakan Minimum Matrikulasi / Asasi
Program Perniagaan		
22.	Ijazah Sarjana Muda Perniagaan (Kepujian) (Keusahawanan Kejuruteraan) **RP52** (6 Semester)	**Memenuhi Syarat Am Universiti** **serta** **Syarat Khas Program** **Syarat Khas Program:** Lulus **Sijil Matrikulasi KPM / Asasi Sains UM / Asasi UiTM** / setaraf (dalam aliran sains, aliran teknikal atau aliran perakaunan) dengan mendapat: Sekurang-kurangnya **Gred C (2.00)** dalam mana-mana satu (1) daripada mata pelajaran berikut: **Aliran Sains / Aliran Teknikal:** **Mathematics / Physics / Engineering Physics / Chemistry / Engineering Chemistry / Biology / Computer Science / Civil Engineering Studies / Mechanical Engineering Studies / Electrical And Electronic Engineering Studies / Computing** **atau** **Aliran Perakaunan:** **Mathematics / Ekonomi / Pengurusan Perniagaan / Akaun** **dan** Mendapat sekurang-kurangnya **kepujian (Gred C)** di peringkat **Sijil Pelajaran Malaysia (SPM) / setaraf** di dalam mata pelajaran berikut: **(i) Bahasa Inggeris** **dan** **(ii) Salah satu (1) daripada mata pelajaran berikut:** Mathematics / Additional Mathematics / Physics / Chemistry / Biology / Lukisan Kejuruteraan / Teknologi Kejuruteraan / Pengajian Kejuruteraan Awam / Pengajian Kejuruteraan Mekanikal / Pengajian Kejuruteraan Elektrik & Elektronik / Prinsip Perakaunan / Ekonomi Asas / Perdagangan / Pengajian Keusahawanan / Perakaunan Perniagaan **dan** Calon tidak cacat anggota sehingga menyukarkan pembelajaran.

BIL	(i) Program Pengajian (ii) Kod (iii) Tempoh Pengajian	Kelayakan Minimum Matrikulasi / Asasi
Program Perniagaan		
23.	Ijazah Sarjana Muda Perniagaan (Kepujian) (Perniagaan Antarabangsa) **RE09** (6 Semester)	**Memenuhi Syarat Am Universiti serta Syarat Khas Program** **Syarat Khas Program:** Lulus **Sijil Matrikulasi KPM / Asasi Sains UM / Asasi UiTM** / setaraf (dalam aliran sains, aliran teknikal atau aliran perakaunan) dengan mendapat: Sekurang-kurangnya **Gred C (2.00)** dalam mana-mana satu (1) daripada mata pelajaran berikut: **Aliran Sains / Aliran Teknikal:** **Mathematics / Physics / Engineering Physics / Chemistry / Engineering Chemistry / Biology / Computer Science / Civil Engineering Studies / Mechanical Engineering Studies / Electrical And Electronic Engineering Studies / Computing** **atau** **Aliran Perakaunan:** **Mathematics / Ekonomi / Pengurusan Perniagaan / Akaun** **dan** Mendapat sekurang-kurangnya **kepujian (Gred C)** di peringkat **Sijil Pelajaran Malaysia (SPM) / setaraf** di dalam mata pelajaran berikut: **(i) Bahasa Inggeris** **dan** **(ii) Salah satu** (1) daripada mata pelajaran berikut: Mathematics / Additional Mathematics / Prinsip Perakaunan / Ekonomi Asas / Perdagangan / Pengajian Keusahawanan / Perakaunan Perniagaan **dan** Calon tidak cacat anggota sehingga menyukarkan pembelajaran.

<table>
<tr><th>BIL</th><th>(i) Program Pengajian
(ii) Kod
(iii) Tempoh Pengajian</th><th>Kelayakan Minimum Matrikulasi / Asasi</th></tr>
<tr><th colspan="3">Program Teknologi Kejuruteraan</th></tr>
<tr><td>24.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Awam (Kepujian) (Pembinaan)
RY11
(8 Semester)</td><td rowspan="7">Memenuhi Syarat Am Universiti
serta
Syarat Khas Program

Syarat Khas Program:

Mendapat sekurang-kurangnya Gred C (2.00) pada peringkat Matrikulasi / Asasi dalam mana-mana mata pelajaran berikut:-

(i) Physics / Engineering Physics / Chemistry / Engineering Chemistry/ Biology / Civil Engineering Studies / Mechanical Engineering Studies / Electrical And Electronic Engineering Studies;

dan

(ii) Mathematics

Calon yang menggunakan kelayakan mata pelajaran Chemistry / Engineering Chemistry / Biology / Civil Engineering Studies / Mechanical Engineering Studies / Electrical And Electronic Engineering Studies pada peringkat Matrikulasi / Asasi perlu mendapat sekurang-kurangnya kepujian (Gred C) pada peringkat SPM dalam mata pelajaran Physics.

dan

Calon tidak buta warna dan tidak cacat anggota sehingga menyukarkan kerja amali.</td></tr>
<tr><td>25.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Kimia (Kepujian) (Proses Kimia Industri)
RY20
(8 Semester)</td></tr>
<tr><td>26.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Kimia (Kepujian) (Bioteknologi Industri)
RY21
(8 Semester)</td></tr>
<tr><td>27.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Elektrik (Kepujian) (Kuasa Industri)
RY31
(8 Semester)</td></tr>
<tr><td>28.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Elektrik (Kepujian) (Teknologi Robotik dan Automasi)
RY32
(8 Semester)</td></tr>
<tr><td>29.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Elektronik (Kepujian) (Sistem Elektronik)
RY40
(8 Semester)</td></tr>
<tr><td>30.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Elektronik (Kepujian) (Rekabentuk Telekomunikasi Elektronik)
RY41
(8 Semester)</td></tr>
</table>

BAHASA MELAYU

BIL	(i) Program Pengajian (ii) Kod (iii) Tempoh Pengajian	Kelayakan Minimum Matrikulasi / Asasi
Program Teknologi Kejuruteraan		
31.	Ijazah Sarjana Muda Teknologi Kejuruteraan Elektronik (Kepujian) (Rekabentuk Rangkaian Elektronik) **RY43** (8 Semester)	**Memenuhi Syarat Am Universiti serta Syarat Khas Program** **Syarat Khas Program:** Mendapat sekurang-kurangnya **Gred C (2.00)** pada peringkat Matrikulasi / Asasi dalam mana-mana mata pelajaran berikut:- **(i) Physics / Engineering Physics / Chemistry / Engineering Chemistry/ Biology / Civil Engineering Studies / Mechanical Engineering Studies / Electrical And Electronic Engineering Studies;** **dan** **(ii) Mathematics** Calon yang menggunakan kelayakan mata pelajaran **Chemistry / Engineering Chemistry / Biology / Civil Engineering Studies / Mechanical Engineering Studies / Electrical And Electronic Engineering Studies** pada peringkat Matrikulasi / Asasi perlu mendapat sekurang-kurangnya **kepujian (Gred C)** pada peringkat SPM dalam mata pelajaran **Physics**. **dan** Calon tidak buta warna dan tidak cacat anggota sehingga menyukarkan kerja amali.
32.	Ijazah Sarjana Muda Teknologi Kejuruteraan Elektronik (Kepujian) (Elektronik Bersepadu) **RY44** (8 Semester)	
33.	Ijazah Sarjana Muda Teknologi Kejuruteraan Mekanikal (Kepujian) (Pemesinan) **RY55** (8 Semester)	
34.	Ijazah Sarjana Muda Teknologi Kejuruteraan Mekanikal (Kepujian) (Sistem Pertanian) **RY56** (8 Semester)	
35.	Ijazah Sarjana Muda Teknologi Kejuruteraan Mekanikal (Kepujian) (Pembangunan Produk) **RY57** (8 Semester)	
36.	Ijazah Sarjana Muda Teknologi Kejuruteraan Mekanikal (Kepujian) (Pemprosesan Bahan) **RY58** (8 Semester)	

BIL	(i) Program Pengajian (ii) Kod (iii) Tempoh Pengajian	Kelayakan Minimum Matrikulasi / Asasi
Program Komunikasi Media Baharu		
37.	Ijazah Sarjana Muda Komunikasi Media Baharu (Kepujian) **RA72** (6 Semester)	**Memenuhi Syarat Am Universiti** **serta** **Syarat Khas Program** **Syarat Khas Program:** **Lulus Sijil Matrikulasi KPM / Asasi Sains UM / Asasi UiTM / setaraf (dalam aliran sains, aliran teknikal atau aliran perakaunan)** dengan mendapat: Sekurang-kurangnya **Gred C (2.00)** dalam mana-mana satu (1) daripada mata pelajaran berikut: Aliran Sains / Aliran Teknikal: **Mathematics / Physics / Engineering Physics / Chemistry / Engineering Chemistry / Biology / Computer Science / Civil Engineering Studies / Mechanical Engineering Studies / Electrical And Electronic Engineering Studies / Computing** **atau** **Aliran Perakaunan:** **Mathematics / Ekonomi / Pengurusan Perniagaan / Akaun** **dan** **Mendapat sekurang-kurangnya Tahap 2 (Band 2) dalam Malaysia University English Test (MUET)** **dan** Calon tidak cacat anggota sehingga menyukarkan pembelajaran.

BAHASA MELAYU

SYARAT KEMASUKAN BAGI PROGRAM PENGAJIAN IJAZAH SIDANG AKADEMIK 2015/2016

CALON LEPASAN STPM

BIL	(i) Program Pengajian (ii) Kod (iii) Tempoh Pengajian	Kelayakan Minimum STPM
		Syarat Am Universiti Lulus Sijil Pelajaran Malaysia (SPM) / Setaraf dengan mendapat kepujian dalam mata pelajaran **Bahasa Melayu / Bahasa Malaysia atau kepujian Bahasa Melayu / Bahasa Malaysia** Kertas Julai. **dan** Lulus Peperiksaan Sijil Tinggi Persekolahan Malaysia (STPM) dengan mendapat **sekurang-kurangnya PNGK 2.00** dan mendapat sekurang-kurangnya : • **Gred C (NGMP 2.00)** mata pelajaran **Pengajian Am**; **dan** • **Gred C (NGMP 2.00)** dalam **dua (2)** mata pelajaran lain. **dan** Mendapat sekurang-kurangnya **Tahap 1 (Band 1)** dalam **Malaysian University English Test (MUET)**.

BIL	(i) Program Pengajian (ii) Kod (iii) Tempoh Pengajian	Kelayakan Minimum STPM
Program Kejuruteraan		
1.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Awam) **RK01** (8 Semester)	**Memenuhi Syarat Am Universiti** **serta** **Syarat Khas Program** **Syarat Khas Program:** Mendapat sekurang-kurangnya **Gred C (NGMP 2.00)** pada peringkat STPM dalam mata pelajaran berikut: **(i) Physics / Chemistry;** **dan** **(ii) Mathematics T / Further Mathematics** Calon yang menggunakan kelayakan mata pelajaran **Chemistry** pada peringkat STPM perlu mendapat sekurang-kurangnya **kepujian (Gred C)** pada peringkat SPM dalam mata pelajaran **Physics**. **dan** Calon tidak buta warna dan tidak cacat anggota sehingga menyukarkan kerja amali.
2.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Mikroelektronik) **RK05** (8 Semester)	
3.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) Kejuruteraan Mekanikal **RK08** (8 Semester)	
4.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Pembuatan) **RK13** (8 Semester)	
5.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Komputer) **RK20** (8 Semester)	
6.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Sistem Elektrik) **RK23** (8 Semester)	
7.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Mekatronik) **RK24** (8 Semester)	

BIL	(i) Program Pengajian (ii) Kod (iii) Tempoh Pengajian	Kelayakan Minimum STPM
Program Kejuruteraan		
8.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Elektronik Industri) **RK45** (8 Semester)	**Memenuhi Syarat Am Universiti** **serta** **Syarat Khas Program** **Syarat Khas Program:** Mendapat sekurang-kurangnya **Gred C (NGMP 2.00)** pada peringkat STPM dalam mata pelajaran berikut: **(i) Physics / Chemistry;** **dan** **(ii) Mathematics T / Further Mathematics** Calon yang menggunakan kelayakan mata pelajaran **Chemistry** pada peringkat STPM perlu mendapat sekurang-kurangnya **kepujian (Gred C)** pada peringkat SPM dalam mata pelajaran **Physics**. **dan** Calon tidak buta warna dan tidak cacat anggota sehingga menyukarkan kerja amali.
9.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Perhubungan) **RK53** (8 Semester)	
10.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Metalurgi) **RK56** (8 Semester)	
11.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Rekabentuk Produk) **RK84** (8 Semester)	
12.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Elektronik) **RK86** (8 Semester)	
13.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Fotonik) **RK89** (8 Semester)	
14.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Rangkaian Komputer) **RK93** (8 Semester)	
15.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Elektrik Sistem Tenaga) **RK96** (8 Semester)	

BIL	(i) Program Pengajian (ii) Kod (iii) Tempoh Pengajian	Kelayakan Minimum STPM
Program Kejuruteraan		
16.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Alam Sekitar) **RK07** (8 Semester)	**Memenuhi Syarat Am Universiti** **serta** **Syarat Khas Program** **Syarat Khas Program:** Mendapat sekurang-kurangnya **Gred C (NGMP 2.00)** pada peringkat STPM dalam mata pelajaran berikut: **(i) Physics / Chemistry;** **dan** **(ii) Mathematics T / Further Mathematics** Calon yang menggunakan kelayakan mata pelajaran **Chemistry** pada peringkat STPM perlu mendapat sekurang-kurangnya **kepujian (Gred C)** pada peringkat SPM dalam mata pelajaran **Physics**. **dan** Calon tidak buta warna dan tidak cacat anggota sehingga menyukarkan kerja amali.
17.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) Kejuruteraan Bahan **RK12** (8 Semester)	
18.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Bioproses) **RK28** (8 Semester)	
19.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Polimer) **RK32** (8 Semester)	
20.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Elektronik Bioperubatan) **RK85** (8 Semester)	
21.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Biosistem) **RK90** (8 Semester)	

BIL	(i) Program Pengajian (ii) Kod (iii) Tempoh Pengajian	Kelayakan Minimum STPM
Program Perniagaan		
22.	Ijazah Sarjana Muda Perniagaan (Kepujian) (Keusahawanan Kejuruteraan) **RP52** (6 Semester)	**Memenuhi Syarat Am Universiti** **serta** **Syarat Khas Program** **Syarat Khas Program:** Lulus Sijil Tinggi Pelajaran Malaysia (STPM) / setaraf dengan mendapat: Sekurang-kurangnya **Gred C (2.00)** dalam mana-mana satu (1) daripada mata pelajaran berikut: **Aliran Sains / Sastera:** **Mathematics T / Further Mathematics / Mathematics M / Physics / Chemistry / Biology / Economy / Pengurusan Perniagaan / Perakaunan / Information And Communications Technology (ICT)** **dan** Mendapat sekurang-kurangnya **kepujian (Gred C)** di peringkat **Sijil Pelajaran Malaysia (SPM)** / setaraf di dalam mata pelajaran berikut: **(i) Bahasa Inggeris** **dan** **(ii) Salah satu (1) daripada mata pelajaran berikut:** Mathematics / Additional Mathematics / Physics / Chemistry / Biology / Lukisan Kejuruteraan / Teknologi Kejuruteraan / Pengajian Kejuruteraan Awam / Pengajian Kejuruteraan Mekanikal / Pengajian Kejuruteraan Elektrik d& Elektronik / Prinsip Perakaunan / Ekonomi Asas / Perdagangan / Pengajian Keusahawanan / Perakaunan Perniagaan **dan** Calon tidak cacat anggota sehingga menyukarkan pembelajaran.

BIL	(i) Program Pengajian (ii) Kod (iii) Tempoh Pengajian	Kelayakan Minimum STPM
		Program Perniagaan
23.	Ijazah Sarjana Muda Perniagaan (Kepujian) (Perniagaan Antarabangsa) **RE09** (6 Semester)	**Memenuhi Syarat Am Universiti serta Syarat Khas Program** **Syarat Khas Program:** Lulus Sijil Tinggi Pelajaran Malaysia (STPM) / setaraf dengan mendapat: Sekurang-kurangnya **Gred C (2.00)** dalam mana-mana satu (1) daripada mata pelajaran berikut: **Aliran Sains / Sastera:** **Mathematics T / Further Mathematics / Mathematics M / Physics / Chemistry / Biology / Economy / Pengurusan Perniagaan / Perakaunan / Information And Communications Technology (ICT)** **dan** Mendapat sekurang-kurangnya **kepujian (Gred C)** di peringkat **Sijil Pelajaran Malaysia (SPM)** / setaraf di dalam mata pelajaran berikut: **(i) Bahasa Inggeris** **dan** **(ii) Salah satu (1) daripada mata pelajaran berikut:** Mathematics / Additional Mathematics / Prinsip Perakaunan / Ekonomi Asas / Perdagangan / Pengajian Keusahawanan / Perakaunan Perniagaan **dan** Calon tidak cacat anggota sehingga menyukarkan pembelajaran.

BIL	(i) Program Pengajian (ii) Kod (iii) Tempoh Pengajian	Kelayakan Minimum STPM
	Program Perniagaan	
24.	Ijazah Sarjana Muda Teknologi Kejuruteraan Awam (Kepujian) (Pembinaan) **RY11** (8 Semester)	**Memenuhi Syarat Am Universiti** **serta** **Syarat Khas Program** **Syarat Khas Program:** Mendapat sekurang-kurangnya **Gred C (NGMP 2.00)** pada peringkat STPM dalam mata pelajaran berikut: **(i) Physics / Chemistry / Biology;** **dan** **(ii) Mathematics T / Further Mathematics** Calon yang menggunakan kelayakan mata pelajaran **Chemistry / Biology** pada peringkat STPM perlu mendapat sekurang-kurangnya **kepujian (Gred C)** pada peringkat SPM dalam mata pelajaran **Physics**. **dan** Calon tidak buta warna dan tidak cacat anggota sehingga menyukarkan kerja amali.
25.	Ijazah Sarjana Muda Teknologi Kejuruteraan Kimia (Kepujian) (Proses Kimia Industri) **RY20** (8 Semester)	
26.	Ijazah Sarjana Muda Teknologi Kejuruteraan Kimia (Kepujian) (Bioteknologi Industri) **RY21** (8 Semester)	
27.	Ijazah Sarjana Muda Teknologi Kejuruteraan Elektrik (Kepujian) (Kuasa Industri) **RY31** (8 Semester)	
28.	Ijazah Sarjana Muda Teknologi Kejuruteraan Elektrik (Kepujian) (Teknologi Robotik dan Automasi) **RY32** (8 Semester)	
29.	Ijazah Sarjana Muda Teknologi Kejuruteraan Elektronik (Kepujian) (Sistem Elektronik) **RY40** (8 Semester)	
30.	Ijazah Sarjana Muda Teknologi Kejuruteraan Elektronik (Kepujian) (Rekabentuk Telekomunikasi Elektronik) **RY41** (8 Semester)	

<table>
<tr><th>BIL</th><th>(i) Program Pengajian
(ii) Kod
(iii) Tempoh Pengajian</th><th>Kelayakan Minimum STPM</th></tr>
<tr><th colspan="3">Program Perniagaan</th></tr>
<tr><td>31.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Elektronik (Kepujian) (Rekabentuk Rangkaian Elektronik)
RY43
(8 Semester)</td><td rowspan="6">Memenuhi Syarat Am Universiti
serta
Syarat Khas Program

Syarat Khas Program:

Mendapat sekurang-kurangnya Gred C (NGMP 2.00) pada peringkat STPM dalam mata pelajaran berikut:

(i) Physics / Chemistry / Biology;

dan

(ii) Mathematics T / Further Mathematics

Calon yang menggunakan kelayakan mata pelajaran Chemistry / Biology pada peringkat STPM perlu mendapat sekurang-kurangnya kepujian (Gred C) pada peringkat SPM dalam mata pelajaran Physics.

dan

Calon tidak buta warna dan tidak cacat anggota sehingga menyukarkan kerja amali.</td></tr>
<tr><td>32.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Elektronik (Kepujian) (Elektronik Bersepadu)
RY44
(8 Semester)</td></tr>
<tr><td>33.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Mekanikal (Kepujian) (Pemesinan)
RY55
(8 Semester)</td></tr>
<tr><td>34.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Mekanikal (Kepujian) (Sistem Pertanian)
RY56
(8 Semester)</td></tr>
<tr><td>35.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Mekanikal (Kepujian) (Pembangunan Produk)
RY57
(8 Semester)</td></tr>
<tr><td>36.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Mekanikal (Kepujian) (Pemprosesan Bahan)
RY58
(8 Semester)</td></tr>
</table>

BAHASA MELAYU

BIL	(i) Program Pengajian (ii) Kod (iii) Tempoh Pengajian	Kelayakan Minimum STPM
	Program Sains Sosial	
37.	Ijazah Sarjana Muda Komunikasi Media Baharu (Kepujian) **RA72** (6 Semester)	**Memenuhi Syarat Am Universiti** **serta** **Syarat Khas Program** **Syarat Khas Program:** Lulus Sijil Tinggi Pelajaran Malaysia (STPM) / setaraf dengan mendapat: Sekurang-kurangnya **Gred C (2.00)** dalam mana-mana satu (1) daripada mata pelajaran berikut: **Aliran Sains/Sastera:** Mathematics T / Mathematics M / Physics / Chemistry / Biology / Information And Communications Technology (ICT) / Mathematics M / Ekonomi / Pengurusan Perniagaan / Perakaunan / Kesusasteraan Melayu Komunikatif / Sejarah / Geografi / Sains Sukan / Seni Visual dan Mendapat sekurang-kurangnya **Tahap 2 (Band 2)** dalam **Malaysia University English Test (MUET)** **dan** Calon tidak cacat anggota sehingga menyukarkan pembelajaran.

SYARAT KEMASUKAN BAGI PROGRAM PENGAJIAN IJAZAH SIDANG AKADEMIK 2015/2016
CALON LEPASAN DIPLOMA/SETARAF

BIL	(i) Program Pengajian (ii) Kod (iii) Tempoh Pengajian	Kelayakan Minimum Diploma/Setaraf
		Lulus peperiksaan Sijil Pelajaran Malaysia (SPM) atau peperiksaan yang diiktiraf setaraf dengannya oleh Kerajaan Malaysia serta mendapat **kepujian dalam mata pelajaran Bahasa Melayu** atau **kepujian Bahasa Melayu Kertas Julai;** **dan** Memiliki kelulusan **Diploma** atau kelulusan lain yang diiktiraf setaraf dengannya oleh Kerajaan Malaysia dan diluluskan oleh Senat Universiti; **atau** Lulus peperiksaan **Sijil Tinggi Persekolahan Malaysia (STPM) tahun 2013** atau **sebelumnya** dengan mendapat sekurang-kurangnya **PNGK 2.00** dan mendapat; • **Gred C (NGMP 2.00) dalam mata pelajaran Pengajian Am;** **dan** • **Gred C (NGMP 2.00) dalam dua (2) mata pelajaran lain;** **atau** Lulus peperiksaan **Matrikulasi / Asasi tahun 2014** atau **sebelumnya** dengan mendapat sekurang-kurangnya **PNGK 2.00**; **dan** Mendapat sekurang-kurangnya **Tahap 1 (Band 1)** dalam Malaysian **University English Test (MUET)**.

BAHASA MELAYU

BIL	(i) Program Pengajian (ii) Kod (iii) Tempoh Pengajian	Kelayakan Minimum Diploma/Setaraf
	Program Kejuruteraan	
1.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Awam) **RK01** (8 Semester)	**Memenuhi Syarat Am Universiti** **serta** **Syarat Khas Program** **Syarat Khas Program:** **<u>Kelayakan Diploma</u>** **Memiliki Diploma dari Institusi Pengajian Tinggi Awam (IPTA)** atau institusi-institusi lain yang diiktiraf dalam **bidang yang sesuai** dengan kursus yang dipohon. Mendapat sekurang-kurangnya **PNGK 2.50** di peringkat **Diploma**. **Nota:** Pengecualian daripada beberapa mata pelajaran yang berkaitan boleh diberi tertakluk kepada keputusan peperiksaan yang diperolehi di peringkat diploma. **(Calon perlu sertakan salinan transkrip akademik dari semester satu hingga semester akhir semasa menghantar permohonan ke UniMAP).** Kelulusan pada peringkat Sijil **TIDAK** akan dipertimbangkan. **atau** **<u>Kelayakan STPM / Matrikulasi / Asasi (Tahun 2014 atau sebelumnya)</u>** Mengikut syarat kemasukan kelayakan STPM / Matrikulasi / Asasi tahun semasa.
2.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Mikroelektronik) **RK05** (8 Semester)	
3.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Alam Sekitar) **RK07** (8 Semester)	
4.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Mekanikal) **RK08** (8 Semester)	
5.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Bahan) **RK12** (8 Semester)	
6.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) Kejuruteraan Pembuatan **RK13** (8 Semester)	
7.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Komputer) **RK20** (8 Semester)	
8.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Sistem Elektrik) **RK23** (8 Semester)	

BIL	(i) Program Pengajian (ii) Kod (iii) Tempoh Pengajian	Kelayakan Minimum Diploma/Setaraf
	Program Kejuruteraan	
9.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Mekatronik) **RK24** (8 Semester)	**Memenuhi Syarat Am Universiti serta Syarat Khas Program** **Syarat Khas Program:** **<u>Kelayakan Diploma</u>** **Memiliki Diploma dari Institusi Pengajian Tinggi Awam (IPTA)** atau institusi-institusi lain yang diiktiraf dalam **bidang yang sesuai** dengan kursus yang dipohon. Mendapat sekurang-kurangnya **PNGK 2.50** di peringkat **Diploma**. **Nota:** Pengecualian daripada beberapa mata pelajaran yang berkaitan boleh diberi tertakluk kepada keputusan peperiksaan yang diperolehi di peringkat diploma. **(Calon perlu sertakan salinan transkrip akademik dari semester satu hingga semester akhir semasa menghantar permohonan ke UniMAP).** Kelulusan pada peringkat Sijil **TIDAK** akan dipertimbangkan. **atau** **<u>Kelayakan STPM / Matrikulasi / Asasi (Tahun 2014 atau sebelumnya)</u>** Mengikut syarat kemasukan kelayakan STPM / Matrikulasi / Asasi tahun semasa.
10.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Bioproses) **RK28** (8 Semester)	
11.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Polimer) **RK32** (8 Semester)	
12.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Elektronik Industri) **RK45** (8 Semester)	
13.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) Kejuruteraan Perhubungan **RK53** (8 Semester)	
14.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Metalurgi) **RK56** (8 Semester)	
15.	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Rekabentuk Produk) **RK84** (8 Semester)	
16	Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Elektronik Bioperubatan) **RK85** (8 Semester)	

<table>
<tr><th>BIL</th><th>(i) Program Pengajian
(ii) Kod
(iii) Tempoh Pengajian</th><th>Kelayakan Minimum Diploma/Setaraf</th></tr>
<tr><th colspan="3">Program Kejuruteraan</th></tr>
<tr><td>17.</td><td>Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Elektronik)
RK86
(8 Semester)</td><td rowspan="5">Memenuhi Syarat Am Universiti
serta
Syarat Khas Program

Syarat Khas Program:

<u>Kelayakan Diploma</u>

Memiliki Diploma dari Institusi Pengajian Tinggi Awam (IPTA) atau institusi-institusi lain yang diiktiraf dalam bidang yang sesuai dengan kursus yang dipohon.

Mendapat sekurang-kurangnya PNGK 2.50 di peringkat Diploma.

Nota:
Pengecualian daripada beberapa mata pelajaran yang berkaitan boleh diberi tertakluk kepada keputusan peperiksaan yang diperolehi di peringkat diploma.

(Calon perlu sertakan salinan transkrip akademik dari semester satu hingga semester akhir semasa menghantar permohonan ke UniMAP).

Kelulusan pada peringkat Sijil TIDAK akan dipertimbangkan.

atau

<u>Kelayakan STPM / Matrikulasi / Asasi (Tahun 2014 atau sebelumnya)</u>

Mengikut syarat kemasukan kelayakan STPM / Matrikulasi / Asasi tahun semasa.</td></tr>
<tr><td>18.</td><td>Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Fotonik)
RK89
(8 Semester)</td></tr>
<tr><td>19.</td><td>Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Biosistem)
RK90
(8 Semester)</td></tr>
<tr><td>20.</td><td>Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Rangkaian Komputer)
RK93
(8 Semester)</td></tr>
<tr><td>21.</td><td>Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Elektrik Sistem Tenaga)
RK96
(8 Semester)</td></tr>
</table>

BIL	(i) Program Pengajian (ii) Kod (iii) Tempoh Pengajian	Kelayakan Minimum Diploma/Setaraf
Program Perniagaan		
22.	Ijazah Sarjana Muda Perniagaan (Kepujian) (Keusahawanan Kejuruteraan) **RP52** (6 Semester)	**Memenuhi Syarat Am Universiti serta Syarat Khas Program** **Syarat Khas Program:** **<u>Kelayakan Diploma</u>** **Memiliki Diploma dari Institusi Pengajian Tinggi Awam (IPTA)** atau institusi-institusi lain yang diiktiraf dalam **bidang yang sesuai** dengan kursus yang dipohon. Mendapat sekurang-kurangnya **PNGK 2.50** di peringkat **Diploma**. **Nota:** Pengecualian daripada beberapa mata pelajaran yang berkaitan boleh diberi tertakluk kepada keputusan peperiksaan yang diperolehi di peringkat diploma. **(Calon perlu sertakan salinan transkrip akademik dari semester satu hingga semester akhir semasa menghantar permohonan ke UniMAP).** Kelulusan pada peringkat Sijil **TIDAK** akan dipertimbangkan. **atau** **<u>Kelayakan STPM / Matrikulasi / Asasi (Tahun 2014 atau sebelumnya)</u>** Mengikut syarat kemasukan kelayakan STPM / Matrikulasi / Asasi tahun semasa.
23.	Ijazah Sarjana Muda Perniagaan (Kepujian) (Perniagaan Antarabangsa) **RE09** (6 Semester)	

<table>
<tr><th>BIL</th><th>(i) Program Pengajian
(ii) Kod
(iii) Tempoh Pengajian</th><th>Kelayakan Minimum Diploma/Setaraf</th></tr>
<tr><th colspan="3">Program Teknologi Kejuruteraan</th></tr>
<tr><td>24.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Awam (Kepujian) (Pembinaan)
RY11
(8 Semester)</td><td rowspan="7">Memenuhi Syarat Am Universiti
serta
Syarat Khas Program

Syarat Khas Program:

<u>Kelayakan Diploma</u>

Memiliki Diploma dari Institusi Pengajian Tinggi Awam (IPTA) atau institusi-institusi lain yang diiktiraf dalam bidang yang sesuai dengan kursus yang dipohon.

Mendapat sekurang-kurangnya PNGK 2.50 di peringkat Diploma.

Nota:
Pengecualian daripada beberapa mata pelajaran yang berkaitan boleh diberi tertakluk kepada keputusan peperiksaan yang diperolehi di peringkat diploma.

(Calon perlu sertakan salinan transkrip akademik dari semester satu hingga semester akhir semasa menghantar permohonan ke UniMAP).

Kelulusan pada peringkat Sijil TIDAK akan dipertimbangkan.

atau

<u>Kelayakan STPM / Matrikulasi / Asasi (Tahun 2014 atau sebelumnya)</u>

Mengikut syarat kemasukan kelayakan STPM / Matrikulasi / Asasi tahun semasa.</td></tr>
<tr><td>25.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Kimia (Kepujian) (Proses Kimia Industri)
RY20
(8 Semester)</td></tr>
<tr><td>26.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Kimia (Kepujian) (Bioteknologi Industri)
RY21
(8 Semester)</td></tr>
<tr><td>27.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Elektrik (Kepujian) (Kuasa Industri)
RY31
(8 Semester)</td></tr>
<tr><td>28.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Elektrik (Kepujian) (Teknologi Robotik dan Automasi)
RY32
(8 Semester)</td></tr>
<tr><td>29.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Elektronik (Kepujian) (Sistem Elektronik)
RY40
(8 Semester)</td></tr>
<tr><td>30.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Elektronik (Kepujian) (Rekabentuk Telekomunikasi Elektronik)
RY41
(8 Semester)</td></tr>
</table>

<table>
<tr><th>BIL</th><th>(i) Program Pengajian
(ii) Kod
(iii) Tempoh Pengajian</th><th>Kelayakan Minimum Diploma/Setaraf</th></tr>
<tr><th colspan="3">Program Teknologi Kejuruteraan</th></tr>
<tr><td>31.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Elektronik (Kepujian) (Rekabentuk Rangkaian Elektronik)
RY43
(8 Semester)</td><td rowspan="6">Memenuhi Syarat Am Universiti
serta
Syarat Khas Program

Syarat Khas Program:

<u>Kelayakan Diploma</u>

Memiliki Diploma dari Institusi Pengajian Tinggi Awam (IPTA) atau institusi-institusi lain yang diiktiraf dalam bidang yang sesuai dengan kursus yang dipohon.

Mendapat sekurang-kurangnya PNGK 2.50 di peringkat Diploma.

Nota:
Pengecualian daripada beberapa mata pelajaran yang berkaitan boleh diberi tertakluk kepada keputusan peperiksaan yang diperolehi di peringkat diploma.

(Calon perlu sertakan salinan transkrip akademik dari semester satu hingga semester akhir semasa menghantar permohonan ke UniMAP).

Kelulusan pada peringkat Sijil TIDAK akan dipertimbangkan.

atau

<u>Kelayakan STPM / Matrikulasi / Asasi (Tahun 2014 atau sebelumnya)</u>

Mengikut syarat kemasukan kelayakan STPM / Matrikulasi / Asasi tahun semasa.</td></tr>
<tr><td>32.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Elektronik (Kepujian) (Elektronik Bersepadu)
RY44
(8 Semester)</td></tr>
<tr><td>33.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Mekanikal (Kepujian) (Pemesinan)
RY55
(8 Semester)</td></tr>
<tr><td>34.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Mekanikal (Kepujian) (Sistem Pertanian)
RY56
(8 Semester)</td></tr>
<tr><td>35.</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Mekanikal (Kepujian) (Pembangunan Produk)
RY57
(8 Semester)</td></tr>
<tr><td>36</td><td>Ijazah Sarjana Muda Teknologi Kejuruteraan Mekanikal (Kepujian) (Pemprosesan Bahan)
RY58
(8 Semester)</td></tr>
</table>

BIL	(i) Program Pengajian (ii) Kod (iii) Tempoh Pengajian	Kelayakan Minimum Diploma/Setaraf
Program Komunikasi Media Baharu		
37.	Ijazah Sarjana Muda Komunikasi Media Baharu (Kepujian) **RA72** (6 Semester)	**Memenuhi Syarat Am Universiti** **serta** **Syarat Khas Program** **Syarat Khas Program:** **<u>Kelayakan Diploma</u>** Memiliki **Diploma** dari **Institusi Pengajian Tinggi Awam (IPTA)** atau institusi-institusi lain yang diiktiraf dalam **bidang yang sesuai** dengan kursus yang dipohon. Mendapat sekurang-kurangnya **PNGK 2.50** di peringkat Diploma. **dan** Mendapat sekurang-kurangnya **Tahap 2 (Band 2)** dalam **Malaysian University English Test (MUET)**. **Nota:** Pengecualian daripada beberapa mata pelajaran yang berkaitan boleh diberi tertakluk kepada keputusan peperiksaan yang diperolehi di peringkat diploma. **(Calon perlu sertakan salinan transkrip akademik dari semester satu hingga semester akhir semasa menghantar permohonan ke UniMAP).** Kelulusan pada peringkat Sijil **TIDAK** akan dipertimbangkan. **atau** **<u>Kelayakan STPM / Matrikulasi / Asasi (Tahun 2014 atau sebelumnya)</u>** Mengikut syarat kemasukan kelayakan STPM / Matrikulasi / Asasi tahun semasa.

SISTEM AKADEMIK

Kurikulum program pengajian Sarjana Muda Kejuruteraan dan Sarjana Muda Teknologi Kejuruteraan dirangka untuk dilengkapkan dalam tempoh 4 tahun manakala bagi program pengajian Sarjana Muda Perniagaan dan Sarjana Muda Komunikasi Media Baharu pula dalam tempoh 3 tahun, dengan setiap Tahun Akademik atau Sidang Akademik dibahagikan kepada Semester I dan Semester II. Setiap semester mengandungi 14 minggu pembelajaran. Peperiksaan akan diadakan pada hujung semester. Kursus-kursus yang ditawarkan dibahagikan mengikut peringkat pengajian iaitu peringkat 100, 200, 300 dan 400.

Bagi tujuan pengijazahan, pelajar Sarjana Muda Kejuruteraan perlu mengambil kursus-kursus Teras berjumlah 120 unit, pelajar Sarjana Muda Teknologi Kejuruteraan pula perlu mengambil kursus-kursus Teras berjumlah 123 unit, pelajar Sarjana Muda Perniagaan perlu mengambil 72 atau 74 unit Kursus Teras (mengikut pengkhususan yang diambil) dan 30 unit Kursus Elektif manakala pelajar Sarjana Muda Komunikasi Media Baharu pula perlu mengambil 87 unit kursus Teras dan 15 unit Kursus Elektif.

Pelajar juga perlu mengambil kursus Keperluan Universiti sebanyak 17 unit bagi program Sarjana Muda Kejuruteraan, 19 unit bagi program Sarjana Muda Teknologi Kejuruteraan, 20 unit bagi program Sarjana Muda Perniagaan dan Sarjana Muda Komunikasi Media Baharu pula perlu mengambil 18 unit kursus Keperluan Universiti.

Pelajar juga perlu lulus semua kursus dan mendapat jumlah kredit yang diperlukan mengikut program pengajian masing-masing serta PNGK sekurang-kurangnya 2.00 untuk bergraduat.

STRUKTUR PROGRAM

Struktur program Sarjana Muda Kejuruteraan, Sarjana Muda Kejuruteraan Teknologi Kejuruteraan, Sarjana Muda Perniagaan dan Sarjana Muda Komunikasi Media Baharu dikelompokkan seperti yang ditunjukkan dalam Jadual 1 (a), (b), (c), (d) dan (e). Bagi tujuan pengijazahan, pelajar dikehendaki untuk mengambil sejumlah 137 unit bagi program Sarjana Muda Kejuruteraan, 142 unit bagi program Sarjana Muda Teknologi Kejuruteraan, 122 unit atau 124 unit bergantung kepada pengkhususan program Sarjana Muda Perniagaan dan 120 unit bagi program Sarjana Muda Komunikasi Media Baharu.

Jadual 1(a): Struktur Program Sarjana Muda Kejuruteraan

SARJANA MUDA KEJURUTERAAN	
KURSUS	**UNIT**
KURSUS TERAS KEJURUTERAAN	**120**
KURSUS KEPERLUAN UNIVERSITI	**17**
a. Keusahawanan Kejuruteraan	2
b. Kemahiran Berfikir	2
c. Bahasa Melayu Universiti	2
d. Bahasa Inggeris untuk Komunikasi Teknikal	2
e. Tamadun Islam & Tamadun Asia/Budaya Malaysia	2
f. Hubungan Etnik	2
g. Ko-kurikulum	3
h. Kursus Opsyen	2
JUMLAH	**137**

Jadual 1(b): Struktur Program Sarjana Muda Teknologi Kejuruteraan

SARJANA MUDA TEKNOLOGI KEJURUTERAAN	
KURSUS	**UNIT**
KURSUS TERAS TEKNOLOGI KEJURUTERAAN	**123**
KURSUS KEPERLUAN UNIVERSITI	**19**
a. Keusahawanan Kejuruteraan	2
b. Kemahiran Berfikir	2
c. Bahasa Melayu Universiti	2
d. Bahasa Inggeris untuk Komunikasi Teknikal	2
e. Tamadun Islam & Tamadun Asia/Budaya Malaysia	2
f. Hubungan Etnik	2
g. Kemahiran & Teknologi dalam Komunikasi	2
h. Ko-kurikulum	3
i. Kursus Opsyen	2
JUMLAH	**142**

Jadual 1(c): Struktur Program Sarjana Muda Perniagaan (Keusahawanan Kejuruteraan)

SARJANA MUDA PERNIAGAAN (KEUSAHAWANAN KEJURUTERAAN)	
KURSUS	**UNIT**
KURSUS TERAS PERNIAGAAN	**72**
ELEKTIF	**30**
KURSUS KEPERLUAN UNIVERSITI	**20**
a. Keusahawanan Kejuruteraan	2
b. Kemahiran Berfikir	2
c. Bahasa Melayu Universiti	2
d. Bahasa Inggeris Akademik	2
e. Tamadun Islam & Tamadun Asia/Budaya Malaysia	2
f. Hubungan Etnik	2
g. Kemahiran & Teknologi dalam Komunikasi	2
h. Komunikasi dalam Perniagaan	3
i. Ko-kurikulum	3
JUMLAH	**122**

Jadual 1(d): Struktur Program Sarjana Muda Perniagaan (Perniagaan Antarabangsa)

SARJANA MUDA PERNIAGAAN (PERNIAGAAN ANTARABANGSA)	
KURSUS	**UNIT**
KURSUS TERAS PERNIAGAAN	**74**
ELEKTIF	**30**
KURSUS KEPERLUAN UNIVERSITI	**20**
a. Keusahawanan Kejuruteraan	2
b. Kemahiran Berfikir	2
c. Bahasa Melayu Universiti	2
d. Bahasa Inggeris Akademik	2
e. Tamadun Islam & Tamadun Asia/Budaya Malaysia	2
f. Hubungan Etnik	2
g. Kemahiran & Teknologi dalam Komunikasi	2
h. Komunikasi dalam Perniagaan	3
i. Ko-kurikulum	3
JUMLAH	**124**

Jadual 1(e): Struktur Program Sarjana Muda Komunikasi Media Baharu

SARJANA MUDA KOMUNIKASI MEDIA BAHARU	
KURSUS	**UNIT**
KURSUS TERAS MEDIA BAHARU	**87**
ELEKTIF	**15**
KURSUS KEPERLUAN UNIVERSITI	**18**
a. Kemahiran Berfikir	2
b. Bahasa Melayu Universiti	3
c. Bahasa Inggeris Akademik	2
d. Tamadun Islam & Tamadun Asia/Budaya Malaysia	2
e. Hubungan Etnik	2
f. Bahasa Asing	4
g. Ko-kurikulum	3
JUMLAH	**120**

JENIS-JENIS KURSUS

1. **Kursus Keperluan Universiti**
   Kursus Keperluan Universiti ialah kursus-kursus di luar pengkhususan pelajar. Kursus-kursus ini ditawarkan oleh Pusat Pengajian Pembangunan Insan dan Teknokomunikasi (iKOM), Pusat Bahasa Antarabangsa dan Pusat Kokurikulum. Semua kursus ini wajib diambil dan pelajar perlu lulus dengan gred C sebagai syarat utama untuk pengijazahan. Kursus-kursus tersebut ialah:

   a. **Keusahawanan Kejuruteraan (2 unit)**
   Semua pelajar wajib mengambil kursus Keusahawanan Kejuruteraan. Pelajar digalakkan mengambil kursus-kursus lain di dalam kategori ‘keusahawanan’, di mana unit yang dikumpul boleh dikira sebagai Kursus Opsyen.

   b. **Kemahiran Berfikir (2 unit)**
   Semua wajib mengambil kursus Kemahiran Berfikir.

   c. **Bahasa Melayu Universiti (2 unit)**
   Kursus Bahasa Melayu Universiti wajib diambil oleh semua pelajar.

d. Bahasa Inggeris Untuk Komunikasi Teknikal/ Bahasa Inggeris Akademik (2 unit)
Semua pelajar wajib mengambil kursus Bahasa Inggeris untuk Komunikasi Teknikal (bagi program Sarjana Muda Kejuruteraan dan Sarjana Muda Teknologi Kejuruteraan) atau kursus Bahasa Inggeris Akademik (bagi program Sarjana Muda Perniagaan dan Sarjana Muda Komunikasi Media Baharu). Pelajar yang memperolehi Band 1, 2 atau 3 dalam MUET diwajibkan mengambil Bahasa Inggeris Asas dan mendapat kelulusan minimum Gred C sebelum dibenarkan mengambil Bahasa Inggeris untuk Komunikasi Teknikal atau Bahasa Inggeris Akademik. Dua (2) unit tambahan kursus Bahasa Inggeris Asas ini akan dikira sebagai Kursus Opsyen (rujuk perkara [h]). Pelajar yang memperolehi Band 4 atau 5 dalam MUET tidak perlu mengambil Bahasa Inggeris Asas sebelum mengambil Bahasa Inggeris untuk Komunikasi Teknikal atau Bahasa Inggeris Akademik. Pelajar yang memperolehi Band 4 atau 5 dalam MUET tidak dibenarkan mengambil Bahasa Inggeris Asas sebagai kursus Opsyen.

e. Tamadun Islam & Tamadun Asia/Budaya Malaysia (2 unit)
Kursus Tamadun Islam & Tamadun Asia wajib diambil oleh semua pelajar tempatan manakala kursus Budaya Malaysia wajib diambil oleh semua pelajar antarabangsa.

f. Hubungan Etnik (2 unit)
Semua pelajar wajib mengambil kursus Hubungan Etnik.

g. Kemahiran dan Teknologi Dalam Komunikasi (2 unit)
Kursus Kemahiran dan Teknologi dalam Komunikasi wajib diambil oleh pelajar Sarjana Muda Teknologi Kejuruteraan dan Sarjana Muda Perniagaan.

h. Kursus Opsyen
Kursus Opsyen terdiri daripada kursus-kursus yang ditawarkan oleh Pusat Pengajian Pembangunan Insan dan Teknokomunikasi (iKOM) dan Pusat Bahasa Antarabangsa untuk pelajar Program Sarjana Muda Kejuruteraan dan Sarjana Muda Teknologi Kejuruteraan bertujuan untuk memberi nilai tambah kepada pelajar.

i. Komunikasi Dalam Perniagaan (3 unit)
Kursus Komunikasi dalam Perniagaan wajib diambil oleh semua pelajar program Sarjana Muda Perniagaan.

j. Program Ko-Kurikulum (3 unit)
Semua pelajar diwajibkan mengumpul 3 unit ko-kurikulum sepanjang pengajiannya di UniMAP. Dua (2) unit Badan Beruniform perlu diambil oleh pelajar secara berpakej iaitu 1 unit pada Semester I dan 1 unit lagi pada Semester II (dalam Tahun Pertama pengajian). Bagi kursus bukan Badan Beruniform, sebanyak 1 unit boleh diambil dalam mana-mana semester.

2. Kursus Teras (Sarjana Muda Kejuruteraan)
Kursus Teras terdiri daripada kursus-kursus Kejuruteraan yang wajib diambil oleh semua pelajar bidang Sarjana Muda Kejuruteraan. Kursus-kursus ini menjadi keperluan utama untuk pengijazahan. Pelajar yang gagal mana-mana kursus Teras Kejuruteraan mesti mengulanginya dan lulus sebelum layak dipertimbangkan untuk pengijazahan.

3. Kursus Teras (Sarjana Muda Teknologi Kejuruteraan)
Kursus Teras terdiri daripada kursus-kursus Teknologi Kejuruteraan yang wajib diambil oleh semua pelajar bidang Teknologi Kejuruteraan. Kursus-kursus ini menjadi sebahagian keperluan untuk pengijazahan. Pelajar yang gagal mana-mana kursus Teras Teknologi Kejuruteraan mesti mengulanginya sebelum layak dipertimbangkan untuk pengijazahan.

4. **Kursus Teras (Sarjana Muda Perniagaan)**
   Kursus Teras bagi Program Sarjana Muda Perniagaan UniMAP dibahagikan kepada dua kumpulan iaitu Kursus Teras Perniagaan dan Kursus Teras Program.

   Kursus Teras Perniagaan terdiri daripada kursus-kursus kontemporari dalam bidang perniagaan yang wajib diambil oleh semua pelajar program Sarjana Muda Perniagaan di UniMAP manakala Kursus Teras Program ditawarkan mengikut pengkhususan yang dipilih oleh pelajar.

   Kursus-kursus Teras ini menjadi sebahagian keperluan untuk pengijazahan. Pelajar yang gagal mana-mana Kursus Teras mesti mengulanginya sebelum layak dipertimbangkan untuk pengijazahan.

5. **Kursus Elektif (Sarjana Muda Perniagaan)**
   Pelajar Sarjana Muda Perniagaan boleh memilih kursus Elektif berdasarkan minat mereka dalam bidang-bidang tertentu.

6. **Kursus Pra-Syarat**
   Kursus Pra-syarat merupakan kursus yang wajib diambil dan lulus oleh pelajar, sebelum mendaftar kursus yang berikutnya. Kursus yang berikutnya itu dikenakan pra-syarat ke atasnya seperti yang ditentukan dalam struktur akademik program Ijazah Sarjana Muda. Pelajar yang gagal dalam kursus pra-syarat boleh mengambil semula kursus pra-syarat tersebut seiring dengan kursus yang berikutnya (dalam semester sama), namun hendaklah memohon dan mendapatkan kelulusan Dekan Pusat Pengajian.

SISTEM UNIT

Setiap kursus diberikan nilai yang dikenali sebagai UNIT. Unit diberikan berdasarkan skop dan kedalaman kursus berkenaan. Kecuali dalam kes-kes tertentu, nilai unit bagi kursus yang mempunyai unit adalah seperti Jadual 2:

Jadual 2: Penilaian Unit bagi setiap minggu untuk Semester 14 Minggu

Bentuk Pertemuan	Nilai Unit	Jumlah Pertemuan Setiap Minggu
Kuliah	1	1 jam
Makmal/Tutorial	1	2 jam
Projek Tahun Akhir	1	3 jam
Pembelajaran berbantu melibatkan mod penyampaian lain seperti Problem-based Learning (PBL), pembelajaran-e (e-learning modules), lawatan kerja dll.	1	3 jam
Latihan Industri	1*	Bergantung kepada program pengajian

** Nota: Nilai 1 unit bagi Latihan Industri adalah setara dengan 2 minggu latihan*

PENDEKATAN PENGAJARAN DAN PEMBELAJARAN DI UniMAP

Kebanyakan Kursus Teras yang ditawarkan merangkumi komponen teori dan komponen praktikal dengan nilaian jam pertemuan seperti berikut:

1. **Komponen Teori**
   Satu (1) unit komponen Teori adalah bersamaan dengan 1 jam kuliah/tutorial/bacaan seminggu atau 14 jam dalam satu semester.

2. **Komponen Praktikal**
   Satu (1) unit komponen Praktikal bagi program Kejuruteraan adalah bersamaan 2 jam pertemuan dalam seminggu atau 28 jam pertemuan dalam 1 semester. Satu (1) unit komponen Praktikal bagi program Teknologi Kejuruteraan adalah bersamaan 3 jam pertemuan dalam seminggu atau 42 jam pertemuan dalam 1 semester.

Bagi kebanyakan Kursus Teras, pelajar perlu menjalani projek mini dan menduduki peperiksaan atau viva pada penghujung semester.

Komponen praktikal terdiri daripada bentuk-bentuk pengajaran dan pembelajaran berikut:

1. **Pembelajaran di dalam makmal** - sepasukan pelajar yang terdiri dari 2-3 orang, menjalankan satu eksperimen. Di dalam beberapa program makmal asas, setiap pelajar menjalankan eksperimen secara individu (1:1) dan bukannya dalam pasukan.

2. **Pembelajaran menggunakan Teaching Factory** - sepasukan pelajar yang terdiri dari 5-6 orang menjalankan sesebuah larian proses (process run) dengan menggunakan peralatan skala sebenar yang digunakan di industri.

3. **E-pembelajaran** – pendekatan pembelajaran yang diperkukuhkan dengan ICT, yang melengkapkan pendekatan pembelajaran konvensional. Pelajar mempelajari kursus atau topik-topik tertentu menggunakan modul yang boleh diakses dari laman web UniMAP. Modul mengandungi nota kuliah dalam bentuk multimedia, yang merangkumi audio, video, grafik, animasi, simulasi, permainan, dan pelbagai lagi aktiviti berbentuk interaksi.

4. **Pendedahan kepada industri** - pelajar menjalankan lawatan ke industri selama tempoh masa tertentu beberapa kali sepanjang pengajiannya di UniMAP. Ini termasuklah program IndEx (Pendedahan kepada Industri), InTra (Latihan Industri), Keusahawanan Industri, dan lain-lain lagi.

LATIHAN INDUSTRI

Latihan Industri merupakan kursus 4 unit bagi pelajar Sarjana Muda Kejuruteraan, 12 unit bagi pelajar Sarjana Muda Teknologi Kejuruteraan, 6 unit bagi pelajar Sarjana Muda Perniagaan dan 6 unit bagi pelajar Sarjana Muda Komunikasi Media Baharu.

Pelajar Sarjana Muda Kejuruteraan Tahun 3 dikehendaki untuk menjalani 12 minggu Latihan Industri untuk mendapatkan 4 kredit, pelajar Sarjana Muda Teknologi Kejuruteraan Tahun 4 pula dikehendaki untuk menjalani 12 minggu Latihan Industri untuk mendapatkan 12 kredit manakala pelajar Tahun 3 program Sarjana Muda Komunikasi Media Baharu pula dikehendaki menjalani 12 minggu Latihan Industri untuk mendapatkan 6 kredit untuk kursus ini.

Pelajar program Sarjana Muda Perniagaan (Perniagaan Antarabangsa) pula akan mengikuti Latihan Industri pada Semester ke-2 dan ke-4, mengikut Pilihan Pertama iaitu (2+2) atau Pilihan Kedua (3+1). Bagi Pilihan Pertama (2+2), pelajar akan mengikuti 2 fasa (2 bulan + 2 bulan) Latihan Industri di syarikat-syarikat multinasional di Malaysia dan bagi Pilihan Kedua (3+1), pelajar akan menjalani Latihan Industri di syarikat multinasional di Malaysia dan lawatan sambil belajar di luar negara (International Business Field Trips).

Pelajar program Sarjana Muda Perniagaan (Keusahawanan Kejuruteraan) akan mengambil bahagian dalam program Perniagaan Inkubator selama 12 minggu. Mereka akan mendapat 6 jam kredit selepas Semester ke-4.

Purata pertemuan selama 8 jam sehari selama 5 hari dalam seminggu, di mana 8 jam sehari x 5 hari = 40 jam seminggu, dianggap sebagai jam penilaian (waktu bekerja yang ditetapkan oleh organisasi/ syarikat).

Tujuan utama Latihan Industri ialah:-

- Menyemai sikap profesional dalam kalangan pelajar.
- Menyedarkan pelajar tentang kepentingan dan kaitan yang kuat antara latihan industri, makmal/amali dan teori kejuruteraan.
- Memberi pendedahan awal kepada pelajar tentang persekitaran dan keadaan di industri serta amalannya. Para pelajar berpeluang melengkapkan diri sebagai bekalan untuk menghadapi pengalaman akan datang, baik di dalam pengajian akademik mahupun latihan-latihan seterusnya.

Pusat Kerjasama Industri dan Agensi Kerajaan (CIGC) akan menyelaraskan bersama pusat-pusat lain kursus-kursus yang melibatkan industri seperti di bawah:

1. Pendedahan Industri (IndEx)
    a. Program singkat 1 hari
    b. Pakar-pakar, pengurus dan jurutera-jurutera dari industry dijemput untuk mengadakan taklimat, demonstrasi dan dialog mengikut jadual yang disediakan
    c. Melibatkan lawatan ke industri
    d. Pendedahan ini adalah bagi pelajar-pelajar yang telah menyempurnakan pengajian Tahun 1

2. Pendedahan Keusahawanan Industri (IndEnt)
    a. Program singkat 1 hari
    b. Penyertaan sektor Industri Kecil, firma R&D dan badan-badan kerajaan seperti Kementerian Pembangunan Usahawan dan Koperasi.
    c. Berbentuk taklimat, dialog, dan demonstrasi
    d. Melibatkan pelajar-pelajar Tahun 2

PROGRAM INKUBATOR PERNIAGAAN

Pendekatan Pengajaran dan Pembelajaran untuk program Sarjana Muda (Keusahawanan Kejuruteraan) bukan sahaja meliputi kuliah dan tutorial tetapi juga Latihan Praktikal melalui Program Inkubator Perniagaan. Selepas semester ke-4, pelajar akan mengambil bahagian dalam Program Perniagaan Inkubator selama 12 minggu. Mereka akan mendapat 6 jam kredit.

Pelajar dibimbing oleh syarikat-syarikat dalam Inkubator Perniagaan. Ini akan memberi mereka peluang untuk menjadi sebahagian daripada pasukan yang terlibat dalam pembangunan produk yang mungkin membawa kepada pengkomersilan. Mereka dapat mengetahui bagaimana idea dan inovasi boleh membawa kepada penghasilan produk untuk pengguna. Di samping itu, mereka juga akan melihat sendiri aliran proses perniagaan.

Pada akhir Program Inkubator Perniagaan, pelajar dikehendaki menyediakan satu laporan mengenai pengalaman mereka sepanjang Program Inkubator Perniagaan yang telah mereka jalani dalam syarikat-syarikat terpilih.

Inkubator perniagaan Malaysia telah membentuk satu kumpulan yang rapat di bawah National Incubator Network Association (NINA) dan bergabung dengan Association of Asean Business Incubation (AABI). Antara ahli-ahli pertubuhan ini termasuklah Technology Park Malaysia, Perbadanan Pembangunan Teknologi Malaysia, SIRIM dan Kulim Technology Park Corporation. UniMAP bekerjasama rapat dengan pertubuhan-pertubuhan ini untuk menjamin kejayaan program tersebut.

PROGRAM LAWATAN KERJA UNTUK PERNIAGAAN ANTARABANGSA *(INTERNATIONAL BUSINESS FIELD TRIPS)*

Pada semester ke-2 dan ke-4, pelajar Sarjana Muda (Perniagaan Antarabangsa) pula akan mengikuti Latihan Industri mengikut Pilihan Pertama (2+2) atau Pilihan Kedua (3+1).

Bagi Pilihan Pertama, iaitu Pilihan 2+2, pelajar akan mengikuti 2 fasa (2 bulan + 2 bulan) Latihan Industri di syarikat-syarikat multinasional di Malaysia dan penyelarasannya dilaksanakan dengan kerjasama Pusat Kerjasama Industri dan Agensi Kerajaan (CIGC) UniMAP.

Bagi Pilihan Kedua (3+1), pelajar akan menjalani Latihan Industri di syarikat-syarikat multinasional yang terpilih di Malaysia untuk 3 bulan pertama dan kemudian meneruskan lawatan sambil belajar di luar negara selama 1 bulan lagi. Pelajar diberi kebebasan untuk memilih mana-mana dua pilihan yang diberikan untuk Latihan Industri mengikut minat dan kemampuan kewangan mereka.

KOD KURSUS

Setiap kursus yang ditawarkan mempunyai kod yang tersendiri. Untuk pengajian program Kejuruteraan, Teknologi Kejuruteraan, Perniagaan dan Komunikasi Media Baharu, kod bagi sesebuah kursus diringkaskan dalam Jadual 3(a), 3(b) dan 3(c) di bawah:

Jadual 3(a): Abjad Pertama; Peringkat Pengajian / Jenis program yang ditawarkan di peringkat Sarjana Muda

Abjad Pertama di dalam Kod	Jenis Program
E	Sarjana Muda Kejuruteraan
B	Sarjana Muda Perniagaan
P	Sarjana Muda Teknologi Kejuruteraan
K	Sarjana Muda Komunikasi Media Baharu
U	Kursus Umum (Subjek ini boleh diambil oleh pelajar dari semua program pengajian)

Jadual 3(b): Abjad Kedua; Pusat Pengajian yang Menawarkan Kursus

Abjad Kedua di dalam Kod	Pusat Pengajian
E	PPK Sistem Elektrik
M	PPK Mikroelektronik
K	PPK Komputer & Perhubungan
N	PPK Mekatronik
B	PPK Bahan
P	PPK Pembuatan
R	PPK Bioproses
A	PPK Alam Sekitar
D	Pusat Pengajian Teknologi Kejuruteraan Mekanikal
G	Pusat Pengajian Teknologi Kejuruteraan Elektronik
L	Pusat Pengajian Teknologi Kejuruteraan Elektrik
S	Pusat Pengajian Teknologi Kejuruteraan Awam
T	Pusat Pengajian Teknologi Kejuruteraan Kimia
C	Pusat Kejuruteraan
Q	Institut Matematik Kejuruteraan
I	Pusat Kerjasama Industri dan Agensi Kerajaan
F	Pusat Pengajian Inovasi Perniagaan & Teknousahawan
U	Pusat Pengajian Pembangunan Insan dan Teknokomunikasi
V	Pusat Bahasa Antarabangsa
Z	Pusat Ko-kurikulum

Jadual 3(c): Abjad Ketiga; Kursus Teras atau Kursus Keperluan Universiti;

Abjad Ketiga di dalam Kod	Jenis Kursus
T	Kursus Teras/Elektif
W	Kursus Keperluan Universiti

Tiga angka terakhir bagi sesebuah kod kursus mewakili perkara-perkara berikut iaitu angka pertama adalah tahap kursus (1 = subjek Tahun 1, 2 = subjek Tahun 2, dsb); angka kedua dan ketiga adalah nombor kursus.

Kod bagi sesebuah kursus diringkaskan dalam Jadual 4 di bawah:

Jadual 4: Kod Kursus

A	B	C	1	2	3	4	ANGKA	DESKRIPSI
↓	↓	↓	↓	↓	↓	↓		
↓	↓	↓	↓	↓	↓	→	4	Unit/Kredit
↓	↓	↓	↓	↓	∟	→	3	Kelompok Kursus. (Penentuan kelompok kursus ditentukan oleh Pusat Pengajian masing-masing)
↓	↓	↓	↓	∟	→	→	2	
|	|	|	∟	→	→	→	1	Aras/ Tahap Kursus program Sarjana Muda: • 1=subjek Tahun 1, • 2= subjek Tahun 2, • 3= subjek Tahun 3, • 4= subjek Tahun 4,
↓	↓	∟	→	→	→	→	JENIS KURSUS	Sila rujuk Jadual 3(c)
↓	∟	→	→	→	→	→	PUSAT PENGAJIAN	Sila rujuk Jadual 3(b)
∟	→	→	→	→	→	→	PERINGKAT PENGAJIAN	Sila rujuk Jadual 3(a)

PRA-PENDAFTARAN KURSUS

Pra-pendaftaran kursus adalah suatu sistem yang membolehkan pelajar membuat pra-pendaftaran “atas talian” untuk kursus-kursus di semester seterusnya pada tempoh masa yang lebih awal. Tempoh masa yang ditetapkan untuk pra-pendaftaran ini adalah sebelum bermula cuti semester pada semester semasa. Semua pelajar (Aktif/Percubaan/Berhutang) DIWAJIBKAN melakukan proses pra-pendaftaran ini.

Pelajar dikehendaki mendaftar pada tarikh yang ditetapkan. Kursus yang perlu didaftarkan adalah kursus yang akan diambil pada semester akan datang (semua kursus termasuk Ko-kurikulum). Pelajar mestilah berjumpa Rakan Pendamping Siswa (RPS) dan mengisi borang HEA-09a (Borang Pendaftaran Kursus) sebelum membuat proses Pra-pendaftaran tersebut. Pelajar yang gagal membuat proses Pra-pendaftaran dalam tempoh yang ditetapkan akan menyebabkan pendaftaran rasmi kursus bagi semester hadapan terjejas (tempat tertakluk kepada kekosongan). Pelajar tidak perlu mencetak slip pra-pendaftar ini dan tidak perlu mendapatkan pengesahan daripada RPS.

PENDAFTARAN KURSUS

Semua pelajar yang aktif adalah diwajibkan mendaftar kursus untuk setiap semester. Pendaftaran kursus ini dilakukan secara dalam talian (online) oleh semua pelajar. Pendaftaran kursus mesti dibuat mengikut tarikh yang telah ditetapkan seperti hebahan yang dikeluarkan oleh Unit Kemasukan dan Rekod Pelajar melalui emel dan portal.

Pelajar adalah diwajibkan untuk bertemu dan berbincang dengan Rakan Pendamping Siswa (RPS) berkaitan kursus-kursus yang perlu didaftar. Pelajar perlu membawa bersama slip pendaftaran kursus untuk disahkan oleh RPS dalam sistem pada sesi tersebut. Kursus-kursus yang didaftarkan tanpa mendapat pengesahan dari RPS adalah dianggap tidak sah. Sekiranya berlaku perubahan pada pendaftaran kursus sama ada pelajar menambah, menggugur atau tarik diri kursus dalam tempoh yang ditetapkan, pelajar perlu mendapatkan pengesahan semula daripada RPS.

Pelajar yang gagal mendaftar kursus dalam tempoh masa yang ditetapkan adalah tertakluk kepada penalti berjumlah RM50. Pendaftaran lewat tidak boleh melebihi minggu ketiga (3) semester. Pelajar perlu mengisi Borang HEA-09 (Borang Permohonan Kursus Lewat) dan mesti memperolehi kelulusan daripada Dekan Pusat Pengajian.

Manakala pelajar yang baru mendaftar bagi satu-satu sidang akademik baru akan mendaftar secara online pada tarikh yang dinyatakan pada Minggu Suaikenal mengikut Pusat Pengajian masing-masing. Pelajar akan diberi taklimat tentang kursus, dalam Minggu Suaikenal tersebut di Pusat Pengajian masing-masing.

Adalah menjadi tanggungjawab pelajar untuk menyemak dan memastikan bahawa semua butir-butir yang dinyatakan dalam Slip Pendaftaran Kursus adalah betul. Sebarang permohonan pendaftaran kursus/ penambahan kursus / pengguguran kursus / tarik diri di luar tempoh yang ditetapkan tanpa sebab-sebab yang boleh diterima oleh Universiti, boleh dikenakan denda kecuali pelajar yang mempunyai alasan yang tertentu sahaja akan dipertimbangkan oleh Dekan Pusat Pengajian. Pelajar tidak dibenarkan membuat pendaftaran kursus/penambahan kursus/pengguguran kursus/tarik diri kursus semasa minggu peperiksaan.

Pelajar yang tidak mendaftar kursus maksimum 2 semester berturut-turut tanpa sebarang alasan boleh ditamatkan pengajian dengan menggunakan Borang HEA-20 (Borang Penamatan Pengajian Pelajar).

Pelajar yang telah ditamatkan pengajian dan merayu untuk menyambung semula pengajian perlu menulis surat rayuan permohonan kemasukan kepada Naib Canselor melalui Dekan Pusat Pengajian (perakuan Dekan diperlukan). Penalti RM100 akan dikenakan kepada pelajar bagi setiap rayuan kemasukan semula yang diluluskan.

1. **Pendaftaran Kursus Pelajar Berstatus Aktif**
   Pelajar berstatus Aktif boleh mendaftar kursus secara online tidak melebihi 22 unit dan tidak kurang daripada 10 unit kecuali pelajar yang mengikuti Latihan Industri dan pelajar Semester Akhir yang akan menamatkan pengajian. Pelajar yang ingin mendaftar melebihi 22 unit perlu mendapatkan kebenaran daripada RPS dengan kelulusan daripada Dekan Pusat Pengajian.

   Keterangan mengenai Pendaftaran Kursus pelajar berstatus Aktif diringkaskan seperti di Jadual 5 di bawah:

Jadual 5: Ringkasan Pendaftaran Kursus Pelajar Berstatus Aktif

Status Pelajar	Minimum	Maksimum
Pelajar Aktif	10	22
Pelajar Aktif yang mengambil kursus Latihan Indutri (LI) atau Projek Tahun Akhir (FYP)	10	28

* *Pelajar yang tidak mengambil kursus LI atau FYP boleh mengambil kursus melebihi 22 unit dengan kelulusan Dekan Pusat Pengajian terlebih dahulu dan mengisi Borang HEA-09a (Borang Pendaftaran Kursus).*

2. **Pendaftaran Kursus Pelajar Percubaan [P]**
   Pelajar dengan status Percubaan tidak dibenarkan untuk mendaftar sendiri secara dalam talian (online). Pelajar ini perlu bertemu dengan RPS mereka untuk mendapatkan nasihat dan pengesahan daripada Dekan serta perlu juga mengisi Borang HEA-09b [Borang Pendaftaran Kursus-Berstatus Percubaan (P)] sebelum menyerahkannya kepada Penolong Pendaftar Pusat Pengajian untuk didaftarkan. Hanya Penolong Pendaftar Pusat Pengajian atau Jabatan Pendaftar sahaja yang boleh mendaftarkan kursus bagi pelajar ini. Jumlah unit yang dibenarkan untuk Pelajar Percubaan adalah seperti Jadual 6 berikut:

Jadual 6: Ringkasan Pendaftaran Kursus Pelajar Percubaan [P]

Status Pelajar	Minimum	Maksimum
Percubaan (P1)	10	12
Percubaan (P2)	8	10

PENAMBAHAN / PENGGUGURAN / TARIK DIRI KURSUS

1. **Tambah Kursus**
   a) Tempoh yang dibenarkan untuk penambahan kursus adalah sehingga minggu ke-2 minggu pembelajaran
   b) Pelajar perlu mengisi Borang HEA-11 (Borang Tambah Kursus) dan menyerahkannya kepada Penolong Pendaftar Pusat Pengajian untuk dikemaskini dalam sistem

2. **Gugur Kursus**
   a) Tempoh yang dibenarkan untuk menggugurkan kursus adalah sehingga minggu ke-6 minggu pembelajaran.
   b) Pelajar perlu mengisi Borang HEA-10 (Borang Gugur Kursus). Borang perlu ditandatangani oleh pensyarah kursus, Dekan Pusat Pengajian dan diserahkan kepada Penolong Pendaftar Pusat Pengajian untuk dikemaskini dalam sistem.

3. **Tarik Diri Kursus (TD)**
   a) Pelajar dengan persetujuan Pensyarah Kursus dan Dekan Pusat Pengajian boleh memohon untuk menarik diri daripada kursus yang telah didaftarkan pada semester yang berkenaan tidak lewat dari hari akhir bekerja pada minggu ke-12 minggu pembelajaran.Pelajar yang ingin menarik diri daripada kursus perlulah mengisi Borang HEA-19 (Borang Tarik Diri Kursus).
   b) Kebenaran untuk pelajar menarik diri daripada mengikuti sesuatu kursus adalah tertakluk kepada jumlah unit minimum, kecuali dengan kebenaran Dekan.
   c) Status Tarik Diri (TD) akan dicatatkan dalam rekod pendaftaran kursus dan transkrip akademik pelajar. Walau bagaimanapun, gred tidak akan diambil kira dalam pengiraan PNG dan PNGK.

PERTUKARAN PROGRAM PENGAJIAN

Pertukaran program pengajian bermaksud pelajar menukar program pengajiannya kepada sesuatu program pengajian yang lain atas sebab-sebab tertentu yang dipersetujui oleh kedua-dua Dekan sekarang dan Dekan Pusat Pengajian yang dipohon.

Pertukaran program pengajian tidak dibenarkan kerana ia melibatkan penukaran agihan sumber yang sudah dirancang dengan rapi pada awal sesuatu sidang akademik. Walau bagaimanapun, permohonan rayuan pertukaran program pengajian boleh dipertimbangkan dengan alasan-alasan yang kukuh sahaja dan tertakluk kepada syarat-syarat seperti berikut:

1. Permohonan hanya boleh dibuat oleh pelajar setelah tamat sekurang-kurangnya satu semester pengajian. Pelajar perlu mengisi Borang Permohonan Pertukaran Program Pengajian (HEA-12) dengan lengkap. Borang permohonan boleh didapati di Jabatan Pendaftar atau di Pusat Pengajian. Walau bagaimanapun, bagi kes-kes tertentu, permohonan pelajar untuk pertukaran program pengajian pada permulaan pengajian boleh dipertimbangkan dengan kelulusan Naib Canselor/Timbalan Naib Canselor (Akademik & Antarabangsa).

2. Permohonan perlu dikemukakan dalam masa dua minggu pertama semester bermula. Borang permohonan mestilah disertakan dengan salinan keputusan peperiksaan semester yang terkini atau keputusan pada peringkat Matrikulasi/STPM/Diploma.

3. Pelajar hanya boleh memohon bertukar program pengajian tidak melewati 2 Semester Pertama pengajian di UniMAP. Permohonan setelah masuk semester ketiga pengajian tidak akan dipertimbangkan.

4. Setiap permohonan perlu disertakan dengan sebab-sebab pertukaran program pengajian yang kukuh secara bertulis. Permohonan perlu mendapat perakuan dan kelulusan Rakan Pendamping Siswa (RPS) (program asal dan program dipohon), Dekan Pusat Pengajian (program asal dan program dipohon), Dekan Pengurusan Akademik dan Naib Canselor/Timbalan Naib Canselor (Akademik & Antarabangsa).

5. Bagi pelajar yang mendapat biasiswa/PTPTN atau sebagainya, pelajar mestilah mendapat kelulusan dari penaja masing-masing. Pelajar perlu berurusan secara terus dengan pihak penaja. Penerangan boleh diperolehi daripada Jabatan Hal Ehwal Pelajar dan Alumni.

6. Sekiranya permohonan diluluskan, pelajar perlu mengambil tindakan untuk mendaftar kursus-kursus baru yang ditawarkan dalam program pengajian baru tersebut.

7. Pelajar yang bertukar program pengajian dalam bidang yang sama boleh memohon pemindahan kredit bagi kursus teras dan kursus wajib universiti atau kursus yang sama dalam kurikulum program pengajian baru. Walau bagaimanapun, semua kursus lain yang tidak berkaitan dengan kurikulum program pengajian baru akan kekal dalam transkrip akademik tetapi tidak akan diambil kira dalam pengiraan PNG/PNGK dan kredit.

8. Pelajar yang bertukar program pengajian dalam bidang yang berlainan hanya boleh memohon pemindahan kredit bagi kursus wajib universiti sahaja atau kursus yang sama dalam kurikulum program pengajian baru. Walau bagaimanapun, semua kursus lain yang tidak berkaitan dengan kurikulum program pengajian baru akan kekal dalam transkrip akademik tetapi dan kredit tidak akan diambil kira dalam pengiraan PNG/PNGK.

PENANGGUHAN PENGAJIAN

Penangguhan pengajian adalah kebenaran kepada pelajar untuk tidak mengikuti pengajian pada sesuatu semester atas alasan-alasan tertentu yang dibenarkan Universiti.

Permohonan penangguhan pengajian dibenarkan kepada pelajar yang mempunyai masalah kesihatan dan disahkan sakit oleh Hospital Kerajaan/Doktor Panel Universiti / Pusat Kesihatan UniMAP sahaja. Bagi kes-kes tertentu sijil sakit yang bukan daripada Hospital Kerajaan atau Doktor Panel Universiti perlu mendapat perakuan Pusat Kesihatan UniMAP. Permohonan yang diasaskan selain daripada masalah kesihatan boleh dipertimbangkan sekiranya mempunyai alasan yang munasabah dan mendapat kelulusan Naib Canselor/ Timbalan Naib Canselor (Akademik & Antarabangsa).

Pelajar yang memohon untuk menangguhkan pengajian perlu mengisi Borang Penangguhan Pengajian (HEA/ HEP-13) yang boleh didapati di Pusat Pengajian. Permohonan perlu mendapat perakuan dan kelulusan yang berikut:

1. Perakuan Rakan Pendamping Siswa (RPS),
2. Perakuan Dekan Pusat Pengajian,
3. Perakuan Dekan Jabatan Hal Ehwal Pelajar & Alumni,
4. Perakuan Kaunselor (jika perlu)
5. Perakuan Dekan Pengurusan Akademik, dan
6. Kelulusan Naib Canselor atau Timbalan Naib Canselor (Akademik & Antarabangsa)

Borang pemohonan penangguhan pengajian pelajar perlu dikemukakan sebelum minggu ketujuh (7) pengajian. Pemohonan selepas minggu ketujuh (7) hanya dibenarkan atas sebab kesihatan atau kes-kes tertentu yang mendapat kelulusan Naib Canselor/ Timbalan Naib Canselor (Akademik & Antarabangsa).

Pelajar tidak dibenarkan menangguhkan pengajian melebihi 2 semester berturut-turut kecuali dengan kelulusan Naib Canselor/Timbalan Naib Canselor (Akademik & Antarabangsa). Bagi kes selain sebab kesihatan, pelajar hanya dibenarkan pulang/keluar daripada universiti setelah permohonan penangguhan pengajian mendapat kelulusan universiti. Sekiranya pelajar telah pulang sebelum kelulusan diperoleh, ia adalah di bawah tanggungjawab pelajar sendiri.

Bagi pelajar yang menangguhkan pengajian atas sebab kesihatan/sakit atau untuk alasan-alasan yang dibenarkan, semester berkenaan tidak akan diambil kira dalam pengiraan semester yang digunakan untuk pengijazahan (Tanpa Penalti). Bagi kes Tanpa Penalti, kursus yang didaftarkan pada semester tersebut akan digugurkan, dan sekiranya terdapat keputusan peperiksaan yang telah disahkan pada peringkat Majlis Peperiksaan Universiti (MPU), keputusan peperiksaan tersebut juga akan terbatal.

Pelajar yang menangguhkan pengajian atas sebab selain daripada sebab kesihatan, semester berkenaan akan diambil kira dalam pengiraan semester yang digunakan untuk pengijazahan (Dengan Penalti) kecuali dengan kebenaran Naib Canselor/Timbalan Naib Canselor (Akademik & Antarabangsa). Bagi kes Dengan Penalti, kursus yang didaftarkan pada semester tersebut tidak akan digugurkan dan akan diambil kira dalam semester. Sebarang keputusan peperiksaan yang telah disahkan pada peringkat MPU juga tidak terbatal dan akan tertera dalam transkrip akademik pelajar.

Pelajar akan diberikan amaran secara bertulis oleh Pusat Pengajian sekiranya didapati tidak mendaftar pada sesuatu semester tanpa memberi sebarang permohonan penangguhan pengajian. Pelajar yang tidak memberi sebarang maklum balas dalam sesuatu tempoh yang diberikan boleh dikeluarkan dari senarai nama pelajar berdaftar Universiti/ditamatkan dan disahkan berhenti dari Universiti.

PENTARAFAN PELAJAR

Taraf akademik pelajar diukur dengan sistem Purata Nilai Gred (PNG) sepanjang pengajian di universiti. Seseorang pelajar yang berjaya mendapat sekurang-kurangnya 2.00 bagi PNG pada satu-satu semester diberi taraf 'Aktif' (A) dan boleh meneruskan pengajian dalam semester yang berikutnya. Pelajar juga dikehendaki mendapatkan Purata Nilai Gred Kumulatif (PNGK) sekurang-kurangnya 2.00 untuk berijazah.

Bagi pelajar yang dibenarkan mengambil Kursus Kuratif (iaitu kursus yang ditawarkan semasa cuti panjang), keputusan peperiksaan Kursus-kursus Kuratif akan dicantumkan dengan keputusan peperiksaan Semester 2 untuk menentukan markah PNG dan taraf akademik pelajar. Jika purata gabungan adalah lebih baik, maka pelajar akan diberi taraf terbaharunya tetapi jika purata gabungan adalah kurang baik, maka taraf Semester 2 dikekalkan.

Pelajar dengan PNG kurang daripada 2.00 pada satu-satu semester akan di beri taraf PERCUBAAN 1 (P1). Taraf PERCUBAAN 2 (P2) pula diberikan kepada pelajar yang mendapat PNG kurang daripada 2.00 bagi dua semester berturut-turut. Jika pelajar masih mendapat kurang dari 2.00 bagi PNG semester berikutnya pula, pelajar berkenaan tidak dibenarkan meneruskan pengajian, melainkan PNGK pelajar tersebut melebihi 2.00 dan pihak universiti memperakukannya. Pihak universiti berkuasa menamatkan pengajian mana-mana pelajar yang didapati tidak memenuhi prestasi dan kemajuan akademik yang ditetapkan.

TEMPOH MINIMUM / MAKSIMUM PENGAJIAN PELAJAR

Pelajar Sarjana Muda Kejuruteraan dan Sarjana Muda Teknologi Kejuruteraan perlu menamatkan program pengajian dalam tempoh masa yang telah ditetapkan, iaitu minimum 8 semester (4 tahun) dan tempoh maksimum 14 semester (7 tahun). Walau bagaimanapun, bagi pelajar yang memperolehi pengecualian kredit, tempoh maksimum yang dibenarkan adalah tidak boleh kurang daripada 6 semester (3 tahun) dan tidak lebih daripada 12 semester (6 tahun). Manakala pelajar Sarjana Muda Perniagaan dan Sarjana Muda Komunikasi Media Baharu pula, perlu menamatkan program pengajian dalam tempoh masa minimum 6 semester (3 tahun) dan tempoh maksimum 10 semester (5 tahun).

Tempoh Minimum atau Maksimum pengajian pelajar adalah seperti berikut:

Program Pengajian	Minimum (Semester)	Maksimum (Semester)
Sarjana Muda Kejuruteraan	8	14
Sarjana Muda Teknologi Kejuruteraan	8	14
Sarjana Muda Perniagaan	6	10
Sarjana Muda Komunikasi Media Baharu	6	10

KURSUS KURATIF

Kursus Kuratif ditawarkan kepada pelajar yang akan bergraduat. Pelajar digalakkan mengulang kursus-kursus yang gagal sebelum memohon untuk mengikuti kursus kuratif. Kursus Kuratif diadakan selepas Semester 2. Permohonan bagi Kursus Kuratif adalah amat terhad dan tertakluk kepada penawaran semula kursus tersebut oleh Pusat Pengajian dengan kelulusan Senat. Pelajar hanya dibenarkan mengambil maksimum 10 unit (3 jenis) Kursus Kuratif pada satu-satu masa. Pengajaran-pembelajaran adalah dalam bentuk tutorial sahaja. Kursus Kuratif biasanya mengandungi 2 minggu pembelajaran dan 1 minggu peperiksaan.

PENGECUALIAN KREDIT

Pengecualian kredit ditakrifkan sebagai pengecualian daripada pendaftaran dan mengikuti kursus yang ditetapkan untuk sesuatu program pengajian berdasarkan kursus yang diambil oleh pelajar sebelum diterima masuk ke program pengajian universiti ini sebagaimana yang diluluskan oleh Dekan Pusat Pengajian/Dekan Pengurusan Akademik.

Pengecualian kredit diberi kepada pelajar yang telah mendapat sekurang-kurangnya C dalam kursus tertentu, mengikut sistem penggredan Universiti dan tertakluk kepada terma-terma dan syarat-syarat yang ditetapkan oleh universiti. Pengecualian kredit diberi kepada pelajar yang telah mengambil satu kursus yang sama atau setara dengan 80% kandungan pembelajarannya adalah sama. Ianya juga terpakai untuk kursus-kursus berkaitan yang boleh digabungkan (2 kursus atau lebih) bagi satu kursus di UniMAP untuk diberi pengecualian.

Pengecualian kredit bagi kursus-kursus yang tertentu bergantung kepada senarai kursus yang diluluskan oleh Pusat Pengajian masing-masing yang telah diluluskan oleh Senat.

SISTEM PEPERIKSAAN DAN PENILAIAN

Peperiksaan bertulis diadakan pada hujung semester. Setiap pelajar mestilah terlebih dahulu memenuhi syarat-syarat kuliah, tutorial, amali dan sebagainya sebelum layak menduduki peperiksaan. Tempoh peperiksaan adalah seperti berikut:

Jadual 7: Tempoh Peperiksaan

Nilai Kursus	Tempoh Peperiksaan
1 unit	2 jam
2 – 4 unit	3 jam

Keputusan peperiksaan pelajar ditentukan berdasarkan penilaian secara berterusan dari komponen kerja kursus dan peperiksaan bertulis. Sumbangan kerja kursus adalah 100% jika sesebuah kursus itu keseluruhannya berbentuk makmal. Kerja kursus biasanya merangkumi tugasan, laporan makmal dan ujian. Penilaian prestasi pelajar adalah berdasarkan kepada gred abjad dan mata penilaian seperti berikut:

Jadual 8: Gred Abjad dan Mata Penilaian

GRED	MATA NILAI	STATUS
A	4.00	LULUS
A-	3.75	
B+	3.50	
B	3.00	
B-	2.75	
C+	2.50	
C	2.00	
C-	1.75	TIDAK LULUS
D+	1.50	
D	1.00	
D-	0.75	
F	0.00	

Gred LULUS untuk sesuatu kursus adalah tertakluk kepada keperluan kursus seperti yang berikut:-

1. Gred LULUS untuk semua kursus ialah Gred C dan ke atas
2. Gred TIDAK LULUS adalah Gred C- hingga Gred F
3. Bagi Kursus Teras, sekiranya pelajar memperolehi PNGK (CGPA) $\geq$ 2.00 dan mendapat Gred C- atau Gred D+, ianya adalah dikira sebagai LULUS. Walaubagaimanapun, pelajar dibenarkan untuk mengulang kursus tersebut untuk memperbaiki GPA/CGPA.

Jadual 9: Pengiraan GPA dan CGPA:

KURSUS	UNIT	NILAI GRED [NG]	GRED [G]	JUMLAH NG
EKT121	3	3.75	A-	11.25
EMT102	4	2.50	C+	10.00
EMT111	4	3.50	B+	14.00
EMT112	4	4.00	A	16.00
EQT102	3	1.75	C-	5.25
EUT122	2	2.75	B-	5.50
	20			62.00
PNG	= 62.00/20 = 3.10			
ECT200	3	3.50	B+	10.50
EKT212	4	2.00	C	8.00
EKT230	4	4.00	A	16.00
EKT240	4	3.50	B+	14.00
EQT203	3	3.75	A-	11.25
	18			59.75
PNG	= 59.75/18 = 3.32			
PNGK	= $\dfrac{\text{Jumlah NG Terkumpul}}{\text{Jumlah Bil. Unit Terkumpul}}$ = $\dfrac{62.00 + 59.75}{20 + 18}$ = 3.20			

RAYUAN PENYEMAKAN SEMULA KEPUTUSAN PEPERIKSAAN

Atas sebab-sebab tertentu, pelajar mungkin ingin memohon untuk penyemakan dijalankan ke atas keputusan peperiksaan akhir semester pelajar. Pelajar hanya dibenarkan memohon menyemak semula keputusan peperiksaan akhir semester dalam tempoh 15 hari selepas keputusan rasmi peperiksaan dikeluarkan oleh Jabatan Pendaftar. Permohonan selepas tempoh ini tidak akan dipertimbangkan.

Pelajar perlu menghantar borang HEA-15m [Borang Rayuan Penyemakan Semula Keputusan Peperiksaan] kepada Unit Peperiksaan & Pengijazahan, Bahagian Pengurusan Akademik, Jabatan Pendaftar. Borang rayuan hendaklah dikemukakan dalam tempoh 15 hari selepas keputusan rasmi diumumkan. Pelajar perlu mengisi borang dalam dua (2) salinan. Satu (1) salinan adalah untuk simpanan pelajar.

Kadar bayaran rayuan ialah RM50 untuk setiap kursus. Pembayaran secara tunai atau Wang Pos/Pos Malaysia / Draf Bank / Cek atas nama BENDAHARI UNIMAP.

PENGGUNAAN BAHASA INGGERIS

Bahasa Melayu adalah bahasa rasmi universiti. Walau bagaimanapun Bahasa Inggeris digunakan secara meluas dalam proses pengajaran dan pembelajaran. Ini adalah untuk membantu pelajar dalam kerjaya mereka. Bagi kursus-kursus yang diajar dalam bahasa Inggeris, peperiksaan akan dijalankan dalam bahasa yang sama.

SISTEM RAKAN PENDAMPING SISWA (RPS)

Sistem Penasihatan Akademik menjadi penghubung antara pelajar dengan pensyarah untuk berbincang dan membuat keputusan berkenaan rancangan pengajian pelajar. Walaupun pelajar mendaftar sendiri secara dalam talian (on-line), pelajar perlu berjumpa dengan Rakan Pendamping Siswa (RPS) untuk mendapatkan nasihat semasa tempoh pendaftaran.

RPS adalah satu sistem di mana staf akademik menyelia sekumpulan kecil pelajar sepanjang tempoh pengajian pelajar di UniMAP. ‘Penyeliaan’ di sini melibatkan perjumpaan yang kerap secara tidak formal, di mana pelajar boleh bersantai dengan staf yang berperanan sebagai “‘rakan” bagi membincangkan isu-isu akademik dan sosial yang berkenaan dengan mereka. Pelajar yang mempunyai prestasi akademik yang tidak memuaskan boleh merujuk kepada RPS sebagai ‘mentor’, dan pelajar tersebut menjadi ‘mentee’, di mana ini akan benar-benar membantu pelajar dalam setiap perkara yang memerlukan penyelesaian.

PUSAT-PUSAT PEMANTAPAN AKADEMIK

Pusat-pusat ini ditubuhkan untuk menyokong pencapaian akademik pelajar UniMAP:

1. **Pusat Kejuruteraan**
   Pusat Kejuruteraan ditubuhkan bagi mengendalikan makmal dan bengkel umum (gunasama) yang diperlukan oleh pelbagai program yang ditawarkan di UniMAP.

   Pusat ini juga menyokong aktiviti penyelidikan dan pembangunan di UniMAP serta menjadi pusat mereka bentuk dan menghasilkan produk-produk kejuruteraan yang inovatif. Pusat Kejuruteraan juga menawarkan kemudahan bagi kursus-kursus yang memerlukan latihan dan kemahiran teknikal, selari dengan standard industri.

2. **Institut Matematik Kejuruteraan**
   Institut Matematik Kejuruteraan (IMK) adalah pusat yang merancang dan mengendalikan kurikulum Matematik Kejuruteraan di UniMAP. Ia berperanan sebagai pusat rujukan dalam menyediakan kepakaran dalam kaedah penyelidikan matematik, simulasi dan kaedah statistik. Pusat ini juga berfungsi sebagai pusat latihan dalam kampus dan personel luar kampus dalam bidang yang berkaitan dengan matematik.

3. **Pusat Bahasa Antarabangsa**
   Pusat Bahasa Antarabangsa menyediakan kursus-kursus bahasa Keperluan Universiti untuk semua pelajar UniMAP bagi program pengajian peringkat Diploma dan Ijazah Sarjana Muda. Pusat ini menawarkan bukan sahaja kursus Bahasa Melayu dan kursus Bahasa Inggeris tetapi juga menawarkan kursus-kursus bahasa asing lain seperti Bahasa Arab, Bahasa Jerman, Bahasa Jepun, Bahasa Mandarin, Bahasa Korea, Bahasa Rusia dan Bahasa Thai.

4. **Pusat Ko-kurikulum**
   Pusat Ko-kurikulum menawarkan pelbagai kursus Ko-kurikulum dan Badan-badan Beruniform. Semua pelajar wajib untuk mengambil 3 unit kursus Ko-kurikulum. Pusat ini menawarkan 44 jenis kursus untuk pelajar tanpa mengira program akademik mereka.

5. **Pusat Kerjasama Industri dan Agensi Kerajaan**
   Pusat Kerjasama Industri dan Agensi Kerajaan (CIGC) berperanan menjalin hubungan dengan pihak industri dan agensi kerajaan dalam pelbagai aspek, terutama dalam program yang berkaitan terus dengan pembelajaran pelajar. Program seperti pendedahan kepada industri, forum bersama industri dan Latihan Perindustrian Staf, diselia dan diselaraskan oleh pusat ini. Sesetengah daripada program ini wajib diambil oleh semua pelajar.

BAHAGIAN PENGURUSAN AKADEMIK JABATAN PENDAFTAR

Bahagian Pengurusan Akademik bertanggungjawab mengendalikan urusan-urusan berkaitan kemasukan dan rekod pelajar, peperiksaan dan pengijazahan pelajar serta hal ehwal Senat Universiti.

Bahagian Pengurusan Akademik, Jabatan Pendaftar terdiri daripada:

1. **Unit Kemasukan dan Rekod Pelajar**
   Unit ini bertanggungjawab mengendalikan urusan berkaitan dengan kemasukan dan rekod pelajar. Antara bidang tugas unit ini adalah:

   i. Mengendalikan secara keseluruhan proses pengambilan dan pendaftaran pelajar dalam negara pada peringkat ijazah pertama dan diploma.
   ii. Mengendalikan proses pengambilan dan pendaftaran pelajar antarabangsa pada peringkat ijazah pertama.

iii. Mengurus proses kemasukan dan pengemaskinian data dalam Sistem Maklumat Pelajar.
iv. Menguruskan rekod peribadi pelajar sepanjang pengajiannya di UniMAP.
v. Menguruskan pendaftaran kursus pelajar secara online bagi setiap semester pengajian.
vi. Menguruskan proses pengecualian dan pemindahan kredit pelajar.

2. Unit Peperiksaan dan Pengijazahan

Unit ini bertanggungjawab mengendali dan memantau perjalanan Peperiksaan Akhir Semester dan perkara-perkara yang berkaitan dengannya. Antara bidang tugas unit ini adalah seperti berikut:

i. Mengeluarkan Pekeliling Peperiksaan kepada Pusat Pengajian/ Pusat/Institut.
ii. Mengeluarkan Jadual Waktu Peperiksaan untuk Program Diploma dan Ijazah.
iii. Menguruskan Peperiksaan Akhir Semester dalam jangkamasa yang ditetapkan.
iv. Menjadi Sekretariat kepada Majlis Peperiksaan Universiti.
v. Menguruskan pemprosesan data peperiksaan mengunakan Sistem Maklumat Pelajar.
vi. Mengeluarkan keputusan peperiksaan akhir semester.
vii. Menguruskan proses rayuan pelajar untuk menyemak semula keputusan peperiksaan.
viii. Mengeluarkan Transkrip Akademik selepas Konvokesyen.
ix. Mengendalikan urusan peminjaman dan pemulangan jubah staf akademik.
x. Menyemak kelayakan pengijazahan untuk pelajar tahun akhir serta mengeluarkan surat pengesahan tamat pengajian dan kelayakan berijazah untuk pelajar yang layak bergraduat.
xi. Bertanggungjawab terhadap konvokesyen pelajar dari segi jemputan serta pinjaman dan pemulangan pakaian konvokesyen.
xii. Menguruskan proses penyediaan dan penyerahan skrol pengijazahan kepada graduan.
xiii. Merekod dan mengemaskini data siswazah.

3. Unit Senat

Unit ini bertindak sebagai urusetia kepada Senat Universiti dalam mengendalikan urusan berkaitan dengan hal ehwal Senat Universiti. Antara bidang tugas unit ini adalah:

i. Merancang aktiviti Senat dan Jawatankuasa di bawahnya, di samping menyelaraskan perkara yang berkaitan dengan pihak-pihak lain yang berkenaan.
ii. Menyediakan Kalendar Akademik bagi perakuan dan kelulusan Senat Universiti.
iii. Menguruskan pencalonan penerima Ijazah Kehormat

Alamat:

Bahagian Pengurusan Akademik
Jabatan Pendaftar
Universiti Malaysia Perlis
Tingkat 3, Bangunan KWSP
Jalan Bukit Lagi
01000 Kangar
PERLIS.

SENARAI STAF
BAHAGIAN PENGURUSAN AKADEMIK

Jabatan Pendaftar:

Cik Norsyahiza Hamzah
Ketua Penolong Pendaftar
Tel. : +6(04) 979 8702
Faks : +6(04) 979 8703
e-mel : syahiza@unimap.edu.my

Unit Kemasukan & Rekod Pelajar:

Puan Nor Innar Md Nor
Penolong Pendaftar
Tel. : +6(04) 979 8701
Faks : +6(04) 979 8703
e-mel : norinnar@unimap.edu.my

Tuan Syed Amir Fatir Syed Akhir
Penolong Pendaftar
Tel. : +6(04) 979 7845
Faks : +6(04) 979 8703
e-mel : syedamir@unimap.edu.my

Encik Irma Azqrai Nin Sey Muhamad
Penolong Pendaftar
Tel. : +6(04) 979 7878
Faks : +6(04) 979 8703
e-mel : azqrai@unimap.edu.my

Puan Rosniza Abdul Hamid
Pembantu Tadbir (Perkeranian/Operasi)
Tel. : +6(04) 979 8706
Faks : +6(04) 979 8703
e-mel : rosniza@unimap.edu.my

Puan Tengku Amanina Tengku Aziz
Pembantu Tadbir (Perkeranian/Operasi)
Tel. : +6(04) 979 8706
Faks : +6(04) 979 8703
e-mel : amanina@unimap.edu.my

Puan Azniyanty Abdullah
Pembantu Tadbir (Perkeranian/Operasi)
Tel. : +6(04) 979 7941
Faks : +6(04) 979 8703
e-mel : azniyanty@unimap.edu.my

Encik Faizan Abdul
Pembantu Tadbir (Perkeranian/Operasi)
Tel. : +6(04) 979 7941
Faks : +6(04) 979 8703
e-mel : faizan@unimap.edu.my

Encik Amirrul Amar Mazri
Pembantu Tadbir (Perkeranian/Operasi)
Tel. : +6(04) 979 7940
Faks : +6(04) 979 8703
e-mel : amirrulamar@unimap.edu.my

Encik Ra'qil Afzal Raus
Pembantu Am Pejabat
Tel. : +6(04) 979 8706
Faks : +6(04) 979 8703
e-mel : afzal@unimap.edu.my

Unit Peperiksaan dan Pengijazahan:

Puan Rahaida Ab. Rahim
Penolong Pendaftar
Tel. : +6(04) 979 8705
Faks : +6(04) 979 8703
e-mel : rahaida@unimap.edu.my

Puan Salfarina Omar
Penolong Pendaftar
Tel. : +6(04) 979 8700
Faks : +6(04) 979 8703
e-mel : salfarina@unimap.edu.my

Encik Fathul Azan Faezan
Penolong Pendaftar
Tel. : +6(04) 979 2984
Faks : +6(04) 979 8703
e-mel : fathulazan@unimap.edu.my

Encik Hamizal Hamid
Pembantu Tadbir (Perkeranian/Operasi)
Tel. : +6(04) 979 8708
Faks : +6(04) 979 8703
e-mel : hamizal@unimap.edu.my

Puan Norazwati Abdullah
Pembantu Tadbir (Perkeranian/Operasi)
Tel. : +6(04) 979 8708
Faks : +6(04) 979 8703
e-mel : norazwati@unimap.edu.my

Encik Mohammad Sharil Abd Rasid
Pembantu Tadbir (Perkeranian/Operasi)
Tel. : +6(04) 979 8708
Faks : +6(04) 979 8703
e-mel : sharilrasid@unimap.edu.my

Puan Munirah Jamil
Pembantu Tadbir (Perkeranian/Operasi)
Tel. : +6(04) 979 8708
Faks : +6(04) 979 8703
e-mel : munirahjamil@unimap.edu.my

Encik Mohd. Afendi Mat Ja
Pembantu Tadbir (Perkeranian/Operasi)
Tel. : +6(04) 979 8708
Faks : +6(04) 979 8703
e-mel : mohdafendi@unimap.edu.my

Puan Maisarah Ab. Karim
Pembantu Tadbir (Perkeranian/Operasi)
Tel. : +6(04) 979 8707
Faks : +6(04) 979 8703
e-mel : maisarah@unimap.edu.my

Encik Mohd Hafizi Che Yusof
Pembantu Tadbir (Perkeranian/Operasi)
Tel. : +6(04) 979 8707
Faks : +6(04) 979 8703
e-mel : hafiziyusof@unimap.edu.my

Encik Muhammad Faisal Norshidi
Pembantu Am Operasi
Tel. : +6(04) 979 8708
Faks : +6(04) 979 8703
e-mel : muhdfaisal@unimap.edu.my

Unit Senat:

Puan Nurazrina Abd. Rahman
Penolong Pendaftar Kanan
Tel. : +6(04) 979 8562
Faks : +6(04) 979 8703
e-mel : nurazrina@unimap.edu.my

Puan Tihazariah Husin
Pembantu Tadbir (Perkeranian/Operasi)
Tel. : +6(04) 979 8561
Faks : +6(04) 979 8703
e-mel : tihazariah@unimap.edu.my

ACADEMIC CALENDAR 2015/2016 SESSION
(DEGREE PROGRAMME)

SEMESTER 1 7th September 2015 - 17th January 2016 (19 Weeks)				
ACTIVITIES	**DATE**		**PERIOD**	**NOTES**
Registration New Intake / Orientation	1st September 2015	6th September 2015	6 Days	**Independence Day** 31st August 2015
Lecture	7th September 2015	8th November 2015	9 Weeks	**Malaysia Day** 16th September 2015 **Hari Raya Aidiladha** 24th September & 25th September 2015 **Awal Muharam** 14th October 2015
Mid Semester Break	9th November 2015	15th November 2015	1 Weeks	**Deepavali** 10th November 2015
Lecture	16th November 2015	20th December 2015	5 Weeks	-
Study week	21th December 2015	27th December 2015	1 Week	**Maulidur Rasul** 24th December 2015 **Christmas** 25th December 2015
Examination	28th December 2015	17th January 2016	3 Weeks	
Semester Break	19th January 2016	16th February 2015	4 Weeks	**Chinese New Year** 8th & 9th February 2016

ACADEMIC CALENDAR 2015/2016 SESSION
(DEGREE PROGRAMME)

SEMESTER 2 15th February 2016 – 26th June 2016 (19 Weeks)				
AKTIVITIES	**DATE**		**PERIOD**	**NOTE**
Lecture	15th February 2016	10th April 2016	8 Weeks	
Mid Semester Break	11th April 2016	17th April 2016	1 Weeks	-
Lecture	18th April 2016	29st May 2016	6 Weeks	**Labour Day** 1st May 2016 **Israk Mikraj** 5th May 2016 **Birthday of DYMM Tuanku Raja Perlis** 17th May 2016 **Wesak Day** 21st May 2016
Study week	30st May 2016	5th June 2016	1 Weeks	**Birthday of SPB Yang Di-Pertuan Agung** 4th June 2016
Examination	6th June 2016	26th June 2016	3 Weeks	**Nuzul Al-Quran** 22thJuly 2016
Semester Break / Industrial Training	27th June 2016	4th September 2016	10 Weeks * Industrial Training	**Hari Raya Aidilfitri** 7th July 2016 & 8th July 2016 **Independence Day** 31st August 2016

** Industrial Training for 3rd year students of Bachehor of Engineering and 2rd Year students of Bachelor of Business (Entrepreneurship Engineering) will start for 27th June 2016 until 4th September 2016 (10 weeks)*

ADMISSION REQUIREMENTS FOR UNDERGRADUATE DEGREE PROGRAM ACADEMIC SESSION OF 2014/2015

INTERNATIONAL STUDENTS

COUNTRY	GENERAL REQUIREMENTS	SPECIFIC REQUIREMENTS		
China	• Completed 12 years of education in 3 levels of schooling (Primary School, Junior Middle School, and Senior Middle School). • Graduated from Senior Middle School with Senior High School Certificate. • Obtain minimum average score of 60% in Senior High School Certificate. • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent toTOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%
Indonesia	• Completed 12 years of education in 3 levels of schooling (Primary School, Junior Secondary School, and Senior Secondary School @ Sekolah Menengah Atas). • Pass Senior Secondary @ Sekolah Menengah Atas examination. • Pass with minimum Grade Point Average (GPA) of 6.00 - 10.00 in Senior Secondary @ Sekolah Menengah Atas examination. • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent toTOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%

COUNTRY	GENERAL REQUIREMENTS	SPECIFIC REQUIREMENTS		
Saudi Arabia	• Completed 12 years of education in 3 levels of schooling (Elementary School, Intermediate School, and General Secondary School/Technical Junior College) • Pass and obtain at least 60% in General Secondary Education Certificate (Tawjihiyah)/ Secondary Vocational School Diploma/ Secondary Commercial School Diploma/ Secondary Agricultural School Diploma examination. • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent toTOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%
Iraq	• Completed 11 or 12 years of education in 3 levels of schooling (Primary School, Intermediate Secondary School, and Preparatory Secondary School/Vocational Secondary School) • Pass and obtain at least 60% in Preparatory Secondary School/Vocational Secondary School. • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent to TOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%

COUNTRY	GENERAL REQUIREMENTS	SPECIFIC REQUIREMENTS		
Nigeria	• Completed 12 years of education in 2 or 3 levels of schooling (Primary School, Junior Secondary School and Senior Secondary School/Technical Secondary School) • Pass and obtain at least B+ in five (5) subjects in Senior School Certificate. • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent toTOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%
Thailand	• Completed 12 years of education in 3 levels of schooling (Primary School, Lower Secondary School and Upper Secondary School/Religious School) • Pass and obtain at least CGPA 2.4 or 60% in Higher Secondary School Certificate (Mathayam Suksa 6) • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent toTOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%

BAHASA INGGERIS (ENGLISH)

COUNTRY	GENERAL REQUIREMENTS	SPECIFIC REQUIREMENTS		
Uzbekistan	• Completed 11 or 12 years of education in 2 levels of schooling (Primary School, General Secondary School and Technical Secondary School/ Upper Secondary School /Specialized Secondary School) • Pass and obtain at least 60% in Technical Secondary School/ Upper Secondary School / Specialized Secondary School. • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent toTOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%
Yemen	• Completed 12 years of education in 2 levels of schooling (Basic and Upper Secondary School / Vocational Secondary School) • Pass both Intermediate School Certificate (ISC) and General Secondary School Certificate (Al-Thanawiya) examination. • Obtain at least 60% in General Secondary School Certificate (Al-Thanawiya). • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent toTOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%

<table>
<tr><th>COUNTRY</th><th>GENERAL REQUIREMENTS</th><th colspan="3">SPECIFIC REQUIREMENTS</th></tr>
<tr><td rowspan="5">Somalia</td><td rowspan="5">• Completed 12 years of education in 2 levels of schooling (Primary School and Secondary School)

• Pass and obtain at least 60% in Secondary School Leaving Certificate (SSLC) or Technical Secondary School Certificate.

• Obtain TOEFL 525 / IELTS 5.5 / Equivalent

(Candidates who do not possess qualification equivalent toTOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP).

• Other requirements that have been endorsed by the University Senate.</td><td rowspan="4">Bachelor of Engineering</td><td colspan="2">(Electronic-Based)</td></tr>
<tr><td>• English
• Mathematics
• Physics/Chemistry</td><td>60%
60%
60%</td></tr>
<tr><td colspan="2">(Bio-Based)</td></tr>
<tr><td>• English
• Mathematics
• Physics/Chemistry/Biology</td><td>60%
60%
60%</td></tr>
<tr><td>Bachelor of Business</td><td>• English
• Mathematics
• Physics/Chemistry/Biology
or
Business/ Economics/ Commerce/Accounting</td><td>60%
60%
60%

60%</td></tr>
<tr><td rowspan="5">Mauritius</td><td rowspan="5">• Completed 12 years of education in 3 levels of schooling (Primary School, Lower Secondary School and Upper Secondary School)

• Pass Higher School Certificate / General Certificate of Education A-level examination and pass at least three (3) subjects (Advanced Level).

• Obtain TOEFL 525 / IELTS 5.5 / Equivalent

(Candidates who do not possess qualification equivalent toTOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP).

• Other requirements that have been endorsed by the University Senate.</td><td rowspan="4">Bachelor of Engineering</td><td colspan="2">(Electronic-Based)</td></tr>
<tr><td>• English
• Mathematics
• Physics/Chemistry</td><td>60%
60%
60%</td></tr>
<tr><td colspan="2">(Bio-Based)</td></tr>
<tr><td>• English
• Mathematics
• Physics/Chemistry/Biology</td><td>60%
60%
60%</td></tr>
<tr><td>Bachelor of Business</td><td>• English
• Mathematics
• Physics/Chemistry/Biology
or
Business/ Economics/ Commerce/Accounting</td><td>60%
60%
60%

60%</td></tr>
</table>

COUNTRY	GENERAL REQUIREMENTS	SPECIFIC REQUIREMENTS		
Sudan	• Completed 11 years of education in 2 levels of schooling (Basic School and Secondary School / Technical School) • Pass and obtain at least 60% in Sudan Secondary School Certificate. • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent toTOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%
Syria	• Completed 12 years of education in 3 levels of schooling (Basic Education I School, Basic Education II School and General Secondary School / Technical Secondary School) • Pass and obtain at least 60% in Al-Shahada Al Thanawiyah Al Amma @ Secondary School Leaving Certificate / Al Shahada Al-Thanawiyah Al-Fanniyya @ Technical Baccalaureat. • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent toTOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%

COUNTRY	GENERAL REQUIREMENTS	SPECIFIC REQUIREMENTS		
Jordan	• Completed 12 years of education in 2 levels of schooling (Basic School and Secondary School / Vocational Secondary School) • Pass and obtain at least 60% in Al-Tawjihi @ General Secondary Education Certificate / Vocational Certificate. • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent toTOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%
Pakistan	• Completed 12 years of education in 2 levels of schooling (Secondary School and Higher Secondary School) • Pass and obtain at least 60% in Higher Secondary School Certificate (HSSC). • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent to TOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%

COUNTRY	GENERAL REQUIREMENTS	SPECIFIC REQUIREMENTS		
Libya	• Completed 12 years of education in 2 levels of schooling (Basic School and Secondary School) • Pass and obtain at least 60% in Secondary Education Certificate. • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent to TOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%
Ethiopia	• Completed 12 or 13 years of education in 3 levels of schooling (Primary School, General Secondary School and Preparatory Secondary School/ Technical/Vocational School) • Pass and obtain at least Grade C for 5 subjects in Ethiopian Higher Education Entrance Examination (EHEEE) or Technical/Vocational School Certificate. • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent toTOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%

COUNTRY	GENERAL REQUIREMENTS	SPECIFIC REQUIREMENTS		
Iran	• Completed 12 years of education in 3 levels of schooling (Primary School, Secondary School and Pre-University) • Pass Secondary/High School Diploma and Pre-University Certificate (KONKUR) with minimum score of 13 in KONKUR. • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent toTOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%
Palestine	• Completed 12 years of education in 2 levels of schooling (Basic School and Secondary School/ Technical Secondary School) • Pass and obtain at least 60% in Secondary School Certificate (Al-Tawjihi). • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent toTOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%

<table>
<tr><th>COUNTRY</th><th>GENERAL REQUIREMENTS</th><th colspan="3">SPECIFIC REQUIREMENTS</th></tr>
<tr><td rowspan="5">Chad</td><td rowspan="5">• Completed 13 years of education in 2 levels of schooling (Primary School and Secondary School)

• Pass and obtain at least 60% in Baccalaureat.

• Obtain TOEFL 525 / IELTS 5.5 / Equivalent

(Candidates who do not possess qualification equivalent to TOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP).

• Other requirements that have been endorsed by the University Senate.</td><td rowspan="4">Bachelor of Engineering</td><td colspan="2">(Electronic-Based)</td></tr>
<tr><td>• English
• Mathematics
• Physics/Chemistry</td><td>60%
60%
60%</td></tr>
<tr><td colspan="2">(Bio-Based)</td></tr>
<tr><td>• English
• Mathematics
• Physics/Chemistry/Biology</td><td>60%
60%
60%</td></tr>
<tr><td>Bachelor of Business</td><td>• English
• Mathematics
• Physics/Chemistry/Biology
or
Business/ Economics/ Commerce/Accounting</td><td>60%
60%
60%

60%</td></tr>
<tr><td rowspan="5">Algeria</td><td rowspan="5">• Completed 13 years of education in 2 levels of schooling (Primary School and Secondary School)

• Pass Diploma of Secondary Education (Baccalaureat) with minimum score of 15.

• Obtain TOEFL 525 / IELTS 5.5 / Equivalent

(Candidates who do not possess qualification equivalent to TOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP).

• ∴Other requirements that have been endorsed by the University Senate.</td><td rowspan="4">Bachelor of Engineering</td><td colspan="2">(Electronic-Based)</td></tr>
<tr><td>• English
• Mathematics
• Physics/Chemistry</td><td>60%
60%
60%</td></tr>
<tr><td colspan="2">(Bio-Based)</td></tr>
<tr><td>• English
• Mathematics
• Physics/Chemistry/Biology</td><td>60%
60%
60%</td></tr>
<tr><td>Bachelor of Business</td><td>• English
• Mathematics
• Physics/Chemistry/Biology
or
Business/ Economics/ Commerce/Accounting</td><td>60%
60%
60%

60%</td></tr>
</table>

<table>
<tr><th>COUNTRY</th><th>GENERAL REQUIREMENTS</th><th colspan="3">SPECIFIC REQUIREMENTS</th></tr>
<tr><td rowspan="5">Bangladesh</td><td rowspan="5">• Completed 12 years of education in 2 levels of schooling (Secondary School and Higher Secondary School)

• Pass and obtain at least 60% in Higher Secondary School Certificate (HSSC).

• Obtain TOEFL 525 / IELTS 5.5 / Equivalent

(Candidates who do not possess qualification equivalent toTOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP).

• Other requirements that have been endorsed by the University Senate.</td><td rowspan="4">Bachelor of Engineering</td><td colspan="2">(Electronic-Based)</td></tr>
<tr><td>• English
• Mathematics
• Physics/Chemistry</td><td>60%
60%
60%</td></tr>
<tr><td colspan="2">(Bio-Based)</td></tr>
<tr><td>• English
• Mathematics
• Physics/Chemistry/Biology</td><td>60%
60%
60%</td></tr>
<tr><td>Bachelor of Business</td><td>• English
• Mathematics
• Physics/Chemistry/Biology
or
Business/ Economics/ Commerce/Accounting</td><td>60%
60%
60%

60%</td></tr>
<tr><td rowspan="5">United Arab Emirates (UAE)</td><td rowspan="5">• Completed 12 years of education in 3 levels of schooling (Primary School, Preparatory School and Secondary School)

• Pass and obtain at least 60% in Secondary School Leaving Certificate (Al-Tawjihiyya).

• Obtain TOEFL 525 / IELTS 5.5 / Equivalent

(Candidates who do not possess qualification equivalent toTOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP).

• Other requirements that have been endorsed by the University Senate.</td><td rowspan="4">Bachelor of Engineering</td><td colspan="2">(Electronic-Based)</td></tr>
<tr><td>• English
• Mathematics
• Physics/Chemistry</td><td>60%
60%
60%</td></tr>
<tr><td colspan="2">(Bio-Based)</td></tr>
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60%
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<tr><td>Bachelor of Business</td><td>• English
• Mathematics
• Physics/Chemistry/Biology
or
Business/ Economics/ Commerce/Accounting</td><td>60%
60%
60%

60%</td></tr>
</table>

COUNTRY	GENERAL REQUIREMENTS	SPECIFIC REQUIREMENTS		
Lebanon	• Completed 12 years of education in 3 levels of schooling (Primary School, Intermediate School and Secondary School) • Pass and obtain at least 12/20 in Baccalauréat Libanais. • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent toTOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%
Myanmar	• Completed 11 years of education in 3 levels of schooling (Primary School, Middle School, and High School) • Pass University Entrance Examination and obtain minimum average score of 360/600 or 60%. • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent toTOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%

COUNTRY	GENERAL REQUIREMENTS	SPECIFIC REQUIREMENTS		
Tunisia	• Completed 13 years of education in 2 levels of schooling (Primary School and Secondary School) • Pass and obtain at least 12/20 in Baccalauréat. • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent to TOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%
Cameroon	• Completed 14 years of education in 2 levels of schooling (Primary School, Secondary School and High School) • Pass GCE A-Level with average score of 60%/ equivalent, and obtain at least C in relevant subjects. • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent toTOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%

COUNTRY	GENERAL REQUIREMENTS	SPECIFIC REQUIREMENTS		
Egypt	• Completed 11 or 13 years of education in 3 levels of schooling (Primary School, Preparatory School and General Secondary School/Technical Secondary School) • Pass and obtain at least 60% in Secondary Education Certificate (Thanaweya Amma). • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent toTOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%
Cambodia	• Completed 12 years of education in 3 levels of schooling (Primary School, Lower Secondary School and Upper Secondary School) • Pass Diploma of Upper Secondary with minimum score of C/60%/equivalent. • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent toTOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%

COUNTRY	GENERAL REQUIREMENTS	SPECIFIC REQUIREMENTS		
Vietnam	• Completed 12 years of education in 3 levels of schooling (Primary School, Lower Secondary School and Upper Secondary School) • Pass University Entrance Examination and obtain minimum average score of 6.0/60%/equivalent. • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent to TOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%
Turkey	• Completed 12 years of education in 2 levels of schooling (Basic School and High School) • Pass Lise Diplomasi and obtain minimum average score of 3.00/60%/equivalent. • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent toTOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%

COUNTRY	GENERAL REQUIREMENTS	SPECIFIC REQUIREMENTS		
Tanzania	• Completed 13 years of education in 2 levels of schooling (Primary School and Secondary School). • Pass Advanced Certificate of Secondary Education (A level) with 'principal pass' in at least 2 related subjects. • Obtain minimum Grade C in English at O level. • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent to TOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%
Zimbabwe	• Completed 13 years of education in 2 levels of schooling (Primary School and Secondary School). • Pass Zimbabwe General Certificate of Education Advanced Level with 'principal pass' in at least 2 related subjects. • Obtain minimum Grade C in English at Zimbabwe General Certificate of Education Ordinary Level. • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent to TOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%

COUNTRY	GENERAL REQUIREMENTS	SPECIFIC REQUIREMENTS		
Qatar	• Completed 12 years of education in 3 levels of schooling (Primary School, Preparatory School and Secondary School) • Pass and obtain at least 60% in General Secondary Education Certificate (Al-Thanawiyya Al-Amma). • Obtain TOEFL 525 / IELTS 5.5 / Equivalent (Candidates who do not possess qualification equivalent to TOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP). • Other requirements that have been endorsed by the University Senate.	Bachelor of Engineering	**(Electronic-Based)**	
			• English • Mathematics • Physics/Chemistry	60% 60% 60%
			(Bio-Based)	
			• English • Mathematics • Physics/Chemistry/Biology	60% 60% 60%
		Bachelor of Business	• English • Mathematics • Physics/Chemistry/Biology or Business/ Economics/ Commerce/Accounting	60% 60% 60% 60%

THE ACADEMIC SYSTEM

The Bachelor of Engineering and The Bachelor of Engineering Technology curriculum are designed to be completed in 4 years while the Bachelor in Business and the Bachelor of New Media Communication are to be completed in 3 years with each academic year divided into Semester I and Semester II. Each semester consists of 14 study weeks. Examination will be held at the end of the semester. Courses are divided into four levels which are levels 100, 200, 300, and 400.

For the graduation purposes, Bachelor of Engineering students must complete 120 units of Core Courses and the Bachelor of Engineering Technology students will have to complete 123 units of Core Courses. Bachelor of Business students must complete 72 or 74 units of Core Courses (based on specialization) and 30 units of Elective Courses while the Bachelor of New Media Communication students must complete 87 units of Core Courses and 15 units Elective Courses.

Students are also required to complete University Requirement Courses of 17 units for Bachelor of Engineering Degree, 19 units for Bachelor of Engineering Technology Degree, 20 units for Bachelor of Business Degree and 18 units for Bachelor of New Media Communication.

To graduate, students also need to pass all courses and obtain the required number of credits according to their respective study programmes as well as a GCPA of at least 2.00.

PROGRAMME STRUCTURE

The programme structures for the Bachelor of Engineering, Bachelor of Engineering Technology, Bachelor of Business and Bachelor of New Media Communication programme are shown in Tables 1 (a), 1 (b), 1 (c), 1 (d) and 1 (e). Students are required to complete 137 units for Bachelor of Engineering, 142 units for Bachelor of Engineering Technology, 122 or 124 units for Bachelor of Business and 120 units for Bachelor of New Media Communication in order to graduate.

Table 1(a): Programme Structure for Bachelor of Engineering

BACHELOR OF ENGINEERING	
COURSES	**UNIT (S)**
ENGINEERING CORE COURSES	**120**
UNIVERSITY REQUIREMENT COURSES	**17**
a. Engineering Entrepreneurship	2
b. Thinking Skills	2
c. University Malay Language	2
d. English for Technical Communication	2
e. Islamic and Asian Civilization/Malaysian Cultures	2
f. Ethnic Relations	2
g. Co-Curriculum	3
h. Optional Course	2
TOTAL	**137**

Table 1(b): Programme Structure for Bachelor of Engineering Techology

BACHELOR OF ENGINEERING TECHNOLOGY	
COURSES	**UNIT (S)**
ENGINEERING TECHNOLOGY CORE COURSES	**123**
UNIVERSITY REQUIREMENT COURSES	**19**
a. Engineering Entrepreneurship	2
b. Thinking Skills	2
c. University Malay Language	2
d. English for Technical Communication	2
e. Islamic and Asian Civilization/Malaysian Cultures	2
f. Ethnic Relations	2
g. Skills and Technology in Communication	2
h. Co-Curriculum	3
i. Optional Course	2
TOTAL	**142**

BAHASA INGGERIS (ENGLISH)

Table 1(c): Programme Structure for Bachelor of Business

BACHELOR OF BUSINESS (ENGINEERING ENTREPRENEURSHIP)	
COURSES	**UNIT (S)**
BUSINESS CORE COURSES	**72**
ELECTIVES	**30**
UNIVERSITY REQUIREMENT COURSES	**20**
a. Engineering Entrepreneurship	2
b. Thinking Skills	2
c. University Malay Language	2
d. English for Academic Purposes	2
e. Islamic and Asian Civilization/Malaysian Cultures	2
f . Ethnic Relations	2
g. Skills and Technology in Communication	2
h. Business Communication	3
i. Co-Curriculum	3
TOTAL	**122**

Table 1(d): Programme Structure for Bachelor of Business (International Business)

BACHELOR OF BUSINESS (INTERNATIONAL BUSINESS)	
COURSES	**UNIT**
BUSINESS CORE COURSES	**74**
ELECTIVES	**30**
UNIVERSITY REQUIREMENT COURSES	**18**
a. Engineering Entrepreneurship	2
b. Thinking Skills	2
c. University Malay Language	2
d. English for Academic Purposes	2
e. Islamic and Asian Civilization/Malaysian Cultures	2
f. Ethnic Relations	2
g. Skills and Technology in Communication	2
h. Business Communication	3
i. Co-Curriculum	3
TOTAL	**124**

Table 1(e): Programme Structure for Bachelor of New Media Communication

BACHELOR OF NEW MEDIA COMMUNICATION	
COURSES	**UNIT**
NEW MEDIA COMMUNICATION CORE COURSES	**87**
ELECTIVES	**15**
UNIVERSITY REQUIREMENT COURSES	**18**
a. Thinking Skills	2
b. University Malay Language	3
c. English for Academic Purposes	2
d. Islamic and Asian Civilization/Malaysian Cultures	2
e. Ethnic Relations	2
f. Foreign Language	4
g. Co-Curriculum	3
TOTAL	**120**

TYPES OF COURSES

1. **University Core Courses**
   University Core Courses are courses which are NOT the student's major. These courses are offered by the School of Human Development and Techonocommunication (iKOM), the Centre of International Languages (CIL) and the Co-Curriculum Centre. All these courses are compulsory and students need to pass with grade C to graduate. The University Core Courses are:

   a. **Engineering Entrepreneurship (2 units)**
   All students are required to take Engineering Entrepreneurship course. Students are also advised to take other courses in the entrepreneurship category, where the units collected will cover the Optional Course requirement.

   b. **Thinking Skills (2 units)**
   Thinking Skills is compulsory for all students.

   c. **University Malay Language (2 units)**
   University Malay Language is compulsory for all students.

BAHASA INGGERIS (ENGLISH)

d. English for Technical Communication/ English for Academic Purposes (2 units)
It is compulsory for all students to take English for Technical Communication (for Bachelor of Engineering and Bachelor of Engineering Technology) or English for Academic Purposes (for Bachelor of Business and Bachelor of New Media Communication). Students who obtained Band 1, 2 or 3 in MUET must take Foundation English and pass with a minimum of Grade C before enrolling for English for Technical Communication or English for Academic Purposes. These two (2) additional units will be counted as their Option course (refer item (h)). Students who acquired Band 4 or 5 in MUET are not required to take Foundation English before enrolling for English for Technical Communication or English for Academic Purposes. Students who acquired Band 4 or 5 in MUET are also not allowed to take Foundation English as their Option course.

e. Islamic and Asian Civilization/Malaysian Cultures (2 units)
Islamic and Asian Civilization is compulsory for all local students, while Malaysian Cultures is compulsory for all international students.

f. Ethnic Relations (2 units)
Ethnic Relations is compulsory for all students.

g. Skills and Technology in Communication (2 units)
Skills and Technology in Communication is compulsory for all Bachelor of Engineering Technology and Bachelor of Business students.

h. Optional Courses
Optional Courses are courses which are offered by the School of Human Development and Techonocommunication (iKOM) and The Centre for International Languages for the students of Engineering and Engineering Technology. Two (2) units of Optional Courses have to be taken by students of Bachelor of Engineering and Engineering Technology students, during their study in UniMAP.

i. Business Communication (3 units)
Business Communication is compulsory for all students of Bachelor of Business.

j. Co-Curriculum Programme (3 units)
All students are required to collect 3 units for Co-Curriculum during their study at UniMAP. Two (2) units are to be collected from Uniformed Bodies, where the 1st unit needs to be taken in Semester I and another 1 unit in Semester II (in the First Year of study), while the other 1 unit can be collected from any other Co-Curriculum courses in any semester.

2. Core Courses (Bachelor of Engineering)
Core Courses are courses that must be taken by Bachelor of Engineering students. These courses are part of the requirements for graduation. Students who fail Core Courses must repeat them and pass before they can graduate.

3. Core Courses (Bachelor of Engineering Technology)
Core Courses are courses that must be taken by Bachelor of Engineering Technology students. These courses are part of the requirements for graduation. Students who fail Core Courses must repeat them and pass before they can graduate.

4. Core Courses (Bachelor of Business)
There are two types of Core Courses for the Bachelor of Business:

a. **Business Core Course:** Business Core Courses are contemporary courses in the business field. It is compulsory for Bachelor of Business students to take these courses.

b. **Programme Core Courses:** Programme Core Courses meanwhile are offered based on the students' major.

These courses are part of graduation requirement. Students who fail any of the Core Courses must repeat them and pass before they can graduate.

5. **Elective Courses (Bachelor of Business)**
   Students can choose Elective Courses based on their interests.

6. **Prerequisite Courses**
   All students MUST take and pass prerequisite courses set before registering for any subsequent courses. The subsequent courses have prerequisites which have to be fulfilled as determined in the academic programme structure of the degree programmes offered. Students, who fail the prerequisite courses and intend to take them together with the subsequent courses in the same semester, must apply to and obtain the approval of the Dean of schools. Note, however, that prerequisite and subsequent courses cannot be taken together in the same semester for language courses.

THE UNIT SYSTEM

Each course is given a value known as the UNIT. The unit is based on the scope and the depth of a course. With the exception of certain cases, the value of a unit for each Teaching & Learning mode is in Table 2:

Table 2: Unit Evaluation per Week for 14-Week Semester

Form of Contact	Unit Value	Total Contact/ Week
Lecture	1	1 hour
Laboratory/Tutorial	1	2 hours
Final Year Project	1	3 hours
Assisted Learning involving delivery mode such as Problem Based Learning (PBL), e-learning modules, visits ect….	1	3 hours
Industrial Training	1*	Depending on the programme of study

*** Note: The value of 1 unit of the Industrial Training is equivalent to 2 weeks of training.*

TEACHING AND LEARNING APPROACHES AT UniMAP

Many of the Core Courses offered include Theory Component and Practical Component, the value of contact hours for which is detailed below:

1. **Theory Component**
   One (1) unit of Theory Component is equivalent to 1 hour of lecture/ tutorial/reading per week or 14 hours per semester.

2. **Practical Component**
   One (1) unit of Practical Component for Engineering programme is equivalent to 2 contact hours per week or 28 hours per semester. One (1) unit of Practical Component for Engineering Technology programme is equivalent to 3 contact hours per week or 42 hours per semester.

For most of the Core Courses, students are required to complete a mini project and sit for an examination or a Viva Voce at the end of the semester.

The Practical Components consist of the following teaching and learning modes:

1. **Lab Intensive Learning** - two or three students carry out an experiment in a group. In some basic lab intensive programmes, each student will conduct an experiment individually (1:1) and not in a group.

2. **Teaching Factory Learning** - five to six students carry out a process run in a group using actual scale equipment used in industry.

3. **E-Learning** - Learning approach that is reinforced using ICT, complementing the conventional approach. Through the UniMAP website, students obtain access to course modules and topics. The modules consist of lecture notes in multimedia format such as audio, video, graphic, animation, simulation, games and other interactive activites.

4. **Exposure to Industry** - Students will make multiple visits to industry for a certain period of time throughout their study at UniMAP. These include IndEx (Industrial Exposure) programmes, InTra (Industrial Training), Industrial Entrepreneurship Exposure (IndEnt) and others.

INDUSTRIAL TRAINING

Industrial Training is a course, carrying 4 units for Bachelor of Engineering students, 12 units for Bachelor of Engineering Technology students, 6 units for Bachelor of Business and Bachelor of New Media Communication students.

Third (3rd) Year Bachelor of Engineering students are required to undergo 12 weeks of Industrial Training in order to collect 4 credits for this course while 4th Year of Bachelor of Engineering Technology students are required to undergo 12 weeks of Industrial Training in order to collect 12 credits for this course. Third year students Bachelor of New Media Communication required to undergo 12 weeks of Industrial Training in order to collect 12 credits for this course.

Students of Bachelor of Business (International Business) are required to do Industrial Training during the 2nd and 4th semester. Students have two options to choose from, Option 1 (2+2) or Option 2 (3+1). For Option 1 (2+2), students will undergo two phases (2 months +2 months) of Industrial Training in selected multinational companies in Malaysia. For Option 2 (3+1), students will undergo Industrial Training in the selected multinational companies in Malaysia for the first 3 months, followed by an educational trip abroad (International Business Field Trips).

Bachelor of Business (Engineering Entrepreneurship) students will undergo practical training via the Business Incubator programme for 12 weeks. They will earn 6 credits hours after the 4th semester.

Contact hours evaluation is calculated based on an average of 8 contact hours per day for 5 days in a week, where 8 hours per day x 5 days = 40 hours per week (working hours for designated organization/corporation).

The main objectives of the Industrial Training are to:

- Instill professionalism in students
- Raise students' awareness on the importance and connection between industrial training, lab - intensive and engineering theories.
- Provide students with early exposure to industrial environment and practices. Students also are given the opportunity to equip themselves with the necessary skills and knowledge needed in their respective academic and training fields.

The Centre for Industrial and Governmental Collaboration (CIGC) coordinates programmes which require the involvement of industry and government's agencies with relevant units and centres:

1. Industrial Exposure (IndEx) - for students who have completed Year 1.
   a. Short term exposure programme - 1 day
   b. Talks, briefings, demonstrations by and dialogues with experts, managers and engineers from the industry
   c. Visits to industry

2. Industrial Entrepreneurship Exposure (IndEnt) - for Year 2 students
   a. Short term exposure programme - 1 day
   b. Briefings, demonstrations by and dialogues with small sector industries, R&D firms and government bodies such as the Ministry of Entrepreneur and Cooperative Development.

BUSINESS INCUBATOR PROGRAMME

Teaching and Learning approaches for Bachelor of Business (Engineering Entrepreneurship) programme, not only includes lectures and tutorials but also Practical

Training through the Business Incubator Program. After the 4th semester, students will participate in the Business Incubator Programme for 12 weeks which will earn them 6 credit hours.

Students are mentored by companies in Business Incubators, providing them the opportunity to be part of the team involved in product development which may even lead to commercialisation. They will experience how ideas and innovations can lead to products for consumers. In addition to that, they will see for themselves the flow of business processes.

At the end of the programme, students are required to prepare a report on their experience throughout the Business Incubator Programme in the selected companies.

Malaysian Business Incubators form a tightly-knit group under the National Incubator Network Association (NINA) which is affiliated with the Association of Asean Business Incubation (AABI). Its members include Technology Park Malaysia, Malaysian Technology Development Corporation, SIRIM and Kulim Technology Park Corporation. UniMAP works closely with these organisations to ensure the success of the programme.

INTERNATIONAL BUSINESS FIELD TRIPS

Students will undergo industrial training in their second (2nd) and fourth (4th) semester. They have two options to choose from; Option 1 (2+2) or Option 2 (3+1). For the Option 1 (2+2), students will undergo two phases (2 months +2 months) of Industrial Training in selected multinational companies in Malaysia. Coordination will be conducted in collaboration with UniMAP Centre for Industrial and Governmental Collaboration (CIGC).

For Option 2 (3+1), students will undergo Industrial Training in selected multinational companies in Malaysia for the first 3 months and then proceed to an educational trip abroad for a period of 1 month. Students are given the freedom to choose any one of the two options given for their Industrial Training according to their interest and financial abilities.

COURSE CODE

Each course is assigned a code. For Bachelor of Engineering, Bachelor of Engineering Technology, Bachelor of Business and Bachelor of New Media Comunication programmmes, the codes are summarized in Tables 3(a), 3(b) and 3(c) below:

Table 3(a): First Alphabet;
Type of programme offered at the Bachelor Degree level.

First alphabet in the code	Type of programme offered
E	Bachelor of Engineering
B	Bachelor of Business
P	Bachelor of Engineering Technology
K	Bachelor of New Media Communication
U	General Course (This subject can be taken by students from all programmes)

Table 3(b): Second Alphabet;
Courses offered by faculties

Second alphabet in the code	Faculty offering courses
E	School of Electrical Systems Engineering
M	School of Microelectronic Engineering
K	School of Computer & Communication Engineering
N	School of Mechatronic Engineering
B	School of Material Engineering
P	School of Manufacturing Engineering
R	School of Bioprocess Engineering
A	School of Environmental Engineering
D	School of Mechanical Engineering Technology
G	School of Electronic Engineering Technology
L	School of Electrical Engineering Technology
S	School of Civil Engineering Technology
T	School of Chemical Engineering Technology

Second alphabet in the code	Faculty offering courses
C	Engineering Centre
Q	Institute of Engineering Mathematics
I	Centre for Industrial and Governmental Collaboration
F	Centre of Business Innovation and Technopreneurship (PPIPT)
U	School of Human Development and Techonocommunication (iKOM)
V	Centre for International Languages
Z	Co-Curriculum Centre

Table 3(c): Third Alphabet; University's Requirements and Core Courses

Third alphabet in the code	Types of Courses (University Requirement or Core Courses)
T	Core Courses
W	University Requirements Courses

The three numbers which follow the Alphabet Codes represent the following; The first number represents the level of course. The second and third represent numbers assigned to the course. The codes are simplified in Table 4.

Table 4: Course Code

A	B	C	1	2	3	4	NUMBERS	DESCRIPTION
↓	↓	↓	↓	↓	↓	↓		
↓	↓	↓	↓	↓	↓	→	4	Units/Credits
↓	↓	↓	↓	↓	∟	→	3	Course numbers. (The course number is determined by each School)
↓	↓	↓	↓	∟	→	→	2	
|	|	|	∟	→	→	→	1	Level of courses: • 1= 1^{st} year subjects, • 2= 2^{nd} year subjects, • 3= 3^{rd} year subjects, • 4= 4^{th} year subjects,
↓	↓	∟	→	→	→	→	TYPE OF COURSE	Refer Table 3(c)
↓	∟	→	→	→	→	→	FACULTIES	Refer Table 3(b)
∟	→	→	→	→	→	→	TYPE OF PROGRAMME	Refer Table 3(a)

PRE-REGISTRATION

Pre-registration is a system that enable students to pre-register their courses via online for all the courses to be taken in the following semesters at an earlier period. The period set for the preregistration is before the semester break of each semester. All students (Active/ P1 or P2 Status/ With Outstanding Fees) ARE REQUIRED to perform the preregistration process.

Students MUST register within the deadline set. Courses to be registered are courses to be taken in the following semester (all courses including Cocurriculum Courses). Students are encouranged to meet with their Rakan Pendamping Siswa (RPS) and to fill up the HEA-09a (Course Registation Form) form prior to the Pre-registration process. Students who fail to Pre-register their courses within the period set, run the risk of their official registration to be affected (seat for the course are subject to availability). For the pre-registration, students are not required to print the Pre-registration slip or to get the approval from their RPS.

COURSE REGISTRATION

All active students are required to register for courses for each semester. The course registration is done online by all students. Course registration must be completed within the dates specified by the Student Admissions and Records Unit via email and portal.

Students are required to discuss with their Rakan Pendamping Siswa (RPS) regarding courses that they will have to register for each semester. Students must bring the registration slip for verification by RPS in the system during the discussion session. Registration of courses without the RPS verification is considered INVALID. If there are any changes in student course registration, i.e add, drop or withdraw courses within the prescribed period, the student must also obtain verification from the RPS.

Students who fail to register within the prescribed period shall be subject to a penalty of RM50. Late registration must not exceed the 3rd week of the semester. Students must complete form HEA-09 (Late Registration Form) and obtain the approval from the Dean.

New students will register online on the specified date during the orientation week according to their School. Students will be briefed by their school about courses in their programme of study during the orientation week.

Students are responsible to check and ensure that all the particulars stated in the Course Registration Slip are correct. Student who apply to add/ drop/ withdraw registration after the prescribed period without reasons accepted by the university, may be fined. Registration after the prescribed period will only be considered by the Dean of the School for students with specific reasons. Students are not allowed to register add/drop/withdraw during the examination week.

Students who do not register for a maximum of 2 consecutive semesters without any reason can be terminated through the submission of form HEA-20 (Termination of Study Form).
Students who have been terminated and wish to place an appeal to reasume their studies may do so by submitting an appeal letter to the Vice-Chancellor through the Dean (Dean's verification required). A penalty of RM100 will be imposed on the student whose application for re-admission has been approved.

1. **Active Student Course Registration**
   All "Active" students are allowed to register not more than 22 units and not less than ten 10 units except for those who are involved in Industrial Training and the Final Year Project. Student, who wish to register more than 22 units, need to obtain approval from their RPS and verification by the Dean. Table 5 below summarises units that students can register for each semester based on their status:

Table 5: Summary of Units for Active Student

Student Status	Minimum	Maximum
Active Student	10	22
Active student with Industrial Training (LI) and Final Year Project (FYP)	10	28

**** Students who do not take FYP or LI can take more than 22 units but with the approval from the Dean and must also fill the HEA-09a form (Course Registration Form).*

2. **Probation Student Course Registration (P)**
   Student with the "Probation" status are not allowed to register online, by themselves. The students must meet up with their RPS to obtain confirmation from the Dean. They also need to fill up form HEA-09b (Course Registration Form-Probation (P)) before handing it to the Assistant Registrar. Only the Assistant Registrar of School/Registrar Office is allowed to register the subjects for the students in this case. The numbers of units allowed is as in Table 6 below:

Table 6: Summary of Units for Probation Student

Student Status	Minimum	Maximum
Probation (P1)	10	12
Probation (P2)	8	10

ADD COURSES / DROP COURSES / COURSE WITHDRAWAL

1. **Adding Courses**
   a. The period of time allowed for the adding of courses is up to week 2 (week of study).
   b. Students are required to fill in Form HEA-11 (Adding Course Form) before submitting it to the Assistant Registrar of the School to be updated in the system.

2. **Dropping Courses**
   a. The period of time allowed to drop courses is up to the week 6 (week of study).
   b. Students must use Form HEA-10 (Dropping Courses Form), to be signed by the course

lecturer, Dean of the School and submit it to the Assistant Registrar of the School to be updated in the system.

3. **Course Withdrawal (TD)**
   a. With the consent of Course Lecturer and Dean of the School, a student may apply to withdraw from a course registered in a semester not later than the last day of work at week 12 (week of study). To apply to withdraw from a course, student must fill in Form HEA-19 (Course Withdrawal Form).
   b. Permission to allow students to withdraw a course is subject to the minimum unit allowed except with permission of the Dean.
   c. Witdrawal status (TD) will be recorded in the record of registration and academic transcript. However, the grade will not be included to contribute towards the GPA and CGPA.

CHANGE OF PROGRAMME

Change of programme refer to the changing of a programme of study to another, for reason agreed by both of the current Dean and Dean of school offering the intended programme.

Students are not encouraged to change programmes as it involves distribution of resources that have been planned at the beginning of each academic session. However, an appeal to change programme can be considered based on certain conditions:

1. An application can only be made by students upon completion of at least one semester of study. The students will have to complete form HEA-12 (Change of Programme Application Form). The application form is available at the Registry Department or at Schools. However, for certain cases, change of programme at the beginning of study, may be considered with approval by the Vice Chancellor or Deputy Vice Chancellor (Academic & International).

2. The application must be submitted within the first 2 weeks of the semester. The application form must be attached together with a copy of the latest semester result or Matriculation/STPM/Diploma result.

3. Students can only apply for change of programme no later than the first 2 semesters of study at UniMAP. An application made into the 3rd semester of study will not be considered.

4. Every application for change of programme must be justified with strong reasons for the change. The application must be approved by the RPS (the current and intended programme), Dean of the school (the current and intended programme), the Dean of Academic Management and Vice Chancellor / Deputy Vice Chancellor (Academic & International).

5. For students who have obtained scholarships or PTPTN or other types of sponsorships, must be obtained approval from their respective sponsors. Students need to deal directly with their sponsors. Further advice may be obtained from the Student Affairs and Alumni Department.

6. If the application is successful, the student must register for new courses offered in the new programme.

7. Students who change programmes in the same field can apply for credit transfer for Core Courses and University Core Courses or a similar course in the curriculum of the new programme. While the other courses which have been taken but not related to the curriculum of the new programme will remain in academic transcrip, the GPA/CGPA and credit amassed will not be taken into account.

8. Student who change programmes across different fields can only apply for credit transfer for University Core Course or similar courses in the curriculum of the new programme. While other courses which have been taken but are not related to the curriculum of the

new programme will remain in academic transcrip, the GPA/CGPA and credits amassed will not be taken into account.

POSTPONEMENT OF STUDY

Postponement of study is permission granted to students for not attending studies in a semester for reasons allowed by the university.

Postponement of study is permitted for students who have health problems and whose illness is verified by government hospitals or University panel doctors or Pusat Kesihatan UniMAP. For certain cases, medical certificate from hospitals other than that mentioned, must be approved by Pusat Kesihatan UniMAP. An application made due to reasons other than ill health may be considered if it is reasonable and approved by the Vice Chancellor / Deputy Vice Chancellor (Academic and International).

Students can apply for postponement of study by filling in Form HEA/HEP-13 (Borang Penangguhan Pengajian / Postponement of Study Application Form) which can be obtained from The Registry Department or schools. Application must be:

1. Recommended by the Rakan Pendamping Siswa (RPS)
2. Recommended by the Dean of School
3. Recommended by the Dean of Student Affairs and Alumni
4. Recommended by the counsellor (if applicable)
5. Recommended by the Dean of Academic Management and
6. Approved by the Vice Chancellor / Deputy Vice Chancellor (Academic and International).

Application for postponement of study should be submitted before the 7th week of an academic session. Application made after that period will only be allowed for medical reasons and other reasons with the approval of the the Vice Chancellor / Deputy Vice Chancellor (Academic and International).

Students are not allowed to postpone their studies for more than 2 semesters consecutively except with the approval of the Vice Chancellor / Deputy Vice Chancellor (Academic and International). In cases not related to health, students are only allowed to leave the university after the application for postponement is approved by the university. Student who leave university before the approval is granted, do so is at their own risk.

For students who postpone their studies due to health problem, the current semester in which s/he is registered will not be counted for graduation (without penalty). For case without penalty, courses registered in the particular semester will be dropped and results verified by the Majlis Peperiksaan Universiti (MPU) (if any), will be cancelled.

Students who postpone their study due to reasons OTHER than health, the current semester in which s/he is registered will be taken into account for graduation (with penalty) unless permitted with the approval of the Vice Chancellor / Deputy Vice Chancellor (Academic and International). For cases with penalties, courses registered in the particular semester will not be dropped and will be taken into account for that semester. Results verified by the Majlis Peperiksaan Universiti (MPU) are valid and will appear in the academic transcript.

A warning letter will be issued to students who do not register for the present semester without submitting any application to postpone their studies. Student who fail to submit an application for the postponement of studies within a period of time will be terminated from the university. Their names will be dropped from the list of Registered Students and verified as having quit from the university.

STUDENT GRADING

A student’s academic performance is measured using the Grade Point Average (GPA) system throughout the university academic session. A student who obtains at least a 2.00 for their GPA in a semester will be awarded

the 'Active' (A) status and will be allowed to continue with the next semester. Students are also required to obtain minimum Cumulative Grade Point Average (CGPA) of 2.00 in order to graduate.
For students who are allowed to take the Curative Course (course offered during long semester break), the examination results will be combined with their Semester 2 examination results, in order to determine the GPA and student academic status. If the combined average is better, then the student will be given a new status, but if the combined average is less than the result for Semester II, then the status of Semester 2 will be maintained.

Students with GPA lower than 2.00 in a semester, will be given the Probation 1 (P1) status. The Probation 2 (P2) status is given to students with GPA lower than 2.00 for two consecutive semesters. If the GPA of the student is still lower than 2.00 for the following semester, the student will not be allowed to continue his/her studies, unless the CGPA of those students exceeded 2.00 and with the University approval. The University authorities have the right to terminate any student who does not perform and fulfil the academic requirements stated by the university.

MINIMUM AND MAXIMUM PERIOD OF STUDY

Bachelor of Engineering and Bachelor of Engineering Technology students have to complete their study within the duration given, which is a minimum 8 semesters (4 years) or the maximum 14 semesters (7 years). However, for students who are given credit exemptions, the duration given to complete their study cannot be less than 6 semesters (3 years) and not more than 12 semesters (6 years). Bachelor of Business and Bachelor of New Media Communication students' should complete the programme within a minimum of 6 semesters (3 years) and a maximum of 10 semesters (5 years).

The minimum and maximum period of study is as follow:

Programme	Minimum (Semester)	Maximum (Semester)
Bachelor of Engineering	8	14
Bachelor of Engineering Technology	8	14
Bachelor of Business	6	10
Bachelor of New Media Communication	6	10

CURATIVE COURSES

Curative Courses are offered to student who will graduate. Students are encouraged to repeat courses that have failed before applying for curative courses. Curative Courses are held after Semester 2. Registration for Curative Courses is very limited and depends on whether the particular course is offered by the school and is approved by the Senate. Students are only allowed to take a maximum of 10 units (3 courses) at one time. Only tutorials will be conducted for these courses. Curative course normally comprises 2 weeks of tutorials and a week of examinations.

CREDIT EXEMPTION

Credit Exemption is defined as an exemption from registration and study of a course prescribed for a programme, based on the course taken by the student before being accepted into the university programme, as approved by the Dean of a School/ Dean of Academic Management.

Credit Exemption is given to students who have obtained at least a C in certain courses, according to the grading system of the University and subject to the terms and conditions set by the university. Credit Exemption is given to students who have taken a course that is the same as, or cointain at least 80% similarities to a course for which exemption is applied. Two or more courses can also be combined for the purpose of credit exemption for one course offered at UniMAP.

Credit exemption for certain courses depend on the list of courses approved by the respective School and has been approved by the Senate.

EXAMINATION AND EVALUATION SYSTEM

Written examination is conducted at the end of the semester. Every student must fulfil the requirements for lecture, tutorial, practicum and other requirements before being eligible to sit for an exam. The duration for the exams is as follows:

Figure 7: Examination Duration

Course Value	Examination Duration
1 unit	2 hours
2 – 4 units	3 hours

Students' examination results are based on course work component and written examination. A course work carries the value of 100% if the entire course is lab structured. Coursework consists of assignments, lab reports and test. Students' achievement is based on letter grades and points as follows:

Figure 8: Letter grades and points

GRADE	GRADE POINT	STATUS
A	4.00	PASS
A-	3.75	
B+	3.50	
B	3.00	
B-	2.75	
C+	2.50	
C	2.00	
C-	1.75	FAIL
D+	1.50	
D	1.00	
D-	0.75	
F	0.00	

The passing grade of a course is subject to the requirement of the course as follows;

1. The PASSING grade for all courses is Grade C and above
2. The FAILING grade is C- to F
3. For Core Courses, if students were to obtain a CGPA of ≥ 2.00 and has obtained C-/D+, they would be considered as having PASSED. However, students are allowed to repeat the course to improve GPA/ CGPA.

Figure 9: Calculation of GPA and CGPA:

COURSE	UNIT	GRADE VALUE [NG]	GRADE [G]	TOTAL NG
EKT121	3	3.75	A-	11.25
EMT102	4	2.50	C+	10.00
EMT111	4	3.50	B+	14.00
EMT112	4	4.00	A	16.00
EQT102	3	1.75	C-	5.25
EUT122	2	2.75	B-	5.50
	20			62.00
GPA = 62.00/20 = 3.10				
ECT200	3	3.50	B+	10.50
EKT212	4	2.00	C	8.00
EKT230	4	4.00	A	16.00
EKT240	4	3.50	B+	14.00
EQT203	3	3.75	A-	11.25
	18			59.75
GPA = 59.75/18 = 3.32				
CGPA = Total Accumulated Grade Value / Total Accumulated Unit = (62.00 + 59.75) / (20 + 18) = 3.20				

APPEAL FOR EXAMINATION RESULTS REVISION

In certain cases, a student might wish to apply for a revision of their examination results. Students are only allowed to appeal for a revision within the duration of 15 days after the examination results are officially released by the Registrar. Application after this duration will not be considered.

Students must submit form HEA-15m (Examination Results Review Appeal Form) to the Examination & Graduation Unit, Academic Management Division, and Registry Department. The appeal form must be submitted within the period of 15 days after the official result is announced. Students will have to fill in their details in two (2) copies, one of which is the student copy. Students will be charged RM50 per course for appealed. Payment shall be made in cash or using Money Order / Pos Malaysia / Bank Draft / Cheque in the name BENDAHARI UniMAP.

ENGLISH LANGUAGE USE

Malay is the official language of the university. However English is used widely in the teaching and learning process at UniMAP. This is to help students in their career. For courses that are taught in English, the examination will be conducted in the same language.

BUDDY SYSTEM (RAKAN PENDAMPING SISWA)

Buddy System (Rakan Pendamping Siswa) or RPS is a system which connects students and lecturers to allow them to discuss and decide on students' study plan. Even though course registration is done online, students are advised to meet with their RPS during the registration exercise for advisory purposes.

In the system, an academic staff supervises a small group of students for the whole duration of the students' study period in UniMAP. 'Supervision' here entails frequent meetings under informal settings, where students are able to discuss about academic and social issues with their lecturers who act as a 'buddy' to them. Students who have unsatisfactory academic performance may refer to RPS as a mentor, and the student is a 'mentee'.

ACADEMIC SUPPORT CENTRES

These centres are established to support UniMAP students' academic achievement.

1. **Engineering Centre**
   The Engineering Center was established to manage laboratories and workshops which are vitally needed for various programmes in UniMAP.
   Besides managing laboratories and workshops, this centre also supports research and development activities in UniMAP and aspires to be a centre for designing and creating innovative engineering products. The Engineering Centre also offers facilities for courses which require training and technical skills, conforming to industry standard.

2. **Institute of Engineering Mathematics (IMK)**
   The Institute of Engineering Mathematics is a centre which plans and handles engineering mathematics curriculum in UniMAP. It also serves as as a reference centre in providing expertise in mathematical research methods, simulation and statistical methods. IMK also serves as a training center for in-campus and off-campus personnel in fields related to mathematics.

3. **Centre for International Languages (CIL)**
   The Centre for International Languages (CIL) provide language courses which are a requirement for students enrolled in all UniMAP programmes, at both diploma and undergraduate degree levels. CIL offers not only Bahasa Melayu and English but also foreign languages such as Arabic, German, Japanese, Mandarin, Korean, Russian and Thai language.

4. Co-curiculum Centre
The Co-curiculum Centre offers many co-curricular and uniform bodies courses. It is compulsory for all undergraduate students to take co-curricular courses. This centre offers up to 44 co-curricular courses for students irrespective of their academic programmes.

5. Centre for Industrial and Governmental Collaboration (CIGC)
The Centre for Industrial and Governmental Collaboration (CIGC) liaises with industrial sectors in various aspects, especially in programmes directly related to students' learning. Programmes such as exposure to industry, industrial forum, staff industrial training and others are handled by this centre. Some of these programmes are compulsory for all students.

ACADEMIC MANAGEMENT DIVISION, REGISTRAR'S DEPARTMENT

Academic Management Division is responsible for handling matters related to admission and student records, examinations and graduation of students and the Senate.

The units in the Academic Management Division, Registrar Department are:

1. Admissions and Student Records Unit
The admissions and Student Records Unit is responsible for handling matters related to the admission and student records. This unit carries out the following tasks:

i. Conduct the overall process of recruitment and registration of local of students at first degree and diploma level.
ii. Conduct the process of recruitment and enrolment of international students at undergraduate level.
iii. Manage and updating the data processing aspects of the Student Information System.
iv. Manage personal records of students throughout their studies at UniMAP.
v. Manage students' online course registration every semester.
vi. Manage the process of unit exemptions and credit transfer for students.

2. Examinations and Graduation Unit
The examination and Graduation Unit is responsible to manage and monitor the process of Final Examinations and other matters related. This unit is responsible for the following:

i. Issue the Examination Circular to Schools/ Centres/ Institutes.
ii. Issue Examination Schedules for Diploma and Degree Programmes.
iii. Manage the Final Examination during the prescribed period.
iv. Acts as the Secretariat for the University Examination Council.
v. Manage the processing of exanmination data using the Student Information System.
vi. Issue Final Exam results.
vii. Manage students' appeal for a review of examination results.
viii. Issue academic transcripts after the Convocation.
ix. Conduct the process of borrowing and returning of robes for academic staff.
x. Review students' eligibility to graduate for final year students and issue Completion of Study letter.
xi. Responsible for the students convocation process with regard to the invitation, borrowing and returning of robes.
xii. Manage the preparation and delivery of graduation scrolls to the graduates.
xiii. Record and update data of graduates.

3. The Senate Unit

The Senate Unit is responsible for handling matters related to the Senate. The unit is responsible for the following:

i. Plan activities of the Senate and Committee, as secretariat and coordinate with other relevant parties
ii. Provides Academic Calendar for certification and approval of the Senate
iii. Manage the nomination of Honorary Degree recipients

Address:

Academic Management Division,
Registrar's Department
Universiti Malaysia Perlis
3rd Floor, KWSP Building
Jalan Bukit Lagi
01000 Kangar
PERLIS.

STAFF OF ACADEMIC MANAGEMENT DIVISION:

Registrar Department:

Ms. Norsyahiza Hamzah
Chief Assistant Registrar
Tel. : +6(04) 979 8702
Fax : +6(04) 979 8703
e-mail : syahiza@unimap.edu.my

Admissions and Student Records Unit:

Mrs. Nor Innar Md Nor
Assistant Registrar
Tel. : +6(04) 979 8701
Fax : +6(04) 979 8703
e-mail : norinnar@unimap.edu.my

Mr. Syed Amir Fatir Syed Akhir
Assistant Registrar
Tel. : +6(04) 979 7845
Fax : +6(04) 979 8703
e-mail : syedamir@unimap.edu.my

Mr. Irma Azqrai Nin Sey Muhamad
Assistant Registrar
Tel. : +6(04) 979 7878
Fax : +6(04) 979 8703
e-mail : azqrai@unimap.edu.my

Mrs. Rosniza Abdul Hamid
Administrative Assistant (Clerical/Operational)
Tel. : +6(04) 979 8706
Fax : +6(04) 979 8703
e-mail : rosniza@unimap.edu.my

Mrs. Tengku Amanina Tengku Aziz
Administrative Assistant (Clerical/Operational)
Tel. : +6(04) 979 8706
Fax : +6(04) 979 8703
e-mail : amanina@unimap.edu.my

Mrs. Azniyanty Abdullah
Administrative Assistant (Clerical/Operational)
Tel.: +6(04)-9797941
Fax: +6(04)-9798703
e-mail: azniyanty@unimap.edu.my

Mr. Faizan Abdul
Administrative Assistant (Clerical/Operational)
Tel. : +6(04) 979 7941
Fax : +6(04) 979 8703
e-mail : faizan@unimap.edu.my

Mr. Amirrul Amar Mazri
Administrative Assistant (Clerical/Operational)
Tel. : +6(04) 979 7940
Fax : +6(04) 979 8703
e-mail: amirrulamar@unimap.edu.my

Mr. Ra'qil Afzal Raus
Office Assistant
Tel. : +6(04) 979 8706
Fax : +6(04) 979 8703
e-mail : afzal@unimap.edu.my

Examinations and Graduation Unit:

Mrs. Rahaida Ab. Rahim
Assistant Registrar
Tel. : +6(04) 979 8705
Fax : +6(04) 979 8703
e-mail : rahaida@unimap.edu.my

Mrs. Salfarina Omar
Assistant Registrar
Tel. : +6(04) 979 8700
Fax : +6(04) 979 8703
e-mail : salfarina@unimap.edu.my

Mr. Fathul Azan Faezan
Assistant Registrar
Tel. : +6(04) 979 2984
Faks : +6(04) 979 8703
e-mail : fathulazan@unimap.edu.my

Mr. Hamizal Hamid
Administrative Assistant (Clerical/Operational)
Tel. : +6(04) 979 8708
Fax : +6(04) 979 8703
e-mail : hamizal@unimap.edu.my

Mrs. Norazwati Abdullah
Administrative Assistant (Clerical/Operational)
Tel. : +6(04) 979 8708
Fax : +6(04) 979 8703
e-mail : norazwati@unimap.edu.my

Mr. Mohammad Sharil Abd Rasid
Administrative Assistant (Clerical/Operational)
Tel. : +6(04) 979 8708
Fax : +6(04) 979 8703
e-mail : sharilrasid@unimap.edu.my

Mrs. Munirah Jamil
Administrative Assistant (Clerical/Operational)
Tel. : +6(04) 979 8708
Fax : +6(04) 979 8703
e-mail : munirahjamil@unimap.edu.my

Mr. Mohd. Afendi Mat Ja
Administrative Assistant (Clerical/Operational)
Tel. : +6(04) 979 8708
Fax : +6(04) 979 8703
e-mail : mohdafendi@unimap.edu.my

Mrs. Maisarah Ab. Karim
Administrative Assistant (Clerical/Operational)
Tel. : +6(04) 979 8707
Fax : +6(04) 979 8703
e-mail : maisarah@unimap.edu.my

Mr. Mohd Hafizi Che Yusof
Administrative Assistant (Clerical/Operational)
Tel. : +6(04) 979 8707
Fax : +6(04) 979 8703
e-mail : hafiziyusof@unimap.edu.my

Mr. Muhammad Faisal Norshidi
Operational Assistant
Tel. :+6(04) 979 8708
Fax :+6(04) 979 8703
e-mail : muhdfaisal@unimap.edu.my

The Senate Unit:

Mrs. Nurazrina Abd. Rahman
Senior Assistant Registrar
Tel. : +6(04) 979 8562
Fax : +6(04) 979 8703
e-mail : nurazrina@unimap.edu.my

Mrs. Tihazariah Husin
Administrative Assistant (Clerical/Operational)
Tel. : +6(04) 979 8561
Fax : +6(04) 979 8703
e-mail : tihazariah@unimap.edu.my

School Of Microelectronic Engineering

Programmes Offered

- **Diploma of Engineering (Microelectronic Engineering)**
- **Bachelor of Engineering (Hons.) (Microelectronic Engineering)**
- **Bachelor of Engineering (Hons.) (Electronic Engineering)**
- **Bachelor of Engineering (Hons.) (Photonic Engineering)**
- **M.Sc. (Microelectronic System Design Engineering) (by Mixed Mode)**
- **M.Sc. (Microelectronic Engineering)**
- **M.Sc. (Electronic Engineering)**
- **M.Sc. (Photonic Engineering)**
- **Ph.D (Microelectronic Engineering)**
- **Ph.D (Electronic Engineering)**
- **Ph.D (Photonic Engineering)**

Address

SCHOOL OF MICROELECTRONIC ENGINEERING
Universiti Malaysia Perlis (UniMAP)
Pauh Putra Campus
02600 Arau, Perlis

Tel: +6(04) 988 5509
Fax: +6(04)988 5510
e-mail: dean_ue@unimap.edu.my

INTRODUCTION

School of Microelectronic Engineering (SoME), among the pioneer schools established in UniMAP, is a comprehensive institution, offering formative undergraduate degrees with research and design elements. Our undergraduate degrees provide the opportunity to gain knowledge and develop personal skills on an intensive high-quality programme at the cutting edge of technology.

Our undergraduate degrees are offered based on demands from the industry and fulfilled the requirement of professional bodies. In SoME, creating the environment in which forefront teaching and learning process can flourish and highly demanded expertise can be produced is always our top priority. As a SoME undergraduate student, you will have the opportunity to take advantage of our great study environment and best quality facilities of industrial standards.

Some of the facilities available at SoME

- Award winning Micro Fabrication Cleanroom
- State of the art Nano Fabrication Cleanroom
- IC Design Laboratory
- Failure Analysis Laboratory
- Photonics Laboratory
- Tun Abdul Razak Laser Laboratory (TARELL)
- Microprocessor Laboratory

Come and reinvent yourself, join our B.Eng programmes and create your future at SoME.

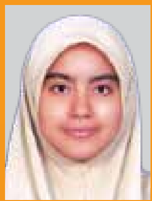
STAFF DIRECTORY

Dean
Assoc. Prof. Dr. Rizalafande Bin Che Ismail
e-mail: rizalafande@unimap.edu.my

Deputy Dean
(Academic and Research)
Dr. Mohd Najib Bin Mohd Yasin
e-mail: najibyasin@unimap.edu.my

Deputy Dean
(Student Development and Alumni)
Mr. Wan Mokhzani Bin Wan Norhaimi
e-mail: wanmokhdzani@unimap.edu.my

Degree Programme Chairperson
(Microelectronic Engineering)
Dr. Nurul Izza Binti Mohd Nor
e-mail: izza@unimap.edu.my



Degree Programme Chairperson
(Electronic Engineering)
Dr. Shazlina Binti Johari
e-mail: shazlinajohari@unimap.edu.my

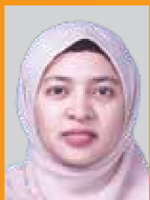
Degree Programme Chairperson
(Photonic Engineering)
Dr. Ong Siok Lan
e-mail: slong@unimap.edu.my

Diploma Programme Chairperson
(Microelectronic Engineering)
Mr. Mohd Rosydi Bin Zakaria
e-mail: rosydizakaria@unimap.edu.my

Postgraduate Programme Chairperson
Dr. Norhawati Binti Ahmad
e-mail: norhawati@unimap.edu.my

Coordinator For Industrial Networking and Quality Management
Mr. Steven A/L Taniselass
e-mail: steven@unimap.edu.my

Assistant Registrar
Mrs. Zuraida Binti Ismail
e-mail: zuraidaismail@unimap.edu.my



LECTURERS

Prof. Dr. Zul Azhar Bin Zahid Jamal
Ph.D (Electronic Materials), Univ. of Liverpool, UK
M.A (Physics), Western Michigan Univ., USA
B.Sc (Physics), Western Michigan Univ., USA
Tel. : +6(04) 979 8729
e-mail : zulazhar@unimap.edu.my

Prof. Dr.
Sudhanshu Shekhar Jamuar
Ph.D. (Electrical Engineering) IIT Kanpur, India
M.Tech. (Electrical Engineering) IIT Kanpur, India
B.Sc. Engineering (Electronics and Communication), B I T Sindri, India
Tel. : +6(04) 988 5525
email : ssjamuar@unimap.edu.my

Prof. Dr. Uda Bin Hashim
Ph.D (Microelectronics), UKM
B.Sc (Physics), UKM
Tel. : +6(04) 985 1208
e-mail : uda@unimap.edu.my

Prof. Dr. Zaliman Bin Sauli
Ph.D (Microelectronic Eng.), UniMAP
M.Sc (Advance Semiconductor Materials and Devices), Univ. of Surrey, UK
B.Sc (Physics), UTM
Tel. : +6(04) 988 5509
e-mail : zaliman@unimap.edu.my

Assoc. Prof. Dr.
Prabakaran A/L Poopalan
Ph.D (Optical Fiber), UM
M.Sc (Laser), UM
B.Sc (Physics),UM
Tel. : +6(04) 979 8480
e-mail : prabakaran@unimap.edu.my

Assoc. Prof. Dr.
Rizalafande Bin Che Ismail
Ph.D (Microelectronics System Design), Newcastle University, UK
M.Eng (Microelectronic), RMIT Univ., Australia
B.Eng (Electrical-Electronic), UTM
Tel. : +6(04) 988 5500
e-mail : rizalafande@unimap.edu.my

Assoc. Prof. Dr. Yufridin Bin Wahab
Ph.D (Electrical Engineering), Victoria Univ., Australia
M.Sc (Electrical and Electronic Engineering), USM
B.Eng (Electrical and Electronic Engineering), USM
Tel. : +6(04) 979 8877
e-mail : yufridin@unimap.edu.my

Dr. Ala'eddin Ahmad Jaber Saif
Ph.D (Microelectronic Eng.), UniMAP
M.Sc (Applied Physics), Hashemite University, Jordan
B.Sc (Physics), Hashemite University, Jordan
Tel. : +6(04) 988 5538
e-mail : alaeddin@unimap.edu.my

Dr. Asral Bin Bahari Jambek
Ph.D (Electronic), Univ. of Edinburgh, UK
M.Sc (Electronics Engineering), UPM
B.Eng (Electronics Engineering), Univ. of Southampton, UK
Tel. : +6(04) 988 5570
e-mail : asral@unimap.edu.my

Dr. Azizi Bin Harun
Ph.D (Mechatronic Engineering), UniMAP
M.Eng (Electrical, Electronics & Telecommunication), UTM
B.Sc (Electrical Engineering), Syracuse Univ. New York
Tel. : +6(04) 988 5575
e-mail : aziziharun@unimap.edu.my

Dr. Mohamad Halim Bin Abd. Wahid
Ph.D (Electronic Engineering), Aston Univ., UK
M.Sc (Semiconductor Physics), UM
B.Sc (Physics), UM
Tel. : +6(04) 988 5556
e-mail : mhalim@unimap.edu.my

Dr. Mohd Khairuddin
Bin Md Arshad
Dr.Sc.Ing (Nanoelectronics), Université Catholique de Louvain, Belgium
M.Sc (Microelectronics), UKM
B.Eng (Mechatronic), UTM
Tel. : +6(04) 979 8581
e-mail : mohd.khairuddin@unimap.edu.my

Dr. Mohd Najib Bin Mohd Yasin
Ph.D (Electrical and Electronics Engineering), Univ. of Sheffield, UK
M.Eng (Electronics), Univ. of Sheffield, UK
Tel. : +6(04) 988 5501
e-mail : najibyasin@unimap.edu.my

Dr. Mohd Nazrin Bin Md Isa
Ph.D (Electronic Engineering), Univ. of Edinburgh, Scotland, UK
M.Sc (Electronic Systems Design Engineering), USM
B.Eng (Electrical Engineering), KuiTTHO, Malaysia
Tel. : +6(04) 988 5564
e-mail : nazrin@unimap.edu.my

Dr. Muammar Bin Mohamad Isa
Ph.D (Electrical and Electronic Engineering), Univ. Of Manchester, UK
M.Sc (Microelectronics), UKM
B.Eng (Electrical-Electronics), UNITEN
Tel. : +6(04) 988 5555
e-mail : muammar@unimap.edu.my

Dr. Muhammad Mahyiddin Bin Ramli
Ph.D (Nanotechnology), Univ. Of Surrey UK
M. Eng. Sc (Microelectronic Design), Univ. College Cork, Ireland
B.Eng (Microelectronic Engineering), KUKUM
Tel. : +6(04) 988 5509
e-mail : mmahyiddin@unimap.edu.my

Dr. Mukhzeer Bin Mohamad Shahimin
Ph.D (Electronics and Electrical Engineering), Univ. of Southampton, UK
B.Eng (Electronic Engineering), Univ. of Southampton, UK
Tel. : +6(04) 988 5721
e-mail : mukhzeer@unimap.edu.my

Dr. Nazuhusna Binti Khalid
Ph.D (Electronic), La Trobe Univ., Australia
M.Eng (MEMS), Griffith Univ., Australia
B.Eng (Microelectronic Engineering), KUKUM
Tel. : +6(04) 988 5509
e-mail : nazuhusna@unimap.edu.my

Dr. Nor Azura Malini Binti Ahmad Hambali
Ph.D (Communication and Network Engineering), UPM
M.Sc (Communication and Network Engineering), UPM
B.Eng (Computer and Communication System Engineering), UPM
Tel. : +6(04) 988 5545
e-mail : azuramalini@unimap.edu.my

Dr. Norhawati Binti Ahmad
Ph.D (Electrical and Electronic Engineering), Univ. Of Manchester, UK
M.Sc (Microelectronics), UKM
B.Eng (Electrical-Electronics), UNITEN
Tel. : +6(04) 988 5503
e-mail : norhawati@unimap.edu.my

Dr. Nur Syakimah Binti Ismail
Ph. D (Nanobio-engineering), Osaka Univ. Japan
M.Sc (Electrical, Electronic and System), UKM
B.Eng (Electrical and Electronic), UKM
Tel. : +6(04) 988 5544
e-mail : syakimah@unimap.edu.my

Dr. Nurul Izza Binti Mohd Nor
Ph.D (Electronic Engineering), La Trobe University, Australia
M.Eng (Microelectronic Engineering), RMIT University, Australia.
B.Eng (Microelectronic Engineering), KUKUM
Tel. : +6(04) 988 5504
e-mail : izza@unimap.edu.my

Dr. Ong Siok Lan
Ph.D (Electronics), Univ. of Sheffield, UK
B.Eng (Electronics), USM.
Tel. : +6(04) 988 5505
e-mail : slong@unimap.edu.my

Dr. Ramzan Bin Mat Ayub
Ph.D (Microelectronic Eng.), UniMAP
MSc (Physics), USM, Penang
BSc (Physics), USM, Penang
Tel. : +6(04) 979 7814
e-mail : ramzan@unimap.edu.my

Dr. Rozana Aina Maulat Osman
Ph.D (Material Science and Engineering), Univ. of Sheffield, UK
B.Eng (Microelectronic Engineering), KUKUM
Tel. : +6(04) 988 5532
e-mail : rozana@unimap.edu.my

Dr. Sanna Binti Taking
Ph.D (Electrical and Electronics Engineering), Univ. of Glasgow, UK
M.Sc (Microelectronics), UKM
B.Eng (Electric, Electronics and Systems), UKM
Tel. : +6(04) 988 5565
e-mail : sanna@unimap.edu.my

Dr. Shahrir Rizal Bin Kasjoo
Ph.D (Electrical and Electronic Engineering), Univ. Of Manchester, UK
M.Eng (Electrical and Electronic), Imperial College London, UK
Tel. : +6(04) 988 5504
e-mail : sharirrizal@unimap.edu.my

Dr. Shaiful Nizam Bin Mohyar
Ph.D (Electronics Eng.) Gunma Univ., Japan
M.Eng (Nanomaterial System Eng.), Gunma Univ., Japan.
B.Eng (Electronic Eng), Univ. of Electro-Communications, Japan.
Tel. : +6(04) 988 5543
e-mail : nizammohyar@unimap.edu.my

Dr. Shazlina Binti Johari
Ph.D (Mechanical Engineering), Univ. of Canterbury, Christchurch, NZ
MEng.Sc (Microelectronic Design), Univ. College Cork, Ireland
B.Eng (Electronic), Univ. Malaysia Perlis, (UniMAP)
Dip. (Electronic Eng), Univ. Teknologi Malaysia (UTM)
Tel. : +6(04) 988 5508
e-mail : shazlinajohari@unimap.edu.my

Dr. Sohiful Anuar Bin Zainol Murad
Ph.D (Electronics), Kyushu Univ., Japan.
M.Sc (Electronic System Design Engineering), USM
B.Eng (Electronic), Saga Univ., Japan.
Tel. : +6(04) 988 5571
e-mail : sohiful@unimap.edu.my

Dr. Syarifah Norfaezah Binti Sabki
Ph.D (Physics-Nanoscience), Univ. of Nottingham, UK
M.Sc (Solid-State Physics - Microelectronics), USM
B.Sc (Applied Physics), UKM
Tel. : +6(04) 988 5516
e-mail : norfaezah@unimap.edu.my

Dr. Vithyacharan AL Retnasamy
Ph.D (Microelectronic Eng.), UniMAP
M.Sc (Advance Manufacturing Technology, Photonics), USM
B.Eng (Materials and Minerals), USM
Tel. : +6(04) 988 5516
e-mail : rcharan@unimap.edu.my

Bibi Nadia Binti Taib
M.Sc (Microelectronics), UKM
B.Eng (Microelectronic Engineering), KUKUM
Tel. : +6(04) 988 5550
e-mail : bibinadia@unimap.edu.my

Hariyanti Binti Mohd Saleh
M.Eng (Electrical-Microelectronics and Computer System), UTM
B.Eng (Electrical-Electronic), UiTM
Tel. : +6(04) 988 5540
e-mail : hariyanti@unimap.edu.my

Ili Salwani Binti Mohamad
M.Sc (Microelectronics), UKM
B.Eng (Microelectronic Engineering), UKM
Tel. : +6(04) 988 5534
e-mail : ilisalwani@unimap.edu.my

Mohd Hafiz Bin Ismail
M.Sc (Microelectronics System Design), Univ. of Southampton, UK
B.Eng (Electronics Engineering), Univ. of Southampton, UK
Tel. : +6(04) 988 5509
e-mail : hafizismail@unimap.edu.my

Mohd Rosydi Bin Zakaria
M.Sc (Microelectronics), UKM
B.Eng (Microelectronic Engineering), UniMAP
Tel. : +6(04) 988 5506
e-mail : rosydizakaria@unimap.edu.my

Nor Farhani Binti Zakaria
M.Sc in Engineering (Bionics), Tokyo Univ. of Technology, Japan
B.Eng (Electronics), Tokyo Univ. of Technology, Japan
Tel. : +6(04) 988 5546
e-mail : norfarhani@unimap.edu.my

Nor Hidayah Binti Saad
M.Sc (Electronic System Design Engineering), USM
B.Eng (Electronic Engineering), USM
Tel. : +6(04) 988 5548
e-mail : hidayahsaad@unimap.edu.my

Nor Roshidah Binti Yusof
M.Sc (Solid State Physics), USM
B.App.Sc (Engineering Physics), USM
Tel. : +6(04) 988 5542
e-mail : roshidahyusof@unimap.edu.my

Norina Binti Idris
M.Sc (Electrical and Electronics Engineering), USM
B.Sc ((Electrical Engineering (Communications)), New Mexico State Univ., USA
Dip.Ed (English Language), Maktab Perguruan Persekutuan Pulau Pinang
Tel. : +6(04) 988 5523
e-mail : norina@unimap.edu.my

Ir. Nurulazmi B Abd Rahman
P. Eng. MIEM, MIEEE, MMSET
M.Eng (Electrical), UiTM
B.Eng. (Electrical) UTM
Tel. : +6(04) 988 5541
e-mail : nurulazmi@unimap.edu.my

Siti Salwa Binti Mat Isa
M.Sc.Eng (Microelectronic Design), Univ. College Cork, Ireland
B.Eng (Microelectronic Engineering), KUKUM
Tel. : +6(04) 988 5579
e-mail : sitisalwa@unimap.edu.my

Steven A/L Taniselass
M.Sc (Microelectronic Engineering), UniMAP
B.Eng (Microelectronic Engineering), UniMAP
Tel. : +6(04) 988 5507
e-mail : steven@unimap.edu.my

Wan Mokhzani Bin Wan Nor Haimi
M.Sc (Microelectronic Engineering), UniMAP
B.Eng (Electronic Engineering), UniMAP
Tel. : +6(04) 988 5502
e-mail : wanmokhdzani@unimap.edu.my

TEACHING ENGINEER

Ahmad Syahir Bin Ahmad Bakhit
B.Eng Hons (Electronics (Nanotechnology)), MMU
Tel. : +6(04) 985 2555
e-mail : syahirbakhit@unimap.edu.my

Afzan Binti Kamarudin
B.Eng (Electronic), USM
Tel. : +6(04) 988 5521
e-mail : afzan@unimap.edu.my

Faradilla Binti Aziz
B.Eng (Microelectronic Engineering), KUKUM
Tel. : +6(04) 988 5509
e-mail : faradilla@unimap.edu.my

Mohd Azarulsani Bin Md. Azidin
B.Eng (Electronic Engineering), MMU
Tel. : +6(04) 985 5171
e-mail : azarulsani@unimap.edu.my

Mohd Fhaizal Bin Radzi
B.Eng (Electronics Engineering), York Univ., UK
Tel. : +6(04) 988 5519
e-mail : fhaizal@unimap.edu.my

Mohd Khairul Bin Md. Kamil
B.Eng (Electronic), USM
Tel. : +6(04) 988 5509
e-mail : mohdkhairul@unimap.edu.my

Mohd Sallehudin Bin Saad
B.Eng (Electric, Electronic & System (Microelectronic)), UKM
Tel. : +6(04) 985 2555
e-mail : sallehudin@unimap.edu.my

Norlida Binti Abu Bakar
B.Eng (Electrical Engineering), UiTM
Tel. : +6(04) 979 8760
e-mail : norlida@unimap.edu.my

Roslin Bin Jamaludin
B.Eng (Electronic), USM
Tel. : +6(04) 988 5519
e-mail : roslin@unimap.edu.my

Wan Azlianawati Binti Wan Aziz
B.Eng (Electronic), USM
Tel. : +6(04) 988 5509
e-mail : wanazlianawati@unimap.edu.my

STUDY LEAVE

Ahmad Husni Bin Mohd. Shapri
M.Sc (Computer Science), UPM
B.Eng (Computer Engineering), UTM
e-mail : ahmadhusni@unimap.edu.my

Hasnizah Binti Aris
M.Sc (Electrical and Electronics-MEMS), UKM
B.Eng (Electrical, Electronic and System), UKM
e-mail : hasnizah@unimap.edu.my

Mazlee Bin Mazalan
M.Eng (Microelectronic), Victoria Univ., Australia
B.Eng (Microelectronic Engineering), UniMAP
Dip. (Electronic Engineering), UTM
e-mail : mazleemazalan@unimap.edu.my

Mohd Fairus Bin Ahmad
M.Sc (Electronic), USM
B.Eng (Electric and Electronic), UTM
e-mail : fairusahmad@unimap.edu.my

Mohd Natashah Bin Norizan
M.Sc (Microelectronics), UKM
B.Eng (Electronic Engineering), UniMAP
e-mail : mohdnatashah@unimap.edu.my

Noraini Binti Othman
M.Sc (Electrical and Electronics), UTP
B.Eng (Microelectronic), UKM
e-mail : noraini_othman@unimap.edu.my

Norazeani Binti Abdul Rahman
M.Sc (Microelectronics), UKM
B.Eng (Microelectronic Engineering), KUKUM
e-mail : azeani@unimap.edu.my

Norhayati Binti Sabani
M.Sc (Microelectronics), UKM
B.Eng (Microelectronic Engineering), KUKUM
e-mail : hayatisabani@unimap.edu.my

Nurjuliana Binti Juhari
M.Sc (Physics), UM
B.Sc (Applied Physics), UM
e-mail : nurjuliana@unimap.edu.my

Razaidi Bin Hussin
M.Sc (Microelectronic Engineering), UniMAP
B.Eng (Electrical-Mechatronics), UTM
e-mail : shidee@unimap.edu.my

Safizan Binti Shaari
M.Eng (Electric and Electronics), Toyama Univ., Japan
B.Eng (Electric and Electronics), Fukui Univ., Japan
Dip.Eng (Electronic Control), Nagano Kosen, Japan
e-mail : safizan@unimap.edu.my

Shamsul Amir Bin Abdul Rais
M.Eng (Sustainable Energy and Environmental Engineering), Osaka Univ., Japan
B.Eng (Nuclear Engineering), Osaka Univ., Japan
e-mail : shamsulamir@unimap.edu.my

Siti Zarina Binti Md. Naziri
M.Sc (Electrical and Electronic Engineering), USM,
B.Eng (Electrical and Electronic Engineering), USM
e-mail : sitizarina@unimap.edu.my

SKIM LATIHAN TENAGA PENGAJAR AKADEMIK (SLAB)

Arif Mawardi Bin Ismail@Suhaimee
- Program Ph.D, Pennsylvania State University, US

Nurul Bariah Binti Idris
- Program Ph.D, UniMAP

Syed Muhammad Mamduh Bin Syed Zakaria
- Program Ph.D, UniMAP

Zarimawaty Binti Zailan
- Program Ph.D, UniMAP

Anishaziela Binti Azizan
- Program Master UniMAP

ASSISTANT ENGINEERS

Bahari Bin Man
Cert. (Power Electrical Engineering), Politeknik Port Dickson
Tel. : +6(04) 985 2555
e-mail : bahari@unimap.edu.my

Haffiz Bin Abd. Razak
Cert. (Power Electrical Engineering), POLIMAS
Tel. : +6(04) 985 2555
e-mail : haffiz@unimap.edu.my

Maznah Binti Mat
Cert. (Electronic Engineering (Communications)), POLIMAS
Tel. : +6(04) 988 5521
e-mail : maznah@unimap.edu.my

Mohd Hapiz Alimin Bin Mohd. Asri
Cert. (Electric and Electronic Engineering), POLIMAS
Tel. : +6(04) 985 2555
e-mail : mhapiz@unimap.edu.my

Mohd Zulkarnail Bin Ab. Hamid
Cert. (Electric Technology (Service and Installation)), Kolej Komuniti
Cert. (IT Administration MLVK Level II), Yayasan Pendidikan Johor
Tel. : +6(04) 985 2555
e-mail : zulkarnail@unimap.edu.my

Sharifah Roshida Binti Syed Mat Noor
Dip. (Electronic Engineering) POLIMAS
Cert. (Electronic Engineering (Communications)), POLIMAS
Tel. : +6(04) 979 8014 / 8015
e-mail : sh.roshida@unimap.edu.my

TECHNICIANS

Mohamad Fandi Bin Puteh
Cert. (Electric and Electronic Engineering), PTSS
Tel. : +6(04) 988 5520
e-mail : fandiputeh@unimap.edu.my

Mohd Husyaidi Bin Rosni
Cert. (Electric and Electronic Engineering), PTSS
Tel. : +6(04) 979 2555
e-mail : husyaidi@unimap.edu.my

Noorshamira Binti Mustaffa
Cert. (Electric and Electronic Engineering), PTSS
Tel. : +6(04) 985 5172
e-mail : noorshamira@unimap.edu.my

Sharifah Salmah Binti Syed Mat Noor
Dip. (Electronic), POLIMAS
Cert. (Electric and Electronic Engineering), POLIMAS
Tel. : +6(04) 988 5509
e-mail : shsalmah@unimap.edu.my

ADMINISTRATIVE STAFF

Zuraida Binti Ismail
Assistant Registrar
B.BA (International Business Management), UUM
Tel. : +6(04) 988 5512
e-mail : zuraidaismail@unimap.edu.my

Shah Rizan Bin Mohd. Rejab
Science Officer
MBA (General Management), UUM
B.Sc (Physics), UPM
Tel. : +6(04) 988 5511
e-mail : rizan@unimap.edu.my

Roslinda Binti Fazal Mohamad
Secretary
Dip. (Office Management and Technology), UiTM Seri Iskandar
Tel. : +6(04) 988 5509
e-mail : roslinda@unimap.edu.my

Azimah Binti Aziz@Azaib
Administrative Assistant
STPM
Tel. : +6(04) 988 5515
e-mail : azimah@unimap.edu.my

Nur Nabilah Binti Rambeli @ Ramli
Administrative Assistant
STPM
Tel. : +6(04) 988 5514
e-mail : nurnabilah@unimap.edu.my

Afzazila Binti Tahar
Administrative Assistant
Tel. : +6(04) 988 5514
e-mail : afzazila@unimap.edu.my

Nazmi Bin Sabu
General Office Assistant
SPM
Tel. : +6(04) 988 5513
e-mail : nazmi@unimap.edu.my

BACHELOR OF ENGINEERING (HONS.) (MICROELECTRONIC ENGINEERING)

PROGRAMME OBJECTIVES (PEO)

PEO1
Graduates who are leaders in the field of electronic engineering or chosen field as demonstrated through career advancement

PEO2
Graduates who are members of and contribute to professional society

PEO3
Graduates who engaged in life-long learning or continuous education opportunities

PEO4
Graduates who contribute towards research and development

PEO5
Graduates who are entrepreneurial engineers

PROGRAM OUTCOMES (PO)

PO1
Ability to acquire and apply knowledge of mathematics, science, engineering and in-depth technical competence in Electronic (Microelectronic) engineering discipline to the solution of complex engineering problem

PO2
Ability to identify, formulate and solve complex engineering problems

PO3
Ability to design solutions for complex engineering problems and systems, components or processes to meet desired needs.

PO4
Ability to conduct investigation into complex problems as well as to analyze and interpret data.

PO5
Ability to use techniques, skills and modern engineering tools necessary for complex engineering practices so as to be easily adaptable to industrial needs.

PO6
Ability to understand the social, cultural, global and environmental responsibilities of a professional engineer.

PO7
Ability to demonstrate understanding of entrepreneurship, the process of innovation and the need for environmental and sustainable development.

PO8
Ability to understand the professional and ethical responsibilities and commitment to the community.

PO9
Ability to function on multi-disciplinary teams.

PO10
Ability to communicate effectively on complex engineering activities with the engineering community and with society at large

PO11
Ability to understand the need for and an ability to engage in life-long learning

PO12
Ability to demonstrate understanding of project management and finance principles

School of Microelectronic Engineering

CURRICULUM STRUCTURE 2015/2016
BACHELOR OF ENGINEERING (HONS.) (MICROELECTRONIC ENGINEERING)
(SCHOOL OF MICROELECTRONIC ENGINEERING)

YEAR	YEAR 1		YEAR 2		YEAR 3			YEAR 4	
SEMESTER	I	II	III	IV	V	VI		VII	VIII
Engineering Core	EMT114/3 Introduction to Electric Circuits	EMT124/3 Fundamental of Electrical Engineering	EMT282/3 Principles of Engineering Materials	EMT243/3 Introduction to IC Design	EMT353/3 Digital Integrated Circuit Design	EMT360/3 Control Engineering	EIT 302/4 Industrial Training & Engineering Innovation	EMT445/2 Final year Project	EMT446/4 Final Year Project
	ECT111/3 Engineering Skills	EMT125/3 Digital Electronic Principles I	EMT235/3 Digital Electronic Principles II	EMT245/3 Introduction to Microprocessor Design	EMT357/3 Fundamental of Microelectronic Fabrication	EMT367/3 Microelectronic Fabrication		EMT470/3 Semiconductor Packaging	EMT454/3 Nanoelectronic Engineering
	EMT181/3 Physics for Electronics	EMT115/3 Programming Language	EMT272/3 Semiconductor Fundamental	EMT293/3 Signal Analysis	EMT358/3 Communication Engineering	EMT369/3 Power Electronic		EMT475/3 Computer Organization Architecture	**EMTXXX/3 Elective course
	EMT116/3 Electronic Devices	EMT182/3 Analog Electronic I	EMT238/3 Electromagnetic Theory	EMT283/3 Analog Electronic II	EMT352/3 Advanced Devices	EMT381/4 Microelectronic Design Project		EMT478/3 Instrumentation	EMT480/3 Reliability and Failure Analysis
								EMT490/3 Micro-Electro-Mechanical Systems	
Non-Eng.	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT203/3 Engineering Mathematics III	EQT271/3 Engineering Statistics				EUT442/2 Professional Engineers	EUT444/3 Management for Engineers
		UUWXXX/2 Foundation English II							
University Required (17)	UUW410/2 University Malay Language	UUWXXX/1 Co-Curiculum	*UUWXXX/2 Option	UUW224/2 Engineering Entrepreneurship	UUW235/2 Ethnic Relations	UUW233/2 Islamic & Asia Civilization			
	UUWXXX/1 Co-Curiculum		UUWXXX/1 Co-Curiculum		UUW322/2 Thinking Skills	UUW212/2 University English			
140	18	18	18	17	16	17		16	16

*UUWXXX/2 if MUET Band 3 and below is compulsory to take UVW112/2 Foundation English.
**EMT462/3 Optoelectronic Systems or EMT488/3 Digital Signal Processing

BACHELOR OF ENGINEERING (HONS.) (ELECTRONIC ENGINEERING)

PROGRAMME OBJECTIVES (PEO)

PEO1
Graduates who are leaders in the field of electronic engineering or chosen field as demonstrated through career advancement

PEO2
Graduates who are members of and contribute to professional society

PEO3
Graduates who engaged in life-long learning or continuous education opportunities

PEO4
Graduates who contribute towards research and development

PEO5
Graduates who are entrepreneurial engineers

PROGRAM OUTCOMES (PO)

PO1
Ability to acquire and apply knowledge of mathematics, science, engineering and in-depth technical competence in Electronic engineering discipline to the solution of complex engineering problem

PO2
Ability to identify, formulate and solve complex engineering problems

PO3
Ability to design solutions for complex engineering problems and systems, components or processes to meet desired needs.

PO4
Ability to conduct investigation into complex problems as well as to analyze and interpret data.

PO5
Ability to use techniques, skills and modern engineering tools necessary for complex engineering practices so as to be easily adaptable to industrial needs.

PO6
Ability to understand the social, cultural, global and environmental responsibilities of a professional engineer.

PO7
Ability to demonstrate understanding of entrepreneurship, the process of innovation and the need for environmental and sustainable development.

PO8
Ability to understand the professional and ethical responsibilities and commitment to the community.

PO9
Ability to function on multi-disciplinary teams.

PO10
Ability to communicate effectively on complex engineering activities with the engineering community and with society at large

PO11
Ability to understand the need for and an ability to engage in life-long learning

PO12
Ability to demonstrate understanding of project management and finance principles

CURRICULUM STRUCTURE 2015/2016
BACHELOR OF ENGINEERING (HONS.) (ELECTRONIC ENGINEERING)
(SCHOOL OF MICROELECTRONIC ENGINEERING)

YEAR	YEAR 1		YEAR 2		YEAR 3			YEAR 4	
SEMESTER	I	II	III	IV	V	VI		VII	VIII
Engineering Core	EMT114/3 Introduction to Electric Circuits	EMT124/3 Fundamental of Electrical Engineering	EMT 282/3 Principles of Engineering Materials	EMT243/3 Introduction to IC Design	EMT353/3 Digital Integrated Circuit Design	EMT360/3 Control Engineering	EIT 302/4 Industrial Training & Engineering Innovation	EMT445/2 Final year Project	EMT446/4 Final Year Project
	ECT111/3 Engineering Skills	EMT125/3 Digital Electronic Principles I	EMT235/3 Digital Electronic Principles II	EMT245/3 Introduction to Microprocessor Design	EMT355/3 Microcontroller	EMT363/3 VLSI Design		EMT463/3 MEMS Design and Fabrication	EMT483/3 System on Chip
	EMT116/3 Electronic Devices	EMT115/3 Programming Language	EMT272/3 Semiconductor Fundamental	EMT293/3 Signal Analysis	EMT358/3 Communication Engineering	EMT369/3 Power Electronic		EMT475/3 Computer Organization Architecture	**EMTXXX/3 Elective course
	EMT181/3 Physics for Electronics	EMT182/3 Analog Electronic I	EMT238/3 Electromagnetic Theory	EMT 283/3 Analog Electronic II	EMT368/3 Reliability and Testability in Integrated Circuit Design	EMT382/4 Electronic Design Project		EMT478/3 Instrumentation	EMT488/3 Digital Signal Processing
								EMT479/3 Analogue Integrated Circuit Design	
Non -Eng.	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT203/3 Engineering Mathematics III	EQT271/3 Engineering Statistics				EUT442/2 Professional Engineers	EUT444/3 Management for Engineers
		UUWXXX/2 Foundation English II							
University Required (17)	UUW410/2 University Malay Language	UUWXXX/1 Co-Curiculum	*UUWXXX/2 Option	UUW224/2 Engineering Entrepreneurship	UUW235/2 Ethnic Relations	UUW233/2 Islamic & Asia Civilization			
	UUWXXX/1 Co-Curiculum		UUWXXX/1 Co-Curiculum		UUW322/2 Thinking Skills	UUW212/2 University English			
140	18	18	18	17	16	17	4	16	16

*UUWXXX/2 if MUET Band 3 and below is compulsory to take UVW112/2 Foundation English.
**EMT462/3 Optoelectronic Systems or EMT480/3 Reliability and Failure Analysis

BACHELOR OF ENGINEERING (HONS.) (PHOTONIC ENGINEERING)

PROGRAMME OBJECTIVES (PEO)

PEO1
Graduates who are leaders in the field of electronic engineering or chosen field as demonstrated through career advancement

PEO2
Graduates who are members of and contribute to professional society

PEO3
Graduates who engaged in life-long learning or continuous education opportunities

PEO4
Graduates who contribute towards research and development

PEO5
Graduates who are entrepreneurial engineers

PROGRAM OUTCOMES (PO)

PO1
Ability to acquire and apply knowledge of mathematics, science, engineering and in-depth technical competence in Electronic (Photonic) engineering discipline to the solution of complex engineering problem

PO2
Ability to identify, formulate and solve complex engineering problems

PO3
Ability to design solutions for complex engineering problems and systems, components or processes to meet desired needs.

PO4
Ability to conduct investigation into complex problems as well as to analyze and interpret data.

PO5
Ability to use techniques, skills and modern engineering tools necessary for complex engineering practices so as to be easily adaptable to industrial needs.

PO6
Ability to understand the social, cultural, global and environmental responsibilities of a professional engineer.

PO7
Ability to demonstrate understanding of entrepreneurship, the process of innovation and the need for environmental and sustainable development.

PO8
Ability to understand the professional and ethical responsibilities and commitment to the community.

PO9
Ability to function on multi-disciplinary teams.

PO10
Ability to communicate effectively on complex engineering activities with the engineering community and with society at large

PO11
Ability to understand the need for, and an ability to engage in life-long learning

PO12
Ability to demonstrate understanding of project management and finance principles

CURRICULUM STRUCTURE 2015/2016
BACHELOR OF ENGINEERING (HONS.) (PHOTONIC ENGINEERING)
(SCHOOL OF MICROELECTRONIC ENGINEERING)

YEAR		YEAR 1		YEAR 2		YEAR 3			YEAR 4	
SEMESTER		I	II	III	IV	V	VI		VII	VIII
Engineering Core		EMT114/3 Introduction to Electric Circuit	EMT124/3 Fundamental of Electrical Engineering	EMT294/3 Principles of Optics	EMT283/3 Analog Electronic II	EMT393/3 Advanced Optics	EMT360/3 Control Engineering	EIT 302/4 Industrial Training & Engineering Innovation	EMT445/2 Final year Project	EMT446/4 Final Year Project
		ECT111/3 Engineering Skills	EMT125/3 Digital Electronic Principles I	EMT235/3 Digital Electronic Principles II	EMT245/3 Introduction to Microprocessor Design	EMT394/3 Photonic Materials and Devices	EMT395/3 Photonic Fabrication Engineering		EMT496/3 Micro-Optical-Electro-Mechanical-System	EMT462/3 Optoelectronic Systems
		EMT116/3 Electronic Devices	EMT115/3 Programming Language	EMT295/3 Quantum Mechanics	EMT293/3 Signal Analysis	EMT358/3 Communication Engineering	EMT369/3 Power Electronic		EMT475/3 Computer Organization Architecture	EMT494/3 Optical Communication
		EMT181/3 Physics for Electronics	EMT182/3 Analog Electronic I	EMT238/3 Electromagnetic Theory	EMT297/3 Physics of Semiconductor	EMT396/3 Principles of Integrated Circuit Design	EMT383/4 Photonic Design Project		EMT478/3 Instrumentation	**EMTXXX/3 Elective Course
									EMT491/3 Optical Design	
Non -Eng.		EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT203/3 Engineering Mathematics III	EQT271/3 Engineering Statistics				EUT442/2 Professional Engineers	EUT444/3 Management for Engineers
			UUWXXX/2 Foundation English II							
University Required (17)		UUW410/2 University Malay Language	UUWXXX/1 Co-Curiculum	*UUWXXX/2 Option	UUW224/2 Engineering Entrepreneurship	UUW235/2 Ethnic Relations	UUW233/2 Islamic & Asia Civilization			
		UUWXXX/1 Co-Curiculum		UUWXXX/1 Co-Curiculum		UUW322/2 Thinking Skills	UUW212/2 University English			
140		18	18	18	17	16	17	4	16	16

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** EMT488/3 Digital Signal Processing or EMT480/3 Reliability and Failure Analysis

COURSE SYLLABUS

EMT114/3
INTRODUCTION TO ELECTRIC CIRCUITS

Course Synopsis

Introduction to Electric Circuit course introduce students the method of analysis for linear electrical circuits based on the direct current (DC) and alternating current (AC) circuit theorems. The course can be categorized into 2 parts. First part is focusing on DC circuit. It covers the fundamental laws & theorem, circuit analytical technique, passive & active elements. Second part, it emphasize on ac circuit. It is introduces phasors, sinusoidal state analysis, using previous analytical techniques, under sinusoidal state excitation, RLC circuits, AC power calculations & power factor correction, RMS values & 3-phase balanced systems. At the end of the course, the student should be able to apply the theorems and concepts in order to analyze any linear electric circuits.

References

1. Alexander, C.K, Sadiku, M.N.O, Fundamental of Electric Circuit, 3rd Editions, Mc Graw-Hill, 2009
2. Nilsson, J.W. Riedel, S.A, Electric Circuit, 6th Edition, Prentice Hall, 2001
3. Irwin, J.D, Nelms, R.M, Basic Engineering Circuit Analysis, 8th Edition, John Wiley, 2005
4. Robbins, A.H, Miller, W.C, Circuit Analysis: Theory and Practice, 3rd Edition, Thomson/Delmar Learning, 2003
5. Hyat, W.H, Durbin, S.M, Kimmerly, J.E, Engineering Circuit Analysis, 6th Edition, Mc Graw Hill, 2002

EMT115/3
PROGRAMMING LANGUAGE

Course Synopsis

Integrating hardware and software is one aspect to be a good engineer, thus an electronic engineer should be competence in programming. This course will focus on the computer software program development using C programming language which is widely used programming language for creating computer programs. The syllabus will cover the theory of programming concepts and principles in order to solve the engineering problems. The students will be exposed to the coding, executing and debugging techniques during C program development.

References

1. Paul Deitel, Harvey Deitel, “C: How to Program, 7th Edition”, Prentice Hall, 2009.
2. Harry H. Cheng, “C for Engineers and Scientists, an Interpretive Approach”, McGraw Hill, International Edition, 2010.
3. Deitel and Deitel, Sudin, S., Ahmad, R.B. and Yacob, Y., “C How To Program”, Pearson-Prentice Hall, 2006.
4. K. N. King, “C Programming: A Modern Approach, 2nd Edition”, W. W. Norton & Company, 2008.
5. Noel Kalicharan, “C Programming - An Advanced Course”, CreateSpace, 2008.

EMT 116/3
ELECTRONIC DEVICES

Course Synopsis

This course will expose students to the basic electronic devices. The topic covered the fundamental concept of electronic devices. Students will expose to basic operation of diode and biasing circuits using data sheet. Students also will expose to diode application. The topics covered including Half wave rectifiers, Full wave rectifiers, Power Supply Filter and Regulators, Clipper and Clamper Diode circuits and Voltage Multipliers. Bipolar Junction Transistors (BJTs) and various types of Field Effect Transistors (FETs) are also covered in this course. The topics focus on the transistor structure, basic operation, characteristics and parameters, biasing and troubleshooting.

References

1. Floyd, T., Electronic Devices, 7th Edition, Prentice Hall, 2002.
2. Boylestad, R.L, Nashelsky, L., Electronic Devices and Circuit Theory, 8th Edition, Prentice Hall, 2002.
3. Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, 10th Edition, Prentice Hall, 2008
4. Ben Streetman and Sanjay Banerjee, Solid State Electronic Devices (6th Edition), Prentice Hall, 2005
5. Thomas L. Floyd, Electronics Fundamentals: Circuits, Devices and Applications, 7th Edition, Prentice Hall, 2006

EMT 124/3
FUNDAMENTAL OF ELECTRICAL ENGINEERING

Course Synopsis

This course focuses on the fundamental of electrical engineering and power electronics which consists of two parts; electrical machinery and instrumentation. This course will provide the basic knowledge in power transmission, machinery, power processing devices and metering. The topics covered in this course are transformers, AC and DC machines, AC and DC meters, AC and DC bridges, AC and DC converters, and sensors & transducers.

References

1. Chapman.S.J. (2005). *Electric Machinery Fundamentals*. 4th ed. Singapore: McGraw Hill.
2. Larry.D.Jomes and A.F. Chin. (1991). *Electronic Instruments and Measurements.* USA: Prentice Hall.
3. Z.A.Yamayee and J.L.Bala. (1993). *Electromechanical Energy Devices & Power Systems*. USA: Wiley & Sons.
4. C.S Rangan, G.R. Sarma & V.S. Mani, "Instrumentation Devices & System" Tata, McGraw-Hill Publishing Company Limited, 2004.
5. Bhas S. Guru & Huseyin R. Hiziroglu, "Electric Machinery and Transformers", 2001, Oxford University Press.

EMT 125/3
DIGITAL ELECTRONIC PRINCIPLES I

Course Synopsis

This course provides introductory of digital concept mainly numbering system, operation & codes, Boolean Algebra, and basic logic gates. Students are exposed to logic design, particularly combinational logic functions and sequential circuit design.

References

1. T. L. Floyd, "Digital Fundamentals", 10th Edition, Prentice Hall, 2009.
2. Rafikha Aliana, Norina Idris, Phak Len Eh Kan, Mohammad Nazri, Digital Electronics Design, 1st Ed. Prentice Hall, 2007.
3. R. H. Katz and G. Borriello, "Contemporary Logic Design", 2nd Edition, Prentice Hall, 2005.
4. R. J. Tocci, N. S.Widmer and G. L. Moss, "Digital Systems: Principles and Applications", 10th Edition, Prentice Hall, 2006.
5. Digital Design 4th Ed., M. M. Mano and M. D. Ciletti, Prentice Hall, 2008.

EMT181/3
PHYSICS FOR ELECTRONICS

Course Synopsis

This course provides the principles of Physics, specifically as a foundation course for electronics, microelectronics and photonics. It is a calculus based course. The course is similar to undergraduate basic physics course consisting from classical physics of mechanics, thermodynamics, basic optics, electricity and magnetism, modern physics and the introductory to the electric conductivity for solid.

References

1. P.A. Tipler and G. Mosca, "Physics for Scientist and Engineers (with Modern Physics)", Freeman Company (2008).
2. Serway and Jewett, "Physics for Scientist and Engineers (with Modern Physics)", 9th ed., Brooks/Cole, (2013).
3. J.D. Cutnell, K.W. Johnson, and K.D. Fisher, "Physics", 9th Ed., John-Wiley & Sons, (2012).
4. D. Halliday and R. Resnick, "Fundamental of Physics", Ext. 7th Ed. Wiley, (2004).
5. A.D. Kraus, A.V-Cohen, "Design and Analysis of Heat Sinks (Thermal Management of Microelectronic and Electronic System Series)", Wiley-Interscience, (1995).

EMT 182/3
ANALOG ELECTRONICS I

Course Synopsis

This course exposes the students to the basic knowledge in analogue circuits. The exposure encompasses amplifier design based on bipolar and field effect transistor, for single as well as multistage designs, power amplifiers, frequency response of amplifiers and also exposure to a few specialize device such as Shockley Diodes, SCS, Diac, Triac, SCR, Optotransistor, LASCR and Optocouplers. Emphasize is placed on basic designs aspects and applications. The course has been design to provide basic analogue electronics skills covering theories and practical.

References

1. Donald A. Neamen, *'Microelectronic: Circuit Analysis & Design, 4th Ed.'*, McGraw Hill International Edition, 2012.
2. Thomas L. Floyd, *'Electronic devices: Conventional Current Version',* 9th ed.', Prentice Hall, 2011
3. Robert L. Boylestead & Louis Nashelsky, '*Electronic Devices and Circuit Theory'*, 10th ed, Prentice Hall, 2011

EMT 283/3
ANALOG ELECTRONICS II

Course Synopsis

This course offers the students an exposure to the Operational Amplifier: Operation, differential, common-mode, parameters, basic op-amp, practical op-amp circuits, op-amp datasheet; Applications of op-amp and frequency response: Summing amplifier, Voltage Follower, Comparator, Integrator, Differentiator, frequency response and compensation; Feedback Circuits: Concepts of feedback, types of feedback connection, practical feedback circuit, feedback amplifier; Oscillator: Basic operating, principles of an oscillator, phase shift, Wien Bridge, Crystal oscillator, uni-junction; Active filter: Basic filter, filter response characteristics, low-pass filter, high-pass filter, band-pass filter, band-stop filter, frequency response measurement. Design of filter, Butterworth, Chebychev and Elliptic; Voltage regulators: Basic series and basic shunt regulators, IC regulators and applications.

References

1. Donald A. Neaman, *Electronic Circuit Analysis and Design*, 2nd Ed., Mc-Graw Hill, 2006
2. Floyd, T., Electronic Devices, 7th Ed., Pearson Education. Inc.,2005
3. Boylestead, R.L, and Nashelsky, L., Electronic Devices and Circuit Theory, 7th Ed., Prentice-hall, 1999

EMT 235/3
DIGITAL ELECTRONIC PRINCIPLES II

Course Synopsis

This course exposes the students to Digital Systems Design Concepts, focusing on Sequential Systems, Computer Design Basics as well as the Memory Unit.

References

1. M. M. Mano, Floyd - Digital Electronics Design, Prentice Hall. 2007.
2. Digital Fundamentals 10th Ed., Thomas L. Floyd, Pearson Prentice Hall, 2009.
3. Digital Principles and Design, Donald D. Givone, McGraw-Hill, 2002.
4. Digital Design 4th Ed., M. M. Mano and M. D. Ciletti, Prentice Hall, 2008.
5. Logic and Computer Design Fundamentals, M. Morris Mano and Charles R. Kime, Prentice Hall, 4th Ed., 2008.
6. Fundamentals of Digital Logic with Verilog/VHDL Design, Stephen Brown and Zvonko Vranesic, McGraw Hill 2009.
7. Digital Design – Principles and Practices 4th Ed., John F. Wakerley, Prentice Hall, 2007.

EMT 238/3
ELECTROMAGNETIC THEORY

Course Synopsis

This purpose of this subject is to learn and understand the basic theory of electromagnetism. Students should be able to understand the core concepts of electrostatics and magnetism as well as the combined electromagnetism effect.

References

1. John D. Krauss & Daniel A. Fleisch, Electromagnetics with Applications, 5th ed., Mc Graw Hill
2. Matthew N.O.Sadiku, Elements of electromagnetics, Third Edition, Oxford University Press, 2001
3. Stewart, Joseph V, Intermediate Electromagnetic Theory, world Scientific,2001
4. Branislav M. Notaros, Electromagnetics, Pearson 2011
5. William H. Hayt,John A. Buck, Emgineering Electromagnetics, Mc-Graw Hill 2011

EMT 243/3
INTRODUCTION TO IC DESIGN

Course Synopsis

The course provides the students an exposure on basic logic circuits design, layout design, layout simulation of integrated circuits, as well as basic integrated circuits design techniques..

References

1. Wolf, Rabeay, Jan M. Weste, Neil H.E, Compiled by Norina Idris, Norhawati Ahmad, Rizalafande Che Ismail, Muammar Mohamad Isa, Siti Zarina Md. Naziri, Muhammad Imran Ahmad, “CMOS VLSI; A Design Perspective”, Pearson, 2008.
2. R. Jacob Baker, “CMOS Circuit Design, Layout, and Simulation, 3rd Edition (IEEE Press Series on Microelectronic Systems)”, Wiley-IEEE Press, 2010.
3. Neil Weste, David Harris, “CMOS VLSI Design: A Circuits and Systems Perspective, 4th Edition”, Addison Wesley, 2010.
4. Wayne Wolf, “Modern VLSI Design: IP-Based Design, 4th Edition”, Prentice Hall, 2009.
5. Yuan Taur, Tak H. Ning, “Fundamentals of Modern VLSI Devices, 2nd Edition”, Cambridge University Press, 2009.

EMT 245/3
INTRODUCTION TO MICROPROCESSOR DESIGN

Course Synopsis

The aim of this course is to study the microprocessor architecture and relate that knowledge to the design of microprocessor based systems. This includes the design technique for memory, input and output for the systems. The study of microprocessor instruction set and various software development tools are also emphasized as the knowledge are needed in the design of the microprocessor-based systems

References

1. Ramesh S. Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", Prentice Hall, 2002
2. N Senthil Kumar, M Saravanan, S Jeevananthan, "Microprocessors and Microcontrollers", Oxford University Press, USA, 2011
3. Richard C. Detmer, "Introduction to 80x86 Assembly Language and Computer Architecture", Jones & Bartlett Publishers, 2009
4. Barry B. Brey, "Intel Microprocessors, The (8th Edition)", Prentice Hall, 2008
5. Richard C. Detmer, "Introduction to 80x86 Assembly Language and Computer Architecture", Jones & Bartlett Publishers, 2009
6. John Crisp, "Introduction to Microprocessors and Microcontrollers", Newnes, 2004

EMT 272/3
SEMICONDUCTOR FUNDAMENTAL

Course Synopsis

Introduction to semiconductor devices and technology, energy bands and carrier concentration in thermal equilibrium, carrier transport phenomena, p-n junction, bipolar transistor, MOS diode and MOSFET.

References

1. S. M. Sze, K. K. Ng, *Physics of semiconductor devices*, John Wiley, 2007, USA.
2. F. P. Robert *Advanced Semiconductor Fundamentals*, 2nd ed. 2003, Prentice Hall, USA.
3. Peter Y. Yu, M. Cardona, *Fundamental of Semiconductors: Physics and materials properties (advanced text in physics)*, Springer-Verlag, 2001, Germany.
4. G. G. Streetman, S. K. Banerjee, *Solid State Electronic Devices*, Prentice Hall, 2006, USA.
5. K. Kramer, W. Nicholas, G. Hitchon, *Semiconductor Devices: A Simulation Approach*, Prentice Hall, 1997, USA.
6. D. A. Neamen, Semiconductor physics and devices, McGraw-Hill, 3rd ed. 2003, USA.

EMT282/3
PRINCIPLES OF ENGINEERING MATERIALS

Course Synopsis

The course is tailored to give students a broad introduction to material properties and limitations. The subject will cover fundamental material structure, class of material properties, measurement of the properties, and knowledge to make material selection with better properties. The common micro-structural features of different material classes will be outlined in order to relate material with its characteristics.

References

1. Smith, W.F. and Hashemi, J. (2011). Foundations of Materials Science and Engineering, 5th Edition, McGraw-Hill.
2. Ashby, M., Shercliff, H. and Cebon, D., A., (2007). Materials: engineering, science, processing, and design, Elsevier.
3. Ashby, M. and Jones, D.R.H. (2006). Engineering Materials II: An Introduction to Microstructure, processing, and design, 3rd Edition, Elsevier, Butterworth Heinemann.
4. Sharma, C.P. (2004). Engineering material properties and applications of metal and alloys, Prentice Hall, New Delhi.
5. Rajput, R.K. (2000). Engineering Materials. S.Chand & Companu, New Delhi

EMT 293/3
SIGNAL ANALYSIS

Course Synopsis

This course aims to introduce students to the basics of signals and its analysis. To learn how certain input to a system will produce the required output. To understand signal spectra and the methods to analyze signal and its relations.

References

1. Simon Haykin, Barry Van Veen "*Signals and Systems",* 2nd. Ed., Wiley, 2003
2. Bhagwandas Pannalal Lathi ,"*Signal processing and linear systems*", Oxford University Press, 2000
3. Charles L. Philips, John M. Parr, Eve A. Riskin, "*Signals, Systems and Transforms"*, 3rd Ed., Prentice Hall International Edition, 2003
4. Fred J. Taylor, "*Principles of Signals and Systems"*, McGraw-Hill International Ed. 1994

EMT 294/3
PRINCIPLES OF OPTICS

Course Synopsis

This course provides an introduction to Optics, specifically the classical optics as the foundation course to Advance Optics or the principle of photonics. It is a calculus and vector based course.

References

1. Introduction to Optics, F. L. Pedrotti, L. M. Pedrotti, and L. S. Pedrotti, Third Edition, Benjamin Cummings (2006)
2. Jenkins, F.A. & White, H.E. Fundamentals of Optics (4th Ed.), McGraw-Hill, 2001
3. Pain, H.J. The Physics of Vibration and Waves (6th. Ed.), John Wiley & Sons, 2005.

EMT 295/3
QUANTUM MECHANICS

Course Synopsis

This course provides an introduction to Quantum Physics from historical perspective and the barrier between classical and quantum approaches. It is a calculus, vector and differential equation based course. The understanding of quantum physics is the key foundation to understand the physics of semiconductor, advanced optics, photonic materials and devices, as well as the more advances photonic engineering courses.

References

1. A. Yariv, P. Yeh, “Photonics**”,** Oxford University Press; 6 ed. 2006.
2. Liboff R.L. Introductory Quantum Mechanics, Addison Wesley, 2002
3. A.C. Phillips, “Introduction to Quantum Mechanics”, John Wiley & Sons, 2003.
4. A. Ghatak, “Optics”, McGraw-Hill, 1 ed. 2009.
5. Pedrotti, “Introduction to Optics 3rd Edition”. Addison Wesley, 2007

EMT 297/3
PHYSICS OF SEMICONDUCTOR

Course Synopsis

Introduction to semiconductor devices and technology, energy bands and carrier concentration in thermal equilibrium, carrier transport phenomena, p-n junction, bipolar transistor, MOS diode and MOSFET.

References

1. S. M. Sze, K. K. Ng, *Physics of semiconductor devices*, John Wiley, 2007, USA.
2. F. P. Robert *Advanced Semiconductor Fundamentals*, 2nd ed. 2003, Prentice Hall, USA.
3. Peter Y. Yu, M. Cardona, *Fundamental of Semiconductors: Physics and materials properties (advanced text in physics)*, Springer-Verlag, 2001, Germany.
4. G. G. Streetman, S. K. Banerjee, *Solid State Electronic Devices*, Prentice Hall, 2006, USA.
5. K. Kramer, W. Nicholas, G. Hitchon, *Semiconductor Devices: A Simulation Approach*, Prentice Hall, 1997, USA.
6. D. A. Neamen, Semiconductor physics and devices, McGraw hill, 3rd ed. 2003, USA.

EMT 352/3
ADVANCED DEVICES

Course Synopsis

This course provides extension knowledge on the operation of conventional MOSFETs and BJTs, including investigation of the physical mechanisms underlying the delays and speed limitations of the devices. Moreover, since advances in the electronic industry are rapid and fascinating, the aim of this course is to give sufficient background knowledge on the functioning of different semiconductor devices such as MESFETs, HEMTs, FinFETs, HBTs and BiCMOS.

References

1. B. G. Streetman, S. Banerjee, Solid State Electronic Devices, Prentice Hall International Editions.
2. Y. Tsividis, C. McAndrew, Operation and Modeling of the MOS Transistor, Oxford University Press.
3. S. M. Sze, K. K. Ng, Physics of Semiconductor Devices, John Wiley & Sons.
4. M. Shur, Physics of Semiconductor Devices, Prentice Hall.

EMT 353/3
DIGITAL INTEGRATED CIRCUIT DESIGN

Course Synopsis

This course provides the students an exposure to hardware modelling using Verilog Hardware Description Language, as a means of design entry, simulation and verification of digital circuits. The ModelSim software is used.

References

1. Ciletti M. D., *“Verilog 2001 for Beginners”,* Compiled by Norina Idris et al., Prentice Hall, 2008.
2. Ciletti M. D., “Modelling, Synthesis and Rapid Prototyping with the Verilog HDL”, Prentice Hall, 1999.
3. Palnitkar S., “Verilog HDL, A Guide To Digital Design And Synthesis”, Prentice Hall, 2003.
4. Vahid F. and Lysecky R., “Verilog for Digital Design”, John Wiley & Sons, Inc., 2007.
5. Katz R. H. and Borriello G., “Contemporary Logic Design”, 2nd Edition, Prentice Hall, 2005.

EMT 355/3 MICROCONTROLLER

Course Synopsis

The aim or this course is to study the concept and requirement of embedded system. This includes the characteristic of embedded system, hardware and software development, single chip microcontroller and programming technique in assembly language and C, basic multitasking concept, developing and embedded system application.

References

1. Muhammad Ali Mazidi & Janice Gillispie Mazidi, The 8051 Microcontroller and Embedded Systems, Prentice Hall 2000
2. W. Kleitz, Microprocessor and Microcontroller Fundamentals: The 8085 and 8051 Hardware and Software, Prentice Hall, 1998.
3. James W. Stewart & Kai X. Miao, The 8051 Microcontroller: Hardware, Software and Interfacing, Prentice Hall 2nd Ed. 1999

EMT 357/3 FUNDAMENTAL OF MICROELECTRONIC FABRICATION

Course Synopsis

This introductory course on microelectronic fabrication focuses on the concept and the basics of semiconductor materials, process technology and the fabrication processes of Integrated Circuits (ICs). Topics covered in this course are as follow Introduction to Microelectronic Fabrication, Cleanroom Technology, Safety & Protocol, Basics of Semiconductor, Wafer Manufacturing, Semiconductor Materials, Wafer Cleaning, Thermal Processes I: Oxidation, Thermal Processes II: Diffusion, Thermal Processes III: Ion Implantation & Annealing, Photolithography I, Photolithography II, Metallization I : CVD, Metallization II : PVD and Etching.

References

1. Hong Xiao. (2001). *Introduction to Semiconductor Manufacturing Technology*. Prentice Hall.
2. Peter Van lant. (2000). *Microchip Fabrication: A Practical Guide to Semiconductor Processing*. McGraw Hill.
3. Campbell, S. A. (2001). *Science And Engineering of Microelectronics Fabrication*. New York: Oxford University Press.
4. Handbook of Contamination Control in Microelectronics - Principle, Applications and Technology. Edited by Tolliver, D. (1998). Noyes Publications.
5. Introduction to Microelectronic Fabrication, Volume V, Second Edition, Richard C. Jaeger, Prentice Hall, 2002.
6. Semiconductor Devices, Physics and Technology, 2nd Edition, S.M. Sze, John Wiley & Sons, Inc, 2002.
7. Silicon VLSI Technology: Fundamentals, Practice and Modelling, James D. Plummer, Michael D. Deal and Peter B. Griffin, Prentice Hall, 2000.

EMT 358/3 COMMUNICATION ENGINEERING

Course Synopsis

This course will cover all the basic principles and concepts of analogue and digital communication including the basic elements of communications, signal analysis, amplitude modulation, angle modulations and digital modulations, as well as transmission channels and medium. In addition, introductions to signal propagations and calculations of signal to noise ratio are also introduced to relate the students with real world applications.

References

1. Wayne Tomasi,” Electronic Communication System, Fundamental Through Advanced”,5th Ed. Pearson Prentice Hall,2004
2. Paul Young, Electronics Communications Techniques, 5th Edition, Prentice Hall, 2004
3. Mullet,”Basic Telecommunications: The Physical Layer”, Thomson Learning, 2003.
4. S. Haykin, “Communication Systems”, 5th Ed. Wiley, 2009.
5. B.P.Lathi, Zhi Ding, “Modern Digital and Analogue Communication Systems”, 4th Ed. Oxford Univ Press, 2009.
6. A.B.Calson, P. Crilly, “Communication Systems”, 5th Ed. McGraw Hill, 2009.

EMT 360/3
CONTROL ENGINEERING

Course Synopsis

This is an introduction course to control systems engineering. Students will be exposed to the mathematical modelling for mechanical, electrical as well as electro-mechanical systems using transfer functions, signal-flow graphs and Mason's rule. They will conduct system performance analysis in time and frequency domain. System stability will also be studied along with root locus analysis. Finally the students will be introduced to system compensation design using PID and lead-lag controllers. The laboratory sessions will be conducted to enable the students to test the theory.

References

1. Modern Control Systems 11th Edition, Richard C. Dorf and Robert H. Bishop, 2008
2. Control Systems Engineering 4th Edition, Norman S. Nise, John Wiley & Sons, 2004.
3. Modern Control Engineering 5th Edition, Ogata K., Prentice Hall, 2010
4. Automatic Control Systems Farid Golnaraghi and Benjamin Kuo, 2009.
5. Stubberud, I. William, J. DiStefano, “Schaum's Outline of Feedback and Control Systems”, 4th Ed. McGraw Hill, 2006.

EMT 363/3
VLSI DESIGN

Course Synopsis

This course will cover various important elements for VLSI design such as sequential circuit, clock tree, wire interconnect and power dissipation and low power design.

References

1. Niel H.E. Waste, David Harris (2005). CMOS VLSI Design: A Circuits and Systems Perspective, 3rd Edition Addison Wesley.
2. Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic (2003). Digital Integrated Circuits: A Design Perspective. 2nd Edition. Prentice Hall.
3. Keating and Pierre Bricaud (2002). Reuse Methodology Manual for System-on-a-Chip Designs. 3rd Edition. Springer.
4. Surviving the SOC Revolution - A Guide to Platform-Based Design (1999). by Henry Chang, Lee Todd, Andrew McNelly, Grant Martin, Merrill Hunt, Larry Cooke. 1st Edition Springer
5. Wayne Wolf. (2002). *Modern VLSI Design: System-on-Chip Design*. 3rd ed. Prentice Hall PTR.

EMT 367/3
MICROELECTRONIC FABRICATION

Course Synopsis

This course focuses on the fabrication process module of the CMOS technology. The students should be able to design, produce a mask, prepare the runcard (process flow of the MOSFET), fabricate the MOSFET, analyse and characterise the devices electrically. The students should also able to understand the important CMOS process modules such as well technology, isolation technology, multi level interconnect technology as well as related device issues mainly associated with the device miniaturisation.
Topics covered in this course are as follow:

1. Microelectronic fabrication overview
2. Standard CMOS process flow and cross section
3. CMOS process sub-integration module:
   i) Well technology
   ii) MOS device isolation technology
   iii) Gate oxide integrity and characterisation,
   iv) Multilevel interconnect technology (metallisation and multilevel dielectrics, planarisation, contact and via),
   v) MOS scaling effect; short channel effect, hot carrier effect, device characterisation;
   vi) IV and CV test.

References

1. Hong Xiao. (2001). Introduction to Semiconductor manufacturing Technology. Prentice Hall.
2. Michael Quirk & Julian Serba. (2001). Semiconductor Manufacturing Technology. Prentice Hall.
3. S.Wolf & R.N. Tauber. (1986). Silicon processing for the VLSI Era – Volume 1 Process Technology.
4. S.Wolf & R.N. Tauber. (1986). Silicon processing for the VLSI Era – Volume 2 Process Integration.
5. S.Wolf & R.N. Tauber. (1986). Silicon processing for the VLSI Era – Volume 3 Submicron MOSFET.

EMT 368/3
RELIABILITY AND TESTABILITY IN INTEGRATED CIRCUIT DESIGN

Course Synopsis

This course provides an understanding of integrated circuit testing for improved testability and the reliability in electronic devices. Students will have the opportunity to identify and apply techniques required for the design of Integrated Circuits with facilities for testing and reliability. This course also will expose students how to apply advanced verification techniques into the design flow, debug and test their design through the use of industry standard EDA tools.

References

1. Parag K. Lala,Digital Circuit Testing and Testability, MO: Academic Press, 2002
2. William K. Lam, *Hardware Design Verification: Simulation and Formal Method-Based Approaches, Prentice Hall, 2005.*
3. Janick Bergeron*, Writing Testbenches: Functional Verification of HDL Models, Kluwer, 2003.*
4. Alessandro Birolini, Reliability Engineering Theory and Practice, Springer (India), 2006.

EMT 369/3
POWER ELECTRONIC

Course Synopsis

Topics covered are: Fundamental Concepts of Power Electronics, Power Semiconductor Devices, Power Electronic Circuits, AC-DC Conversion, AC-AC Conversion, DC-DC Conversion and DC-AC Conversion.

References

1. Mohan, Undeland, Robbins. (1995). *Power Electronics: Converters, Applications & Design.* 2nd ed. John Wiley and Sons, Inc.
2. Cyril W. Lander. (1993). Power Electronics. 3rd ed. McGraw-Hill.
3. Daniel W Hart (1997), Introduction to Power Electronics, Prentice Hall International.
4. J.S. Chitode (2007), Power Electronics, Technical Publications Pune.
5. Issa Batarseh (2004), Power Electronic Circuits, John Wiley & Sons, Inc.

EMT 381/382/383/3
MICROELECTRONIC/ELECTRONIC/ PHOTONIC DESIGN PROJECT

Course Synopsis

An exposure to the students in integrated design project. This project encompasses practical, innovation and invention elements in designing a solution to a specific engineering application. The students are expected to implements the knowledge and skills obtained in solving the specific engineering problem. The students are also need to practice their professional and social responsibilities in giving a sustainable solution via functioning in a multidisciplinary team.

EMT 393/3
ADVANCED OPTICS

Course Synopsis

This course is the extension course from Principles of Optics and focusing on the Principles of Photonics, from Ray Optics to Non-Linear Optics. It is advanced mathematics based courses, with the knowledge in EM Theory and Quantum Physics.

References

1. B.E.A. Saleh, "Fundamental of Photonics", Wiley-Interscience, 2007.
2. Jenkins, F.A. & White, H.E. Fundamentals of Optics (4th Ed.), McGraw-Hill, 2001

EMT 394/3
PHOTONIC MATERIALS & DEVICES

Course Synopsis

This course is related to the materials used for photonics devices which involve fundamental understanding on optics in its first initial part, followed with physics of the photonics materials and finally a few examples of photonics devices with understanding on the operation.

References

1. B.E.A. Saleh, "Fundamental of Photonics", Wiley-Interscience, 2007.
2. Jenkins, F.A. & White, H.E. Fundamentals of Optics (4th Ed.), McGraw-Hill, 2001

EMT 395/3
PHOTONIC FABRICATION ENGINEERING

Course Synopsis

This course will develop the student's basic understanding of the principles of Diffractive Optical Elements (DOE). The students are also required to gain in depth knowledge of the cleanroom protocol. The required topics are photolithography, fabrication process of DOE and optical performance testing, electronic packaging, development trends, design and packaging of High Power LED and Reliability Engineering.

References

1. Donald C. O'Shea, Thomas J. Suleski, Alan D. Kathman, Dennis W. Prather, "Diffractive Optics: Design, Fabrication, and Test", SPIE Publications (December 29, 2003)
2. Alan R. Mickelson, Nagesh R. Basavanhally, Yung-Cheng Lee, "Optoelectronic Packaging" (Wiley Series in Microwave and Optical Engineering) (1997)
3. Sheng Liu and Xiaobing Luo, "LED Packaging for Lighting Applications: Design, Manufacturing, and Testing" Wiley; 1 edition (July 5, 2011)

EMT 396/3
PRINCIPLES OF INTEGRATED CIRCUIT DESIGN

Course Synopsis

The course provides the students an exposure on basic logic circuits design, layout design, layout simulation of integrated circuits, as well as basic integrated circuits design techniques..

References

1. Wolf, Rabeay, Jan M. Weste, Neil H.E, Compiled by Norina Idris, Norhawati Ahmad, Rizalafande Che Ismail, Muammar Mohamad Isa, Siti Zarina Md. Naziri, Muhammad Imran Ahmad, "CMOS VLSI; A Design Perspective", Pearson, 2008.
2. R. Jacob Baker, "CMOS Circuit Design, Layout, and Simulation, 3rd Edition (IEEE Press Series on Microelectronic Systems)", Wiley-IEEE Press, 2010.
3. Neil Weste, David Harris, "CMOS VLSI Design: A Circuits and Systems Perspective, 4th Edition", Addison Wesley, 2010.
4. Wayne Wolf, "Modern VLSI Design: IP-Based Design, 4th Edition", Prentice Hall, 2009.
5. Yuan Taur, Tak H. Ning, "Fundamentals of Modern VLSI Devices, 2nd Edition", Cambridge University Press, 2009.

EMT 445/2
FINAL YEAR PROJECT

Course Synopsis

An exposure to the students in microelectronic/electronic/photonic based research project

References

Based on project title

EMT 446/4
FINAL YEAR PROJECT

Course Synopsis

An exposure to the students in microelectronic/electronic/photonic based research project.

References

Based on project title

EMT 454/3
NANOELECTRONIC ENGINEERING

Course Synopsis

The aim of this course is to study the underlying physical principles, the fabrication technologies, and applications of a broad range of nanoelectronic devices. This includes device scaling of standard MOSFETs into nanoscale dimensions, electron transport and quantum effects in nanostructures and their applications, nanocharacterization, and nanofabrication methods (e.g., submicron optical lithography and electron-beam lithography).

References

1. J. H. Davies, The Physics of Low-Dimensional Semiconductors: An Introduction, Cambridge University Press.
2. Y. Tsividis, C. McAndrew, Operation and Modeling of the MOS Transistor, Oxford University Press.
3. V. V. Mitin, V. A. Kochelap, M. A. Stroscio, Introduction to Nanoelectronics – Science, Nanotechnology, Engineering, and Applications, Cambridge University Press.

EMT 463/3
MEMS DESIGN AND FABRICATION

Course Synopsis

The aim of this course is to provide the introduction and overview of MEMS market, scaling laws, MEMS devices and applications, MEMS materials and fabrication methods, and basic MEMS concepts including pressure and acceleration.

References

1. Nadim Maluf & Kirt Williams 'An Introduction to Microelectromechanical Systems Engineering", 2nd edition, Artech House Inc, 2004
2. Tai-Ran Hsu, MEMS and Microsystems; Design and Manufacture, Boston, McGraw Hill 2000
3. Hong Xiao, Introduction to Semiconductor Manufacturing Technology, Prentice Hall, 2001
4. Tai-Ran Hsu. MEMS Packaging (2004). EMIS Processing Series 3. INSPEC.
5. James J. Allen. Micro Electro Mechanical System Design (2005). CRC Press. Taylor & Francis Group.

EMT 470/3
SEMICONDUCTOR PACKAGING

Course Synopsis

Students will be exposed to Microsystems packaging, the role of packaging in microelectronics, fundamental of IC assembly, general semiconductor process flow, design for reliability, thermal management, sealing and encapsulation, packaging material and processes, and latest packaging technology trend via latest scientific papers. The students will also be exposed to identifying critical packaging parameters and interpreting data of their own designed experiment. Mathematical modelling in packaging are also introduced.

References

1. Rao Tummala. 2001. Fundamentals of Microsystem Packaging. Mc-Graw Hill Professional.
2. M. Datta, T.Osaka, J.W Schultze (Editor). 2005. *"Microelectronic Packaging"*. CRC Press, Florida U.S
3. Glenn R. Blackweel, 2000. *"The Electronic Packaging Handbook".* CRC Press LLC. Florida U.S.
4. William D. Brown (Editor). 1999," *Advanced Electronic Packaging with Emphasis on Multichip Modules*", IEEE Press Series on Microelectronics Systems. The Institute of Electrical and Electronics Engineers, Inc. New York.

EMT 462/3
OPTOELECTRONIC SYSTEM

Course Synopsis

The students studying this course will develop a basic understanding of the principles and practices of modern optoelectronic device includes fibre optic, semiconductor laser, photodiode and LED. The important functions for applications for these optoelectronic devices will acquire in optoelectronic system such as optical communication and display technology. Practical skills by using software in optical fibre systems and measurement will also be acquired.

References

1. John Wilson and John Hawkes, Opto-Electronics: An Introduction, 3rd Edition, Prentice-Hall, 1998.
2. S.O. Kasap. Optoelectronics and Photonics, Principles and Practices, Prientice Hall, 2001
3. Amnon Yariv, Pochi Yeh, Photonics: Optical electronics in Modern Communications, 2007
4. Ghatak and Thyagarajan, Introduction to Fiber Optics, Cambridge University Press, 1998.
5. John M. Senior, Optical Fiber Communications; Principles and Practice, 2nd Edition, Prentice-Hall, 1992.

EMT 475/3
COMPUTER ORGANIZATION AND ARCHITECTURE

Course Synopsis

This subject will focus on the computer system with various designs of interface techniques, organization and architecture. The syllabus will covered the theory of basic computer system, format of instruction set, memory organization and arithmetic logic unit as well as certain issues of designing such as bus structure, parallel processing, pipelining and memory management.

References

1. William Stallings "Computer Organization and Architecture: Designing for Performance", 8th Edition, Prentice Hall, 2010
2. John L. Hennessy and David A. Patterson "Computer Architecture: A Quantitative Approach", 4th Edition, Morgan Kaufmann, 2006
3. Linda Null "The Essentials of Computer Organization and Architecture", Jones & Bartlett Pub., 2006
4. Miles J. Murdocca and Vincent P. Heuring "Computer Architecture and Organization: An Integrated Approach", Wiley, 2007

EMT 478/3
INSTRUMENTATION

COURSE SYNOPSIS

This course covers the fundamental of electronic instrumentation. This includes the working principle and transduction properties of sensors and transducers. Importance and techniques of signal conditioning is emphasized. Element and principle of data acquisition and their applications are discussed. Modern stand-alone and computer-based measurement instruments are covered.

References

1. Kalsi, H.S. "Electronic Instrumentation", Tata McGraw-Hill Publishing Co. Ltd., 2005
2. C.S. Rangan, G.R. Sarmaand V.S. Mani. "Instrumentation Devices & Systems", Tata McrGraw-Hill Publishing Co. Ltd., 2004
3. A.K. Sawhneyand P. Sawhney. "A Course in Electronic and Electrical Measurement and Instrumentation", Dhanpat Rai & Co. (P) Ltd., 2001

EMT 479/3
ANALOG INTEGRATED CIRCUIT DESIGN

Course Synopsis

The course covers MOS characteristics, Second order effects, Basic Cells, Single stage Amplifier, Differential amplifier, MOS Op amp and Op-amp Application.

References

1. Behzad Razavi, Design of Analogue CMOS Integrated Circuit, McGraw-Hill, 2000.
2. Phillip E. Allen, Douglas R. Holberg, CMOS Analogue Circuit Design, Oxford University Press, 2002.
3. Paul R. Gray, Analysis and Desgn of Analogue Integrated Circuit, 4th Ed, Wiley.
4. R. Jacob Baker, CMOS Circuit Design, Layout, and Simulation, Revised Second Edition Wiley-IEEE Press; 2 edition, 2007,
5. Niel H.E. Waste, David Harris. CMOS VLSI Design: A Circuits and Systems Perspective, Addison Wesley, 4 edition, 2010

EMT 480/3
RELIABILITY & FAILURE ANALYSIS

Course Synopsis

This course is basically divided into two areas: Reliability & Failure Analysis. In the first section of Reliability, students will learn the concept of Reliability, its terms & definitions, the different types of Reliability Distributions and also the different types of Reliability Prediction Techniques such as FMEA & FTA. In the second section of Failure Analysis, students will be exposed to the different types of FA techniques commonly conducted on a failed semiconductor device and the test instrumentation associated with each technique.

References

1. Patrick O'Connor (2002). Practical Reliability Engineering, Wiley
2. Ebeling, C. E. (1997). Reliability and Maintainability Engineering, McGraw Hill
3. Lawrence C. Wagner, (1999). *Failure Analysis of Integrated Circuits: Tools and Techniques.* Kluwer Academic Publishers.
4. Perry L. Martin (1999). *Electronic Failure Analysis Handbook*.: McGraw Hill
5. E. Ajith Amerasekera and Farid N. Najm (1997). *Failure Mechanisms in Semiconductor Devices.* 2nd Ed.: John Wiley & Sons
6. Friedrich Beck (1998). *Integrated Circuit Failure Analysis: A Guide to Preparation Techniques.* : John Wiley & Sons

EMT 483/3
SYSTEM ON CHIPS

Course Synopsis

This course will cover system on chip design including design methodology, IP design and platform-based design. This course will also cover various important elements for chip design such as sequential circuit, clock tree, low power design, power distribution and deep submicron interconnect.

References

1. Niel H.E. Waste and David Harris "CMOS VLSI Design: A Circuits and Systems Perspective", 3rd ed., Addison Wesley, 2004
2. Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic "Digital Integrated Circuits: A Design Perspective", 2nd ed., Prentice Hall, 2003
3. Keating and Pierre Bricaud "Reuse Methodology Manual for System-on-a-Chip Designs", 3rd ed., Springer, 2002
4. Sudeep Pasricha and Nikil Dutt "On-Chip Communication Architectures: System on Chip Interconnect", Morgan Kaufmann, 2008
5. Wayne Wolf "Modern VLSI Design: System-on-Chip Design", 3rd ed., Prentice Hall PTR, 2002

EMT 488/3
DIGITAL SIGNAL PROCESSING

Course Synopsis

This course is a continuation from introduction to signal analysis course that will more emphasize to digital signal analysis. This course will cover the topics related to Discrete Time Signal, Fourier Transform, Sampling process, IIR and FIR digital filter design.

References

1. Ifeachor & Jervis,"Digital Signal Processing: a practical Approach", 2/e, Prentice Hall.
2. Sanjit K. Mitra, "Digital Signal Processing, A Computer-Based Approach", 4/e., McGraw Hill, 2005
3. Proakis and Manolakis, "Digital Signal Processing", Pearson, 4/e
4. S. Orfanidis," Introduction to Signal Processing", PH 1996
5. C.T.Chen," Digital Signal Processing", Oxford 2001
6. B.P.Lathi," Signal Processing and Linear Systems", Oxford

EMT 490/3
MICRO-ELECTRO-MECHANICAL-SYSTEMS

Course Synopsis

This course will focus on design and simulation of MEMS devices. The design will include various of analysis types such as structural, electrical and mechanical while the fabrication technology will focus on bulk and surface micromachining. This course will also discuss the application and technology of MEMS packaging in various fields.

References

1. Chang Liu. Foundation of MEMS. Pearson International Edition (2006). Prentice Hall.
2. Tai-Ran Tsu. MEMS & Microsystems Design and Manufacture (2002). McGraw Hill.
3. Tai-Ran Hsu. MEMS Packaging (2004). EMIS Processing Series 3. INSPEC.
4. James J. Allen. Micro Electro Mechanical System Design (2005). CRC Press. Taylor & Francis Group.
5. Hong Xiao, Introduction to Semiconductor Manufacturing Technology, Prentice Hall, 2001

EMT 491/3
OPTICAL DESIGN

Course Synopsis

To expose students to optical components and system design. The course covers Basic Optics & Optical System Specifications, Stops, Pupils, and Other Basic Principles, Diffraction, Aberrations, and Image Quality, The Concept of Optical Path Difference, Review of Specific Geometrical Aberrations, Material Selection, Spherical and Aspherical Surfaces, Design Forms & Processes, Gaussian Beam Imagery, Illumination System Design and Tolerancing, Producibility, Evaluation & Manufacturing. Students will be familiar with design softwares.

References

1. Robert F. Fischer, Bijana Tadic, “Optical System Design”, McGraw-Hill Professional; 1 edition (2000).
2. W. J. Smith, “Modern Lens Design”, 2nd ed., McGraw-Hill, (2005).
3. D. Malabar, & Z. Malacara, “Handbook of Optical Design”, 2nd ed., Marcel-Dekker, (2004).
4. Warren J. Smith, “Modern Optical Engineering”, McGraw-Hill Professional; 3rd edition (2000)

EMT 494/3
OPTICAL COMMUNICATION

Course Synopsis

This course is to introduce the various optical fiber modes, configurations and various signal degradation factors associate with optical fiber. Also study the various optical source and optical detectors and their used in optical communication systems.

References

1. R. Ramaswami**, “**Optical Networks: A Practical Perspective, 3rd Edition”, Morgan Kaufmann; 3rd edition (July 16, 2009)
2. J, Senior, “Optical Fiber Communications: Principles and Practice”, Prentice Hall; 3rd edition (December 26, 2008)

EMT 496/3
MICRO-OPTICAL-ELECTRO-MECHANICAL-SYSTEMS

Course Synopsis

This course is an introductory about MOEMS in term of fabrication and its systems. MOEMS is related with the integration of micro-optic and Micro-Electro-Mechanical system (MEMS) which involves sensing or manipulating optical signals on a very small size scale using integrated mechanical, optical, and electrical systems. Both of these two technologies independently involve in batch processing similar to integrated circuits, and micromachining similar to fabrication of microsensor.

References

1. Manouchehr E. Motamedi (Author, Editor), “MOEMS: Micro-Opto-Electro-Mechanical Systems” SPIE Publications (April 1, 2005).
2. P. Rai-Choudhury, “MEMS and MOEMS: Technology and Applications”, SPIE Press, 2000

Career Opportunities

There are a lot of demand for microelectronic, electronic & photonic engineers that are capable either in the private or government sectors, mainly in the field of designing, fabrication & IC testing. Job prospects and careers for graduates are definitely great.

Among the electronic, microelectronic and photonic graduates specific abilities and skills that can be undertaken as a career are:

- Semiconductor/Microelectronic fabrication
- IC Design for digital, analogue, mixed signals & RF-IC
- IC Layout Design, System On Chip for digital, analogue, mix signal and RF-IC.
- Mask design
- ASICs (Application Specific ICs) design & VLSI (Very Large Scale Integration)
- MEMS (Micro Electro Mechanical Systems) design
- Photonic design
- Design based on Verilog HDL / VHDL (Very High-Speed IC Hardware Description Language)
- Fast-prototype device for IC fabrication
- Device & process simulation
- Failure analysis & testing
- IC Packaging
- IC Testing
- Reverse-Engineering on ICs
- Optical Communications Design


UNIVERSITI MALAYSIA PERLIS

School of Computer and Communication Engineering

Programmes Offered

• Doctor of Philosophy (Ph.D)
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• Master of Science (Communication Engineering)
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• Bachelor of Engineering (Hons.) (Communication Engineering)
• Bachelor of Engineering (Hons.) (Computer Network Engineering)
• Diploma in Computer Engineering

Address

SCHOOL OF COMPUTER AND COMMUNICATION ENGINEERING
d/a Kompleks Pusat Pengajian Kejuruteraan Pembuatan
Universiti Malaysia Perlis (UniMAP)
Tingkat 1, Kampus Tetap Pauh Putra
02600 Arau, Perlis.

Tel.: +6(04) 988 5461
Fax: +6(04) 988 5462

INTRODUCTION

The School of Computer and Communication Engineering was established on 30th April 2002. The School of Computer and Communication Engineering adheres to the philosophy that emphasizes the importance of setting up Coppermine integration of knowledge, skills and practices that make the concept a true appreciation of science. The foundations of knowledge combined with good values of life that intellectual culture can be fostered and digested to form a way of life that is dynamic, progressive and civilized.

Based on the philosophy, the curriculum and programmes offered at the School of Computer and Communication Engineering are continually reviewed and updated on an ongoing basis by:

- Taking into consideration the opinion, concluded the study results and feedback from the community, especially in industry.
- Fulfilling the requirements of the professional advisory boards such as the Institute of Engineers Malaysia and Board of Engineers Malaysia.
- Ensuring a balance of theory and practical expertise.
- Ensuring that learning is always at world-class level.

STAFF DIRECTORY

Dean
Prof. Dr. R. Badlishah Bin Ahmad
e-mail: badli@unimap.edu.my

Deputy Dean
(Academic and Research)
Dr. Shahrul Nizam Bin Yaakob
e-mail: shahrulnizam@unimap.edu.my

Deputy Dean
(Student Development and Alumni)
Dr. Muzammil Bin Jusoh
e-mail: muzammil@unimap.edu.my

Chairperson of B.Eng Program
(Computer Engineering Programme)
Dr. Rozmie Razif Bin Othman
e-mail: rozmie@unimap.edu.my

Chairperson of B.Eng Program
(Communication Engineering)
Ms. Noor Syazana Binti Arshad
e-mail: syazana@unimap.edu.my

Chairperson of B.Eng Program
(Computer Networking Engineering)
Dr. Mohd Nazri Bin Mohd Warip
e-mail: nazriwarip@unimap.edu.my

Chairperson of Diploma Program
(Computer Engineering Programme)
Dr. Rosemizi Bin Abd. Rahim
e-mail: rosemizi@unimap.edu.my

Chairperson of
Postgraduate Programme
Dr. Phak Len A/L Eh Kan
e-mail: phaklen@unimap.edu.my

Coordinator for Industrial Networking
and Quality Management
Dr. Ruzelita Binti Ngadiran
e-mail: ruzelita@unimap.edu.my

Senior Assistant Registrar
Ms. Norzaililah Binti Zainoddin
e-mail: zaililah@unimap.edu.my

LECTURERS

Professor Dr. R Badlishah bin Ahmad
Ph.D. (Electric and Electronic), University of Strathclyde, UK
M.Sc. (Optoelectronics), University of Strathclyde, UK
B.Eng. (Hons) (Electric and Electronic), University of Glasgow, UK
Diploma Elektrik Perhubungan (DEP), Universiti Teknologi Malaysia
Tel. : +6(04) 988 5461
Fax : +6(04) 988 5462
e-mail : badli@unimap.edu.my

Professor Dr.
Syed Alwee Aljunid bin Syed Junid
Ph.D. (Communication And Network Engineering), UPM
B.Eng. (Computer System and Communication), UPM
B.T.E.C Higher National Diploma in Engineering U.K
Diploma in Electrical Engineering (Power), ITM
Tel. : +6(04) 979 8784
Fax : +6(04) 979 8790
e-mail : syedalwee@unimap.edu.my

Professor Dr. Sabira Khatun
Ph.D (Communication & Network Engineering), UPM
Ph.D (Mobile Computing in Megneto_ Hydrodynamics), University of Rajshahi, Bangladesh
M.Sc (Applied Mathematics: Numerical Analysis), University of Rajshahi, Bangladesh B.Sc (Honours in Applied Mathematics), University of Rajshahi, Bangladesh
Fax : +6(04) 988 5462
e-mail : sabira@unimap.edu.my

Professor Dr. Puteh binti Saad
(Visiting Professor)
Ph.D (Computer Science), UTM
M.Sc (Computer Science), University of Strathclyde, UK
B.Sc (Chemistry Engineering), UM
Research Areas : Artificial Intelligence, Pattern Recognition & Image Processing
Fax : +6(04) 988 5462
e-mail : puteh@unimap.edu.my

Associate Professor Dr.
Mohd. Fareq bin Abd. Malek
Ph.D. (Radio Frequency, Microwave and Free Electron Maser), Liverpool, U.K.
MSc. (Eng.) Distinction (Microelectronic Systems and Telecommunications), Liverpool, U.K.
B.Eng. (Hons.) (Electronic and Communication Engineering), Birmingham, U.K.
Tel. : +6(04) 9885600/5601
Fax : +6(04) 9885602
e-mail : mfareq@unimap.edu.my

Associate Professor Ir. Dr.
Mohd. Faizal bin Jamlos
Ph.D (Electrical Engineering), UTM
M.Eng (Electrical and Electronic Engineering), Adelaide University, Australia
B.Eng (Hons) (Computer Engineering), KUKUM
Fax : +6(04) 988 5462
e-mail : faizaljamlos@unimap.edu.my

Associate Professor Ir. Dr.
Anuar bin Mat Safar
Ph.D (Communication Engineering) , UniMAP
M.Sc. (Information Technology), UUM
B.Eng. Electric & Electronic, USM
P.Eng., BEM (2005)
Tel. : +6(04) 976 9287 / 976 9323
Fax : +6(04) 979 7936
e-mail : anuarms@unimap.edu.my

Dr. Shahrul Nizam bin Yaakob
Ph.D (Computer System Engineering), University of South Australia (UniSA)
M.Sc. (Computer Engineering), KUKUM
B.Eng. (Hons.), (Electric-Electronic) UTM
Tel. : +6(04) 988 5461
Fax : +6(04) 988 5462
e-mail : shahrulnizam@unimap.edu.my

Dr. Muzammil Bin Jusoh
Ph.D (Communication Engineering), UniMAP
M.Sc. (Electrical-Electronic Telecommunication Engineering), Universiti Teknologi Malaysia
B.Eng. (Electrical Telecommunication Engineering), Universiti Teknologi Malaysia
Tel. : +6(04) 988 5461
Fax : +6(04) 988 5462
e-mail : muzammil@unimap.edu.my

Dr. Rozmie Razif bin Othman
Ph.D (Software Engineering), USM
M.Eng in Telecommunication, UM
B.Eng (Hons) in Electronics (Computer) MMU
Tel. : +6(04) 988 5461
Fax : +6(04) 988 5462
e-mail : rozmie@unimap.edu.my

Dr. Mohd Nazri bin Mohd Warip
Ph.D in Electronic & Electrical Engineering (Broadband-optical), University of Strathclyde, UK
M.Eng in Electrical-Electronic & Telecommunications, UTM
B.Eng (Hons.) in Electronic & Electrical Engineering, University of Portsmouth, UK
Diploma in Electrical Communication Engineering, UTM
Professional Qualifications:
- Chartered Engineer (CEng), The Engineering Council, United Kingdom, Registration No. 574803.
- Chartered IT Professional (CITP), BCS, The Chartered Institute for IT, United Kingdom. Membership No. 990225878.

Tel. : +6(04) 988 5461
Fax : +6(04) 988 5462
e-mail : nazriwarip@unimap.edu.my

Dr. Phak Len a/l Eh Kan
Ph.D (Computer Engineering), UniMAP
MSc (Information Technology), UUM
B.Eng. Elektrik (Elektronik), UTM
Diploma Kejuruteraan Elektrik (Perhubungan), UTM
Tel. : +6(04) 988 5461
Fax : +6(04) 988 5462
e-mail : phaklen@unimap.edu.my

Dr. Ruzelita binti Ngadiran
Ph.D in Communications, Sensors and Signal Processing, Newcastle University, United Kingdom
Sarjana Kejuruteraan Sains (Komputer), UKM
Ijazah Sarjana Muda Kejuruteraan Komunikasi dan Komputer, UKM
Tel. : +6(04) 988 5461
Fax : +6(04) 988 5462
e-mail : ruzelita@unimap.edu.my

Dr. Rosemizi bin Abd Rahim
Ph.D (Communication Engineering), UniMAP
M.Sc (Electronic System Design Engineering), USM
B.Eng (Electrical Engineering)(Hons), UiTM
Diploma in Electrical Engineering, ITM
Tel. : +6(04) 988 5461
Fax : +6(04) 988 5462
e-mail : rosemizi@unimap.edu.my

Dr. Mohd Najmuddin bin Mohd Hassan
Ph.D (Kej. Elektronik), Athlone Institute of Technology, Ireland
M.Sc. (IT), Universiti Teknologi MARA
B.Eng. (Communication), Universiti Teknologi Malaysia
Diploma Electric (Electronic), Universiti Teknologi MARA
Tel : +6(04) 977 4029
Fax : +6(04) 977 4026
e-mail : najmuddin@unimap.edu.my

Dr. Azremi bin Abdullah Al-Hadi
D.Sc (Tech.) in Radio Engineering, Aalto University, Finland.
M.Sc. (Communication Engineering), Birmingham University, UK.
B.Eng (Electrical and Electronics), Universiti Sains Malaysia.
Tel : +6(04) 976 5418
Fax : +6(04) 979 8334
e-mail : azremi@unimap.edu.my

Dr. Soh Ping Jack
Ph.D (Electrical Eng), KU Leuven, Belgium
M.Eng. (Electrical-Electronics & Telecommunications), UTM
B.Eng. (Electrical-Telecommunications), UTM
Tel. : +6(04) 979 8787
Fax : +6(04) 979 8790
e-mail : pjsoh@unimap.edu.my

Dr. Hilal Adnan Fadhil
Ph.D (Communication Engineering), UniMAP
M.Sc. in Electronic and Communications Enginering / Modern Communications Engineering, Al-Nahrain University, Iraq
B.Sc in Electronic and Communications Engineering, Al-Nahrain University, Iraq
Fax : +6(04) 988 5462
e-mail : hilaladnan@unimap.edu.my

Dr. Md. Mijanur Rahman
Ph.D (Photonics Based Quantum Communication), Multimedia University
M.Sc (IT) - Satellite Image Interpretation, Universiti Malaysia Sarawak
B.Sc in Computer Science & Engineering, Bangladesh University of Engineering & Technology
Fax : +6(04) 988 5462
e-mail : mijanur@unimap.edu.my

Dr. Mohammad Shahrazel bin Razalli
Ph.D (Communication and Networking Engineering), UPM
M.Sc. (Communications and Network Engineering), UPM
B.Eng (Hons) in Electronic Engineering, The University of Leeds, United Kingdom
Diploma in Electric Engineering (Electronics), Institut Teknologi Mara
Fax : +6(04) 988 5462
e-mail : shahrazel@unimap.edu.my

Dr. Ong Bi Lynn
Ph.D (Computer Network), UUM
M.Sc. Business Management, UUM
B.Eng (Hons) Electrical and Electronic Engineering, UMS
Fax : +6(04) 988 5462
e-mail : drlynn@unimap.edu.my

Dr. Rafikha Aliana binti A. Raof
Sarjana (M.Sc.) –Intelligent Knowledge Based System (IKBS), UUM
Sarjana Muda Kejuruteraan Elektronik (Komputer), MMU
Fax : +6(04) 988 5462
e-mail : rafikha@unimap.edu.my

Dr. Siti Zuraidah binti Ibrahim
Ijazah Kedoktoran Kejuruteraan Komunikasi, University of Queensland, Australia
Ijazah Sarjana (Kejuruteraan Komunikasi), UTM
Ijazah Sarjana Muda Kejuruteraan (Telekomunikasi), UM
Fax : +6(04) 988 5462
e-mail : sitizuraidah@unimap.edu.my

Dr. Latifah Munirah binti Kamarudin
Ph.D (Computer Engineering), UniMAP
M.Sc. Communication Network and Management, University of Portsmouth, UK
B.Eng (Hons) Computer Science and Media Engineering, University of Yamanashi, Japan
Fax : +6(04) 988 5462
e-mail : latifahmunirah@unimap.edu.my

Dr. Zahereel Ishwar bin Abdul Khalib
Ph.D (Computer Engineering), UniMAP
Sarjana Sains (Sains Komputer-Kejuruteraan Perisian Masa Nyata), UTM
B.Sc. in Computer Engineering, California State University, Sacramento, USA
Fax : +6(04) 988 5462
e-mail : zahereel@unimap.edu.my

Dr. Muhammad Imran bin Ahmad
Ph.D (Computer Vision and Pattern Recognition), Newcastle University, UK
M.Sc. (Embedded System Design Engineering), USM
B.Eng. (Electronics), UTM
Fax : +6(04) 988 5462
e-mail : m.imran@unimap.edu.my

Dr. Nik Adilah Hanin binti Zahri
Ph.D (Medical Engineering), University of Yamanashi, Japan
M. Eng (Computer Science and Media), University of Yamanashi, Japan
B. Eng (Computer Science and Media), University of Yamanashi, Japan
Fax : +6(04) 988 5462
e-mail : adilahhanin@unimap.edu.my

Dr. Norsuhaida binti Ahmad
Ph.D (Radar-Image Processing), University of Strathclyde, United Kingdom
Sarjana Kejuruteraan Elektrik (Telekomunikasi), KUiTTHO
Ijazah Sarjana Muda Kejuruteraan Elektrik (Elektronik), UTM
Fax : +6(04) 988 5462
e-mail : norsuhaida@unimap.edu.my

Dr. Muataz Hameed Salih Al-Doori
Ph.D. (Computer Engineering/FPGA Embedded Multiprocessor Design), UniMAP
M.Sc. (Computer Engineering), University of Technology, Baghdad, Iraq
B.Sc. (Computer Engineering), University of Technology, Baghdad, Iraq
Fax : +6(04) 988 5462
e-mail : muataz@unimap.edu.my

Dr. Junita binti Mohd Nordin
Ph.D (Communication Engineering), UniMAP
MSc in RF Communication System, University of Southampton, UK.
BSc in Electrical Electronic Engineering, Universiti Tenaga Nasional,
Fax : +6(04) 988 5462
e-mail : junita@unimap.edu.my

Dr. Wee Fwen Hoon
Ph.D (Communication Engineering), UniMAP
B.Eng. (Communication Engineering), UniMAP
Fax : +6(04) 988 5462
e-mail : fhwee@unimap.edu.my

Dr. Yasmin binti Mohd. Yacob
Ph.D Kecerdikan Berkomputer, USM
M.Sc. Computer Science, UPM
B.Sc. Computer Science, Univ. of Michigan, USA
Fax : +6(04) 988 5462
e-mail : yasmin.yacob@unimap.edu.my
URL : http://publicweb.unimap.edu.my/~yasmin

Dr. Said Amirul Anwar bin Ab. Hamid @ Ab. Majid
Ph.D. (Imaging), USM
M.Sc. Electronic Engineering, (Birmingham)
B.Eng. (USM)
Fax : +6(04) 988 5462
e-mail : said@unimap.edu.my

Dr. Mohd Rashidi bin Che Beson
Ph.D (Communication Engineering), Universiti Malaysia Perlis
M.Sc (Communication Engineering), Universiti Malaysia Perlis
B.Eng (Hons) (Communication Engineering), Universiti Malaysia Perlis
Diploma in Electronic Engineering (Communication), POLIMAS
Fax : +6(04) 988 5462
e-mail : rashidibeson@unimap.edu.my

Dr. Abdul Rahman Bin Kram
Ph.D. (Communication Engineering), Universiti Malaysia Perlis
M.Sc. (Communication Engineering), Universiti Malaysia Perlis
B.Eng. (Hons) (Communication Engineering), Universiti Malaysia Perlis
Fax : +6(04) 988 5462
e-mail : rahmankram@unimap.edu.my

Dr. Ku Nurul Fazira binti Ku Azir
Ph.D (Electronic, Electrical and Computer Engineering),University of Birmingham, UK
M.Sc. (Human Centered System), University of Birmingham, UK
B.Sc. (Computer Science), Coventry University, UK
Diploma Computer Science, Kolej-Poly Tech Mara Kuala Lumpur
Fax : +6(04) 988 5462
e-mail : fazira@unimap.edu.my

Dr. Naimah binti Yaakob
Ph.D. (Computer Science and Information Technology), RMIT University, Australia
M.Sc. (Computer and Information Engineering), Universiti Islam Antarabangsa
B.Eng. (Hons) (Computer and Information Engineering),Universiti Islam Antarabangsa,
Fax : +6(04) 988 5462
e-mail : naimahyaakob@unimap.edu.my

Dr. Naseer Sabri Salim
Ph.D. (Computer Engineering), University Malaysia Perlis
M.Sc. (Computer Control), University of Technology, Iraq
B.sc. (Hons) (Computer Engineering), University of Baghdad, Iraq
Fax : +6(04) 988 5462
e-mail : naseersabri@unimap.edu.my

Dr. Saidatul Norlyana Azemi
Ph.D (Electrical & Electronic Engineering), RMIT University, Australia
M.Sc (Communication Engineering), University Malaysia Perlis, Malaysia
B.Eng (Hons)(Communication Engineering), University Malaysia Perlis, Malaysia
Fax : +6(04) 988 5462
e-mail : snorlyana@unimap.edu.my

Dr. Amiza binti Amir
Ph.D. (Information Technology), Monash University, Melbourne, Australia.
M.Sc. (Information Technology) (by Research), Universiti Utara Malaysia
B.Sc (Hons) (Computer Science), Universiti Teknologi Malaysia
Fax : +6(04) 988 5462
e-mail : amizaamir@unimap.edu.my

Dr. Ali Amer Ahmed Alrawi
Ph.D. (Computer Engineering), Universiti Malaysia Perlis
M.Sc. (Electrical Engineering), University of Technology Baghdad, Iraq
B.Sc. (Electrical and Control Engineering), University of Technology Baghdad, Iraq
Fax : +6(04) 988 5462
e-mail : aliamer@unimap.edu.my

Dr. Thennarasan Sabapathy
Ph.D. (Communication Engineering), Universiti Malaysia Perlis
M.Eng.Sc. (Wireless Communication), Multimedia University, Malaysia
B.Eng. (Hons) (Electric-Telecommunication), Universiti Teknologi Malaysia
Fax : +6(04) 988 5462
e-mail : thennarasan@unimap.edu.my

Mr. Suhizaz bin Sudin
Sarjana Sains Komputer, UPM
Ijazah Sarjana Muda Teknologi Maklumat (Hons), UUM
Tel. : +6(04) 988 5442
Fax : +6(04) 988 5444
e-mail : suhizaz@unimap.edu.my

Mr. Ahmad Nasir bin Che Rosli
M.Sc. (Computer Engineering), UniMAP
B. Comp. Science (Artificial Intelligence), UM
Tel : +6(04) 979 7912
Fax : +6(04) 979 7907
e-mail : ahmadnasir@unimap.edu.my

Ms. Noor Syazana binti Arshad
M.Sc Electrical Engineering (Communication), UTHM
B.Eng (Hons.) Electrical Engineering (Electronic), UiTM
Diploma Electrical Engineering (Electronic), UiTM
Tel. : +6(04) 988 5461
Fax : +6(04) 988 5462
e-mail : syazana@unimap.edu.my

Mdm. Sahadah binti Ahmad
M.Eng. (Electric - Electronics and Telecommunication), UTM
Advanced Diploma in Electrical (Electronics) Engineering, ITM
Diploma in Electrical (Electronics) Engineering, ITM
Fax : +6(04) 988 5462
e-mail : shahadah@unimap.edu.my

Mr. Che Muhammad Nor bin Che Isa
M.Eng Telecommunications, University of South Australia
B.Eng. (Kepujian) (Kejuruteraan Perhubungan), UniMAP
Diploma in Electric Engineering (Networking), UTM
Fax : +6(04) 988 5462
e-mail : cmnor@unimap.edu.my

Mr. Mohd. Shaiful Aziz bin Rashid Ali
M.Sc in Programmable Digital Systems, University of Brighton, UK
B.Eng (Hons.) (Computer Engineering), UniMAP
Higher National Diploma (HND) in Telecommunications Engineering, British Malaysian Institute
Fax : +6(04) 988 5462
e-mail : shaifulaziz@unimap.edu.my

Mr. Mohamed Elshaikh Elobaid Said Ahmed
M.Sc in Electrical and Electronics Engineering, UTP
B.Sc (Hons) in Engineering Technology (Computer Engineering Technology), University of Gezira, Sudan
Fax : +6(04) 988 5462
e-mail : elshaikh@unimap.edu.my

Mr. Muhamad Sani bin Mustafa
Sarjana (Rekabentuk Sistem Elektronik), USM
B.Eng. (Hons.) (Computer Engineering), KUKUM
Fax : +6(04) 988 5462
e-mail : sani@unimap.edu.my

Mr. Md. Mostafijur Rahman
M.Sc (Computer Engineering), UniMAP
B.Sc (Hons) (Computer Science), National University of Bangladesh
Fax : +6(04) 988 5462
e-mail : mostafijur@unimap.edu.my

Mr. Akbah A. Khalifa
M.Sc. Mechatronic Engineering, UniMAP
B.Sc Electrical Engineering, Iraq
Fax : +6(04) 988 5462
e-mail : akbah@unimap.edu.my

Mdm. Sabarina binti Ismail
Sarjana Kejuruteraan Elektrik, UTM
Ijazah Sarjana Muda Kejuruteraan dengan kepujian (Komputer & Perhubungan), USM
Fax : +6(04) 988 5462
e-mail : sabarina@unimap.edu.my

Mdm. Nurulisma binti Hj. Ismail
M.Sc. Information Technology, UUM
Bachelor of Information Technology (Hons.), UUM
Fax : +6(04) 988 5462
e-mail : nurul@unimap.edu.my

Mdm. Salina binti Mohd Asi
Sarjana Sains (Sains Komputer – Kejuruteraan Perisian Masa Nyata), UTM
Sarjana Muda Sains Komputer (Kepintaran Buatan), UTM
Diploma in Science Computer, UTM
Fax : +6(04) 988 5462
e-mail : salina@unimap.edu.my

Mr. Zulkifli bin Husin
M.Sc. (Rekabentuk Sistem Elektronik), USM
B.Eng. in Mechatronic, UTM
Diploma in Electronic, UTM
Fax : +6(04) 988 5462
e-mail : zulhusin@unimap.edu.my

Mdm. Rohani binti S Mohamed Farook
Sarjana Sains Teknologi Maklumat (Penyelidikan:Kepintaran Buatan), UUM
Ijazah Sarjana Muda Teknologi Maklumat dengan kepujian, UUM
Fax : +6(04) 988 5462
e-mail : rohani@unimap.edu.my

Mdm. Nordiana binti Mohamad Saaid
M.Eng. (Telecommunication Engineering), Royal Melbourne Institute of Technology (RMIT) University, Australia
B.Eng. (Hons.) (Electronic & Communications Engineering), The University of Leeds, United Kingdom
International Baccalaureate (IB), MARA College Banting, Selangor
Fax : +6(04) 988 5462
e-mail : dianams@unimap.edu.my

Mdm. Rusnida binti Romli
Sarjana Sains Teknologi Maklumat (Penyelidikan:Realiti Maya), UUM
Ijazah Sarjana Muda Teknologi Maklumat (Sains Komputan), UNIMAS
Fax : +6(04) 988 5462
e-mail : rusnida@unimap.edu.my

Mdm Siti Julia binti Rosli
M.Sc (Computer Engineering), UniMAP (2014)
B.Eng (hons.) (Computer Engineering), UniMAP (2009)
Diploma in Information Technology (IT), ITTAR (2005)
Fax : +6(04) 988 5462
e-mail : sitijulia@unimap.edu.my

Mr. Ir. Rosdisham bin Endut
M.Sc. (Communications and Network Engineering), Universiti Putra Malaysia
B. Eng. (Telecommunications Engineering), Universiti Malaya
Fax : +6(04) 988 5462
e-mail : rosdisham@unimap.edu.my

STUDY LEAVE

Mr. Mohd. Alif Hasmani bin Abd. Ghani
Sarjana Sains (Sains Komputer), USM
Sarjana Muda Sains Komputer (Hons), USM
e-mail : alifhasmani@unimap.edu.my

Mdm. ‘Aini Syuhada binti Md Zain
M.Eng. (Communication and Computer), UKM
B.Eng. (Computer and Information) (Hons.), UIAM
e-mail : ainisyuhada@unimap.edu.my

Mr. Mohamad Suhaizal bin Abu Hassan
Sarjana Sains (Kejuruteraan Rekabentuk Sistem Elektronik), USM
B. Eng. (Electric – Electronics), UTM
e-mail : suhaizal@unimap.edu.my

Mdm. Aznor Hanah binti Abdul Halim
M.Sc. (Electric & Electronics Engineering), USM
B. Eng. (Hons.) (Electric & Electronics Engineering), USM
e-mail : aznor@unimap.edu.my

Mdm. Wan Nur Suryani Firuz binti Wan Ariffin
M. Eng. (Computer and Communications), UKM
B.Eng. (Computer Systems and Communication), UPM
e-mail : suryanifiruz@unimap.edu.my

Mdm. Hasliza binti A. Rahim @ Samsuddin
M.Sc. (Kejuruteraan Rekabentuk Sistem Elektronik), USM
B.Sc. in Electrical Engineering (Modern Communication System), University of Southern California, USA
e-mail : haslizarahim@unimap.edu.my

Miss Nur Farhan binti Kahar
M.Sc. (Computer Engineering), UniMAP
B.Eng. (Hons.) (Electronic Engineering), USM
e-mail : nurfarhan@unimap.edu.my

Mr. Fazrul Faiz bin Zakaria
M.Research in Microelectronic Architecture, Network and Communication System, TELECOM Bretagne (France)
M.Sc. Telecommunications and Electronic Engineering, TELECOM Bretagne (France)
B.Eng. (Hons.) Communication Engineering, UniMAP
Diploma in Electronic Engineering (Communication), UTM
e-mail : ffaiz@unimap.edu.my

Mr. Zahari bin Awang Ahmad
M.Eng. (Electrical - Computer and Microelectronic System), UTM
B.Sc. in Electrical Engineering, University of Kentucky, Lexington KY, USA
e-mail : zahari@unimap.edu.my

Miss Hasnah binti Ahmad
M. Eng. (Hons.) (Electronic Engineering), Royal Melbourne Institute of Technology (RMIT) University, Australia
B. Eng. (Hons.) (Electrical and Electronic Engineering), USM
e-mail : hasnahahmad@unimap.edu.my

Mdm. Ismahayati binti Adam
M.Eng. (Electric - Electronics and Telecommunication), UTM
B.Eng. (Electric - Telecommunication), UTM
e-mail : ismahayati@unimap.edu.my

Mdm. Norizan binti Mohamed Nawawi
M.Eng. (Electric - Electronics and Telecommunication), UTM
B.Eng. (Electric - Telecommunication), UTM
e-mail : norizan@unimap.edu.my

Mdm. Nur Baya binti Mohd. Hashim
M.Sc. (Electronic Systems Design Engineering), USM
B.Eng. (Hons.) (Computer and Communication Engineering), UKM
e-mail : baya@unimap.edu.my

Miss Hasneeza Liza binti Zakaria
M.Sc. (Sains Komputer – Kejuruteraan Perisian Masa Nyata), UTM
Ijazah Sarjana Muda Teknologi Maklumat, UUM
e-mail : hasneeza@unimap.edu.my

Mr. Muhamad Asmi bin Romli
Ijazah Sarjana Sains (Kejuruteraan Elektrik & Elektronik), USM
Ijazah Sarjana Muda Kejuruteraan (Kepujian) (Kejuruteraan Elektrik dan Elektronik), USM
Fax : +6(04) 988 5462
e-mail : asmi@unimap.edu.my

Mr. Mohd. Zaizu bin Ilyas
Sarjana Sains (Kejuruteraan Elektrik, Elektronik dan Sistem), UKM
B.Eng. (Electronic and Information Engineering), Tokyo University of Agriculture and Technology, Japan
Assc. Eng. (Electrical Engineering), Tsuyama National College of Technology, Japan
Fax : +6(04) 988 5462
e-mail : zaizu@unimap.edu.my

TEACHING ENGINEERS

Mr. Mohammad Nazri bin Md. Noor
B.Eng. Elektrik (Perhubungan) (Kepujian), UTM
Fax : +6(04) 988 5462
e-mail : nazri@unimap.edu.my

Mr. Mohd. Fisol bin Osman
Ijazah B.Eng. Elektrik dan Elektronik, Liverpool
Fax : +6(04) 988 5462
e-mail : mohd.fisol@unimap.edu.my

Mdm. Shariffah Zarihan binti Syed Zaharim Helmi
B.Eng. (Hons.) Electronics Majoring in Microwave and Communications, Multimedia University (MMU)
Fax : +6(04) 988 5462
e-mail : zarihan@unimap.edu.my

Mr. Mat Nor Mohamad bin Ismail
Ijazah B.Eng. Elektrik (Komputer) (Kepujian), KUiTTHO
Fax : +6(04) 988 5462
e-mail : matnor@unimap.edu.my

Mdm. Nazatul Syima binti Saad
B.Eng. (Hons.) (Electric) (Telekomunikasi), KUiTTHO
Sijil Kejuruteraan Elektrik (Kuasa), Politeknik Sultan Abdul Halim Mu'adzam Shah (POLIMAS), Kedah
Fax : +6(04) 988 5462
e-mail : nazatul@unimap.edu.my

Mr. Mohd. Ridzuan bin Mohd. Nor
B.Eng. (Hons.) (Computer Engineering), KUKUM
Fax : +6(04) 988 5462
e-mail : mohdridzuan@unimap.edu.my

Mdm. Fazlina binti Farid
B.Eng. (Hons.), (Communication) UIAM
Fax : +6(04) 988 5462
e-mail : fazlinafarid@unimap.edu.my

Mdm. Noor Fazreen binti Bakar
Ijazah Sarjana Muda (Kepujian) Kejuruteraan Elektrik (Elektronik), UiTM
Diploma Kejuruteraan Elektrik (Elektronik), UiTM
Fax : +6(04) 988 5462
e-mail : fazreen@unimap.edu.my

ASSISTANT ENGINEER

Mr. Noorzaki bin Zainal
BTEC Higher National Diploma (HND) Electrical/Electronic Engineering, The British Malaysian Institute, Kuala Lumpur
Sijil Kemahiran Kajisawat Instrumen Elektronik, IKM Sungai Petani
Fax : +6(04) 988 5462
e-mail : norzaki@unimap.edu.my

Mr. Megat Norizan bin Megat Shafiee
Diploma Kejuruteraan Elektrik, POLIMAS
Sijil Kejuruteraan Elektronik (Kawalan), Politeknik Shah Alam
Fax : +6(04) 988 5462
e-mail : megat@unimap.edu.my

Mdm. Siti Zauyah binti Othman
Diploma Kejuruteraan Elektronik (Komputer), Politeknik Seberang Perai (PSP)
Sijil Kejuteraan Elektronik (Komputer), Politeknik Sultan Abdul Halim Mu'adzam Shah (POLIMAS), Kedah
Fax : +6(04) 988 5462
e-mail : sitizauyah@unimap.edu.my

Mr. Basri bin Hamid
Diploma Kejuruteraan Elektrik (Elektronik Kuasa dan Kawalan), Politeknik Sultan Abdul Halim Mu'adzam Shah (POLIMAS), Kedah
Sijil Kejuruteraan Elektronik (Kawalan), Politeknik Ungku Omar (PUO), Ipoh
Fax : +6(04) 988 5462
e-mail : basri@unimap.edu.my

Mr. Mohamad Haris bin Uzir
Diploma Kejuruteraan Elektrik (Elektronik Kuasa dan Kawalan), Politeknik Sultan Abdul Halim Mu'adzam Shah (POLIMAS), Kedah
Sijil Kejuruteraan Elektrik (Kuasa), POLIMAS, Jitra
Fax : +6(04) 988 5462
e-mail : haris@unimap.edu.my

Mdm. Suraya binti Harun
Diploma Kejuruteraan Elektronik (Perhubungan), POLIMAS
Sijil Kejuruteraan Elektronik (Perhubungan), Politeknik Shah Alam
Fax : +6(04) 988 5462
e-mail : suraya_harun@unimap.edu.my

Mr. Che Mohamad bin Che Hashim
Sijil Kejuruteraan Elektronik (Perhubungan), POLIMAS
Fax : +6(04) 988 5462
e-mail : mohamad@unimap.edu.my

Mr. Mohammad Dzahir bin Zainun
Sijil Kejuruteraan Elektronik (Komputer), POLIMAS
Fax : +6(04) 988 5462
e-mail : dzahir@unimap.edu.my

Mr. Mohd. Aniff bin Mohammad
Certificate in Electric and Electronic, POLIMAS
Fax : +6(04) 988 5462
e-mail : aniff@unimap.edu.my

Mr. Azizul Hafifi bin Abd. Rahman
Certificate in Domestic Electrical, Kolej Komuniti Arau
Fax : +6(04) 988 5462
e-mail : hafifi@unimap.edu.my

Mr. Shahril bin Rosidi
Diploma Kejuruteraan Elektrik, Politeknik Sultan Abdul Halim Mu'adzam Shah (POLIMAS), Kedah
Sijil Kejuruteraan Elektronik (Perhubungan), POLIMAS
Fax : +6(04) 988 5462
e-mail : shahrilrosidi@unimap.edu.my

TECHNICIANS

Mr. Izdiharuddin bin Ismail
Sijil Teknologi Maklumat, POLIMAS
Fax : +6(04) 988 5462
e-mail : izdiharuddin@unimap.edu.my

Mdm. Assyafinar binti Asri
Sijil Sistem Komputer Dan Sokongan, Kolej Komuniti Arau
Fax : +6(04) 988 5462
e-mail : assyafinar@unimap.edu.my

Miss Nor Hasmah binti Halip
Sijil Sistem Komputer Dan Sokongan, Kolej Komuniti Arau
Fax : +6(04) 988 5462
e-mail : norhasmah@unimap.edu.my

Mdm. Suzanna binti Salwi
Sijil Sistem Komputer Dan Sokongan, Kolej Komuniti Arau
Fax : +6(04) 988 5462
e-mail : suzanna@unimap.edu.my

En. Hasfizul bin Mohd. Yusoff
Sijil Sistem Komputer, Kolej Komuniti Arau
Fax : +6(04) 988 5462
e-mail : hasfizul@unimap.edu.my

ADMINISTRATIVE STAFFS

Ms. Norzaililah binti Zainoddin
Senior Assistant Registrar
M.Sc. Management, UUM
B.Int. Affairs Management, UUM
Tel. : +6(04) 988 5463
Fax : +6(04) 988 5462
e-mail : zaililah@unimap.edu.my

Mdm. Zuraida binti Mansor
Office Secretary
Diploma Pengurusan dan Teknologi Pejabat, UiTM Cawangan Perak, Seri Iskandar
Tel. : +6(04) 988 5461
Fax : +6(04) 988 5462
e-mail : zuraida@unimap.edu.my

Mdm. Noorlizawati binti Abdullah
Administrative Assistant (Clerical/Operational)
Fax : +6(04) 988 5462
e-mail : lizawati@unimap.edu.my

Mdm. Nur Hazwanie binti Mokhtar
Administrative Assistant
(Clerical/Operational)
Fax : +6(04) 988 5462
e-mail : hazwanie@unimap.edu.my

Mdm. Noor Haryaney binti Roslan
Administrative Assistant
(Clerical/Operational)
Fax : +6(04) 988 5462
e-mail : haryaney@unimap.edu.my

Mr. Roshaizan bin Darus
General Office Assistant
Fax : +6(04) 988 5462
e-mail : roshaizandarus@unimap.edu.my

BACHELOR OF ENGINEERING (HONOURS) (COMPUTER ENGINEERING)

PROGRAMME OBJECTIVES (PEO)

PEO1
Graduates who are leaders in the field of Computer engineering or chosen field as demonstrated via career advancement.

PEO2
Graduates who are members of and contribute to professional society.

PEO3
Graduates who engaged in life-long learning or continuous education opportunities.

PEO4
Graduates who contribute towards research and development.

PEO5
Graduates who are entrepreneurial engineers.

PROGRAMME OUTCOMES (PO)

PO 01
Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in computer engineering discipline to solve the complex engineering problem

PO 02
Ability to identify, formulate and solve complex engineering problems.

PO 03
Ability to design solutions for complex engineering problems and systems, components or processes to meet desired needs.

PO 04
Ability to conduct investigation into complex problems as well as to analyze and interpret data.

PO 05
Ability to use techniques, skills and modern engineering tools necessary for complex engineering practices so as to be easily adaptable to industrial needs.

PO 06
Understanding of the social, cultural, global and environmental responsibilities of a professional engineer.

PO 07
Ability to have entrepreneurship, the process of innovation and the need for environmental and sustainable development.

PO 08
Ability to understand the professional and ethical responsibilities and commitment to the community.

PO 09
Ability to function on multi-disciplinary teams.

PO 10
Ability to communicate effectively on complex engineering activities with the engineering community and with society at large.

PO 11
A recognition of the need for, and an ability to engage in life-long learning.

PO 12
Demonstrate the understanding of project management and finance principles.

CURRICULUM STRUCTURE FOR BACHELOR OF ENGINEERING (HONOURS) (COMPUTER ENGINEERING)

YEAR	FIRST		SECOND		THIRD			FOURTH	
SEMESTER	I	II	III	IV	V	VI		VII	VIII
Engineering Core (97)	EKT101/4 Electric Circuit Theory	EKT119/3 Electric Circuit II		EKT242/3 Electromagnetic Theory	EKT358/3 Communication Systems		EIT 302/4 Industrial Training	EKT445/2 Final Year Project I	EKT446/4 Final Year Project II
	EKT102/3 Basic Electronic Engineering	EKT104/4 Analog Electronic Circuits I	EKT214/4 Analog Electronic Circuits II	EKT232/3 Signals and Systems	EKT 353/3 Principles of Digital Signal Processing	EKT318/3 Modern Control Systems		EKT424/4 Real-Time Systems	EKT421/3 Software Engineering
		EKT124/3 Digital Electronics I	EKT221/4 Digital Electronics II	EKT222/4 Microprocessor Systems	EKT322/4 Embedded Systems Design	EKT303/4 Principles of Computer Architecture		Program Elective I /3	Open Elective/3
		EKT 103/3 Electrical Engineering		EKT212/4 Measurement and Instrumentation		EKT453/3 Group Design Project		Program Elective II/ 3	
	EKT120/4 Computer Programming		EKT224/3 Algorithm and Data Structures		EKT336/3 Computer Networks	EKT333/3 Modern Operating Systems			
Non Engineering (19)	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II				EUT442/2 Professional Engineers		EUT444/3 Management for Engineers	
	UUT122/2 Skills and Technology in Communication		EQT221/3 Discrete Mathematics and Linear Algebra	EQT272/3 Probability and Statistic					
University Required (17)	UZWXXX/1 Co-curriculum		UVW312/2 English for Technical Communication		UUW224/2 Engineering Entrepreneurship	UUW233/2 Islam & Asia Civilisation (TITAS)		UUW235/2 Ethnic Relation	UVWXXX/2 Option Subjects
		UZWXXX/1 Co-curriculum	UZWXXX/1 Co-curriculum		UUW322/2 Thinking Skills				UVW410/2 University Malay Language
137	17	17	17	17	17	17	4	17	14
Total Units for Graduation 133 + 4 (Industrial Training) = 137									

Open Elective: Any subjects offered by the school or other schools.
Elective I & II : EKT466 Artificial Intelligence, EKT 425 Parallel Computing, EKT 426 Database Management System, EKT 345 Microwave Engineering, EKT 460 Image Processing, EKT450 Mobile Communication Systems, EKT465 Optical Communication Systems, EKT 435 Network Security, EKT454 Wireless Network & Communication

BACHELOR OF ENGINEERING (HONOURS) COMMUNICATION ENGINEERING

PROGRAMME OBJECTIVES (PEO)

PEO1
Graduates who are leaders in the field of Communication engineering or chosen field as demonstrated via career advancement.

PEO2
Graduates who are members of and contribute to professional society.

PEO3
Graduates who engaged in life-long learning or continuous education opportunities.

PEO4
Graduates who contribute towards research and development.

PEO5
Graduates who are entrepreneurial engineers.

PROGRAMME OUTCOMES (PO)

PO 01
Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in communication engineering discipline to solve the complex engineering problem

PO 02
Ability to identify, formulate and solve complex engineering problems.

PO 03
Ability to design solutions for complex engineering problems and systems, components or processes to meet desired needs.

PO 04
Ability to conduct investigation into complex problems as well as to analyze and interpret data.

PO 05
Ability to use techniques, skills and modern engineering tools necessary for complex engineering practices so as to be easily adaptable to industrial needs.

PO 06
Understanding of the social, cultural, global and environmental responsibilities of a professional engineer.

PO 07
Ability to have entrepreneurship, the process of innovation and the need for environmental and sustainable development.

PO 08
Ability to understand the professional and ethical responsibilities and commitment to the community.

PO 09
Ability to function on multi-disciplinary teams.

PO 10
Ability to communicate effectively on complex engineering activities with the engineering community and with society at large

PO 11
A Recognition of the need for, and an ability to engage in life-long learning

PO 12
Demonstrate the understanding of project management and finance principles

CURRICULUM STRUCTURE FOR BACHELOR OF ENGINEERING (HONOURS) (COMMUNICATION ENGINEERING)

YEAR	FIRST		SECOND		THIRD			FOURTH	
SEMESTER	I	II	III	IV	V	VI		VII	VIII
Engineering Core (97)	EKT101/4 Electric Circuit Theory	EKT119/3 Electric Circuit II		EKT242/3 Electromagnetic Theory	EKT314/4 Electronic Instrumentation	EKT357/3 Digital Communication Engineering	EIT 302/4 Industrial Training	EKT445/2 Final Year Project I	EKT446/4 Final Year Project II
	EKT120/4 Computer Programming	EKT104/4 Analog Electronic Circuits I	EKT214/4 Analog Electronic Circuits II	EKT232/3 Signals and Systems	EKT343/4 Principle of Communication Engineering	EKT318/3 Modern Control Systems		EKT440/4 Telecommunication Switching & Network	EKT450/3 Mobile Communication Systems
	EKT102/3 Basic Electronic Engineering	EKT124/3 Digital Electronics I	EKT221/4 Digital Electronics II	EKT222/4 Microprocessor Systems	EKT341/4 Antenna and Propagation	EKT 356/4 Microwave Communication		Program Elective I /3	Program Elective II /3
		EKT 103/3 Electrical Engineering		EKT212/4 Measurement and Instrumentation	EKT353/3 Principle of Digital Signal Processing	EKT303/4 Principle of Computer Architecture		EKT453/3 Group Design Project	
Non Engineering (19)	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II						EUT444/3 Management for Engineers	EUT442/2 Professional Engineers
	UUT122/2 Skills and Technology in Communication		EQT221/3 Discrete Mathematics and Linear Algebra	EQT272/3 Probability and Statistic					
University Required (17)	UZWXXX/1 Co-curriculum	UZWXXX/1 Co-curriculum	UZWXXX/1 Co-curriculum		UVW312/2 English for Technical Communication	UUW224/2 Engineering Entrepreneurship		UUW235/2 Ethnic Relation	UUW322/2 Thinking Skills
			UVWXXX/2 Option Subjects			UVW410/2 University Malay Language			
			UUW233/2 Islam & Asia Civilisation (TITAS)						
133	17	17	16	17	17	18	4	17	14
Total Units for Graduation 133 + 4 (Industrial Training)= 137									

Elective I & II: EKT 467 Radar Engineering, EKT469 Advanced Digital Communication, EKT447 Communication Hardware Design, EKT448 Radio And Television Engineering, EKT449 Advanced Digital Signal Processing, EKT 460 Image Processing, EKT 461 Audio & Video Signal Processing, EKT462 Digital And Data Communication Systems, EKT 463 Satellite Communication, EKT 464 Communication Links, EKT465 Optical Communication Systems, EKT466 Artificial Intelligence, EKT468 Waveform Coding

BACHELOR OF ENGINEERING (HONOURS) (COMPUTER NETWORK ENGINEERING)

PROGRAMME OBJECTIVES (PEO)

PEO 01
Graduates are leaders in the field of Computer Network engineering or chosen field as demonstrated through career advancement.

PEO 2
Graduates who are members and contribute to professional society.

PEO 3
Graduates who engaged in life-long learning or continuous education opportunities.

PEO 4
Graduates make contribute towards research and development.

PEO 5
Graduates who are entrepreneurial engineer.

PROGRAMME OUTCOMES (PO)

PO 01
Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in Computer Network engineering discipline to solve the complex engineering problem.

PO 02
Ability to identify, formulate and solve engineering problems.

PO 03
Ability to design a system, solutions for complex engineering problems and systems, components or processes to meet desired needs.

PO 04
Ability to conduct investigation into complex problems as well as to analyze and interpret data.

PO 05
Ability to use techniques, skills and modern engineering tools necessary for engineering practices so as to be easily adaptable to industrial needs.

PO 06
Understanding of the social, cultural, global and environmental responsibilities of a professional engineer.

PO 07
Ability to have entrepreneurship, the process of innovation and the need for environmental and sustainable development.

PO 08
Ability to understand professional and ethical responsibilities and commitment to the society.

PO 09
Ability to function on multi-disciplinary teams.

PO 10
Ability to communicate effectively on complex engineering activities with the engineering community and with society at large.

PO 11
A recognition of the need for, and an ability to engage in life-long learning.

PO 12
Demonstrate understanding of project management and finance principles

CURRICULUM STRUCTURE FOR BACHELOR OF ENGINEERING (HONOURS) (COMPUTER NETWORK ENGINEERING)

YEAR	FIRST		SECOND		THIRD			FOURTH	
SEMESTER	I	II	III	IV	V	VI		VII	VIII
Engineering Core (97)	EKT101/4 Electric Circuit Theory	EKT 119/3 Electric Circuit II		EKT242/3 Electromagnetic Theory	EKT358/3 Communication Systems		EIT 302/4 Industrial Training	EKT445/2 Final Year Project I	EKT446/4 Final Year Project II
	EKT102/3 Basic Electronic Engineering	EKT104/4 Analog Electronic Circuits I	EKT214/4 Analog Electronics Circuits II	EKT232/3 Signals and Systems	EKT353/3 Principles of Digital Signal Processing	EKT318/3 Modern Control Systems			
		EKT124/3 Digital Electronics I	EKT221/4 Digital Electronics II	EKT222/4 Microprocessor Systems	EKT303/4 Principles of Computer Architecture	EKT333/3 Modern Operating Systems		Program Elective I /3	Open Elective /3
		EKT 103/3 Electrical Engineering		EKT212/4 Measurement and Instrumentation		EKT 453/3 Group Design Project		Program Elective II /3	
	EKT120/4 Computer Programming		EKT224/3 Algorithm and Data Structures		EKT335/3 Principles of Computer Network	EKT355/4 Advanced Computer Network		EKT433/4 Network Modeling	EKT434/3 Network Programming
Non Engineering (19)	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT221/3 Discrete Mathematics and Linear Algebra	EQT272/3 Probability and Statistic					
	UUT122/2 Skills and Technology in Communication					EUT442/2 Professional Engineers		EUT444/3 Management for Engineers	
University Required (15)	UZWXXX/1 Co-curriculum		UVW312/2 English for Technical Communication		UUW224/2 Engineering Entrepreneurship	UUW233/2 Islam & Asia Civilisation (TITAS)		UUW235/2 Ethnic Relation	UVWXXX/2 Option Subjects
		UZWXXX/1 Co-curriculum	UZWXXX/1 Co-curriculum		UUW322/2 Thinking Skills				UVW410/2 University Malay Language
137	17	17	17	17	17	17	4	17	14
Total Units for Graduation 133 + 4 (Industrial training)= 137									

Open Elective: Any 4th Year subjects offered by the school or other schools.
Elective I & II: EKT 421 Software Engineering, EKT454 Wireless Network & Communication, EKT470 Optical Networks, EKT471 Advanced Transport Networks, EKT 460 Image Processing, EKT428 Mobile Computing, EKT465/3 Optical Communication Systems, EKT 450 Network Security

COURSE SYLLABUS

EKT 101/4
ELECTRIC CIRCUIT THEORY

Course Synopsis

Basically this introductory circuit course can be divided into two parts. Part I, consisting of chapter 1 through 4, is devoted to DC circuits. It covers fundamental laws and theorems, circuit analytical techniques, passive and active elements. Part 2, consisting of chapter 5 through 8, deals with AC circuits. It introduces phasors, sinusoidal steady state analysis, using previous analytical techniques under sinusoidal steady state excitation, RLC circuits, AC power calculations and power factor correction, rms values and three-phase balanced systems.

References

1. Alexander, C.K., Sadiku, M.N.O., Fundamentals of Electric Circuits, 4th Editions, McGraw-Hill, 2008
2. Nilsson, J.W., Riedel, S.A., Electric Circuits, 9th Edition, Prentice Hall, 2010
3. Irwin, J.D., Nelms, R.M., Basic Engineering Circuit Analysis, 9th edition, John Wiley, 2008
4. Robbins, A.H, Miller, W.C., Circuit Analysis : Theory and Practice, 4th edition, Thomson/Delmar Learning, 2006
5. Hyat, W.H., Durbin, S.M., Kimmerly, J.E., Engineering Circuit Analysis, 7th Edition, McGraw Hill, 2007

EKT 102/3
BASIC ELECTRONIC ENGINEERING

Course Synopsis

This course will expose the students to the basic electronic devices. The topic covered including introduction to semiconductor: Atomic Structures, Semiconductors, Conductors, and Insulators, Covalent Bonds, Conduction in Semiconductor, N -Type and P-Type Semiconductor, the Diode, Biasing the Diode, Voltage-Current characteristic of a Diode, Diode Models, Testing a Diode.

Students will also expose to the diode application. The topic covered including Half-Wave Rectifiers, Full-Wave Rectifiers, Power Supply Filters and Regulations, Diode Limiting and Clamping Circuits, Voltage Multipliers, The Diode Data Sheet, Troubleshooting, Special Purpose Diodes: Zener Diodes, Zener Diode Applications, Varactor Diodes, Optical Diodes, Other Types of Diodes and Troubleshooting.

Bipolar Junction Transistors (BJT's) and various types of FET are also covered in this course. The topics including Transistor Structure, Basic Transistor Operation, Transistor Characteristic and parameters. The Transistor as an Amplifier, The Transistor as a Switch, Transistor Packages and Terminal Identification, Troubleshooting, Transistor Bias Circuits: The DC Operating Points, Voltage Divider Bias, Other Bias Methods. Field-Effect Transistor (FETs), The JFET, JFET Characteristic & parameters, JFET Biasing, The MOSFET, MOSFET Characteristic and Parameters, MOSFET Biasing, Troubleshooting.

References

1. Floyd, T., "Electronic Devices", 8th Edition, Prentice Hall, 2007
2. Boylestad, R.L., "Electronic Devices and Circuit Theory", 10th Edition, Prentice Hall, 2008.
3. Grob Bernard, Schultz Mitchel E., Basic Electronics, Student Edition with Multisim, 5th Edition, McGraw-Hill 2002.
4. U.S. Bureau of Naval Personnel, Basic Electronics, Dover Publications 1973.
5. McWhorter G., Evans A.J., Basic Electronics, Master Publishing 2004.

EKT 103/3
ELECTRICAL ENGINEERING

Course Synopsis

This subject will expose the students to the basic electrical machines, electronic instrumentation and measurement and power quality. For the electrical machines and machine control, the topics covered include the Power Transformers, DC machines and AC machines. General concepts and basic principle of operation for each electrical machine are covered includes the characteristics and performance analysis. For the instrumentation part, the topics covered include general DC and AC meters, DC and AC bridges and sensors and transducers. Constructions and principles of operation for each part are covered in this part. In addition to that students are exposed to the principle of power quality.

References

1. Chapman S.J.,"Electric Machinery Fundamentals", Fourth Edition, 2005, McGraw Hill, Singapore.

2. Z.A. Yamayee & J.L. Bala, " Electromechanical Energy Devices & Power Systems", 1993, Wiley & Sons, USA.
3. Larry D. Jomes & A.F. Chin, "Electronics Instruments and Measurement", 1991, Prentice Hall, USA.
4. Edward Hughes, John Hiley, Keith Brown, Ian McKenzie-Smith, "Electrical and Electronic Technology",10th Edition, Jun 2008.
5. Austin Hughes, "Electric Motors and Drives: Fundamentals, Types and Applications", Third edition 2006.

EKT 104/4
Analog Electric Circuits 1

Course Synopsis

This course exposes the student the basic knowledge in analog electronic. The exposure encompases amplifier design based on bipolar and field effect transistors, for single and multi stage, power amplifier, frequency response analysis of amplifiers and also exposure to a few specialized device such as Shockley diodes, SCS, Diac, Triac, SCR, Optotransistor, LASCR and Optocouplers. Emphasis is placed on basic design aspects and applications. The course has been designed to provide basic analog electronic skilss covering theories and practicals.

References

1. Donald A. Neamen, 'Electronic Circuit Analysis and Design, 4th Ed., McGraw-Hill, 2010.
2. Boylestad, R.L., Nashelsky, L., 'Electronic Devices and Circuit Theory', 10th Ed., Prentice Hall, 2009.
3. Floyd, T., 'Electronic Devices', 8th Ed., Pearson Education, Inc, 2008.
4. Bogart, T.F., 'Electronic Devices and Circuits', 6th Ed., Prentice Hall, 2004.
5. Adel S. Sedra, Kenneth C. Smith, 'Microelectronic Circuits', 6th Ed., Oxford University Press, 2009.

EKT 119/3
Electric Circuit II

Course Synopsis

This is a core subject. Students will expose to the circuit analysis using Laplace Transform, Fourier Series and Fourier Transform techniques. Students also should be able to explain the concept of frequency responce of AC circuit and two port network.

References

1. Sadiku, M. N. O, Alexander, C. K., Fundamentals of Electric Circuits, Singapore, 4th ed., McGraw-Hill, 2009.
2. Nilsson, J. W. and Riedel, S.A., Electric Circuits, 9th ed, Prentice Hall, 2011.
3. Boylestad, R.L, Introductory Circuit Analysis, 12th ed., Prentice Hall, 2010.
4. Dorf, R.C., Svodoba, J.A., Introduction to Electric Circuits, 8th ed., John Wiley, 2010.
5. Robins, A.H., Miller, W.C., Circuit Analysis: Theory and Practise, 2nd ed., Delmar Learning, 2006.

EKT 120/4
COMPUTER PROGRAMMING

Course Synopsis
One of the aspects of a good engineer is to have the capability of integrating the hardware and the software, thus an electronic engineer should be competence in programming. This course introduces basic programming using high level language (C language). The main objective of this course is to prepare the students with the ability of problem solving with programming, to be able to do analysis with the programming tools such as organization chart, IPO chart, flowchart and pseudo code and then to implement them by developing C program.

References

1. Deitel and Deitel, Sudin, S., Ahmad, R.B. and Yacob, Y., "C How To Program", Pearson-Prentice Hall, 2006.
2. Cheng, H., "C for Engineers and Scientists", McGraw Hill, 2010.
3. Hanly, J.R. and Koffman, E.B., "C Program Design for Engineers", 2nd Ed., Addison-Wesley, 2001.
4. Tan, H.H. and D'Orazio, T.B., "C Programming for Engineering & Computer Science", McGraw Hill, 1999.
5. Sprankle and Maureen, "Problem Solving and Programming Concepts" 7th Ed., Prentice Hall, 2006.

EKT 124/3
DIGITAL ELECTRONICS I

Course Synopsis

Introduction and discussion of the fundamental of digital circuit design and analysis. The lecture and laboratory exercise covers the following topics: Boolean Algebra, Numbering System, Basic Logic Gates, Combinational Circuit Design, Timing Diagram, Bi-Stable Memory Device and Sequential Circuit Design.

References

1. Rafikha Aliana A Raof, Norina Idris, Phaklen Eh Kan, Mohammad Nazri Md. Noor. (2006). Digital Electronics Design. 1st Edition. Malaysia: Prentice Hall.

2. Floyd. TL. (2006). Digital Fundamentals. 9th Edition. New Jersey: Prentice Hall.
3. Ronald J. Tocci. (2003). Digital Systems – Principles and Applications. 7th Ed. New Jersey: Prentice Hall.
4. M. Morris Mano. (2005). Digital Design. 3rd Edition. Prentice Hall.
5. Fundamentals of Digital Logic and Microcomputer Design. Fifth Edition. John Wiley & sons, Inc.

EKT 204/4
ANALOG ELECTRIC CIRCUITS

Course Synopsis

This course exposes the student the basic knowledge in analog electronic. The exposure encompases amplifier design based on bipolar and field effect transistors, for single and multi stage, power amplifier, frequency response analysis of amplifiers and also exposure to a few specialized device such as Shockley diodes, SCS, Diac, Triac, SCR, Optotransistor, LASCR and Optocouplers. Emphasis is placed on basic design aspects and applications. The course has been designed to provide basic analog electronic skilss covering theories and practicals.

References

1. Donald A. Neamen, ’Electronic Circuit Analysis and Design, 4th Ed., McGraw-Hill, 2010.
2. Boylestad, R.L., Nashelsky, L., ‘Electronic Devices and Circuit Theory’, 10th Ed., Prentice Hall, 2009.
3. Floyd, T., ‘Electronic Devices’, 8th Ed., Pearson Education, Inc, 2008.
4. Bogart, T.F., ‘Electronic Devices and Circuits’, 6th Ed., Prentice Hall, 2004.
5. Adel S. Sedra, Kenneth C. Smith, ‘Microelectronic Circuits’, 6th Ed., Oxford University Press, 2009.

EKT 212/4
MEASUREMENT AND INSTRUMENTATION

Course Synopsis

This course covers Theory and Constructional details of Analog instruments. In this course, sources of errors in Energy Meter and their compensation are included together with different types of Power Factor Meters. This course also discusses the use of Cathode ray Oscilloscope and the importance of their components.

References

1. A.K. Ghosh. Introduction to Measurement and Instrumentation 2nd Ed., Prentice Hall of India, 2007.
2. A.J. Diefenderfer. Principles of Electronic Instrumentation 3rd Ed., Thomson, 1994.
3. H.S. Kalsi. Electronic Instrumentation, Tata McGraw-Hill Publishing Company Limited, 2005.
4. C.S. Rangan, G.R. Sarma and V.S. Mani. Instrumentation Devices & Systems, Tata McGraw-Hill Publishing Company Limited, 2004.
5. A.K. Sawhney and P. Sawhney. A Course in Electronic and Electrical Measurement and Instrumentation, Dhanpai Rai & Co. (P) Ltd., 2001

EKT 214/4
ANALOG ELECTRONIC CIRCUITS II

Course Synopsis

This course offers the students an exposure to the operational amplifier: Operation, differential amplifier, common-mode, parameters, basic op-amp, practical op-amp circuits, op-amp datasheet, applications of op-amp and frequency response and compensation; feedback circuits: Concepts and feedback, types of feedback connection, practical feedback circuit, feedback amplifier; Oscillator : basic operating principles of an oscillator, phase shift, Wien bridge, crystal oscillator, uni-juction; action filters : basic filter, filter response characteristics, low-pass filter, high-pass filter, band-pass filter, band-stop filter, frequency response measurement, design of filter, Butterworth, chebchev and Elliptic; Voltage regulators : Basic series and basic shunt regulators, basic switching regulator, IC regulators and applications

References

1. Floyd, T., ‘Electronic Devices’, 8th Ed., Pearson Education, Inc, 2008.
2. Boylestad, R.L., Nashelsky, L., ‘Electronic Devices and Circuit Theory’, 10th Ed., Prentice Hall, 2009.
3. Malvino, A. (1999). Electronic Principles. 6th ed. Mc Graw Hill.
4. Bogart, T.F., ‘Electronic Devices and Circuits’, 6th Ed., Prentice Hall, 2004.
5. Kasap S.O. ‘Principles of Electronics Materials and Devicies’, McGraw-Hill Science/Engineering/Math; 3rd Ed., 2005.

EKT221/4
DIGITAL ELECTRONICS II

Course Synopsis

This course exposes the students to the Combinational Logic System Design, Sequential System, Memory and Programmable Logic Devices, Register Transfer and Datapath, Sequencing and Control as well as Computer Organisation.

References

1. Rafikha Aliana A Raof, Norina Idris, Phaklen Eh Kan, Mohammad Nazri Md. Noor. (2006). Digital Electronics Design. 1st Edition. Malaysia: Prentice Hall.
2. Mano, M. Morris and Kime, Charles R. (2004). Logic and Computer Design Fundamentals. 3rd Edition. New Jersey: Prentice Hall.
3. Wakerly, John F. (2003). Digital Design – Principles & Practices. 3rd Edition. New Jersey: Prentice Hall.
4. M. Morris Mano. (2005). Digital Design. 3rd Edition. Prentice Hall.
5. Introduction to Digital Logic Design, 1st Edition (1993). Addison-Wesley Longman Publishing Co., USA.

EKT222/4
MICROPROCESSOR SYSTEM

Course Synopsis

The aim of this course is to study the Intel 8085 microprocessor architecture and relate that knowledge to the design of microprocessor based systems. This includes the design technique for interfacing memory, input and output for the systems. The study of 8085 instruction set and various software development tools are also emphasized as the knowledge are needed in the design of the microprocessor-based systems.

References

1. R.S. Gaonkar (2002). Microprocessor Architecture, Programming, and Applications with the 8085. Prentice Hall, 5th Edition.
2. W. Kleitz. (1998). Microprocessor and Microcontroller Fundamentals: The 8085 and 8051 Hardware and Software. Prentice Hall.
3. B.B. Brey (1996). The 8085A Microprocessor: Software, Programming and Architecture. Prentice Hall, 2nd Edition.
4. J.A. Seeger. (1995). Introduction to Microprocessors with the INTEL 8085. Oxford University Press, USA
5. W. Routt.(2006). Microprocessor Architecture, Programming, And Systems Featuring The 8085. Delmar Cengage Learning.

EKT 224/3
ALGORITHM AND DATA STRUCTURES

Course Synopsis

This course introduces data types, algorithm and data structures. The topics of array, pointers, structure and union in C are revisited. Then, the linear data structure i.e. stack, queue linked list and non linear data structure i.e. tree and graph are discussed in depth. In addition, sorting and searching algorithm are also included.

References

1. Fundamentals of Data Structures in C (2/E),Horowitz, Sahni & Anderson-Freed, P silicon Press, 2008, USA
2. Data Structures in C and C++, Vinu V. Dass, New Age International, 2006, India
3. Algorithms & Data Structures: The Science of Computing(Electrical and Computer Engineering Series), Douglas Baldwin & Greg W. Scragg, Computer Engineering Series, 2004, USA
4. Data Structure and Algorithm Analysis in C++ (3rd Ed.), Mark Allen Weiss, 2006
5. The Algorithm Design Manual, Steven S. Skiena, Springer-Verlag London Limited, 2008.

EKT 232/3
SIGNALS AND SYSTEMS

Course Synopsis

The course aims to introduce the concept of signals and systems analysis, the continuous signal and discrete signal functions and types of signal transformation. It begins with familiarization with different types of functions and relate them with convolution. To understand the Fourier series, Laplace-transform and Z-transform and familiarize with the properties involved, the transform and the inverse method. In general how the signals and systems are analyzed in the time and frequency domain.

References

1. Simon Haykin, Barry Van Veen. (2003). Signals and Systems. 2nd ed. John Wiley & Sons, Inc.
2. M.J. Roberts. (2003). Signals and Systems, Analysis Using Transform Method and MATLAB. International Edition. McGraw-Hill
3. Charles L. Philips, John M. Parr, Eve A. Risking. (2003). Signals and Systems and Transforms. 3rd Edition. Prentice Hall International.
4. Alan V.Oppenheim and Alan S. Willsky. Signals and Systems, 2nd Edition Prentice Hall,1996.
5. Edward W. Kamen and Bonnie S. Heck. Fundamentals of Signals and Systems using the Web and Matlab Second Edition, Prentice Hall, 2000.

EKT 242/3
ELECTROMAGNETIC THEORY

Course Synopsis

The purpose of this course is to learn the basic theory and analysis of electromagnetic. Student should be able to understand the basic concept of electrostatics, magnetostatics and their effects. Student should also understand the theory and application of transmission line.

References

1. Stuart M Wentworth. (2005). Fundamentals of Electromagnetics with Engineering Applications. Wiley Ed..
2. William H.Hayt, John A Buck.(2001). Engineering Electromagnetics. McGraw Hill, International Edition.
3. Fawwaz T Ulaby (2004). Fundamentals of Applied Electromagnetics. Pearson, Prentice Hall.
4. Roald K. Wangsness. (1987). Electromagnetic Fields, John Wiley and Sons, 1987.
5. Bo Thidé. (2009). Electromagnetic Field Theory Second Edition.

EKT 303/4
PRINCIPLES OF COMPUTER ARCHITECTURE

Course Synopsis

This subject will focus on the computer system with various design of interface techniques, organisation and architecture. The syllabus will covered the theory of basic computer system, format of instruction set, memory organization and arithmetic logic unit as well as certain issues of designing such as bus structure, parallel processing, pipelining and memory management. The student are required to design a simple CPU during a Lab session by using Quartus II software provided by Altera. The lab session will complement the theories given in lectures. FPGA trainer board will be used as a design platform in the lab.

References

1. William Stallings. Computer Organization and Architecture. Seventh Edition. Prentice-Hall.
2. M. Morris Mano. Computer System Architecture. Third Edition. Prentice-Hall.
3. Carl Hamacher, Zvonko Vranesic, Safwat Zaky. Computer Organization. Fifth Edition. McGraw Hill.
4. Andrew S. Tanembaum. Structured Computer Organization. Fifth Edition.
5. Linda Null, The essentials of Computer Organization and Architecture. 2nd Edition. Jones and Bartlett Publishers.

EKT 314/4
INSTRUMENTATION ELECTRONICS

Course Synopsis

Introduce students to the basic of electronic instrumentations, sensors and transducers that can be applied to the modern instrumentation systems; expose students to the elements and principles of data acquisition system with appropriate applications. Practical involves the use of virtual instrumentation software, development of transducer circuits and signal conditioning circuits, interfacing to the microprocessor and the execution of DAQ system.

References

1. Kalsi, H.S. (2005). Electronic Instrumentation. Tata McGraw-Hill Publishing Company Limited.
2. Rangan, C.S., Sarma, G.R. and Mani, V.S. (2004). Instrumentation Devices & Systems. Tata McGraw-Hill Publishing Company Limited.
3. Sawhney, A.K. and Sawhney, P. (2001). A Course in Electronic and Electrical Measurement and Instrumentation. Dhanpat Rai & Co. (P) Ltd.
4. Bentley, J.P.(1995). Principles of Measurement Systems. Longman Singapore Publisher.
5. Kuphaldt T.R.(2009), Lessons in Industrial Instrumentation. Version 0.4 – 2009

EKT318/3
MODERN CONTROL SYSTEMS

Course Synopsis

The Objective of this course is to expose the students to the basic knowledge in the field of control systems. Students will be exposed to basic mathematical modeling of physical system using differential equation and state space representation, stability of linear systems, time response, root locus, frequency domain analysis, and design of control systems using lead and lag compensating networks.

References

1. Nise , Norman S. , “Control Systems Engineering”, John Wiley and Sons , Fourth Edition, 2004.
2. Kuo B.C., “Automatic Control Systems”, Prentice Hall, 8th Edition, 1995.
3. Ogata, K, “Modern Control Engineering”Prentice Hall, 1999.
4. Richard C. Dorf and Robert H Bishop. Modern Control Systems (10th Edition) Prentice Hall; 10 edition 2004.
5. Katsuhiko Ogata. Modern Control Engineering. Publisher: Prentice Hall, 3rd Sub edition 1996.

EKT 322/4
EMBEDDED SYSTEM DESIGN

Course Synopsis

The aim of this course is to study the concept and requirement of embedded system. This includes the characteristic of embedded system, hardware and software development: single chip microcontroller and programming technique in assembly language and C, basic multitasking concept, developing an embedded system application.

References

1. Muhammad Ali Mazidi & Janice Gillispie Mazidi. (2000). The 8051 Microcontroller and Embedded Systems. Prentice Hall 2000
2. James W. Stewart & Kai X. Miao. (1999).The 8051 Microcontroller: Hardware, Software and Interfacing. Prentice Hall 2nd Edition
3. Michael J. Pont (2001).Patterns for Time-Triggered Embedded System. Addison –Wesley.
4. Dreamtech Software Team Programming for Embedded Systems (2002). John Wiley
5. Scott Mackenzie and Raphael Chung-Wei Phan(2006). 8051 Microcontroller. 2006

EKT 333/3
MODERN OPERATING SYSTEM

Course Synopsis

This course introduces the fundamental of operating systems. It also covers theoretical and practical issues underlying operating system design and implementation. The topics include inter process communication, process scheduling, deadlock, memory management, virtual memory and file management system. Formal principles are illustrated with examples and case studies of modern operating system.

References

1. W. Stallings, Operating Systems: Internals and Design Principles, 6th Edition, Pearson Prentice Hall, 2005.
2. Silberchatz, Galvin & Gagne, Operating System Principles, 7th Edition. John Wiley, 2006.
3. A.S. Tanenbaum, A.S. Woodhull, Operating Systems Design and Implementation, 3rd Edition. Prrentice Hall. 2006.
4. Silberchatz, Galvin & Gagne, Operating System Concepts, 7th Edition. John Wiley, 2005.
5. I.M. Flynn and A.M. McHoes, Understanding Operating System, 2nd Edition. PWS Publishing Company, 1999.

EKT 335/3
PRINCIPLES OF COMPUTER NETWORK

Course Synopsis

This course exposes students with the fundamental knowledge of computer networks. Principles of computer network cover so many aspects and it is expanding rigorously. Therefore, this course focuses on the fundamental concept and theories, applications and advantages of computer networks. The topics covered are the application, transport and the network layers which setup the Internet network over the internet.

References

1. J.F. Kurose, Computer Networking A Top-Down Approach, 4th Edition. Addison Wesley, USA, 2008.
2. A. S. Tanenbaum. Computer Networks, 5th Edition, Prentice Hall, 2011.
3. Leon-Garcia and A. Widjaja, Communication Networks: Fundamental Concepts and Key Architectures. 2nd Edition. McGraw Hill Publication, 2004.
4. William Stallings, Data & Computer Communications, 6th Edition, Prentice Hall, 2000.
5. Behrouz Forouzan, Introduction to Data Communications and Networking. Mc-Graw Hill, 1998.

EKT 336/3
COMPUTER NETWORK

Course Synopsis

This course exposes students with the kind and knowledge of computer networks. Computer network technologies cover so many aspects and it is expanding rigorously. Therefore this course focuses on the fundamental concept and theories, applications and advantages of computer networks. Related technologies such as Local Area Network, Wide Area Network and techniques use in data transmission as well as latest technologies use are introduced. Practical exercises such as design, install and testing of a simple computer internetworking which improve understanding and develop skills on networking are integrated in laboratories exercises.

References

1. A. L. Garcia and A. Widjaja. (2004). Communication Networks: Fundamental Concepts and Key Architectures. 2nd Edition. McGraw Hill Publication.
2. A. S. Tanenbaum. (2003). Computer Networks. Prentice Hall.

3. K. C. Mansfield Jr. and J. L. Antonakos (2002). An Introduction to Computer Network, Prentice Hall.
4. J.F. Kurose and K.W.Ross.(2002), Computer Networking: A Top-Down Approach Featuring the Internet. 2nd Edition. Addison Wesley, USA.
5. B. Forouzan, (2006), Data Communications and Networking. Mc-Graw Hill.

EKT 341/4
ANTENNA AND PROPAGATION

Course Synopsis

The purpose of this course is to introduce the fundamental principle of the functions, types and characteristics of antenna. Student should be able to analyze the characteristics of wave and waveguide. Student should also have ability to explain the characteristics of radio wave propagation.

References

1. C.A. Balanis. (2005). Antenna Theory: Analysis and Design. 3rd Edition. Wiley Interscience.
2. Stuart M Wentworth (2005). Fundamentals of Electromagnetics with Engineering Applications. Wiley Edition.
3. Kraus, Marhefka. (2003). Antennas: For All Applications. International Edition. McGraw Hill.
4. Simon R. Saunders & Alejandro Aragón-Zavala. (2007). Antennas and Propagation for Wireless Communication Systems. Second Edition, published by John Wiley & Sons.
5. William Gosling. (1998). Radio Antennas and Propagation: Radio Engineering Fundamentals.

EKT 343/4
PRINCIPLES OF COMMUNICATION ENGINEERING

Course Synopsis

This subject will cover all the basic principles and concepts of communication system including the basic elements of communications, signal analysis, amplitude modulation, angle modulations and digital modulations, as well as transmission channels and medium. In addition, introductions to signal propagations and calculations of signal to noise ratio are also introduced to relate the students with real world applications.

References

1. Wayne Tomasi. (2004). Electronic Communication System, Fundamental Through Advanced. 5th Ed. Pearson Prentice Hall. (Text)
2. K. Sam Shanmugan. (2002). Analog and Digital Communication. Wiley.
3. Simon Haykin. (2001). Communication Systems. 4th Ed. John Wiley.
4. J.M. Wozencraft and I.M. Jacobs. (2005). Principles of Communications Engineering.
5. Umesh Sinha. (2009). Principles Of Communication Engineering. Publisher, Satya Prakashan.

EKT 353/3
PRINCIPLE OF DIGITAL SIGNAL PROCESSING

Course Synopsis

To introduce the applications and review of signal and systems including z-transform. Digital structures, discrete Fourier transform, mathematical analysis of discrete time signal and systems, FFT, IIR filters and their designs, FIR filters and their designs, finite word length effect, simple applications.

References

1. Ifeachor & Jervis. Digital Signal Processing: a practical Approach. 2/e, Prentice Hall.
2. Sanjit K. Mitra (2006) Digital Signal Processing, A Computer-Based Approach, 3/e. McGraw Hill
3. Proakis and Manolakis. Digital Signal Processing. Pearson. 4/e
4. S. Orfanidis. (1996). Introduction to Signal Processing. Prentica Hall.
5. C.T. Chen (2001). Digital Signal Processing. Oxford.
6. B.P. Lathi. Signal Processing and Linear Systems. Oxford

EKT 355/4
ADVANCED COMPUTER NETWORK

Course Synopsis

Comprehensive overview of communications software and hardware involved in wide area networks and their relationship to local area networks are introduces. The course is designed for computer networking majors.
The students are able to identify the major components of the WANSs (Asynchronous Transfer Mode, Integrated Services Digital Network, Synchronous Optical Network, etc.) and the flow of data between the bridges and routers

References

1. A. L. Garcia and A. Widjaja, (2004). Communication Networks: Fundamental Concepts and Key Architectures, 2nd Edition, McGraw Hill Publication.
2. A. S. Tanenbaum, (2003). Computer Networks. Prentice Hall.

3. K. C. Mansfield Jr. and J. L. Antonakos (2002), An Introduction to Computer Network, Prentice Hall
4. J.F. Kurose and K.W.Ross, (2002), Computer Networking: A Top-Down Approach Featuring the Internet, 2nd Edition, Addison Wesley, USA.
5. B. Forouzan, (2006), Data Communications and Networking, Mc-Graw Hill.

EKT 357/3
DIGITAL COMMUNICATION ENGINEERING

Course Synopsis

This subject will cover all the principles and concepts of digital communications including signal analysis and transmission through channel, pulse modulations, speech signal digitization, base band transmission, digital modulation techniques and performance, spread spectrum communications. In addition, the basic telephony system also will be introduced to relate the students with the real application.

References

1. Skalar B. (2005). Digital Communications, Fundamentals and Applications. 2nd Ed. IE Prentice Hall.
2. Pursely M.B. (2005). Introduction to Digital Communications. IE Prentice Hall.
3. M.Schwartz. (2003). Information Transmission, Modulation and Noise. 3rd Ed. McGraw Hill.
4. Proakis, John G. (1995). Digital Communications. 3rd Ed. International Ed. - New York; Singapore. McGraw Hill.
5. John Proakis and Masoud Salehi. (2007). Digital Communications. 5th edition, McGraw-Hill.

EKT 421/3
SOFTWARE ENGINEERING

Course Synopsis

The course shall introduce principles and technique in software engineering, management integration concept, method or process and software metrics. In addition, this course exposes presentation and discussion on specific software engineering method, documentation and tools. It also covers object based need analysis and modeling. This course explains about relevant method to verify and validate prototype developed.

References

1. Lethbridge, T.C., Laganiere, R. [2005]. “Object Oriented Software Engineering”. 2nd Edition, Mc-Graw Hill.
2. Schach, S.R .[2007]. “Classical and Object Oriented Software Engineering”. 7th Edition, Mc-Graw Hill.
3. Sommerville, I. [2007], “Software Engineering”. 8th Edition, Addison Wesley Publication.
4. Pressman, R.S. [2007], “Software Engineering”. 6th Edition, Mc-Graw-Hill Publication.
5. Larman, C. [2004], “Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development “. 3rd Edition, Prentice Hall PTR.

EKT 424/4
REAL TIME SYSTEM

Course Synopsis

The course shall discuss concepts relevant to real time system and concept which differentiates ordinary operating system and real time operating system. Focus and in depth coverage shall be on techniques on developing real time system application which incorporates concurrent and synchronize process on a target embedded board which runs POSIX compliant open source operating system.

References

1. Jane W.S. Liu (2000). Real Time Systems. University of Illinois at Urbana-Campaign. Prentice Hall.
2. Sriram V Iyer. (2004). Embedded Real Time Systems. Tata McGraw Hill.
3. Glass, Graham and Ables, King. (1999). UNIX for programmers and users. Prentice Hall.
4. Bill Gallmeister. (1995) POSIX.4: Programming for the Real-World. O’Reilly and Associates.
5. Qing Lin and Caroline Yao (2003). Real-Time Concepts for Embedded Systems. CMP Books.

EKT 433/4
NETWORK MODELING

Course Synopsis

This course introduces the principle and technique in modeling and analyzing the computer network using software and discrete event simulator technique. The simulation technique is a powerful tool to analyze the network without the possibilities to destroy the real network. The students are able to understand the concept of network model, develop and analyze the computer network using this simulation technique.

Reference

1. Hall, J. Banks, J. Carson, B. L. Nelson, D. Nicol, “Discrete-Event System Simulation, Fourth Edition, Prentice Hall 2005.

2. M. S. Obaidat, G. I. Papadimitriou, "Applied System Simulation: Methodologies and Applications", Springer 2003.
3. M. Gen, R, Cheng & L. Lin, "Network Models and Optimization", Springer, 2008.
4. D. P. Bertsekas, " Network Optimization – Continuous and Discrete Models", Athena Scientific,1998.
5. S. Evans, "Telecommunications Network Modeling, Planning and Design", British Communication Technology, 2008

EKT 434/3
NETWORK PROGRAMMING

Course Synopsis

The aims of this course are to introduce the students of the programming in computer network and get familiar with the mechanism of protocols that consists in the network. The skills to programme the network protocols to works properly to transfer data from the sender to the receiver are exposed. The students are able to analyze, test, develop and design the protocols that are setting up a network.

Reference

1. Harvey M. Deitel, Paul J. Deitel and Sean E. Santry, [2002], "Advanced Java™ 2 Platform How to Program" 2nd Edition, Prentice Hall.
2. Marty Hall and Larry Brown, " Core Web Programming: The Sun Microsystems Press JAVA Series" 2nd Edition, Prentice Hall, 2004
3. Jan Graba, "An Introduction to Network Programming with Java", 2nd Edition, Springer, 2007.
4. W. R. Steven, "Unix Network Programming, Networking APIs: Sockets and XTI", 2nd Edition, Addition-Wesley, 2004
5. E. R. Harold, "Java Network Programming", O'Reilly, 2005.

EKT440/4
TELECOMMUNICATION SWITCHING AND NETWORKS

Course Synopsis

This course is about telecommunication and data networks which highlight fundamental knowledge of computer network and its applications. Its main objective is to provide to the students solid understanding of the main characteristics of several important switching systems. In addition, it also gives exposure to Local Area Network (LAN), Wide Area Network (WAN) and also data transmission techniques.

References

1. L. Garcia and A. Widjaja. (2004). Communication Networks: Fundamental Concepts and Key Architectures. 2nd Edition. McGraw Hill Publication.
2. S. Tanenbaum. (2003). Computer Networks. Prentice Hall.
3. K. C. Mansfield Jr. and J. L. Antonakos (2002). An Introduction to Computer Network. Prentice.
4. P.Gnanasivam. (2008). Telecommunication Switching and Networks" New Age Publications (Academic).
5. Viswanathan Thiagarajan (2010). Telecommunication Switching Systems And Networks Phi Learning Publication.

EKT450/3
MOBILE COMMUNICATION SYSYTEMS

Course Synopsis

The course aims to provide knowledge in mobile communications, especially different system characteristics and their effect on wireless network performance. The mobility puts high requirements on the communication system and these requirements together with possible solutions are an essential part of the course. The course focuses on

- wireless network performance and trade-offs
- cellular network planning and modeling
- radio resource management (RRM) and mobility management (MM)
- Wireless wide area network (WWAN) architectures.

References

1. David Tse, Pramod Viswanath, Foundamentals of Wireless Communications, Cambridge Press, 2005.
2. G. L. Stuber, Principles of Mobile Communication, Kluwer Acdemic, 1996.
3. J. G. Proakis, Digital Communications, McGraw-Hill, 1995.
4. T. S. Rappaport, Wireless Communications: Principles and Practice, Prentice Hall, 1996.
5. W. C. Jakes, Microwave Mobile Communications , IEEE Press, 1974.
6. K. Feher, Wireless Digital Communications - Modulation & Spread Spectrum Applications , Prentice Hall, 1995.

EKT 445/2
FINAL YEAR PROJECT I

Course Synopsis

This course aims to expose students the method of problem solving, data analysis, prototype design and research in computer and communication engineering fields. The student will be given an engineering problem (or encourage to identify on their own) and gain expertise by problem solving, investigation, research writing and effective presentation of the research outcome in the form of thesis and seminar.

EKT446/4
FINAL YEAR PROJECT II

Course Synopsis

This course aims to expose students the method of problem solving, data analysis, prototype design and research in computer and communication engineering fields. The student will be given an engineering problem (or encourage to identify on their own) and gain expertise by problem solving, investigation, research writing and effective presentation of the research outcome in the form of thesis and seminar.

EKT 453/3
GROUP DESIGN PROJECT

Course Synopsis

In this course, students will be divided into small groups working on design-based projects. Each group (consists of 3-4 students) will work on a discipline-related project which involves a complex engineering problem and design system, components or processes which integrates core areas and meeting the specified needs.
Upon completion of the course, students should be able to design one advanced electronic system component using related tools. Moreover, students are exposed to the method of problem solving, design process, and data analysis, with appropriate consideration for public health and safety, cultural, societal, and environmental.

EIT 302/4
INDUSTRIAL TRAINING

Course Synopsis

The course will expose to technical and application aspect as well as other aspect such as company organization structure, company operation, department function, work procedure, safety procedure, management, communication, technical skills, project management and presentation. The students also required to submit their log book and final report at the end of Industrial Training. Overall, the course is a practical-based.

Reference

1. UniMAP Industrial Training Guideline Rev A (July 2008)
2. UniMAP Industrial Training Log Book

Career Opportunities

Employment and career prospects of graduates upon graduation are very encouraging. The graduates can work in the industry in the following areas:

- Product design and digital control system based on microcontroller systems.
- Design equipment components for optical telecommunication systems, wired and wireless.
- Research and Development of electronic-based Industry, University, MIMOS, SIRIM,
- National Remote Sensing Centre, Statutory Authorities and Government.

Careers Can Be Pursued:

- Electronic Engineers
- Product Engineer
- Telecommunications Engineer
- Design Engineer
- System Engineer
- Network Engineer
- Research & Development Engineer
- Executive Engineer
- Tech Entrepreneur

School of Mechatronic Engineering

Programme Offered

- **Diploma in Engineering (Mechatronic)**
- **Bachelor of Engineering (Hons) (Mechatronic)**
- **Bachelor of Engineering (Hons) (Mechanical)**
- **Bachelor of Engineering (Hons) (Biomedical Electronic)**
- **Master of Science (Mechatronic Engineering)**
- **Master of Science (Mechanical Engineering)**
- **Master of Science (Biomedical Electronic Engineering)**
- **Doctor of Philosophy (Mechatronic Engineering)**
- **Doctor of Philosophy (Mechanical Engineering)**
- **Doctor of Philosophy (Biomedical Electronic Engineering)**

Address

SCHOOL OF MECHATRONIC ENGINEERING
Universiti Malaysia Perlis (UniMAP),
Pauh Putra Campus,
02600 Arau, Perlis, Malaysia.

Tel: +6(04) 988 5166
Fax: +6(04) 988 5167

INTRODUCTION

School of Mechatronic Engineering was established in 2003 to meet the nation growing needs of professionals – particularly in the field of mechatronic, mechanical and biomedical electronics engineering. This is in-line industrial demand and consistent with Malaysian Industrial Master Plan 2, 1996-2005 (Laporan Pelan Induk Perindustrian 2). The academic curriculums are designed with balanced emphasis in both engineering sciences and practical elements. Additionally, the teaching and learning activities are conducted by embedding theoretical knowledge with suitable laboratory sessions supported by advanced equipments. This approach to engineering education will greatly benefits UniMAP students and ensuring them in keeping abreast with latest technological development.

School of Mechatronic Engineering at UniMAP offers three degree programmes – namely Mechatronic Engineering Programme, Mechanical Engineering Programme and Biomedical Electronic Programme. The curriculum of each programme is designed to produce graduate professionals who equipped with necessary analytical skills and ability to work in multidisciplinary engineering fields and industries. Furthermore, learning environment is enjoyable and competitive with a good mixture of local and international students.

Mechatronic Engineering programme emphasis on multi-disciplinary field that is synergistic of electrical, mechanical, electronics, control and computer engineering disciplines. This enables its graduates to have good analytical and design knowledge of integrated mechatronic systems to cater for the needs in the robotics and automation industry.

Mechanical Engineering programme stress on the design and synthesis of mechanical components and systems. Mechanical engineers are usually involved in research and development, design and manufacturing, engine and thermal energy systems and also machinery. Mechanical engineering graduates are highly flexible and could work in almost every industrial engineering sector.

Biomedical Electronic engineering programme combines knowledge of electrical, electronic and mechanical engineering, as well as medical sciences – such as anatomy and physiology – with a strong emphasis in medical instrumentation and design. Combination of the knowledge in these areas enables engineers to understand principles in instrumentation and design of medical devices, and foster advances in medical technologies to cater for the needs in the biomedical industry.

Additionally, School of Mechatronics Engineering also offers Diploma in Engineering (Mechatronics) and postgraduate programme by research.

STAFF DIRECTORY

Dean
Assoc. Prof. Dr. Abu Hassan Bin Abdullah
Tel: +6(04) 988 5165 / 5354
e-mail: abu.hassan@unimap.edu.my

Deputy Dean
(Academic and Research)
Dr. Shafriza Nisha Bin Basah
Tel: +6(04) 988 5169
e-mail: shafriza@unimap.edu.my

Deputy Dean
(Student Development and Alumni)
Dr. Nashrul Fazli Bin Mohd Nasir
Tel: +6(04) 988 5173
e-mail: nashrul@unimap.edu.my

Programme Chairperson
(Mechatronic Engineering)
Dr. Muhammad Juhairi Aziz Bin Safar
Tel: +6(04) 988 5161
e-mail: juhairi@unimap.edu.my

Programme Chairperson
(Mechanical Engineering)
Dr. Mohd Afendi Bin Rojan
Tel: +6(04) 988 5162
e-mail: afendirojan@unimap.edu.my

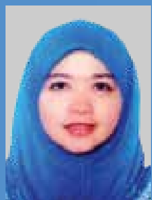
Programme Chairperson
(Biomedical Electronic Engineering)
Dr. Zulkarnay Bin Zakaria
Tel: +6(04) 988 5159
e-mail: zulkarnay@unimap.edu.my

Diploma Programme Chairperson
Mr. Fathinul Syahir Bin Ahmad Sa'ad
Tel: +6(04) 988 5160
e-mail: fathinul@unimap.edu.my

Programme Chairperson
(Postgraduate Studies)
Dr. Ruslizam Bin Daud
Tel: +6(04) 988 5323
e-mail: ruslizam@unimap.edu.my

Coordinator of Industrial Networking and Quality Management
Dr. Nasrul Amri Bin Mohd Amin
Tel: +6(04) 988 5317
e-mail: nasrulamin.mohdamin@unimap.edu.my

Assistant Registrar
Mrs. Nurul Shafinaz Binti Ismail
Tel: +6(04) 988 5170
e-mail: shafinaz@unimap.edu.my



LECTURERS

Professor Dr. Ali Yeon bin Md Shakaff
Ph.D. (Electronic) (Newcastle, UK)
B.Sc. (Hons)(Electrical & Electronic) (Newcastle, UK)
Tel. : +6(04) 988 5166
e-mail : aliyeon@unimap.edu.my

Professor Dr. Yusoff bin Mashor
Ph.D. (Sheffield, UK)
M.Sc. (Sheffield, UK)
Tel. : +6(04) 988 5166 / +6(04) 979 8331 / 8336
e-mail : yusoff@unimap.edu.my

Professor Dr. Ghulam Abdul Quadir
Ph.D. (Fluid Mechanics) (Indian Institute of Science)
M.Sc. (Mechanical - Heat Power) (Aligarh Muslim University, India)
B.Sc. (Mechanical) (Bhagalpur, India)
Tel. : +6(04) 988 5208
e-mail : gaquadir@unimap.edu.my

Professor Dr.
Paulraj Murugesa Pandiyan
Ph.D (Computer Science) (Bharathiyar, India)
M.E (Computer Science and Engineering) (Bharathiyar, India)
B.E (Electrical and Electronic) (Madras, India)
Tel.: +6(04) 988 5257
e-mail: paul@unimap.edu.my

Professor Dr. Abdul Hamid bin Adom
Ph.D. (Control Engineering) (LJMU)
M.Sc. (Modern Control and Instrumentation Systems) (LJMU)
B.Eng. (Hons) (Electronic Systems Engineering) (LJMU)
Tel. : +6(04) 988 5165 / 5354
e-mail : abdhamid@unimap.edu.my

Associate Professor Dr.
Hazry bin Desa
Ph.D. (Electrical and Electronic) (Oita, Japan)
B.Eng. (Mechanical) (Tokushima, Japan)
Tel. : +6(04) 988 5166
e-mail : hazry@unimap.edu.my
URL : http://publicweb.unimap.edu.my/~hazry

Associate Professor EurIng. Ir. Dr.
Kenneth Sundaraj
Ph.D. (Image, Vision & Robotics), France
M.Sc. (Image, Vision & Robotics), France
B.Eng. (Electrical), Singapore
Tel. : +6(04) 988 5166
e-mail : kenneth@unimap.edu.my

Associate Professor Dr.
Mohammad Iqbal bin Omar @ Ye Htut
Master of Medicine (Geriatric Medicine) (Edith Cowan, Australia)
Post Grad Diploma (Reproductive Medicine) (D.R.M) (UPM)
Bach. of Medicine & Bach. of Surgery (M.B, B.S) (Yangon)
Tel. : +6(04) 988 8915 / 5321
e-mail : iqbalomar@unimap.edu.my

Associate Professor Dr.
Wan Khairunizam bin Wan Ahmad
Ph.D. (Signal Sensing) (Kagawa, Japan)
B.Eng. (Electrical & Electronic) (Yamaguchi, Japan)
Tel. : +6(04) 988 5169
e-mail : khairunizam@unimap.edu.my

Dr. Ammar Zakaria
Ph.D. (Mechatronic Engineering) (UniMAP)
B.Eng. (Hons) (Electronic and Computer Engineering), Portsmouth, UK
Tel. : +6(04) 988 5166
e-mail : ammarzakaria@unimap.edu.my

Dr. Haftirman
Ph.D. (Material) (Fukui, Japan)
M.Eng. (Industry) (Fukui, Japan)
B.Eng. (Mechanical) (USU, Indonesia)
Tel. : +6(04) 988 5297
e-mail : haftirman@unimap.edu.my

Dr. Marwan Affandi
Ph.D. (Mechanical) (UTM)
M.Eng. (Rational Use of Energy) (A.I.T)
B.Eng. (Mechanical) (USU, Indonesia)
Tel. : +6(04) 988 5234
e-mail : marwan@unimap.edu.my

Dr. Shahriman bin Abu Bakar
Ph.D. (Mechanical) (Mie, Japan)
M.Eng. (Mechanical) (Mie, Japan)
B.Eng. (Mechanical) (Mie, Japan)
Tel. : +6(04) 988 5274
e-mail : shahriman@unimap.edu.my

Dr. Mohd Afendi bin Rojan
CEng MIMechE
Ph.D. (Mechanics and Energy) (Tsukuba, Japan)
M.Eng. (Mechanics and Energy) (Tsukuba, Japan)
B.Eng. (Systems) (Tsukuba, Japan)
Tel. : +6(04) 988 5162
e-mail : afendirojan@unimap.edu.my
URL : http://afendirojan.wordpress.com/

Dr. Siti Khadijah binti Za'aba
Ph.D. (Medical Engineering) (Yamanashi, Japan)
M.Eng. (Electrical & Electronic) (Yamanashi, Japan)
B.Eng. (Electrical & Electronic) (Yamanashi, Japan)
Tel. : +6(04) 988 5161
e-mail : khadijah@unimap.edu.my

Dr. M. Hariharan
Ph.D. (Mechatronic) (UniMAP)
M.Eng.(Applied) (Anna University, Chennai, India)
B.Eng. (Electrical & Electronic) (Bhrathiar, India)
Tel. : +6(04) 988 5166
e-mail : hari@unimap.edu.my

Dr. M. Murugappan
Ph.D. (Bio-Medical Signal Processing) (UniMAP)
M.Eng. (Applied Electronics) (Anna University, India)
B.Eng. (Electrical and Electronics) (Anna University, India)
Tel. : +6(04) 988 5268
e-mail : murugappan@unimap.edu.my

Dr. Shafriza Nisha bin Basah
Ph.D. (Engineering - Computer Vision) (Melbourne, Australia)
M.Sc. (Mechatronic) (London, UK)
B.Eng. (Mechanical) (UNITEN)
Tel. : +6(04) 988 5166
e-mail : shafriza@unimap.edu.my

Dr. Shuhaida binti Yahud
Ph.D. (Biomedical Engineering) (New South Wales, Australia)
M.Sc. (Artificial Organ) (UM)
B.Eng. (Biomedical) (UM)
Tel. : +6(04) 988 5159
e-mail : shuhaidayahud@unimap.edu.my

Dr. Cheng Ee Meng
Ph.D. (Microwave) (UPM)
M.Sc. (Wave Propagation) (UPM)
B.Sc. (Instrumentation Science) (UPM)
Tel. : +6(04) 988 5252
e-mail : emcheng@unimap.edu.my

Dr. Haniza Yazid
Ph.D. (Electrical Engineering), UM
M.Sc. (Computer Engineering), UniMAP
B.Sc. (Computer System and Networking), UM
Tel. : +6(04) 988 5166
e-mail : hanizayazid@unimap.edu.my

Dr. Mohd Shukry bin Abdul Majid CEng MIMechE
Ph.D. (Composite Engineering) (Newcastle University, UK)
M.Sc. (Eng) (Mechanical System) (Liverpool University, UK)
B.Eng. (Hons) (Mechanical Eng) (UMIST, UK)
Tel. : +6(04) 988 5213
e-mail : shukry@unimap.edu.my

Dr. Ahmad Faizal bin Salleh
Ph.D. (Mechanical), Mie University, Japan
M.Eng. (Mechanical), UTM, Malaysia
B.Eng. (Mechanical), Nagoya University, Japan
Tel. : +6(04) 988 5166
e-mail : ahmadfaizal@unimap.edu.my

Dr. Zuradzman bin Mohamad Razlan
Ph.D. (Mechanical Engineering) (System Energy) (Mie, Japan)
Non Degree Research Student (Mie, Japan)
B.Eng. (Hons) Mechanical Eng (System Design), (Yamagata, Japan)
Tel. : +6(04) 988 5166
e-mail : zuradzman@unimap.edu.my

Dr. Mohd Hafiz bin Fazalul Rahiman CEng MIET
Ph.D. (Electrical Engineering) (UTM)
M.Eng. (Electrical)(UTM)
B. Eng. (Electrical – Control & Instrumentation)(UTM)
Tel. : +6(04) 988 5166
e-mail : hafiz@unimap.edu.my
URL : http://hafiz.unimap.edu.my

Dr. Nashrul Fazli bin Mohd Nasir
Ph.D. (Electrical and Computer Engineering) (RMIT, Australia)
M.Sc. (Biomedical) (Keele, UK)
B.Eng. (Hons) (Biomedical) (UM)
Tel. : +6(04) 988 5173
e-mail : nashrul@unimap.edu.my

Dr. Nazahah binti Mustafa
Ph.D. Medical Imaging (Image Processing & Analysis), (Aberdeen, UK)
M.Sc. (Electrical & Electronic) (USM)
B.Eng. (Hons) (Electronic) (USM)
Tel. : +6(04) 988 5166
e-mail : nazahah@unimap.edu.my

Dr. Ruslizam bin Daud
Ph.D. (Mechanical)(UKM)
M.Eng. (Mechanical)(UTM)
B.Eng. (Hons) (Mechanical)(UKM)
Tel. : +6(04) 988 5323
e-mail : ruslizam@unimap.edu.my

Dr. Nasrul Amri bin Mohd Amin
Ph.D. (Mechanical) (South Australia, Australia)
M.Eng. (Mechanical) (Adelaide, Australia)
B.Eng. (Hons) (Mechanical) (KUiTTHO)
Tel. : +6(04) 988 5221
e-mail : nasrulamri.mohdamin@unimap.edu.my

Dr. Khairul Salleh bin Basaruddin
Ph.D. (Mechanical) (Keio, Japan)
M.Eng. (Mechanical) (UTM)
B.Eng. (Hons) (Mechanical) (UTM)
Tel. : +6(04) 988 5280
e-mail : khsalleh@unimap.edu.my

Dr. Tan Wei Hong
Ph.D. (Mechanical) (USM)
M.Eng. (Mechanical) (UTM)
B.Sc. (Industrial Physics) (UTM)
Tel. : +6(04) 988 5282
e-mail : whtan@unimap.edu.my

Dr. Shazmin Aniza binti Abdul Shukor
Ph.D. (Engineering) (Warwick, UK)
M.Eng. (Mechatronic) (KUiTTHO-FH Cologne, Germany)
B.Eng. (Hons) (Mechatronic) (UIA)
Tel. : +6(04) 9885166
e-mail : shazmin@unimap.edu.my

Dr. Mohd Sani bin Mohamad Hashim
Ph.D. (Mechanical) (Adelaide, Australia)
M.Eng. (Mechanical) (UKM)
B.Eng. (Hons) (Mechanical) (UKM)
Tel. : +6(04) 988 5296
e-mail : sanihashim@unimap.edu.my

Dr. Yakubu Dan-Mallam
Ph.D. (Mechanical) (UTP)
M.Eng. (Mechanical) (Abubakar Tafawa Balewa, Nigeria)
B.Eng. (Mechanical) (Maidugauri, Nigeria)
Tel. : +6(04) 988 5322
e-mail : yakubu@unimap.edu.my

Dr. Shah Fenner Khan bin Mohamad Khan
Ph.D. (Mechanical and System) (New Castle, UK)
M.Sc. (Advanced Engineering) (CAE) (UK)
B.Sc. (Mechanical Engineering) (USA)
Cert. Edu. (Technical) (MPT)
Tel. : +6(04) 988 5166
e-mail : sfkhan@unimap.edu.my

Dr. Muhammad Izham bin Ismail
Ph.D. (Mechanical) (Kyoto Institute of Tech., Japan)
M.Eng. (Mechanical) (Kyoto Institute of Tech., Japan)
B.Eng. (Mechanical) (Kyoto Institute of Tech., Japan)
Tel. : +6(04) 988 5315
e-mail : izham@unimap.edu.my

Dr. Md. Tasyrif bin Abdul Rahman
Ph.D. (Mechanical) (Okayama, Japan)
M.Eng. (Mechanical) (Gunma, Japan)
B.Eng. (Mechanical) (Gunma, Japan)
Tel. : +6(04) 988 5189
e-mail : tasyrif@unimap.edu.my

Dr. Mohd Sofian bin Mohammad Rosbi
Ph.D. (Mechanical) (Oita, Japan)
M.Eng.Sc. (Mechanical) (New South Wales, Australia)
B.Eng. (Mechanical) (Hiroshima, Japan)
Tel. : +6(04) 988 5220
e-mail : sofian@unimap.edu.my

Dr. Fauziah binti Mat
Ph.D. (Mechanical) (UniMAP)
M.Eng. (Mechanical) (UKM)
B.Eng. (Hons) (Mechanical) (UKM)
Tel. : +6(04) 988 5293
e-mail : fauziah@unimap.edu.my

Dr. Saidatul Ardeenaawatie binti Awang
Ph.D. (Mechatronic)(UniMAP)
M.Sc. (Medical Physic) (UM)
B.Eng. (Hons) (Biomedical) (UM)
e-mail : saidatul@unimap.edu.my

Dr. Muhammad Juhairi Aziz bin Safar
Ph.D. (Intelligent Mechanical Systems) (Okayama, Japan)
M.Sc. (Bionics) (Tokyo Univ. of Tech., Japan)
B.Eng. (Mechatronics) (Tokyo Univ. of Tech., Japan)
Tel. : +6(04) 988 5161
e-mail : juhairi@unimap.edu.my

Dr. Lam Chee Kiang
Ph.D. (Mechatronic Engineering) (UniMAP)
B.Eng. (Hons) (Mechatronic Engineering) (UniMAP)
Tel. : +6(04) 988 5269
e-mail : lckiang@unimap.edu.my

Dr. Mohd Hanafi bin Mat Som
D.E. (System Design) (University of Fukui, Japan)
M.Eng. (Biomedical) (New South Wales, Australia)
B.Eng. (Hons) (Biomedical) (UM)
e-mail : mhanafi@unimap.edu.my

Dr. Zulkarnay bin Zakaria
Ph.D. (Electrical Engineering) (UTM)
M.Eng. (Electrical – Electronic & Telecommunication) (UTM)
B.Eng. (Hons) (Electrical and Electronic) (USM)
Tel. : +6(04) 988 5166
e-mail : zulkarnay@unimap.edu.my
URL : http://zulkarnay.unimap.edu.my

Mr. Muhd Nur Rahman bin Yahya
M.Sc. (Biomedical Electronic Engineering) (UniMAP)
B.Eng. (Mechanical and Automotive) (Ulsan, South Korea)
Dip (Mechanical System) (Dongyang Mirae, South Korea)
Tel. : +6(04) 988 5166
e-mail : nurrahman@unimap.edu.my

Mr. Handy Ali bin Munir
M.Eng. (Electrical) (UTHM)
B.Sc. (Electrical Engineering) (UTM)
Tel. : +6(04) 988 5166
e-mail : handy@unimap.edu.my

Mr. Norasmadi bin Abdul Rahim
M.Sc. (Electrical) (UiTM)
B.Eng. (Hons) (Electrica)l (UiTM)
Dip. (Electrical) (UiTM)
Tel. : +6(04) 9885223
e-mail : norasmadi@unimap.edu.my
URL : http://norasmadi.unimap.edu.my

Mrs. Saufiah binti Abdul Rahim
M.Sc. (Electrical and Electronic) (USM)
B.Eng. (Hons) (Electrical and Electronic) (USM)
Tel. : +6(04) 988 2550 / 5239
e-mail : saufiah@unimap.edu.my

Mr. Azizul bin Mohamad
M.Eng. (Mechanical) (Curtin, Australia)
B.Eng. (Hons) (Mechanical) (UNITEN)
Tel. : +6(04) 988 5219
e-mail : azizul@unimap.edu.my
URL : http://publicweb.unimap.edu.my/~azizul

Mrs. Siti Nurul Aqmariah binti Mohd. Kanafiah
M.Sc. (Electrical & Electronic) (USM)
B.Eng. (Electrical-Robotics & Automation Control) (UTHM)
Tel. : +6(04) 988 5166
e-mail : aqmariah@unimap.edu.my

Mrs. Norazian binti Abdul Razak
M.Eng. (Biomedical) (UM)
B.Eng. (Biomedical) (UM)
Tel. : +6(04) 988 5313
e-mail : norazianrazak@unimap.edu.my

Mrs. Normahira binti Mamat @ Mohamad Nor
M.Eng. (Biomedical) (UM)
B.Eng. (Biomedical) (UM)
Tel. : +6(04) 988 5294
e-mail : normahira@unimap.edu.my

Mr. Ahmad Firdaus bin Ahmad Zaidi
M.Sc. (Mechatronic) (UIAM)
B.Eng. (Electric & Electronic) (UMS)
Tel. : +6(04) 988 5261
e-mail : ahmadfirdaus@unimap.edu.my

Mr. Hassrizal bin Hassan Basri
M.Eng. (Electrical – Mechatronics & Automatic Control) (UTM)
B.Eng. (Electrical - Mechatronics) (UTM)
Tel. : +6(04) 988 5166
e-mail : hassrizal@unimap.edu.my

Mrs. Nurul Syahirah Binti Khalid
M.Eng. (Electrical - Mechatronics & Automatic Control) (UTM)
B.Eng. (Hons) (Mechatronics) (UTeM)
Tel. : +6(04) 988 5166
e-mail : syahirahkhalid@unimap.edu.my

Mr. Mohd Arinal bin Abd. Halim
M.Eng (Electrical) (Kyushu, Japan)
B.Eng. (Electrical) (Kyushu, Japan)
Tel. : +6(04) 988 5166
e-mail : arinal@unimap.edu.my

Mr. Mohd Noor Arib bin Md. Rejab
M.Sc. (Mechanical) (UPM)
B.Eng. (Hons) (Mechanical) (UPM)
Tel. : +6(04) 988 5166
e-mail : mnarib@unimap.edu.my

Mrs. Hafizawati binti Zakaria
M.Sc. (Mechanical) (UTM)
B.Eng. (Mechanical) (UNITEN)
Tel. : +6(04) 988 5166
e-mail : hafizawati@unimap.edu.my

Mr. Muhammad Sofwan bin Mohamad
M.Eng. (Mechanical) (USM)
B.Eng. (Mechanical) (Kyoto Institute of Tech., Japan)
Tel. : +6(04) 988 5166
e-mail : sofwanmohamad@unimap.edu.my

Mr. Mohd Hafif Basha bin Mohamad Jamel Basha
M.Eng. (Mechanical) (UKM)
B.Eng. (Mechanical) (Hiroshima, Japan)
Tel. : +6(04) 988 5259
e-mail : hafifbasha@unimap.edu.my

Mr. Muhajir bin Ab. Rahim
M.Sc. (Control System Engineering) (Sheffield, UK)
B.Eng. (Hons) (Electrical) (UNITEN)
Tel. : +6(04) 988 5166
e-mail : muhajir@unimap.edu.my
URL : http://publicweb.unimap.edu.my/~muhajir

Mr. Mohd Nor Fakhzan bin Mohd Kazim
M.Eng. (Mechatronic) (UIA)
B.Eng. (Hons) (Mechatronic) (UIA)
Tel. : +6(04) 988 5230
e-mail : fakhzan@unimap.edu.my

Mrs. Masturah Tunnur binti Mohamad Talib
M.Eng. (Electrical – Mechatronic & Automatic Control) (UTM)
B.Eng. (Mechatronic Engineering) (UniMAP)
Dip. (Mechanical - Mechatronic) (Polimas)
Tel. : +6(04) 988 5231
e-mail : masturah@unimap.edu.my

Mr. Ahmad Syayuthi bin Abdul Rahman
M.Eng. (Mechanical - Adv. Manufacturing Tech.) (UTM)
Dip.Ed. (Tech. Management) (IPTKL)
B.Eng. (Hons) (Mechanical) (USM)
Dip. (Mechanical - Manufacturing) (Polimas)
Tel. : +6(04) 988 5166
e-mail : syayuthi@unimap.edu.my

Mr. Jefri Efendi bin Mohd Salih
M.Sc (Mechatronic Eng) (UniMAP)
B.Eng (Hons) (Electrical – Mechatronics) (UTM)
Tel. : +6(04) 988 5166
e-mail : jefri_salih@unimap.edu.my

Mr. Fathinul Syahir bin Ahmad Saad
M.Sc. (Electrical & Electronic) (USM)
B.Sc. (Computational & Electronic Physic) (UM)
Tel. : +6(04) 988 5160
e-mail : fathinul@unimap.edu.my

Mr. Mohd Shuhanaz bin Zanar Azlan
M.Eng. (Electronic) (La Trobe University)
B.Eng. (Hons.)(Mechatronic)
Dip.Ing. (FH) (University of Applied Science Aalen)
Tel. : +6(04) 988 5166
e-mail : shuhanaz@unimap.edu.my

Mrs. Hasimah binti Ali
M.Sc. (Mechatronic) (UIA)
B.Eng. (Hons) (Mechatronic) (UIA)
Tel. : +6(04) 988 5166
e-mail : hasimah@unimap.edu.my

Mrs. Humairah binti Mansor
M.Eng. (Mechatronic) (UniMAP)
B.Eng. (Electrical & Electronic) (UMP)
Tel. : +6(04) 988 5244
e-mail : humairah@unimap.edu.my

LECTURERS (STUDY LEAVE)

Mr. Mohd Nasir bin Ayob
M.Eng. (Mechatronic) (UTM)
B.Eng. (Hons) (Mechatronic) (USM)
e-mail: nasirayob@unimap.edu.my

Mr. Anas bin Mohd Noor
M.Sc. (Electronic System Design) (USM)
B.Eng. (Electronic) (UniMAP)
e-mail: anasnoor@unimap.edu.my

Mr. Nur Saifullah bin Kamaruddin
M.Sc. (Mechanical) (Mie, Japan)
B.Eng. (Mechanical) (Mie, Japan)
e-mail: saifullah@unimap.edu.my

Ms. Nur Farahiyah binti Mohammad
M.Eng. (Biomedical) (Melbourne)
B.Eng. (Hons) (Biomedical) (UM)
e-mail: farahiyah@unimap.edu.my

Mr. Muhamad Khairul bin Ali Hassan
M.Sc. (Mechatronic) (UniMAP)
B.Eng. (Hons) (Mechatronic) (USM)
e-mail: khairulhassan@unimap.edu.my

Mr. Mohd Fahisal bin Abdullah
M.Eng. (Mechatronic & Automatic Control) (UTM)
B.Eng. (Hons) (Mechatronic) (UniMAP)
Dip. (Power Eng.) (UTM)
e-mail: fahisal@unimap.edu.my

Mrs. Nur Liyana binti Tajul Lile
M.Eng. (Mechanical) (UKM)
B.Eng. (Mechatronic) (UIA)
e-mail: liyanatajul@unimap.edu.my

Mr. Ishak bin Ibrahim
M.Sc. (Mechanical) (Mie, Japan)
B.Eng. (Mechanical) (Mie, Japan)
e-mail: ishakibrahim@unimap.edu.my

Mr. Hamzah bin Sakeran
M.Eng. (Biomedical) (New South Wales, Australia)
B.Eng. (Biomedical) (UM)
e-mail: hamzahsakeran@unimap.edu.my

Mr. Ahmad Nasrul bin Norali
M.Eng.Sc. (Biomedical) (New South Wales, Australia)
B.Eng. (Telecommunication) (UM)
e-mail: ahmadnasrul@unimap.edu.my

Mr. Muhamad Safwan bin Muhamad Azmi
M.Sc. (Mechanical) (Mie, Japan)
B.Eng. (Mechanical) (Mie, Japan)
e-mail: safwanazmi@unimap.edu.my

Mr. Anas bin Abdul Rahman
M.Eng. (Mechanical) (UKM)
B.Sc. (Mechanical) (Iowa State, USA)
e-mail: anasrahman@unimap.edu.my

Mr. Imaduddin Helmi bin Wan Nordin
M.Eng. (Mechanical) (Tottori, Japan)
B.Eng. (Mechanical) (Tottori, Japan)
e-mail: imaduddin@unimap.edu.my

Mr. Mohammad Shahril bin Salim
M.Sc. (Biomedical) (Brunel, UK)
B.Eng. (Hons) (Mechanical) (USM)
e-mail: mshahril@unimap.edu.my

Mr. Abdul Halim bin Ismail
M.Sc. (Control & Automation Engineering) (UPM)
B.Eng. (Electrical & Electronic) (UPM)
e-mail: ihalim@unimap.edu.my

Mr. Bukhari bin Ilias
M.Sc. (Mechatronic) (UniMAP)
B.Eng. (Mechatronic) (Middlesex university, UK)
e-mail: bukhari@unimap.edu.my

Mrs. Azian Azamimi binti Abdullah
M.Eng. (Electrical & Electronic) (Tokushima, Japan)
B.Eng. (Electrical & Electronic) (Tokushima, Japan)
e-mail: azamimi@unimap.edu.my

Mrs. Siti Marhainis binti Othman
M.Eng. (Mechatronic & Automatic Control) (UTM)
B.Eng. (Hons) (Mechatronic) (UTM)
e-mail: marhainis@unimap.edu.my

Mr. Tan Wee Choon
M.Eng. (Mechanical) (UTHM)
B.Eng. (Hons) (Mechanical) (UTHM)
e-mail: tweechoon@unimap.edu.my

Mr. Mohd Hafis bin Sulaiman
M.Eng. (Mechanical) (UTM)
B.Eng. (Hons) (Mechanical) (UTM)
e-mail: hafissulaiman@unimap.edu.my

Mr. Mohd Ridzuan bin Mohd Jamir
M.Eng. (Mechanical) (UTM)
B.Eng. (Hons) (Mechanical) (UTM)
e-mail: ridzuanjamir@unimap.edu.my

TEACHING ENGINEERS

Mr. Mohd Hanif Bin Abdul Hamid
B.Eng. (Mechatronic) (UTM)
Tel. : +6(04) 988 5166
e-mail : hanif@unimap.edu.my

Mr. Mohd Anuar Bin Mat
M.Sc. (Mechanical) (USM)
B.Eng. (Hons) (Mechanical) (USM)
Dip. (Mechanical) (UPM)
Tel. : +6(04) 988 5166
e-mail : m.anuar@unimap.edu.my

Mr. Mohd Rudzuan Bin Mohd Nor
B.Eng. (Electrical) (Hiroshima, Japan)
Tel. : +6(04) 988 5324
e-mail : rudzuan@unimap.edu.my

Mr. Nor Shaifudin bin Abdul Hamid
B.Eng. (Hons) (Mechatronics) (UIA)
Tel. : +6(04) 988 5166
e-mail : norshaifudin@unimap.edu.my
URL : http://publicweb.unimap.edu/~norshaifudin

Mr. Mohd Shahril Bin Shariff
B.Eng. (Hons) (Mechanical) (UTM)
Tel. : +6(04) 988 5216
e-mail : mohdshahril@unimap.edu.my

Mr. Wan Shahrizal Bin Wan Nadhari
B.Eng. (Hons) (Mechanical) (UTM)
Tel. : +6(04) 988 5277
e-mail : w.shahrizal@unimap.edu.my

Mr. Wan Mohd Nooriman Bin Wan Yahya
B.Eng. (Mechatronic) (UTM)
Dip. (Mechatronic) (UTM)
Tel. : +6(04) 988 5226
e-mail : nooriman@unimap.edu.my

Mr. Mohd Saifizi Bin Saidon
M.Eng.(Mechatronic) (UniMAP)
B.Eng. (Electrical & Electronics) (Fukui, Japan)
Dip. (Electronic Control) (Gifu, Japan)
Tel. : +6(04) 988 5166
e-mail : saifizi@unimap.edu.my

Mr. Ismail Ishaq Bin Ibrahim
B.Eng. (Mechatronic) (UniMAP)
Tel. : +6(04) 988 5303
e-mail : ismailishaq@unimap.edu.my

Mr. Mohd Khairul Faizi Bin Abd Rahman
B.Eng. (Hons.) (Mechanical - Industrial) (UTM)
Dip. (Mechanical) (KUiTTHO)
Tel. : +6(04) 988 5179
e-mail : mkhairulfaizi@unimap.edu.my

Mr. Mohammad Fauzi Bin Mahmud
B.Eng. (Electrical-Electronics) (UTM)
Dip. Electronic Engineering (Communication) (POLISAS)
Grad. BEM (2010)
Tel. : +6(04) 988 5166
e-mail : mfauzi@unimap.edu.my

Mr. Mohd Asrul bin Md Saad
B.Eng. (Material) (USM)
Tel. : +6(04) 988 5166
e-mail : asrulsaad@unimap.edu.my

Mr. Pubalan a/l Nadaraja
B.Eng. (Hons) (Mechanical)(UniMAP)
Tel. : +6(04) 988 5166
e-mail : pubalan@unimap.edu.my

Mr. Erdy Sulino bin Mohd Muslim Tan
B.Eng. (Mechatronic) (UniMAP)
Tel. : +6(04) 988 5166
e-mail : erdysulino@unimap.edu.my

Mrs. Robiyanti Binti Adollah
B.Eng. (Hons.) (Biomedical) (UM)
Tel. : +6(04) 988 8549
e-mail : robiyanti@unimap.edu.my

Mrs. Adilah Binti Hashim
B.Eng. (Hons.) (Biomedical) (UM)
Tel. : +6(04) 988 3516
e-mail : adilah@unimap.edu.my

Mrs. Norazila Binti Shoib
B.Eng. (Hons.) (Electrical & Electronics) (UTM)
Tel. : +6(04) 988 5308
e-mail : azilashoib@unimap.edu.my

Mrs. Norlaili binti Saad
B.Eng. (Electrical - Control &Instrumentation) (UTM)
Tel. : +6(04) 988 5166
e-mail : norlaili@unimap.edu.my

Mrs. Sharifah Nurul Husna Binti Syed Hanapi
B.Eng. (Mechatronic) (UIA)
Tel. : +6(04) 988 5314
e-mail : nurulhusna@unimap.edu.my

Mrs. Rahaton Azirah binti Ramli
B.Eng. (Manufacturing - Management) (USM)
Tel. : +6(04) 988 5329
e-mail : rahaton@unimap.edu.my

Ms. Farah Hanan Binti Mohd Faudzi
B.Eng. (Hons) (Mechatronic) (UniMAP)
Tel. : +6(04) 988 5181
e-mail : farahh@unimap.edu.my

Ms. Maizatul Nurul Bariah Binti Ahmad
B.Eng. (Hons) (Mechatronic) (UniMAP)
Tel. : +6(04) 988 5289
e-mail : maizatulnurul@unimap.edu.my

TECHNICIANS

Mr. Mohd Nizam bin Hashim
Diploma in Mechanical Engineering (Manufacturing) (POLIMAS)
Certificate of Mechanical Engineering (Manufacturing) (POLIMAS)
Tel. : +6(04) 988 5166
e-mail : nizam@unimap.edu.my

Mr. Norshahrizat bin Shaidin
Diploma in Electrical Engineering (POLIMAS)
Certificate of Electronic Engineering (Control) (PUO)
Tel. : +6(04) 988 5166
e-mail : norsharizat@unimap.edu.my

Mr. Shujairi bin Sahdzar
Diploma in Electrical Engineering (POLIMAS)
Certificate of Electronic Engineering (Control) (POLISAS)
Tel. : +6(04) 988 5166
e-mail : shujairi@unimap.edu.my

Mr. Mohammad Firdaus bin Rejab
Diploma in Electrical Engineering (POLIMAS)
Certificate of Electrical Engineering (POLIMAS)
Tel. : +6(04) 988 5304
e-mail : firdausrejab@unimap.edu.my

Mr. Bazli bin Bahadon
Certificate of Electronic Engineering (PD)
Tel. : +6(04) 988 5232
e-mail : bazli@unimap.edu.my

Mr. Anuar bin Ahmad
Diploma in Mechanical Engineering (Manufacturing) (POLIMAS)
Certificate of Mechanical Engineering (POLIMAS)
Tel. : +6(04) 988 2251
e-mail : anuarahmad@unimap.edu.my

Mr. Mohd Razif bin Omar
Diploma in Mechanical Engineering (Manufacturing) (POLIMAS)
Certificate of Mechanical Engineering (POLIMAS)
Tel. : +6(04) 988 5166
e-mail : mohdrazif@unimap.edu.my

Mr. Rimi Rafeek bin Abd. Latif
Diploma in Mechanical Engineering (Manufacturing) (POLIMAS)
Certificate of Mechanical Engineering (Machinery) (POLIMAS)
Tel. : +6(04) 988 5166
e-mail : rimi@unimap.edu.my

Mr. Mohd Al-Haffiz bin Saad
Certificate of Computer Engineering (PSP)
Tel. : +6(04) 988 5222
e-mail : alhafiz@unimap.edu.my

Mr. Muhamad Aliff bin Mad Yussof
Certificate of Mechanical Engineering (Machinery) (POLIMAS)
Tel. : +6(04) 988 5290
e-mail : aliff@unimap.edu.my

Mr. Mohd Amri bin Zainol Abidin
Diploma in Mechanical Engineering (Mechanical) POLIMAS
Certificate of Mechanical Engineering (PTSS)
Tel. : +6(04) 988 5166
e-mail : amrizainol@unimap.edu.my

Mr. Norzarul Asri bin Kamis
Diploma in Mechanical Engineering (Mechanical) POLIMAS
Certificate of Mechanical Engineering (PTSS)
Tel. : +6(04) 988 5181
e-mail : norzarul@unimap.edu.my

Mr. Muhamad Zakuan bin Abd Samad @ Zakaria
Diploma in Electronic Engineering (PTSS)
Certificate of Electrical and Electronic Engineering (POLIMAS)
e-mail: zakuansamad@unimap.edu.my

Mrs. Siti Khalijah Binti Hasan @ Yusuf,
Certificate in Mechanical Engineering (General Machinery) (PSA)
Politeknik Shah Alam (PSA)
e-mail: sitikhalijah@unimap.edu.my

CRAFTSMEN

Mr. Muhamad Ikbal bin Azudin
Diploma Technology Foundry (CIAST)
Certificate (Level 3) Pattern Maker, (Level 2) Technology Foundry
Tel. : +6(04) 988 5176 / 5175
e-mail : ikbal@unimap.edu.my

Mr. Mohd Yamin bin Jamil
Malaysian Skills Certificate Level 1&2 Arc of Welding(SKM) (ILP Jitra)
Technician Certificate - Jitra Industrial Training
Tel. : +6(04) 988 5175
e-mail : mohdyamin@unimap.edu.my

Mr. Mohamad Amirol bin Johari
Diploma Design Mechanical (UTM)
Tel. : +6(04) 988 5175
e-mail : amirol@unimap.edu.my

Mr. Faridzuan bin Zainoldin
Certificate Center of Automotive Studies Tan Chong Education
Tel. : +6(04) 988 5175
e-mail : faridzuan@unimap.edu.my

ADMINISTRATION STAFFS

Assistant Registrar
Mrs Nurul Shafinaz binti Ismail
B.A (Hons) Mass Communication And Media Study (Broadcasting) (UiTM)
Tel. : +6(04) 988 5170
e-mail : shafinaz@unimap.edu.my

Personal Assistant
Mrs. Norasmira binti Othman
Diploma in Ofiice Management and Technology (UiTM)
Tel. : +6(04) 988 5166
Fax : +6(04) 988 5167
e-mail : norasmira@unimap.edu.my

Assistant Admin Officer
Mrs Shafinur binti Saadon
Sijil Tinggi Pelajaran Malaysia
Tel. : +6(04) 988 5168
e-mail : shafinur@unimap.edu.my

Assistant Admin Officer
Mr. Husni Ashraf bin Hussin
Sijil Pelajaran Malaysia
Tel. : +6(04) 988 5168
e-mail : husniashraf@unimap.edu.my

Assistant Admin Officer
Mr. Mustaza bin Mansor
Sijil Pelajaran Malaysia
Tel. : +6(04) 988 5168
e-mail : mustazamansor@unimap.edu.my

General Worker
Mr. Basri bin Abu Bakar
Sijil Pelajaran Malaysia
Tel. : +6(04) 988 5168
e-mail : basribakar@unimap.edu.my

BACHELOR OF ENGINEERING (HONOURS) (MECHATRONIC ENGINEERING)

PROGRAMME OBJECTIVES (PEO)

PEO 1
Graduates who effectively demonstrate engineering knowledge and entrepreneurial skills by providing practical solutions.

PEO 2
Graduates who effectively demonstrate professionalism in multi-disciplinary engineering environment, leadership quality and teamwork.

PEO 3
Graduates who make contributions to knowledge and establish best engineering practice through research and development.

PEO 4
Graduates who demonstrate an ethical commitment to the community and the profession through involvement with professional organizations and society.

PEO 5
Graduates who engage in life-long learning as demonstrated through career advancement.

PROGRAMME OUTCOMES (PO)

PO 01
Ability to acquire and apply knowledge of mathematics, science, engineering and in-depth technical competence in mechatronic engineering discipline to the solution of complex engineering problem.

PO 02
Ability to identify, formulate and solve complex engineering problems.

PO 03
Ability to design solutions for complex engineering problems and systems, components or processes to meet desired needs.

PO 04
Ability to conduct investigation into complex problems as well as to analyse and interpret data.

PO 05
Ability to use techniques, skills and modern engineering tools necessary for complex engineering practices so as to be easily adaptable to industrial needs.

PO 06
Understanding of the social, cultural, global and environmental responsibilities of a professional engineer.

PO 07
Ability to understand entrepreneurship, the process of innovation and the need for environmental and sustainable development.

PO 08
Ability to understand the professional and ethical responsibilities and commitment to the community.

PO 09
Ability to function on multi-disciplinary teams.

PO 10
Ability to communicate effectively on complex engineering activities with the engineering community and with society at large.

PO 11
A recognition of the need for, and an ability to engage in life-long learning.

PO 12
Demonstrate understanding of project management and finance principles.

CURRICULUM STRUCTURE FOR BACHELOR OF ENGINEERING (HONOURS) (MECHATRONIC ENGINEERING)

YEAR	FIRST		SECOND		THIRD			FOURTH	
SEMESTER	I	II	III	IV	V	VI		VII	VIII
Core Courses (98)	ENT 161/4 Electric Circuits	ENT 162/4 Analog Electronics	ENT 281/3 Signals & Systems	ENT 256/4 Machine Design	ENT 385/3 Control Engineering	ENT 372/4 Robotics	EIT302/4 Industrial Training	ENT 445/2 Final Year Project I	ENT 446/4 Final Year Project II
	ENT 141/3 Engineering Statics	ENT 153/4 Principles of Thermo-fluids and Materials	ENT 263/4 Digital Electronics	ENT 268/3 Electromagnetic Theory	ENT 374/3 Power Systems Engineering	ENT 363/4 Machine Vision Systems		ENT 475/3 Mechatronic Systems Design I	ENT 476/4 Mechatronic Systems Design II
	ECT111/3 Engineering Skills	ENT 142/3 Engineering Dynamics	ENT 286/3 Instrumentation & Measurements	ENT 288/3 Microprocessors	ENT 383/3 Network & Communication Engineering	ENT 386/3 Modern Control Engineering		ENT 471/4 Automation	Elective II/3
			ENT 289/3 Drives and Power Electronics		ENT 373/4 Embedded System Design and Applications	ENT 331/3 Management Production & Control of Quality		Elective I/3	
Non Engineering (22)	ENT189/3 Computer Programming	EQT 102/3 Engineering Mathematics II	EQT 241/3 Numerical Methods & Vector Calculus	EQT 271/3 Engineering Statistics				EUT442/2 Engineers in Society	EUT444/3 Engineering Management
	EQT 101/3 Engineering Mathematics I								
	UUT122/2 Skills and Technology in Communication								
University Requirement (17)	UZW XXX/1 Co-Curriculum	UVW 410/2 University Malay Language	UUW 233/2 Islamic & Asian Civilisations	UUW 322/2 Thinking Skills	UUW XXX/2 Option	UUW 235/2 Ethnic Relations			
		UZW XXX/1 Co-Curriculum	UZW XXX/1 Co-Curriculum	UVW 312/2 English for Technical Communication	UUW 224/2 Engineering Entrepreneurship				
	19	17	19	17	17	16	4	14	14
Total Units for Graduation 137									

Electives:
Elective I: ENT491/3 Robotic Control or ENT493/3 Advanced Control Systems or ENT486/3 Mobile Robotics
Elective II: ENT497/3 Artificial Intelligence in Engineering or ENT474/3 Intelligent Mechatronic Systems or ENT499/3 Digital Signal Processing & Applications

BACHELOR OF ENGINEERING (HONOURS) (MECHANICAL ENGINEERING)

PROGRAMME OBJECTIVES (PEO)

PEO 1
Graduates who effectively demonstrate engineering knowledge and entrepreneurial skills by providing practical solutions.

PEO 2
Graduates who effectively demonstrate professionalism in multi-disciplinary engineering environment, leadership quality and teamwork.

PEO 3
Graduates who make contributions to knowledge and establish best engineering practice through research and development.

PEO 4
Graduates who demonstrate an ethical commitment to the community and the profession through involvement with professional organizations and society.

PEO 5
Graduates who engage in life-long learning as demonstrated through career advancement.

PROGRAMME OUTCOMES (PO)

PO 01
Ability to acquire and apply knowledge of mathematics, science, engineering and in-depth technical competence in mechanical engineering discipline to the solution of complex engineering problem.

PO 02
Ability to identify, formulate and solve complex engineering problems.

PO 03
Ability to design solutions for complex engineering problems and systems, components or processes to meet desired needs.

PO 04
Ability to conduct investigation into complex problems as well as to analyse and interpret data.

PO 05
Ability to use techniques, skills and modern engineering tools necessary for complex engineering practices so as to be easily adaptable to industrial needs.

PO 06
Understanding of the social, cultural, global and environmental responsibilities of a professional engineer.

PO 07
Ability to understand entrepreneurship, the process of innovation and the need for environmental and sustainable development.

PO 08
Ability to understand the professional and ethical responsibilities and commitment to the community.

PO 09
Ability to function on multi-disciplinary teams.

PO 10
Ability to communicate effectively on complex engineering activities with the engineering community and with society at large.

PO 11
A recognition of the need for, and an ability to engage in life-long learning.

PO 12
Demonstrate understanding of project management and finance principles.

CURRICULUM STRUCTURE FOR BACHELOR OF ENGINEERING (HONOURS) (MECHANICAL ENGINEERING)

YEAR	FIRST		SECOND		THIRD			FOURTH	
SEMESTER	I	II	III	IV	V	VI		VII	VIII
Engineering Core (98)	ENT141/3 Engineering Statics	ENT142/3 Engineering Dynamics	ENT241/3 Fluid Mechanics I	ENT247/3 Fluid Mechanics II	ENT345/4 Mechanical Components Design	ENT348/4 Mechanical System Design	EIT 302/4 Industrial Training	ENT445/2 Final Year Project I	ENT446/4 Final Year Project II
	ENT150/3 Engineering Graphic & Computer Aided Drafting	ENT143/3 Thermodynamics I	ENT243/3 Thermodynamics II	ENT245/4 Product Design Development	ENT347/3 Finite Element Methods	ENT342/3 Computational Fluid Dynamics		ENTXXX/3 Elective I	ENTXXX/3 Elective II
	ENT145/3 Materials Engineering	ENT144/2 Machining Skills	ENT242/3 Solid Mechanics I	ENT 246/3 Solid Mechanics II	ENT 388/3 Electronics	ENT346/3 Vibration Mechanics		ENT482/3 Mechanical Design Project I	ENT484/3 Mechanical Design Project II
		ENT188/3 Electrical Technology	ENT286/3 Instrumentations & Measurements	ENT244/3 Manufacturing Processes	ENT343/3 Principles of Heat Transfer	ENT385/3 Control Engineering		ENT457/3 Management, Production & Operations	
						ENT381/2 Microprocessors			
Non Engineering (22)	ENT189/3 Computer Programming								
	UUT122/2 Skills and Technology in Communication					EUT444/3 Engineering Management			EUT442/2 Engineers in Society
	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT241/3 Numerical Methods & Vector Calculus	EQT271/3 Engineering Statistics					
University Required (17)		UVW 410/2 University Malay Language	UUW233/2 Islamic & Asian Civilisations	UVW 312/2 English for Technical Communication	UUW224/2 Engineering Entrepreneurship	UUW 322/2 Thinking Skills			
		UUW235/2 Ethnic Relations			UUWXXX/2 Option				
	UUWXXX/1 Co-curriculum	UUWXXX/1 Co-curriculum	UUWXXX/1 Co-curriculum						
	18	19	18	18	17	20	4	11	12
Total Units for Graduation 137									

Elective:
Elective I: ENT461/3 Renewable Energy / ENT463/3 Elasticity / ENT465/3 Rapid Engineering / ENT462/3 Turbomachinery / ENT464/3 Fracture Mechanics / ENT466/3 Design Optimization
Elective II: ENT431/3 Refrigeration & Air Conditioning / ENT433/3 Plasticity / ENT435/3 Robotics / ENT432/3 Energy Conversion / ENT434/3 Impact Mechanics / ENT436/3 Computer Aided Manufacturing

BACHELOR OF ENGINEERING (HONOURS) (BIOMEDICAL ELECTRONIC ENGINEERING)

PROGRAMME OBJECTIVES (PEO)

PEO 1
Graduates who effectively demonstrate engineering knowledge and entrepreneurial skills by providing practical solutions.

PEO 2
Graduates who effectively demonstrate professionalism in multi-disciplinary engineering environment, leadership quality and teamwork.

PEO 3
Graduates who make contributions to knowledge and establish best engineering practice through research and development.

PEO 4
Graduates who demonstrate an ethical commitment to the community and the profession through involvement with professional organizations and society.

PEO 5
Graduates who engage in life-long learning as demonstrated through career advancement.

PROGRAMME OUTCOMES (PO)

PO 01
Ability to acquire and apply knowledge of mathematics, science, engineering and in-depth technical competence in biomedical electronic engineering discipline to the solution of complex engineering problem.

PO 02
Ability to identify, formulate and solve complex engineering problems.

PO 03
Ability to design solutions for complex engineering problems and systems, components or processes to meet desired needs.

PO 04
Ability to conduct investigation into complex problems as well as to analyse and interpret data.

PO 05
Ability to use techniques, skills and modern engineering tools necessary for complex engineering practices so as to be easily adaptable to industrial needs.

PO 06
Understanding of the social, cultural, global and environmental responsibilities of a professional engineer.

PO 07
Ability to understand entrepreneurship, the process of innovation and the need for environmental and sustainable development.

PO 08
Ability to understand the professional and ethical responsibilities and commitment to the community.

PO 09
Ability to function on multi-disciplinary teams.

PO 10
Ability to communicate effectively on complex engineering activities with the engineering community and with society at large.

PO 11
A recognition of the need for, and an ability to engage in life-long learning.

PO 12
Demonstrate understanding of project management and finance principles.

School of Mechatronic Engineering

CURRICULUM STRUCTURE FOR BACHELOR OF ENGINEERING (HONOURS) (BIOMEDICAL ELECTRONIC ENGINEERING)

YEAR	FIRST		SECOND		THIRD			FOURTH	
SEMESTER	I	II	III	IV	V	VI		VII	VIII
Engineering Core (92)	ENT114/3 Circuit Theory	ENT115/3 Analogue Electronics I	ENT117/3 Engineering Mechanics	ENT218/3 Biomechanics	ENT219/3 Biomaterials	ENT221/3 Biomedical Acts, Standards & Safety	EIT 302/4 Industrial Training	ENT445/2 Final Year Project I	ENT446/4 Final Year Project II
	ECT111/3 Engineering Skills	ENT116/3 Digital Electronic Principles	ENT216/3 Analogue Electronics II	ENT222/3 Electromagnetic Field Theory	ENT220/4 Linear Control System	ENT223/3 Electrical Machine & Drives		ENTXXX/3 Elective I	ENTXXX/3 Elective II
			ENT217/3 Principles of Signasl & Systems	ENT265/4 Microcontroller & Interfaces	ENT315/4 Medical Signal Processing	ENT317/4 Medical Electronics & Bioinstrumentation		ENT427/4 Biomedical Instrumentation Design	ENT438/3 Biomedical Design Project
					ENT316/3 Principles of Communication Systems	ENT318/3 Artificial Organs		ENT413/3 Medical Imaging	
					ENT319/3 Thermofluids	ENT 320/3 Mechanics of Materials			
Non Engineering (28)	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT241/3 Numerical Methods & Vector Calculus	EQT271/3 Engineering Statistics				EUT442/2 Engineers in Society	EUT444/3 Engineering Management
	ENT120/4 Computer Programming	ENT111/4 Anatomy & Physiology	ENT210/3 Biochemistry						
	UUT122/2 Skills and Technology in Communication								
University Required (17)	UUW233/2 Islamic & Asian Civilizations	UVW 410/2 University Malay Language	UUW224/2 Engineering Entrepreneurship	UUW322/2 Thinking Skills					
	UZWXXX/1 Co-Curriculum	UUW235/2 Ethnic Relation	UZWXXX/1 Co-Curriculum	UVW 312/2 English for Technical Communication		UUWXXX/2 Option			
		UZWXXX/1 Co-Curriculum							
	18	18	18	17	17	18	4	15	15
Total Units for Graduation 137									

Elective I (Medical Computing): ENT420/3 Biological System Modeling, ENT421/3 Medical Image Processing, ENT423/3 Artificial Intelligent Systems ENT424/3 Human Machine Interfaces

Elective II (Medical Instrumentation): ENT426/3 Computed Tomography & Applications, ENT427/3 Clinical Engineering, ENT428/3 Medical Robotics & Automation ENT419/3 Biosensors

COURSE SYLLABUS

ENT 111/4
ANATOMY & PHYSIOLOGY

Course Synopsis

An introductory course to human anatomy and physiology, the students will be exposed to the basic knowledge on cell and tissues, skin and appendages, circulatory and cardiovascular system, the respiratory system, nervous system, special senses, the musculoskeletal system, digestive system and metabolism, lymphatic and immune system, the endocrine system, and the urinary system. At the end of the course, the students are expected to have a good grip of basic anatomical and physiological aspects of the human body and able to apply in biomedical engineering problem solving.

Course Outcomes

CO1: Ability to discuss anatomical and physiological function of various systems in human body.
CO2: Ability to discuss homeostasis in human body and distinguish the homeostatic imbalance.
CO3: Ability to measure and discuss basic physiological signals and parameters.

References

1. Seely, R. R., Stephens, T.D., & Tate, P. (2005). Essentials of Anatomy and Physiology. 5th Ed. McGraw Hill.
2. Tortora, G.J., Grabowski, S.R. (2002). Principles of Anatomy and Physiology. 10th Ed. Wiley.
3. Marieb, E. (2000). Human Anatomy & Physiology. 5th Ed. Benjamin-Cummings.
4. Van Wynsberghe, D. M., Noback, C.R., & Carola, R. (1995). Human Anatomy and Physiology. 3rd Ed. Mc-Graw Hill.
5. Marieb, E.N (2009), “Essentials of Human Anatomy & Physiology”, 9th Ed., Benjamin-Cummings.

ENT 114/3
CIRCUIT THEORY

Course Synopsis

This course provide the fundamentals of electrical elements, basic laws such as Kirchorff’s law, Nodal analysis, Thevenin’s law and also circuit theorem i.e. mesh analysis, nodal analysis and superposition theorem. Calculate current, voltage and power in ac circuits using phasor approach. Study the mutual Inductance and transient response in RC, RL and RLC circuits.

Course Outcomes

CO1: Ability to distinguish between voltage and current sources and between the behaviour of resistors, capacitors and inductors in both DC and AC circuits.
CO2: Ability to analyze simple DC and AC circuits using basic circuit laws.
CO3: Ability to analyze more complex DC and AC circuits using techniques of network analysis.
CO4: Ability to design and evaluate basic circuits to meet specifications.

References

1. Robert L. Boylestad. (2007). Introductory Circuit Analysis. 11th Ed. Prentice Hall.
2. Alexander, C.K. and Sadiku, M.N.O. (2007). Fundamental of Electric Circuits. 3rd Edition, McGraw-Hill.
3. Nilssen, J.W. and Riedel, S.(2008), Electric Circuits, 8th Edition, Addison Wesley.
4. Dorf, R.C. and Svoboda, J.A.(1996), Introduction to Electric Circuits, Wiley.
5. Robert A. Pease (2008). Analogue Circuits: World Class Designs. Elsevier.

ENT 115/3
ANALOGUE ELECTRONICS I

Course Synopsis

This course provides fundamental knowledge on analogue electronics. The student will be exposed to the basic structure of semiconductor materials, principle operation of selected electronic components and fundamental of electronic circuit design. Students will be introduced with several types of selected electronic components which are Diode, Bipolar Junction Transistor (BJT), Field Effect Transistor (FET) and Thyristors.

Course Outcomes

CO1: Ability to explain the theory of semiconductor materials and selected electronic devices.
CO2: Ability to illustrate the operation and application of selected electronic devices.
CO3: Ability to design and evaluate diode circuit and biasing of BJT and FET.

References

1. Floyd, T. (2008). Electronic Devices. 8th ed. Prentice Hall.
2. Boylestad, R.L., and Nashelsky, L. (2008). Electronic Devices and Circuit Theory. 10th ed. Prentice Hall.

3. Cathey, J.J. (2002), Schaum's outline of theory and problems of electronic devices and circuits, 2nd edition, McGraw-Hill.
4. Salivahanan, S., Kumar, N.S., Vallavaraj, A(1998)., Electronic Devices and Circuits, Tata McGraw-Hill.
5. Robert A. Pease (2008). Analogue Circuits: World Class Designs. Elsevier.

ENT 116/3
DIGITAL ELECTRONIC PRINCIPLES

Course Synopsis

In this course, the students will be exposed to the basic principle digital systems, digital circuit design and analysis. Lecture and practical will cover Algebra Boolean, Numbering system, Basic Logic Gate, Combinational Logic Circuit Design, Bi-stable Memory Devices, Sequential Circuits Design, Programmable Logic Devices, Signal Interfacing and Processing.

Course Outcomes

CO1: Able to analyze the combinational and sequential logic circuits
CO2: Be able to design and construct simple circuits and system of basic digital electronics

References

1. Floyd, T. (2009). Digital Fundamentals. 10th ed. Prentice Hall.
2. Mano, M.M. (2002). Digital Design. 3rd ed. Prentice Hall.
3. Tocci, R.J. (2001). Digital Systems: Principles and Applications. 8th ed. Prentice Hall.
4. Balaniaban, N. and Carlson, B. Digital Logic Design Principles. 1st ed. Wiley.
5. Donald D. Givone (2003). 'Digital Principles and Design', 1st Ed., Mcgraw-Hill.

ENT 117/3
ENGINEERING MECHANICS

Course Synopsis

The course provides a foundation for the students to analyze mechanical problems using simple and logical methods. The syllabus is designed to enable non-mechanical engineering students to have strong fundamental to solve mechanical problems.

Course Outcomes

CO1: Ability to study and explain fundamental laws in engineering mechanics and solve problems related to resultant force and moment.
CO2: Ability to study, explain and apply equilibrium equations to solve problems of structure with and without friction.
CO3: Ability to study, measure and analyze the relationship of kinematics and kinetics of a particle and rigid body.

References

1. Hibbler, R.C. (2010). Engineering Mechanics: Statics. 12th ed. Prentice Hall.
2. Hibbler, R.C. (2010). Engineering Mechanics: Dynamics. 12th ed. Prentice Hall.
3. Ferdinand P. Beer, E. Russell Johnston & William E.C (2007)., "Vector Mechanics for Engineers: Statics.", 8th ed., Mc Graw Hill.
4. Ferdinand P. Beer, E. Russell Johnston & William E.C.(2007), "Vector Mechanics for Engineers: Dynamics.", 8th ed., Mc Graw Hill.
5. Anthony M. Bedford and Wallace Fowler (2007). Engineering Mechanics: Statics & Dynamics, 5th Edition, Prentice Hall.

ENT 141/3
ENGINEERING STATICS

Course Synopsis

The objective of the course is to evaluate problems related to concept of mechanics in static conditions. It covers topics of equilibrium force analysis of a particle in static conditions, equilibrium force analysis for rigid body, structural analysis, friction analysis, centre gravity and centroid analysis, and moment of inertia analysis.

Course Outcomes

CO1: Ability to evaluate problems related to static equilibrium force, concepts of mechanics and vector mechanics.
CO2: Ability to evaluate problems related to moment of a force, equilibrium in rigid body and forces acting on structures.
CO3: Ability to evaluate problems related to frictions, centre of gravity, centre of mass for a system and moment of inertia of an area.

References

1. R.C. Hibbeler. (2010). *Engineering Mechanics: Statics.* 12th ed., Prentice Hall.
2. Beer and E.R. Johnson Jr. (2005). *Vector Mechanics tor Engineer: Statics*. 7th Ed. In SI Units, McGraw Hill.
3. J.L. Meriam L.G. Kraige (2003). *Engineering Mechanics: Statics*. 7th ed., John Wiley and Sons.

ENT 142/3
ENGINEERING DYNAMICS
(Pre Requisite: ENT 141/3 Engineering Statics)

Course Synopsis

The objective of the course is to enable students to evaluate problems related to mechanics concepts in dynamic condition. The course covers topics of force and acceleration, work and energy, and also impulse and momentum for both kinematics of a particle and planar kinetics of a rigid body problems.

Course Outcomes

CO1: Ability to analyze problems related to rectilinear kinematics, law of motions, and also concepts mechanics and vector mechanics.
CO2: Ability to evaluate problems related to kinematics of particle, involving force and acceleration, work and energy, and also impulse and momentum.
CO3: Ability to evaluate problems related to planar kinetics or a rigid body, involving force and acceleration, work and energy and also impulse and momentum.

References

1. R. C. Hibbler (2009). *Engineering Mechanics: Dynamics*. 12th edition, Pearson / Prentice Hall.
2. Anthony Bedford and Wallace Fowler (2008). *Engineering Mechanics: Dynamics*. 5th edition in SI unit, Prentice Hall.
3. R.C Hibbeler (2006). *Engineering Mechanics: Principles of dynamics*. Pearson/Prentice.
4. Wan Abd Rahman Assyahid dan Suhaimi Ilyas (2006). *Engineering Mechanics (EPT 101)*. Penerbit KUKUM, Perlis.

ENT 143/3
THERMODYNAMICS I

Course Synopsis

To introduce the concepts and basic knowledge of thermodynamics to the students of mechanical engineering. Emphasis will be given to the first and second laws of thermodynamics, physical properties, pure substances, enthalpy, entropy, ideal and real gas, and energy.

Course Outcomes

CO1: Ability to identify, apply the basic concepts of thermodynamics; the concept of energy transfer, the First Law of Thermodynamics and evaluate them.
CO2: Ability to calculate the properties of pure substances and solve problems related to energy evaluate for close and open systems.
CO3: Ability to identify, explain the Second Law of Thermodynamics, apply it to reversible, irreversible processes and analyze energy. Ability to evaluate the entropy of a system undergoing a process.

References

1. Y.A. Cengel and M.A. Boles (2009). *Thermodynamics: An Engineering. Approach*, 6th edition, McGraw-Hill.
2. Kurt C. Rolle (2005). *Thermodynamics and Heat Power.* University of Wisconsin-Platteville.
3. Davin Dunn (2001). *Fundamental Engineering Thermodynamics.* Illustrate edition, Longman Group, United Kingdom.

ENT 144/2
MACHINING SKILLS

Course Synopsis

The objective of this course is to introduce and provide the students with theoretical and practical skills that are required in fabricating and manufacturing mechanical parts or components. At the end of this course the students will be able appreciate various skills and technology in manufacturing processes include Manufacturing Metrology, Welding, Conventional Machining, CNC Machining and EDM Machining.

Course Outcomes

CO1: Ability to describe and choose the proper measurement tools and the safety procedures to complete a particular manufacturing process.
CO2: Ability to construct and describe the proper manufacturing process to complete a finish product.
CO3: Ability to decide and organize the use of proper machine to complete a particular manufacturing process.

References

1. S.K.Garg (2006). *Workshop Technology: Manufacturing processes*. 2nd Edition, Laxmi Publications.
2. Krar, Steve F., Gill, Arthur R., Smid, Peter (2005). *Technology of Machine Tools*. 6th Ed., McGraw Hill.
3. Groover, M. P. (2002). *Fundamental of Modern Manufacturing*. Prentice Hall.
4. Schey, J.A. (2000). *Introduction to Manufacturing Processes*. 3rd Ed., Mc Graw-Hill.

ENT 145/3
MATERIALS ENGINEERING

Course Synopsis

The objective of the course is to enable the students to analyze problems related to material selection, process selection and metal structure in materials engineering. The course covers topics on atomic structure of materials, materials selection, phase diagrams, microstructure, diffusion in solids, physical properties, mechanical properties of metals, light alloys, corrosion and magnetic materials.

Course Outcomes

CO1: Ability to analyze problems related to engineering materials, materials behaviour, atomic structure, materials selection and processing of materials.
CO2: Ability to analyze problems related to metal structure, phase diagrams, diffusion in solids, physical and mechanical properties of metals.
CO3: Ability to analyze problems related to production, forming of metals, light alloys corrosion and magnetic materials.

References

1. William D Callister (2010). *Materials Science and Engineering*. 8th Edition, John Wiley & Sons.
2. Donald R. Askeland and Pradeep P. Phule (2003). *The Science and Engineering of Materials*. 4th Ed., Thomson Brooks/Cole.
3. Kenneth G. Budinski (2010). *Engineering Materials: Properties and Selection.* 9th Ed., Pearson.
4. James F Shackelford (2009). *Introduction to Materials Science for Engineers*. 7th Edition International Edition, Pearson.

ENT 150/3
ENGINEERING GRAPHICS & COMPUTER AIDED DRAFTING

Course Synopsis
The aim of this course is to expose mechanical engineering student to basic concepts and applications of engineering graphics and computer aided drafting.

Course Outcomes

CO1: Ability to design and reproduce drafting and technical drawings using proper techniques.
CO2: Ability to design and reproduce 2-dimensional drawings to 3-dimensional drawings and vice versa.
CO3: Ability to realize basic concepts of drafting and to design engineering projects using computer aided drafting software

References

1. Gary R. Bertoline and Eric N. Wiebe (2008). *Technical Graphics Communication*. 5th Ed., McGraw-Hill.
2. Frederick E. Giesecke, Henry Cecil Spencer, John Thomas Dygdon, Alva Mitchell, Ivan Leroy Hill and James E. Novak (2009). *Technical Drawing*. 13th Ed., Prentice Hall.
3. Timothy Sean Sykes (2002). *AutoCAD 2002 One Step at a Time*. Prentice Hall,.
4. Ralph Grabowski (2002). *Using AutoCAD 2002.* Thomson Learning.

ENT 153/4
PRINCIPLES OF THERMO-FLUIDS AND MATERIALS

Course Synopsis

This course aims to introduce to the mechatronic engineering students the basic knowledge on the principles of mechanical sciences. It includes basic aspects related to material engineering, fluid mechanics and Thermodynamics.

Course Outcomes

CO1: Ability to describe the Mechanical properties of materials and analyse tensile, compressive, shear stresses & strains, and torsional deformation.
CO2: Ability to calculate the pressure variation in a static fluid, and to analyze the resulting hydrostatic forces on plane and curved submerged surfaces.
CO3: Ability to describe, explain and analyze an Energy equation for fluid flow problems.
CO4: Ability to identify, analyze and solve energy balance problems for closed and steady flow systems and devices.

References

1. William D Callister (2010). *Materials Science and Engineering*. 8th Edition, John Wiley & Sons.
2. Yunus A. Cengel and Robert H Hunter (2005). *Fundamentals of Thermal Fluids Sciences*. Int'l Edition, McGraw-Hill.
3. Lim Poh Seng, Tay Seng How and Koh Kok Pin (2003). *Strength of Materials for Polytechnic*, Revised Edition, Prentice Hall.
4. Robert L. Mott (2006). *Applied Fluid Mechanics*. 6th Edition, Pearson.
5. William Fox and Alan T. McDonald (1998). *Introduction to Fluid Mechanic*.

ENT 161/4
ELECTRICAL CIRCUITS

Course synopsis

This course provide the fundamentals of electrical elements, basic laws such as Kirchorff's law, Nodal analysis, Thevenin's law and also circuit theorem i.e. mesh analysis, nodal analysis and superposition theorem. The syllabus covers a calculation of current, voltage and power in ac circuits by using phasor approach, and follows by the study of the mutual Inductance and transient response in RC, RL and RLC circuits.

Course outcomes

CO1: Ability to solve DC problems using basic laws and circuit theorem.
CO2: Ability to solve AC problems using basic laws and circuit theorem.
CO3: Ability to design and evaluate basic circuits to meet specifications.

References

1. Alexander, C.K. and Sadiku, M.N.O.(2007) *Fundamental of Electric Circuits, 3rd Edition*, McGraw-Hill.
2. Robert L. Boylestad. (2007) *Introductory Circuit Analysis*. 11th Ed. Prentice Hall.
3. Nilssen, J.W. and Riedel, S.(2008) *Electric Circuits, 8th Edition,* Addison Wesley.

ENT 162/4
ANALOGUE ELECTRONICS

Course Synopsis

This course is designed to introduce basic concepts of semiconductor electronics and its applications. The course helps students to apply analogue theories for testing, designing and developing of electronic circuits.

Course Outcomes

CO1: Ability to perform the analysis on characteristics of semiconductor devices.
CO2: Ability to design and evaluate analogue circuits by using semiconductor devices.
CO3: Ability to solve circuitry problems in a group.

References

1. Floyd T., "Electronic Devices", 8th Edition, Pearson Prentice Hall, 2008.
2. Boylested R L and Nashelsky L., "Electronics Devices and Circuit Theory", 7th Edition, Prentice Hall, 1999.
3. Schuler C A., "Electronics-Principles and Applications", 6th Edition, Prentice Hall, 2003.
4. Aminian, A., and Kazimierczuk, M., "Electronic Devices- A Design Approach", Pearson Prentice Hall, 2004.
5. Salivahanans S., Kumar N., Vallavaraj A., "Electronic Devices and Circuits", McGraw-Hill, 2007.

ENT 188/3
ELECTRICAL TECHNOLOGY

Course Synopsis

The objective of the course is to introduce the students with the fundamentals concept of electric circuits, electric supply system and installation, magnetic and electromagnetic, inductance, capacitance and AC circuit, three-phase system, basic principles of electrical machines, DC and AC electrical machines, transformer and electrical safety. The laboratory will be used to aid the students understanding of the concept introduced.

Course Outcomes

CO1: Ability to analyze electrical circuits to solve engineering problems.
CO2: Ability to analyze AC Circuits.
CO3: Ability to analyze the characteristics three-phase circuits and electromagnetic.
CO4: Ability to analyze the operation of Electrical Machines and their applications.

References

1. Charles K. Alexander and Matthew N. O. Sadiku (2004). *Fundamentals of Electrical Circuits.* 2nd Ed, McGraw Hill.
2. James W. Nilsson and Susan A. Reidel (2004). *Electric Circuits*. 6th Ed, Prentice Hall.
3. Wildi, T (2002). *Electrical machines, drives and power systems*. Prentice Hall.
4. Bhattacharya, S. K. (1998). *Electrical Machines.* McGraw Hill.
5. P. C. Sen (1997). *Principles of Electric Machines and Power Electronics*. 2nd Edition, Wiley.

ENT 189/3
COMPUTER PROGRAMMING

Course Synopsis

This course is designed to introduce the fundamentals of Computer Programming. It provides an introduction to the principles of procedural programming, data types, control structures, data structures and functions, data representation on the machine level. This course also introduces the basic concepts of object oriented programming.

At the end of this course students should be able to write, debug and document well-structured C applications applied to Mechatronic Engineering

Course Outcomes

CO1: Ability to define the basic programming techniques.
CO2: Ability to apply suitable programming technique to solve a given problem.
CO3: Ability to develop and analyze computer programmes in C and C++ for Mechatronic Applications.

References

1. Deitel & Deitel, Suhizaz Sudin, R. Badlishah and Yasmin Yacob (2006). *C How To Programme*. Pearson-Prentice Hall.
2. Ivor Horton's (2003). *Beginning visual C++.* Wiley Publishing, Inc, Indiana.
3. Tan & D Orazio (1999). *C Programming for Engineering & Computer Science*. Mc Graw Hill.
4. Forouzan, B. A. & Gilberg R. F. (2001). *Computer Science: A Structured Programming Approach Using C*. Brooks/Cole.
5. Al Kelley and Ira Pohl (2000). *C by Dissection: The Essentials of C Programming*. 4th ed., Addison-Wesley.
6. Sprankle and Maureen (2006). *Problem Solving and Programming Concepts*. 7th Edition. Prentice Hall.

ENT 216/3
ANALOGUE ELECTRONICS II
(Pre Requisite: ENT 115/3 Analogue Electronics 1)

Course Synopsis

This course provides further knowledge on analogue electronics. The student will be exposed to the concept and operation of amplifiers including cascade amplifier, power amplifier and the operational amplifier. Students will also be introduced with the operating principles of active filters, feedback circuits, oscillators and voltage regulators.

Course Outcomes

CO1: Ability to analyze the operation, application and frequency response of power amplifiers and operational amplifiers.
CO2: Ability to analyze the principles of active filters, feedback circuits, oscillators and voltage regulators in electronic applications.
CO3: Ability to design amplifiers, active filters and oscillators.

References

1. Floyd, T. (2008). Electronic Devices. 8th ed. Prentice Hall.
2. Boylestad, R.L., and Nashelsky, L. (2008). Electronic Devices and Circuit Theory. 10th ed. Prentice Hall.
3. Cathey, J.J. (2002), "Schaum's outline of theory and problems of electronic devices and circuits", 2nd edition, McGraw-Hill.
4. Salivahanan, S., Kumar, N.S., Vallavaraj, A. (1998), "Electronic Devices and Circuits", Tata McGraw-Hill.
5. Robert A. Pease (2008). Analogue Circuits: World Class Designs. Elsevier.

ENT 217/3
PRINCIPLES OF SIGNALS & SYSTEMS

Course Synopsis

This course introduces the different types of signals and networks present in an engineering systems. Signal and system representations are discussed for both time (Fourier Series) and frequency domains (Fourier and Laplace transform). The concept of transfer function is introduced and other applications of the Laplace transform such as for the solution of differential equations, and circuit analyses are presented. The application of z-transform is introduced in the analysis of signals and systems. At the end of this course, the students are able to analyze different types of signals using numerous transformation techniques and evaluate its performance.

Course Outcomes

CO1: Ability to explain and analyze the application of Fourier Series in signals and Systems.
CO2: Ability to explain and analyze the application of Laplace Transform in Signals and Systems.
CO3: Ability to explain and analyze the application of z-transform in Signals and Systems.
CO4: Ability to communicate clearly and to use modern engineering tools for solving engineering problems.

References

1. B.P. Lathi. (2005). Linear System & Signals. Oxford University Press.
2. C.L. Phillips, J.M. Parr, E.A. Riskin. (2003). Signals, Systems & Transforms. 3rd Ed. Prentice Hall.
3. B.P. Lathi (1998). 'Signal Processing & Linear Systems', Oxford University Press.

4. M.J. Roberts (2003). 'Signals & Systems', McGraw Hill.
5. Charles L. Philips (2007). Signals, Systems and Transforms. 4th Edition. Prentice Hall.

ENT 218/3
BIOMECHANICS
(Pre Requisite: ENT 117/3 Engineering Mechanics)

Course Synopsis

The course aims to introduce the fundamental of biomechanics which covers the engineering mechanics, anatomy and basic applications on the analysis of the human body as mechanical systems.

Course Outcomes

CO1: Ability to define, explain and compare the biomechanics and anatomy terminologies and their relationships

CO2: Ability to differentiate and analyze the relationship of kinematics and kinetics of a particle and rigid body.

CO3: Ability to solve engineering problems by choosing appropriate method that related to statics and dynamics.

References

1. Susan J.H. (2007). Basic Biomechanics. 5th Ed.
2. Iwan W.G. (2006). Principles of biomechanics & Motion Analysis. 3rd Ed.
3. Ellen Kreighbaum and Katharine M Barthels (1996), "Biomechanics: A qualitative approach for studying human movement", 4th Edition.
4. David A.W. (2005), "Biomechanics and Motor Control of Human Movement", 3rd Edition.
5. Joseph H., Kathleen M.K (2003), "Biomechanical Basis of Human Movements", 2nd Edition.

ENT 219/3
BIOMATERIALS

Course Synopsis

This course is designed to provide a fundamental knowledge of materials that are commonly utilized in engineering and biomedical field specifically. Various types of materials currently being utilized for biomedical applications and their biocompatibility with references to the biological environments will be discussed.

Course Outcomes

CO1: Ability to describe the concept of biocompatibility, analyze and follow basic properties of materials in medical applications.

CO2: Ability to propose the suitable materials for specific biomedical applications and explain and display their effects with respect to biocompatibility.

CO3: Ability to assess tissue reactions to implanted biomaterials.

CO4: Ability to illustrate the main components of biomedical implants, describe their function and justify the important characteristics of the implanted materials.

References

1. Temenoff, J.S. and Mikos, A.G. (2008). Biomaterials: The Intersection of Biology and Material Science. Prentice Hall.
2. Callister W.D., "Fundamentals of Materials Science and Engineering: An Integrated Approach", 3rd ed., John Wiley, 2008.
3. Ratner, B.D., Hoffman, A.S., Schoen, F.J., Lemons, J.E. (2004). Biomaterials Science: An Introduction to Materials in Medicine. 2nd Ed. Academic Press.
4. Park, J.B., Bronzino, J.D. (2002). Biomaterials: Principles and Applications. CRC Press.
5. Shi, D. (2004). Biomaterials and Tissue Engineering. Springer.

ENT 220/3
LINEAR CONTROL SYSTEMS

Course Synopsis

This course will introduce students to linear control system techniques for analysis and design; includes mathematical modeling of electrical, mechanical and biomedical systems, stability analysis, time domain analysis and frequency domain analysis. PID and lead-lag controllers design using root locus will be discussed. The controller performance will be evaluated both in time and frequency domains. MATLAB software will be used for the analysis and design. At the end of the course, the students should be able to analyze, design and evaluate controlled systems.

Course Outcomes

CO1: Ability to analyze basic concepts of control theory applications (including biomedical systems).

CO2: Ability to analyze system response, and stability in time domain.

CO3: Ability to analyze system response, and stability in frequency domain.

CO4: Ability to design PID and lead-lag controllers.

References

1. Nise, N.S, (2009). Control Systems Engineering. 4th Ed. Wiley.
2. Ogata, K. (2002). Modern Control Engineering. 4th ed. Prentice Hall.
3. Gopal, M. (1995). Control Systems: Principles and Design. 2nd Ed. Tata McGraw-Hill.
4. Khandpur, R.S. (2003), “Handbook of Biomedical Instrumentation”, 2nd Ed. Tata McGraw-Hill.
5. Carr, J.J., Brown, J.M.(2001), “Introduction to Biomedical Equipment Technology”, 4th Ed. Prentice Hall.

ENT 221/3
BIOMEDICAL ACTS, STANDARDS & SAFETY

Course Synopsis

The course provides an introduction to the acts and standards used in biomedical engineering. This includes ethical issues and the power system safety of electrical appliances especially medical equipments. The course also focuses on the safety issues in the healthcare institution which particularly emphasized on medical devices and their interrelation with the hospital’s environment. At the end of this course, students will appreciate on how acts and standards are established with the requirements in compliance with the acts and standards. Safety aspects and measures will be emphasized so that students will be able to control and be prepared in any situation involving human life.

Course Outcomes

CO1: Ability to employ regulatory standards in ensuring safety and reliability of medical technology.

CO2: Ability to demonstrate safety awareness in dealing with hazards from medical equipment.

CO3: Ability to manage healthcare technology and demonstrate ethical responsibility in the field of biomedical engineering.

References

1. Reese, C.D. (2003). Occupational Health and safety Management: A Practical Approach. Lewis Publishers.
2. Carr, J.J. (2000). Introduction to Biomedical Equipment Technology. 4th Ed. Prentice Hall.
3. Lusardi, M.M., Nielsen, C.C. (2000). Orthotics and Prosthetics in Rehabilitation. Butterworth-Heinneman.
4. Joseph D.B. (2006). Medical Devices and Systems, Biomedical Engineering Handbook. 3rd Ed. Taylor and Francis.
5. Daniel, A.V.(2007), “Biomedical Ethics for Engineers”, Elsevier.

ENT 222/3
ELECTROMAGNETIC FIELD THEORY

Course Synopsis

The course provides a fundamental knowledge on electromagnetic. Student will be exposed to basic postulates of electrostatic and electromagnetic fields and able to solve related problems. On completion of this course, students should have a firm grasp of basic electromagnetic and identify their characteristic in different situations.

Course Outcomes

CO1: Ability to define and explain basic theory of electromagnetism.

CO2: Ability to apply the fundamental mathematics of vector analysis and Maxwell’s equations to solve and analyze electromagnetic problems.

CO3: Ability to identify and differentiate the differences of magnetic materials and relate the EM properties of materials.

CO4: Ability to analyze the characteristic and mechanism of electromagnetic wave in different situation.

References

1. William H. Hayt, Jr and John A. Buck “Engineering Electromagnetics”, 7th Ed., McGraw Hill International Ed. 2006.
2. Ulaby, F.T. (2003). Fundamental of Applied Electromagnetics. Prentice Hall.
3. Kraus, J.D., Fleisch, D.A. (1999). Electromagnetics. 5th ed. McGraw-Hill.
4. Cheng D.K. (1992). Fundamental of Engineering Electromagnetics. Prentice Hall.
5. Dragan Poljak, “Human Exposure to Electromagnetic Fields”, WIT Press, 2004.

ENT 223/3
MACHINES & ELECTRICAL DRIVES

Course Synopsis

This course provides the students both theories and applications of electrical machines and drives which include different types of motor, generator and transformer. This course allows the students to identify and select a suitable electrical machines and drives for various applications.

Course Outcomes

CO1: Ability to explain the principle and operation of different types of electrical machines.
CO2: Ability to compare and analyze the performance characteristics of electrical machines.
CO3: Ability to explain and compare the different types of electrical drives.
CO4: Ability to select and design suitable electronic drives for speed control of electrical machines.

References

1. Theodore Wildi (2006). Electrical Machines, Drives, and Power Systems. 6th Edition.
2. S.J. Chapman (2005), Electric Machinery Fundamentals, 4th Edition, McGraw Hill.
3. Leonard L. Gigsby (2007), Electric Power Engineering Handbook, 2nd Edition, CRC Press.
4. J. F. Gieras (2008). Advancements in Electric Machines (Power Systems), Springer.
5. Andre Veltman (2007). Fundamentals of Electrical Drives (Power Systems), Springer.

ENT 241/3
FLUID MECHANICS I

Course Synopsis

This course aims to develop the student basic knowledge on the principles of fluid mechanics and the application of these principles to practical, applied problems. Emphasis is on fluid properties, fluid statics, flow of fluids in pipes, and in non-circular conduits. The students shall also be introduced on momentum analysis and its application in engineering problems.

Course Outcome

CO1: Ability to identify and calculate various properties of fluids.
CO2: Ability to respond and analyze problems related to fluids statics, fluids kinematics, and conservation of mass and Bernoulli equation.
CO3: Ability to analyze momentum of flow systems, identify moments acting on a control volume and use control volume analysis to determine the forces associated with fluid flow.

References

1. Yunus A. Cengel and John M. Cimbala (2008). *Fluids Mechanics: Fundamentals and Applications*. Int'l Edition, McGraw-Hill.
2. Robert L. Mott (2006). *Applied Fluid Mechanics*. 6th Edition, Pearson.
3. M.C.Potter and D.C. Wiggert (2002). *Mechanics of Fluids*, 3rd Edition, Brooks/Cole.
4. Robert W. Fox and A.T. McDonald (1998). *Introduction to Fluid Mechanics*. 5th Edition, John Wiley and Sons.
5. JF Douglas, JM Gasiorek, JA Swaffield and LB Jack (2005). *Fluid Mechanics*. 5th Edition, Prentice Hall.

ENT 242/3
SOLID MECHANICS I

Course Synopsis

The objective of the course is to introduce the fundamental theories of solid mechanics. The basic of mechanics that have been learned in static and dynamic subjects will be extended and emphasized on solid materials. The course covers the law of mechanics, the concept of stress and strain, torsion and bending. The theoretical knowledge will be emphasized with practical in the lab. The tests of tensile and torsion will be performed. The testing of materials will be referred to international standards so that the students have a proper knowledge of material testing.

Course Outcome

CO1: Ability to apply the fundamental theory of solid mechanics (mechanical properties, the relation between stress and strain).
CO2: Ability to identify, calculate and analyze cases of axial loading, torsion, bending.
CO3: Ability to apply and solve the combination cases by using the stress and strain transformation.

References

1. Hibbeler, R.C. (2008). *Mechanics of Materials*. 7th ed., Prentice Hall.
2. Ferdinand P. Beer (2006). *Mechanics of Materials*. 4rd ed., McGraw-Hill.
3. Barber, J.R. (2001). *Intermediate Mechanics of Materials*. McGraw-Hill.
4. Madhuhar Vable (2002) *Mechanics of Materials*. Oxford.
5. Raymond Parnes (2001). *Solid Mechanics in Engineering*. John Willey & Sons.

ENT 243/3
THERMODYNAMICS II
(Pre Requisite: ENT 143/3 Thermodynamics I)

Course Synopsis

To introduce the concepts and the applications of thermodynamics to the students of mechanical engineering. Emphasis will be given to the gas power cycles, vapour power cycles, refrigeration cycles, gas mixture, gas vapour mixtures and air-conditioning, chemical reactions, compressible flow and the applications in industry and in everyday life.

Course Outcome

CO1: Ability to identify, describe, and illustrate the concepts of gas and vapour power cycles and their applications. Ability to evaluate and solve the related problems.
CO2: Ability to explain refrigeration cycles, heat pumps and refrigerant selection. Ability to calculate and evaluate problems of refrigeration cycles.
CO3: Ability to describe, apply, evaluate and solve the problems of gas mixtures, gas–vapour mixture and air conditioning.
CO4: Ability to explain, interpret and determine the chemical reactions, reacting systems and the adiabatic flame temperature. Ability to explain the concepts of compressible flow and evaluate problems on stagnation, Mach. No., isentropic flow, shock wave and expansion wave.

References

1. Y.A. Cengel and M.A. Boles (2009). *Thermodynamics: An Engineering Approach*. 6th edition, McGraw-Hill.
2. Kurt C. Rolle (2005). *Thermodynamics and Heat Power.* University of Wisconsin-Platteville.
3. Davin Dunn (2001). *Fundamental Engineering Thermodynamics.* Illustrate edition, Longman Group, United Kingdom.
4. W.Z. Black and J.G. Hartley (1996). *Thermodynamics*. English/SI version, 3rd edition, Prentice-Hall.
5. M.J. Moran and H.N. Shapiro (1998). *Fundamentals of Engineering Thermodynamics.* 3rd Edition, John Wiley & Sons.
6. R. Sonntag, C. Borgnakke and G. Van Wylen (1998). *Fundamentals of Thermodynamics*. 5th Edition, John Wiley and Sons.

ENT 244/3
MANUFACTURING PROCESSES

Course Synopsis

This course is an introduction of manufacturing processes and techniques used in industry to convert raw materials into finished or semi-finished part. This includes the study on the characteristics of manufacturing processes such as forming, casting, moulding, rapid prototyping, non-conventional machining and welding, soldering and mechanical fasteners. The influence of materials and processing parameters in understanding individual processes are also highlighted

Course Outcome

CO1: Ability to describe and choose the right raw materials for selected manufacturing processes.
CO2: Ability to describe, display and analyze the manufacturing processes for a finished product.
CO3: Ability to choose, compare and evaluate the use of proper machine to complete a particular manufacturing process.

References

1. S.Kalpakjian and S.R. Schmid (2006). *Manufacturing Engineering and Technology*. 5th ed., Prentice Hall International.
2. S.K.Garg (2006). *Workshop Technology: Manufacturing processes*. 2nd Edition, Laxmi Publications.
3. Krar, Steve F., Gill, Arthur R. and Smid, Peter (2005). *Technology Of Machine Tools.* 6th Ed., McGraw Hill.
4. Groover, M.P. (2002). *Fundamental of Modern Manufacturing.* Prentice Hall.
5. Zainal Abidin Ahmad (1999). *Proses Pembuatan*. Penerbit UTM, Johor.

ENT 245/4
PRODUCT DESIGN DEVELOPMENT

Course Synopsis

The objective of this course is to present in a clear and detailed way a set of product development methods aimed at bringing together the marketing, design, and manufacturing functions of the enterprise. This course aims to develop an understanding of customer's needs and product marketability through the subject theme of "Customers/ User Centred Design". Student will use appropriate engineering approaches and methods to analyze user needs and formulate solution to the design problems.

Course Outcome

CO1: Ability to identify design requirements from general problem descriptions.
CO2: Ability to develop systematically a design from concept to prototype.
CO3: Ability to communicate clearly design ideas and information.
CO4: Ability to evaluate critically the designs using engineering criteria and predictive usage.

References

1. K.T. Ulrich and S. D. Eppinger (2008). *Product Design and Development*, 4th Edition, McGraw-Hill.
2. Richard Budynas and J. Keith Nisbett (2008). *Shigley's Mechanical Engineering Design*. Eighth Edition, McGraw Hill.

3. Joseph E. Shigle and Charles R. Mischke (2001). *Mechanical Engineering Design*. Sixth Metric Edition.
4. Karl T. Ulrich and Steven D. Eppinger (2004). *Product Design and Development*, 3rd Edition, McGraw-Hill.
5. David G. Ullman and David Ullman (2003). *Mechanical Design Process*. 3rd Edition, McGraw Hill.
6. Robert L. Mott (1992). *Machine Elements in Mechanical Design*. 2nd Edition, Maxwell and Macmillan International.
7. Alexander H. Slocum (1992). *Precision Machine Design*, Prentice-Hall International.
8. M. F. Spotts (1992). *Design of Machine Elements.* 6th Edition, Prentice-Hall.
9. Robert C. Juvinall and Kurt M. Marshek (!991). *Fundamentals of Machine Component Design*. 2nd Edition, John Wiley & Sons.

ENT 246/3
SOLID MECHANICS II

Course Synopsis

The objective of the course is to enhance the understanding of the topics that have been learned in Solid Mechanics I. The topics is extended and emphasized on stress transformation occur in beam, shaft and member. It is also covered an introduction on buckling and energy method theory.

Course Outcome

CO1: Ability to analyze shaft, beam and member subjected to various loadings and develop a stress strain transformation analysis.

CO2: Ability to recognize, calculate and solve deflection in structural analysis, calculate buckling and strain energy applied by various loadings.

CO3: Ability to calculate buckling and strain energy applied by various loadings.

References

1. Hibbeler, R.C. (2009). *Mechanics of Materials*. 12th ed., Prentice Hall.
2. Pytel. Kiusalaas (2001). *Mechanics of Materials*. 3rd ed., McGraw-Hill.
3. Barber, J.R. (2001). *Intermediate Mechanics of Materials*. McGraw-Hill.
4. Madhuhar Vable (2002). *Mechanics of Materials*. Oxford.
5. Raymond Parnes (2001). *Solid Mechanics in Engineering*. John Willey & Sons.

ENT 247/3
FLUID MECHANICS II
(Pre Requisite: ENT 241/3 Fluid Mechanics I)

Course Synopsis

This course is to develop the knowledge of student on dimensional analysis and modelling. Emphasis is given to explain equations of motion, and inviscid flow. Some basic, plane potential flows with their superposition are analyzed. Compressible fluid flow and particle mechanics are also covered in this course. At last will be exposed to the concept and analyze of turbo machinery.

Course Outcome

CO1: Ability to analyze dimensional analysis, modelling, and problems related to losses in pipe flows and flow over bodies.

CO2: Ability to evaluate the consequences of compressibility in gas flow and/or the effect of area changes for one dimensional isentropic subsonic and supersonic flows.

CO3: Ability to develop analytical techniques for particle mechanics problems based on Stoke's law/ Darcy's law/Carmen-Kozeny equation in fluid systems.

CO4: Ability to analyze different type of turbomachinery.

References

1. Yunus A. Cengel and John M. Cimbala (2008). *Fluids Mechanics: Fundamentals and Applications.* Int'l Edition, McGraw-Hill.
1. Robert L. Mott (2006). *Applied Fluid Mechanics.* 6th Edition, Pearson.
2. M.C.Potter and D.C. Wiggert (2002). *Mechanics of Fluids*. 3rd Edition, Brooks/Cole.
3. Robert W. Fox and A.T. McDonald (1998). *Introduction to Fluid Mechanics.* 5th Edition, John Wiley and Sons.
4. JF Douglas, JM Gasiorek, JA Swaffield and LB Jack (2005). *Fluid Mechanics*. 5th Edition, Prentice Hall.

ENT 256/4
MACHINE DESIGN

Course Synopsis

This course enables the students to comprehend and identify theoretical design as well as the machine elements that need to be considered in machine design process. This course also encourages the students to think as a machine designer. The concept and principle of machine design taught will be applied in designing machine, focusing on the outcome of innovative student thinking.

Course Outcomes

CO1: Ability to discuss, apply, and organize the concept and principle of design process.
CO2: Ability to discuss, apply, and organize machine elements and analyze position, velocity and acceleration of a point in a linkage.
CO3: Ability to analyze, and construct machine elements to develop a mechanism.
CO4: Ability to apply, analyze and sketch mechanism design (linkage synthesis).

References

1. Robert L. Norton (2008). *Design of Machinery*. 5th Ed., McGraw Hill.
2. David H. Myszka (2005). *Machine & Mechanisms: Applied Kinematic Analysis*. Prentice Hall.
3. Richard G. Budynas and J. Keith Nisbet (2008). *Shigley's Mechanical Engineering Design*. 8th Ed., McGraw Hall.
4. Robert L. Mott (2006). *Machine Elements in Mechanical Design.* 4th Ed. in SI Units, Prentice-Hall.
5. Charles E. Wilson and J. Peter Sandler (2006). *Kinematics and Dynamics of Machinery.* 3rd Ed., Pearson Prentice-Hall.

ENT 263/4
DIGITAL ELECTRONICS
(Pre Requisite: ENT 162/4 Analogue Electronics)

Course Synopsis

This course is designed to introduce the basic principle of digital systems and digital circuit design with analysis. Lecture and practical will cover the following: Algebra Boolean, Numbering system, Basic Logic Gate, Combinational Logic Circuit Design, Bi-stable Memory Devices and Sequential Circuits Design.

Course Outcomes

CO1: Ability to explain the concepts of digital electronic system.
CO2: Ability to analyze the combinational logic circuit.
CO3: Ability to analyze the sequential logic circuit.
CO4: Ability to apply the digital electronic components in Mechatronic engineering applications.

References

1. Flyod, T.L., "Digital Fundamentals", 10th. Ed., Prentice Hall 2009.
2. M.M. Mano, "Digital Design", 3rd Ed., Prentice-Hall 2002.
3. Tocci, RJ., "Digital systems: Principles and Applications", 8th Ed., Prentice Hall 2001.
4. N. Balabanian and B. Carlson, "Digital Logic Design Principles", 1st Ed., John Willey
5. W. Kleitz, "Digital Electronics: A Practical Approach", 6th Ed., USA: Prentice-Hall, 2004

ENT 268/3
PRINCIPLES OF ELECTROMAGNETICS

Course Synopsis

This course is designed to introduce the theories and concepts of electromagnetic fields. Student will be exposed to basic postulates of electrostatic and electromagnetic fields and able to solve related problems. Finally the students will be developing the ability to apply the fundamental mathematics of vector analysis and Maxwell's equations to in electromagnetic problems.

Course Outcomes

CO1: Ability to perform analysis on electric field, electric potential and capacitance due to any distribution of electric charges.
CO2: Ability to perform analysis on magnetic field, magnetic flux density and inductance due to any current distribution.
CO3: Ability to perform analysis on Maxwell's equations and problems related to electromagnetic field.

References

1. Matthew N.O. Sadiku "Elements of Electromagnetics", 4th Ed., Oxford University Press, 2007.
2. William H. Hayt, Jr and John A. Buck "Engineering Electromagnetics", 7th Ed., McGraw Hill International Ed. 2006.
3. David K. Cheng, "Fundamentals of Engineering Electromagnetics" Addison Wesley, 1992.
4. Fawwaz T. Ulaby, "Fundamentals of Applied Electromagnetics", 5th Ed., Pearson International Edition, 2007.
5. Joseph A. Edminister, "Schaum's Outline of Theory and Problems of Electromagnetics", 2nd Ed., McGraw Hill International Ed. 1995.
6. Kraus/Fleisch, "Electromagnetics with Applications", 5th Ed., McGraw Hill International Ed. 1999.

ENT 281/3
SIGNALS AND SYSTEMS

Course Synopsis

This course provides the basics of different types of signals, transformation techniques and communication system. In addition, the students are also exposed to the design of Linear Time Invariant system and its characteristics in this course. Various signal transformation methods on two different domains (time and frequency) such as Fourier series, Fourier transform, Z Transform and Laplace transform is also studied. At the end of this course, the students are able to analyze different types of signals using numerous transformation techniques and evaluate its performance.

Course Outcomes

CO1: Ability to comprehend the concept and identify specific type of signals and systems.
CO2: Ability to analyze the signal using time and frequency domain techniques.
CO3: Ability to develop and formulate a system using both time-domain and frequency-domain techniques.

References

1. Simon Haykin and Barry Van Veen, "Signals and Systems", Wiley, 2nd Edition, 2002.
2. John G. Proakis and Masoud Salehi, "Fundamentals of Communication System", Prentice- Hall, 2005.
3. Charles L. Phillips, John M. Parr, Eve A. Riskin; "Signals, Systems and Transforms", Prentice Hall, Fourth Edition, 2009.
4. M.J. Roberts, "Signals and Systems", International Edition, McGraw Hill, 2003.

ENT 286/3
INSTRUMENTATIONS AND MEASUREMENTS

Course Synopsis

This course provides the knowledge of measurement and instrumentation with various transducers and techniques involving physical phenomena. This includes an overview of general measurement system, errors and signal characteristics, followed by diverse type of sensors and their application in measuring electronics signal, temperatures, humidity, displacement as well as velocity and acceleration, force, torques strain and stress and also the flow rate measurement. The use of computer for interfacing application is also covered in this course.

Course Outcomes

CO1: Ability to explain basic concepts of transducers, sensors and measurement techniques and errors in measurement.
CO2: Ability to apply interfacing concept between transducers, computer and signals obtained from measurement techniques.
CO3: Ability to design measurement system using suitable sensors and transducers.

References

1. Anthony J.W., Ahmad R.G., "Introduction to Engineering Experimentation", 3rd Ed., Prentice Hall, 2010
2. Bentley, J.P., "Principles of Measurement Systems", 4th Edition, Prentice Hall, 2005.
3. Johnson, C., "Process Control Instrumentation Technology", 8th Edition, Prentice Hall, 2006.
4. Doebelin, E.O., "Measurement System: Application and Design", Mc Graw Hill, 2004.
5. Sinclair, I., "Sensors and Transducers", 3rd Edition, Newnes, 2001.

ENT 288/3
MICROPROCESSORS

Course Synopsis

The aim of this course is to study the microprocessor architecture and relate that knowledge to the design of microprocessor based systems. This includes evaluation of a simple application on a microprocessor-based system. This also includes the knowledge of assembly language programming, I/O interfacing, arithmetic operations, data transfer, timers, serial port programming, interrupts, LCD and keyboard interfacing and data converters. The students must able to design and develop simple real-world applications based on PIC 18 microcontroller system.

Course Outcomes

CO1: Ability to describe and explain the theory and basic architecture of microprocessors.
CO2: Ability to write programmes using assembly language and illustrate the PIC18 microcontroller built-in functions.
CO3: Ability to choose the I/O devices and develop a simple microcontroller-based application.

References

1. Muhammad Ali Mazidi, Rolin D. Mckinlay & Danny Causey PIC Microcontroller and Embedded Systems: Using Assembly and C for PIC18, Pearson Prentice Hall 2008.
2. Barry B. Brey Applying PIC18 Microcontrollers: Architecture, Programming, and Interfacing using C and Assembly, Pearson Prentice Hall 2008.

3. Huang Han-Way PIC Microcontroller: An Introduction to Software and Hardware Interfacing, Thomson & Delmar Learning, 2005.
4. John B. Peatman Design with PIC Microcontrollers, Prentice Hall, 1998.
5. Martin Bates "Interfacing PIC Microcontrollers: Embedded Design by Interactive Simulation", Newnes 2006.

ENT 289/3
DRIVES AND POWER ELECTRONICS

Course Synopsis

This course is intended to introduce to the Mechatronic students both theories and applications of: 1) Electromechanical drives, which consists of DC and AC machines, stepper and servo motor, 2) fundamental elements of power electronics and electronic drive control, consisting switching converters and pulse-width-modulation (PWM) techniques and variable speed operation of induction motor and 3) Actuator, which consists of Linear and rotary driven actuator, characteristics of mechanical actuator, selection of actuator. This course also allows the students to identify and select drives and actuators which are suitable for applications.

Course Outcomes

CO1: Ability to choose based on the characteristics for various types of a drive system.
CO2: Ability to analyze and evaluate the performance of different types of a drive system.
CO3: Ability to design and evaluate the drive system and actuators for an optimum performance in various applications.

References

1. Theodore Wildi. Electrical Machines, Drives, and Power Systems. Sixth Edition, 2006.
2. Anthony Esposito. Fluid Power with applications. Sixth Edition, 2003.
3. Charles E. Wilson and J. Peter Sadler. Kinematics and Dynamics of Machinery. Third Edition in SI Units, 2006.
4. Ned Mohan, Electric Drives: An Interactive Approach, MNPERE, 2004.
5. W. Bolton, "Mechatronics: Electronic Control Systems in Mechanical & Electrical Engineering", 3rd Ed., 2003.

ENT 315/4
MEDICAL SIGNAL PROCESSING
(Pre Requisite: ENT 217/3 Principles of Signal and System)

Course Synopsis

This course is an introduction to classification of digital signals and systems and also explains the application of different types of transform domains in the analysis of discrete signals and systems. The course covers the application of discrete Fourier transform (DFT) and fast Fourier transform (FFT) to analyze the digital signals. This course also covers the design of finite impulse response (FIR) filters and infinite impulse response (IIR) filters for analyzing biomedical signals. Finally, this course discusses the application of digital signal processing and digital signal processors. MATLAB software is used in the laboratory sessions.

Course Outcomes

CO1: Ability to explain the basic concept of DSP and acquisition signal process.
CO2: Ability to explain on the filter used and its design.
CO3: Ability to discuss on image processing method.
CO4: Ability to discuss the tools used for DSP.

References

1. Proakis J.G. and Manolakis D.G., (2007), "Digital Signal Processing: Principles, Algorithms and Applications" 4th edition, Prentice Hall
2. Lyons R.G., (2004), "Understanding Digital Signal Processing", 2nd ed, Prentice Hall
3. Mitra S.K., (2006), "Digital Signal Processing", McGraw-Hill
4. Charles L.Byrne (2005). Signal Processing: A Mathematical Approach, Wellesley.
5. Steven Smith (2003). Digital Signal Processing: A Practical Guide for Engineers and Scientists, Elsevier.

ENT 316/3
PRINCIPLES OF COMMUNICATION SYSTEMS

Course Synopsis

This course is designed to introduce the principles of communication system and its applications in communication, broadcasting and other modern equipments. At the end of the course, the students are expected to provide clear understanding in fundamental communication system, relate the principles to various applications in engineering field and propose a conceptual model of a communication setup.

Course Outcomes

CO1: Ability to analyze mathematical function of communication system model.

CO2: Ability to evaluate performance of elements in communication device.
CO3: Ability to propose a conceptual setup of a communication system based on specific requirement.

References

1. Louis E. Frenzel (2008), "Principles of Electronic Communication Systems", 3rd Ed., McGraw-Hill, 2008.
2. N. Benvenuto, R. Corvaja, T. Erseghe, N. Laurenti (2007), Communication Systems – Fundamentals and Design Methods, Willey.
3. Wayne Tomasi (2004), "Electronic Communication System, Fundamental Through Advanced",5th Ed., Pearson Prentice Hall.
4. William L. Schweber (2002), "Electronic Communication Systems: A Complete Course", 4th Edition, Prentice Hall.
5. Mullet (2003)," Basic Telecommunications: The Physical Layer", Thomson Learning.

ENT 317/4
MEDICAL ELECTRONICS & BIOINSTRUMENTATION

Course Synopsis

This course provides an intensive introduction to medical electronics and bioinstrumentation. It will covers sensors and instrumentation for medical applications, as well as measurement of biosignals, such as electrocardiogram (ECG), electroencephalography (EEG), blood pressure and respiratory system. At the end of the course, the students are expected to provide clear understanding in various medical instrumentation principles and demonstrate the ability to apply basic sensors and design basic electronic circuits for medical applications.

Course Outcomes

CO1: Ability to define, discuss, apply, distinguish and assemble basic sensors and transducers in a medical instrumentation system.
CO2: Ability to apply, analyze, design, evaluate and assemble instrumentation amplifiers and analogue filter circuits in medical instrumentation.
CO3: Ability to discuss, explain, apply and analyze medical devices involved in the measurement of cardiovascular and respiratory system.
CO4: Ability to discuss, explain, apply and analyze fundamental concepts in cardiac therapeutic devices and basic medical imaging modalities.

References

1. Webster, J.G. (2010). Medical Instrumentation: Application and Design. 3rd Ed. Wiley.
2. Webster, J.G. (2003). Bioinstrumentation. Wiley.
3. Perez, R. (2002). Design of Medical Electronic Devices. Academic Press.
4. Carr, J.J. (2000). Introduction to Biomedical Equipment Technology. 4th Ed. Prentice Hall.
5. Khandpur, R.S (2007).'Handbook of Biomedical Instrumentation', 2nd Edition, Tata McGraw-Hill.

ENT 318/3
ARTIFICIAL ORGANS

Course Synopsis

This course covers the artificial organ for the heart, kidney, lung, pancreas and ear. These topics focus on the implementation of artificial organs by understanding the anatomical, physiological and biological transport aspects as well as mathematical concepts of the respective organs. At the end of the course, students are expected to have the ability to apply the fundamental principles of the artificial organs, perform simple modeling and able to propose the suitable methods/ devices for each problematic organ.

Course Outcomes

CO1: Ability to describe concepts, fundamental principle and problems regarding artificial organs.
CO2: Ability to analyze mathematical concepts of human physiology, biotransport and artificial organs.
CO3: Ability to illustrate modelling and simulation of human physiological system and artificial organs.

References

1. Marieb E.N. (2006), "Essentials of Human Anatomy and Physiology", 8th Edition, Pearson Benjamin Cummings.
2. Lee Waite, (2006), "Biofluid Mechanics in Cardiovascular System", Mc Graw Hill.
3. Truskey G.A., Fan Yuan, Katz D.F., (2004) "Transport Phenomena in Biological System", Prentice Hall.
4. Dayan P., Abbott L.F., (2001) "Theoretical Neuroscience", MIT Press.
5. Ritter A.B., Reisman S., Michniak B.B., (2005), "Biomedical Engineering Principles", CRC Press.

ENT 319/3
THERMOFLUIDS

Course Synopsis

The objective of the course is to expose the students to the fundamental principles of fluid mechanic, thermodynamic, heat transfer, and also fundamental application of fluid mechanics in Biomedical Engineering. In Fluid Mechanics attention will be given to the fundamental principles of fluid mechanics and definition, fluid statics, fluid dynamics, and flow over bodies. In Thermodynamics focus is on the fundamental principles of thermodynamics and definition, the Zeroth law, the first law and the 2nd law. In Heat Transfer, different modes through conduction, convection and radiation to be covered.

Course Outcomes

CO1: Ability to define, explain and analyze the fundamental principles of thermofluids.
CO2: Ability to define, explain and analyze the fundamental principles of thermodynamics.
CO3: Ability to define, explain and analyze the fundamental principles of heat transfer.

References

1. Massoud, M. (2005). Engineering Thermofluids: Thermodynamics, Fluid Mechanics, and Heat Transfer. 1st Ed. Springer.
2. Cengel Y.A, Boles M.A. (2001). Thermodynamics: an engineering approach. 4th Ed. McGraw Hill.
3. Marquand, C. (2000). Thermofluids: an integrated approach to thermodynamics and fluids mechanics principles. John Willey.
4. Y.A Cengel and R.H Turner. (2008). Fundamental of Thermal Fluid Sciences. 3nd Edition, Mc Graw Hill.
5. Lee Waite (2006), “Biofluid Mechanics in Cardiovascular System”, McGraw Hill.

ENT 331/3
MANAGEMENT PRODUCTION AND CONTROL OF QUALITY

Course Synopsis

This course introduces productivity management such as competitiveness, ratios, work study, learning rates, and linear programming. It also introduces definitions of quality, its dimensions and views, concepts and techniques of total quality control such as statistical process control, process capability, acceptance sampling, and the relationships between productivity and quality. Where applicable, appropriate operations management software will be introduced.

Course Outcomes

CO1: To understand the productivity concepts from different aspects of management,
CO2: To understand the Six Sigma management tools.
CO3: To be able to understand the statistical methods used in quality control and improvement,
CO4: To understand the methods on how labour can improve their productivity and the measurements used to measure the labour productivity.

References

1. Evans, J.R & Lindsay, W.M. (2007). The Management and Control of Quality. 7th Edition. Thompson Learning.
2. Foster, (2006). Managing Quality. 2nd ed. Prentice Hall.
3. Kolarik, W.J. (2005). Creating Quality Concepts, Systems, Strategies, and Tools. McGraw Hill.
4. Besterfield, Dale H. Quality control 7th Edition. Upper Saddle River, New Jersey: Pearson Prentice-Hall, Inc.: 2006
5. C. M. Creveling,, J. L. Slutsky, D. Antis, Jr. Design for Six Sigma in Technology and Product Development, Prentice Hall, 2003

ENT 342/3
COMPUTATIONAL FLUID DYNAMICS

Course Synopsis

This course offers comprehensive contents about computational fluid dynamics. It introduces to finite difference and finite volume methods in the analysis of linear and nonlinear problems. This course discusses inviscid incompressible and compressible fluid flow governed by Euler equations and also incompressible and compressible viscous flows governed by boundary layer and Navier-Stokes equations and explain the concept of simple turbulence modelling.

Course Outcome

CO1: Ability to formulate the mathematic equations to fluid mechanics problem.
CO2: Ability to analyze the CFD results using different types of elements.
CO3: Ability to apply the CFD technique to some applications concerning fluid flow and heat transfer problems.

References

1. Pradip Niyogi, S.K. Chakrabartty and M.K. Laha (2005). *Introduction to Computational Fluid Dynamics*. Pearson.
2. Versteeg, Versteeg, Malalasekra and Malalasekra (2007). *An introduction to Computational Fluid Dynamics: The Finite Volume Method*. 2nd Ed., Pearson.
3. Oleg Zikanov (2010). *Essential Computational Fluid Dynamics*. John Wiley.
4. H.K. Versteeg and W. Malalasekera (1996). *An introduction to Computational Fluid Dynamics: The Finite Volume Method*. 2nd Ed., Longman Scientific & Technical.
5. John D. Anderson, Jr. (1995). *Computational Fluid Dynamics: The Basics with Applications*. McGraw-Hill International editions.
6. Jiyuan Tu, Guan Heng Yeoh and Chaoqun Liu (2008). *Computational fluid dynamics: a practical approach*. Amsterdam: Butterworth-Heinemann.

ENT 343/3 PRINCIPLES OF HEAT TRANSFER

Course Synopsis

This course offers comprehensive contents about energy transferred by interactions of a system with its surrounding which is heat and work. Extended from thermodynamics analysis through study of the modes of heat transfer: conduction, convection and radiation, and through development of relations to calculate heat transfer rate. This course also introduces performance parameters for assessing the efficacy of a heat exchanger and develops methodologies for designing a heat exchanger or for predicting the performance of an existing exchanger operating under prescribed conditions. Mass transfer being introduced in order to extend the knowledge of energy transferred.

Course Outcome

CO1: Ability to formulate heat transfer basic principles i.e. conduction, convection and radiation i.e. Fourier equations, Newton's low of cooling and Black body radiation. Emphasis will be given in ability to estimate heat conduction in steady state and apply the transient heat conduction, and also to evaluate convection problem in fluid flow both in internal and external force.

CO2: Ability to evaluate heat transfer in heat exchangers.

CO3: Ability to evaluate the problems of mass heat transfer, estimate the mass-transfer coefficient and solve the problem for its application in evaporation process.

References

1. Cengel, Y.A. (2008). *Heat Transfer: A Practical Approach*. 3th ed. In SI Units, McGraw-Hill.
2. Holman, J. P. (2010). *Heat Transfer*. 10th Edition, Mc Graw Hill.
3. Frank P. Incropera and David P. Dewitt (2007). *Introduction to Heat Transfer*. 5th Edition, John Wiley & Sons.
4. Arpaci, Selamet and Kao (2000). *Introduction to Heat Transfer*. Prentice Hall.
5. Mohammad Zainal Mohd Yusof (1991). *Pemindahan Haba Kejuruteraan*. Edisi Kedua, 2nd Edition, Penerbit Universiti Teknologi Malaysia.

ENT 345/4 MECHANICAL COMPONENTS DESIGN

Course Synopsis

The objective of the course is to introduce the concepts and principles of mechanical design. The course begins with understanding the design fundamental and followed by the component selection, stress analysis, failure theories, designing mechanical elements. Mechanical elements are screw and fasteners, mechanical springs, bearings, gear, clutches, brakes and flexible mechanical elements. The knowledge of mechanical design will be implemented in a mini project as laboratory assignment - A design of a mechanical machine by utilizing CAD software, Mdesign and Solidworks.

Course Outcome

CO1: Ability to explain, applies the design principles, display the designed model and analyze the failure criterion in mechanical components.

CO2: Ability to explain material properties, select appropriate material and analyze mechanical components using stress and deformation analysis.

CO3: Ability to analyze, propose and display mechanical components for selected mechanical systems.

References

1. Richard Budynas and J. Keith Nisbett (2008). *Shigley's Mechanical Engineering Design*. Eighth Edition, McGraw Hill.
2. Karl T. Ulrich and Steven D. Eppinger (2004). *Product Design and Development*. 3rd Edition, McGraw-Hill.

3. David G. Ullman and David Ullman (2003). *Mechanical Design Process.* 3rd Edition, McGraw Hill.
4. Robert L. Mott (1992). *Machine Elements in Mechanical Design*. 2nd Edition, Maxwell and Macmillan International.
5. Alexander H. Slocum (1992). *Precision Machine Design*. Prentice-Hall International.
6. M. F. Spotts (1991). *Design of Machine Elements*. 6th Edition, Prentice-Hall.
7. Robert C. Juvinall and Kurt M. Marshek (1991). *Fundamentals of Machine Component Design*. 2nd Edition, John Wiley & Sons.

ENT 346/3
VIBRATION MECHANICS

Course Synopsis

The objective of the course is to introduce the students with the skills and knowledge in vibrations disciplines. The syllabus covers the fundamental of vibration and oscillation motion, free vibration, force vibration, transient vibration, two degree of freedom systems and multiple degree of freedom systems. The students will be well prepared towards industrial application elements such as vibration control, vibration measurement and signal analysis methods.

Course Outcome

CO1: Ability to describe basic concept of vibrations and its applications, analyze simple-harmonic motion, measure free and force vibration for single degree of freedom.
CO2: Ability to analyze and measure the response of various systems (two degree and multi degrees of freedom) to various inputs (free and force excitation).
CO3: Ability to develop a model and assess vibration system parameter and estimate effectiveness of vibration isolation.
CO4: Ability to develop the operating measurement and analyze the vibration signals.

References

1. Singiresu S. Rao (2000). *Mechanical Vibration*. Fourth Edition, Prentice Hall.
2. W. Thomson (2004). *Theory of Vibration With Application*. Prentice Hall.
3. W. J. Palm III (2005). *Mechanical Vibration*, John Wiley & Sons.

ENT 347/3
FINITE ELEMENT METHODS

Course Synopsis

The objective of this course is to introduce finite element methods for approximate numerical solutions to engineering problems. The course concentrates on solution of structural problems, but also provides the basis for expanding to other engineering filed problem. The formulation and solution of the finite element system equations for 1, 2 and 3 dimensional elements will be discussed including on how to assemble the finite element equations and applying boundary conditions. Analyses will be conducted using computer programming and commercial FEA software.

Course Outcome

CO1: Ability to understand the fundamental of finite element analysis concepts
CO2: Ability to derive global stiffness matrices for plane frame elements.
CO3: Ability to develop computer programme to solve beam and frame problems by using finite element analysis.
C04: Ability to model and analyze structural problem by using commercial FEM software.

References

1. Tirupathi R. Chandrupatla and Ashok D. Belegundu (2009). *Introduction to Finite Elements in Engineering*. Third edition, Prentice Hall.
2. David V. Hutton (2004). *Fundamental of Finite Element Analysis*. 1st Edition, McGraw-Hill.
3. S. S. Bhavikati (2005). *Finite Element Analysis*. New Age International Publisher.
4. I. M. Smith and D.V. Griffiths (2004). *Programming the Finite Element Method*. 4th Edition, John Wiley & Sons Ltd.
5. Kenneth H. Huebner, Donald L. Dewhirst, Douglas E. Smith and Ted G. Byrom (2001). *The Finite Element Method for Engineers*. 4th edition, John Wiley & Sons.

ENT 348/4
MECHANICAL SYSTEM DESIGN

Course Synopsis

This course is intended as an advanced knowledge of mechanical design for undergraduate level. Bringing together analytical and graphical techniques from previous courses to accomplish the design of a complete mechanism, machine or mechanical system. The course will emphasize on the analytical design techniques used to evaluate machine elements and machinery in mechanical. This course will utilize various Computer Aided Design (CAD) software as tools in analyzing and solving mechanical design problems.

Course Outcome

CO1: Ability to define kinematics of mechanisms, sketch and analyze mechanical elements of a system based on kinematics analysis.
CO2: Ability to describe and evaluate dynamics machinery at mechanical system, and sketch linkage and free-body diagrams.
CO3: Ability to describe and evaluate a balancing of machinery and engine dynamics and sketch in static and dynamic balancing of mechanical system.

References

1. R.L. Norton (2008). *Design of Machinery*. McGraw Hill.
2. Dan B. Marghitu (2005). *Kinematic Chains and Machine Components Design*. Academic Press.
3. R. L. Mott (2006). *Machine Elements in Mechanical Design*. Pearson Prentice Hall.
4. John J. Uicker, Jr., Gordon R. Pennock and Joseph E. Shigley (2003). *Theory of machines and mechanisms*. Oxford University Press, USA.
5. Myszka (2005). *Machines & Mechanisms*. Prentice Hall.
6. C.E. Wilson and J.P. Sadler (2003). *Kinematics and Dynamics of Machinery.* SI Edition, Pearson Prentice-Hall Publishers.

ENT 363/4
MACHINE VISION SYSTEMS

Course Synopsis

This course is designed to introduce the basic concepts of machine vision and provide an understanding of the basic concepts of vision and image acquisition and processing. The course also helps the students to develop the ability of designing machine vision systems for Industrial Applications.

Course Outcomes

CO1: Ability to perform analysis on image acquisition and processing concepts.
CO2: Ability to perform analysis on image feature extraction techniques.
CO3: Ability to design simple machine vision modules.

References

1. Ramesh Jain, Rangachar Kasturi and Brain G Schunck (1995). *Machine Vision.* International edition, McGraw-Hill.
2. Horn, Berthold K. P (1986). *Robot Vision*. Cambridge, MA: MIT Press/ McGraw-Hill.
3. Robert M. Haralick and Linda G. Shapiro (1993). *Computer and Robot Vision*. Addison Wesley Publishing Company Inc. U.S.A.
4. David Forsyth and Jean Ponce (2003). *Computer Vision: A modern approach*. Prentice Hall.
5. Milan Sonka, Vaclav Hlavac and Roger Boyle (1999). Image Processing Analysis and Machine Vision. Brooks/Cole Publishing Company. U.S.A.
6. S.N.Sivanandham and M. Paulraj. ‘Introduction to Artificial Neural Networks’. Vikas Publications, India, 2003

ENT 372/4
ROBOTICS

Course Synopsis

This course is designed to introduce various aspects of Robotics such as the Types of robots, Capabilities, Characteristics, Robot Control Systems and Software, Kinematic Analysis, Principles of Inverse Kinematics, Robot Sensors and Drive mechanisms, Robot Work Dell design and Various industrial Applications.

Course Outcomes

CO1: Ability to choose suitable robots for specific industrial applications.
CO2: Ability to analyze object manipulations by robots for an industrial manufacturing.
CO3: Ability of designing sensor integrated robot control system.
CO4: Ability of designing and scheduling a robot work cell for a maximum productivity.

References

1. Saeed B Niku (2001). *Introduction to Robotics*. Prentice hall.
2. M. P. Groover (1999). *Industrial Robotics*. Mc Graw Hill.
3. K H low (2003). *Robotics: Principles and System Modelling*. Prentice hall.
4. Man Zhihong (2005). *Robotics*. Prentice Hall.
5. R. D. Klaffer, T. A. Chmielewski and M. Negin (2006). *Robotic Engineering: An Integrated Approach*. Prentice-Hall, India.

ENT 373/4
EMBEDDED SYSTEM DESIGN AND APPLICATIONS
(Pre Requisite: ENT 288/3 Microprocessors)

Course Synopsis

The aim of this course is to enable the students to learn the concepts and requirements, as well as design a self-contained embedded system. This includes the study on the characteristics of embedded systems, hardware and software development, single chip microcontroller and programming techniques in C language and developing an embedded system application.

Course Outcomes

CO1: Ability to write a structured programme in C language for embedded system application.
CO2: Ability to choose and apply input output devices to microcontroller.
CO3: Ability to evaluate and develop a self-contained embedded system application.

References

1. Muhammad Ali Mazidi, Rolin D. Mckinlay and Danny Causey (2008). *PIC Microcontroller and Embedded Systems: Using Assembly and C for PIC18*. Pearson Prentice Hall.
2. Barry B. Brey (2008). *Applying PIC18 Microcontrollers: Architecture, Programming, and Interfacing using C and Assembly*. Pearson Prentice Hall.
3. Richard H. Barnett, Sarah Cox and Larry O'Cull (2004). *Embedded C Programming and the Microchip PIC*. Thomson & Delmar Learning.
4. Tim Wilmshurst (2007). *Designing Embedded Systems with PIC Microcontrollers: Principles and Applications*. Newnes.
5. Martin Bates (2006). *Interfacing PIC Microcontrollers: Embedded Design by Interactive, Simulation*. Newnes.

ENT 374/3
POWER SYSTEMS ENGINEERING
(Pre Requisite: ENT 161/4 Electrical Circuits)

Course Synopsis

This course aims to provide basic concepts of power systems which include transmission line, transformer, power flow, fault analysis and system protection.

Course Outcomes

CO1: Ability to discuss the functional concepts of various sections of a power system network.
CO2: Ability to illustrate the functions of single phase, three phase transmission lines and transformers in power flow.
CO3: Ability to analyze fault conditions using symmetrical components.
CO4: Ability to design system protection schemes in a power flow network.

References

1. Glover, Sarma and Overbye (2007). *Power Systems Analysis and Design*. Fourth Edition, Thomson.
2. Steven W.Blume (2007). Electric Power System Basics-for the Non electrical Professional, Wiley Interscience.
3. Mukund R. Patel, (2006); Wind and Solar Power Systems, 2nd Edition, Taylor & Francis. NY
4. Gillbert M. Masters, (2004); Renewable and Efficient Electrical Power Systems, John Wiley, NJ
5. M. N. Bandyopadhyay, (2006); Electrical Power Systems, Wiley Interscience, New Delhi

ENT 381/2
MICROPROCESSOR

Course Synopsis

The aim of this course is to study the Motorola 68HC11 microprocessor architecture and relate that knowledge to the design of microprocessor based systems. This includes evaluation of a simple application on a microprocessor-based system. The study of 68HC11 instruction set and various software development tools are also emphasized as the knowledge are needed in the design of the microprocessor-based systems.

Course Outcomes

CO1: Ability to describe and explain the theory and basic architecture of microprocessor.
CO2: Ability to write and programme a microprocessor system using assembly language .
CO3: Ability to analyze and apply the microcontroller with I/O devices.
CO4: Ability to evaluate a simple application on a microprocessor-based system.

References

1. Muhammad Ali Mazidi, Rolin D. Mckinlay & Danny Causey, PIC Microcontroller and Embedded Systems: Using Assembly and C for PIC18, Pearson Prentice Hall 2008
2. Barry B. Brey, Applying PIC18 Microcontrollers: Architecture, Programming, and Interfacing using C and Assembly, Pearson Prentice Hall 2008
3. R.S. Gaonkar, Microprocessor Architecture, Programming, and Applications with the 8085, 5th Edition, Prentice Hall, 2002.

ENT 383/3
NETWORK & COMMUNICATION ENGINEERING

Course Synopsis

This subject will cover all the basic principles and concepts of communication system including the basic elements of communications, signal analysis, amplitude modulation, angle modulations and digital modulations, as well as transmission channels and medium. In addition, introductions to signal propagations and calculations of signal to noise ratio are also introduced to relate the students with real world applications.

Course Outcomes

CO1: Ability to explain the principle of network and communication systems
CO2: Ability to obtain mathematical model of modulation.
CO3: Ability to apply principle of various types of network and communication systems.
CO4: Ability to select equipments for the industrial network and communication technology.

References

1. George Coulouris, Jean Dollimore, Tim Kindberg, " Distributed Systems: Concepts & Design", 4th Ed., Pearson Education Limited, 2005
2. Richard Zurawski, editor "The Industrial Communication Technology Handbook", CRC Press, 2005.
3. Andrew S. Tanenbaum, Maarten van Steen, "Distributed System: Principles and Paradigms", Prentice-Hall, 2002.
4. Behrouz A. Forouzan, "Data Communications and Networking", 4th Ed., Mc-Graw Hill, 2007.
5. William Stallings, "Data and Computer Communications", 7th Ed., Prentice-Hall, 2004.

ENT 385/3
CONTROL ENGINEERING

Course Synopsis

This is an introduction course to control systems engineering. Students will be exposed to the mathematical modelling for mechanical, electrical as well as electro-mechanical systems using transfer functions, signal-flow graphs and Mason's rule. They will conduct system performance analysis in time and frequency domain. System stability will also be studied along with the root locus analysis. Finally the students will be introduced to system compensation design using PID and lead-lag controllers. The laboratory sessions will be conducted to enable the students to test the theory.

Course Outcome

CO1: The ability to obtain the mathematical model for electrical and mechanical systems.
CO2: Ability to perform system response analysis and stability in time domain.
CO3: Ability to perform system response analysis and stability in frequency domain.
CO4: Ability to evaluate P,PI, PD, PID, lead, lag controllers based on the analysis of the system's response in time and frequency domain.

References

1. Nise, N.S., "Control Systems Engineering", 6th Ed., Wiley, 2011.
2. Kuo B.C. "Automatic Control System" 8th Edition, Prentice Hall, 1995.
3. Ogata, K., "Modern Control Engineering", 4th Ed. Prentice Hall, 2002.
4. Gopal, M., "Control Systems: Principles and Design", 2nd Ed. Tata McGraw-Hill, 2002.

ENT 386/3
MODERN CONTROL ENGINEERING
(Pre Requisite: ENT 385/3 Control Engineering)

Course Synopsis

This course aims to convey the knowledge of classical control systems, advanced classical control method, state space representation of continuous-time system, continuous-time response and performance, specifications, state space analysis and design, advanced state space control system, projects based on problems drawn from mechatronics and manufacturing.

Course Outcomes

CO1: Ability to analyze the concepts of state-space design, non-linear system and digital control.
CO2: Ability to apply the concept of controllability and observability
CO3: Ability to analyze the non linear system.
CO4: Ability to design the digital control.

References

1. Norman S. Nise, "Control System Engineering", 4th Edition, Wiley, 2004
2. Katsuhiko Ogata; "Modern Control Engineering", 4th Edition, Prentice-Hall, 2002.
3. Benjamin C. Kuo; "Automatic Control Systems", 8th Edition, John Wiley, 2003.

4. Richard C. Dorf, Robert H. Bishop; “Modern control System”, 9th Edition, Prentice Hall, 2001
5. Richard Dorf and R.H. Bishop “Modern Control Systems”, Addison-Wesley, 1998.

ENT 388/3
ELECTRONICS

Course Synopsis

This course is designed to introduce the basic concepts of electronics and its applications which cover both analogue and digital devices. This course helps the student to apply the theory to develop and test electronic equipments.

Course Outcome

CO1: Ability to describe and analyze analogue electronics circuits.
CO2: Ability to describe and analyze the digital electronics circuits.
CO3: Ability to select and apply suitable electronic components in mechanical engineering applications.

References

1. Floyd T. (2005). *Electronic Devices*. 7th Edition, Pearson Prentice Hall.
2. Storey, N. (2006). *Electronics: A System Approach*. 3rd Ed., Prentice Hall.
3. Schuler, C. (2008). *Electronics: Principles & Applications*. 7th Ed., Mc Graw Hill.
4. Tocci, R.J., WIdmer, N.S. and Moss, G.L. (2007). *Digital Systems: Principles and Applications*. 9th Ed., Prentice Hall.
5. DIffenderfer, R. (2005). *Electronics Devices: Systems and Applications*. Thomson Delmar Learning.
6. Tocci, R.J. and Ambrosio, F. J. (2003). *Microprocessors and Microcomputers: Hardware and Software*. 6th Ed., Prentice Hall.
7. Hambley, A.R. (2000). *Electronics*. 2nd Ed., Prentice Hall.

ENT 413/3
MEDICAL IMAGING

Course Synopsis

In this course the students are introduced to the basic principle of medical imaging modalities. This will provide them the understanding of various types of diagnostic radiology such as general X-Ray, Mammography, Computed Tomography (CT) and Magnetic Resonance Imaging (MRI). Upon completion, students will be able to apply the fundamental principles and evaluate the efficiency of the medical imaging modalities that have been used in healthcare industry.

Course Outcomes

CO1: Ability to explain the concept of medical imaging modalities used in clinical application.
CO2: Ability to distinguish and explain the sources of energy in medical imaging modalities.
CO3: Ability to discuss and predict tissue reactions to radiation and propose the solution to reduce the radiation by applying Radiation Protection concept.
CO4: Ability to select the most suitable modalities for successful diagnostic.

References

1. Walter Huda (2003), “Review of Radiologic Physics”, Lippincott Williams & Wilkins.
2. Suetens, P. (2002). Fundamental of Medical Imaging. Cambridge University Press.
3. Bushberg,J.T. (2006). The essential physics of medical imaging. 3rd ed. William & Wilkins
4. Prince, J.L. (2006), Medical Imaging Signals and System, Prentice Hall.
5. Glenn F. Knoll (2000).“Radiation Detection and Measurement”, John Wiley and Sons.

ENT 427/4
BIOMEDICAL INSTRUMENTATION DESIGN

Course Synopsis

An advanced course to medical electronics & bioinstrumentation, the students will be exposed to the knowledge of designing bioelectrical amplifier and filters, application of microcontrollers in a data acquisition system, and platforms for telemedicine applications. Their theoretical knowledge will be tested in designing instrumentation for biomedical applications.

Course Outcomes

CO1: Ability to design an instrumentation circuit to acquire biomedical signals
CO2: Ability to develop a PC-based data acquisition device which is capable of acquiring biomedical signals.
CO3: Ability to demonstrate the project needs, design contsraints and requirement for the selected project in Biomedical Electronic Engineering field.

References

1. Webster, J.G. 'Medical Instrumentation: Application and Design', 4th Ed., Wiley, 2010.
2. Khandpur, R.S. 'Handbook of Biomedical Instrumentation', 2nd Edition, Tata McGraw-Hill, 2007.
3. Webster, J.G. 'Bioinstrumentation', Wiley, 2003.
4. Cromwell, L. 'Biomedical Instrumentation and Measurements', 2nd Ed. Prentice-Hall, 2002.
5. Perez, R. 'Design of Medical Electronic Devices', Academic Press, 2002.
6. Carr, J.J. 'Introduction to Biomedical Equipment Technology', 4th Ed. Prentice Hall, 2000.

ENT 438/3
BIOMEDICAL DESIGN PROJECT

Course Synopsis

This course will focus on the design of a biomedical instrumentation for medical applications. Students will utilised their theoretical knowledge in various aspects of bioinstrumentation to solve a biomedical related problem by identifying problem needs, and developing potential designs as well as construct and testing prototypes. Students will be introduced to the principle of engineering design process at the beginning of the course, followed by selection of the project theme. This course provides the opportunity for the students to apply and develop their design, executing project management and polished their interpersonal and communication skill.

Course Outcomes

CO1: Apply technical knowledge and problem-solving skills to serve community, society and profession.

CO2: Ability to design and evaluate the specific sub-system in the design device and system.

CO3: Ability to conduct economic evaluation of the selected project in Biomedical Engineering field.

References

1. Biomedical Engineering & Design Handbook, Volumes I and II
2. Handbook of Biomedical Instrumentation, Khandpur
3. Bioinstrumentation, J.G. Webster
4. Medical Instrumentation, Application and Design, J.G Webster
5. Engineering Design Methods: Strategies for Product Design by Nigel Cross
6. Engineering Design Principles by Ken Hurst
7. Biomedical Instrumentation Systems, S.Chatterjee
8. Biomedical Instrumentation and Measurements, Leslie Cromwell, Fred J.Weibell,Erich A.Pfeiffer

ENT 445/2
FINAL YEAR PROJECT I

Course Synopsis

In this course, students will be applying the knowledge they have learned throughout this programme by implementing them in a research project which is carried out for two semesters. In the first semester, focus is given on the preparation of work schedule, identifying the objectives, and writing the research methodology. Students are expected to begin project work according to the planned schedule.

Course Outcome

CO1: Ability to evaluate engineering issue(s)/problem(s) in proposed Final Year Project.

CO2: Ability to propose methodology for proposed Final Year Project.

CO3: Ability to perform audio visual presentations.

Reference

None

ENT 446/4
FINAL YEAR PROJECT II

Course Synopsis

In this course, students will be applying the knowledge they have learned throughout this programme by implementing them in a research project which is carried out for two semesters. In the second semester, focus is given on the project work (experiments, simulation, etc), analysis of results and final report writing. Students are expected to complete project work according to the planned schedule.

Course Outcome

CO1: Ability to evaluate engineering deliverable via system / prototype / algorithm / software / simulation / experimental analysis.

CO2: Ability to demonstrate project management skills (such as problem solving & interest, creativity, independence and entrepreneurship) in order to achieve project objectives.

CO3: Ability to present the findings of project using audio visual presentations.

Reference

None

ENT 457/3
MANAGEMENT, PRODUCTION & OPERATIONS

Course Synopsis

This course offers comprehensive contents about production and operation management in manufacturing and services. Production and operation management is the process of managing people and resources in order to create a product or a service. This course also introduces students to project management, forecasting theory, goods and services design, process strategy and capacity planning, location and layout strategies, supply chain management, inventory management theory, aggregate planning theory, Material Requirements Planning (MRP) and scheduling theory.

Course Outcome

CO1: Ability to analyze operations management in operations, productivity, project management and forecasting.
CO2: Ability to design operations in goods and services, process control, capacity planning, location and layout strategies.
CO3: Ability to manage operations in supply-chain management, inventory management, aggregate planning, material requirements planning, operations scheduling, maintenance and reliability.

References

1. Jay Heizer and Barry Render (2010). Operations Management. 10th Edition, Person.
2. Steven Nahmias (2009). *Production and Operations Analysis*. McGraw Hill.
3. Russell and Taylor (2009). *Operations Management: Along The Supply Chain*. 6th Edition, John Wiley & Sons.
4. Stephen Chapman (2004). *Fundamentals of Production Planning and Control*. Prentice Hall.
5. R. Dan Reid and Nada R. Sanders (2005). *Operation Management: An Integrated Approach*. 2nd Edition, John Wiley & Sons.
6. Faridah Maarof, Maslin Masrom and Mohd Yunus Majid (1998). *Penyelidikan Operasi: Penggunaan dan Algoritma*. Penerbit Universiti Teknologi Malaysia, Johor.

ENT 471/4
AUTOMATION
(Pre Requisite: ENT 289/3 Drive and Power Electronics)

Course Synopsis

This course aims to convey the knowledge of automation technologies. It combines the automation technology principles and its relationship with assembly process and system, the element of sensor, actuator and drive technology as an input/output component in automation technology. It also covers automation technology and technique in terms of hardware and software control, the automation technology issues in design, engineering analysis, planning, tooling and manufacturing.

Course Outcomes

CO1: Ability to perform analyzes on automation in a production system.
CO2: Ability to perform analyzes and evaluate on elements of an automation system.
CO3: Ability to design and evaluate the automation system for an optimum performance in various applications.

References

1. Mikell P. Groover (2001), “Automation, Production Systems, and Computer-Integrated Manufacturing” 2nd Edition, Prentice Hall
2. Jon Stenerson (2003), “Industrial Automation and Process Control” 1st Edition, Prentice Hall
3. Frank D. Petruzella (1999), “Programmable Logic Controllers” 2nd Edition, Glencoe/McGraw-Hill
4. Ridley, J.E (1999), “Introduction to Programmable Logic Controller”

ENT475/3
MECHATRONIC SYSTEMS DESIGN I

Course Synopsis

This course focuses on the methodologies, processes and elements for the design an integrated mechatronic system. It covers the philosophy mechatronic system design and evaluates all related design tools for a mechatronics system. It reviews all elements of a mechatronic system and introduces the first part of the mechatronic system design project.

Course Outcomes

CO1: Ability to design, develop and evaluate measurement, instrumentation and actuation systems.
CO2: Ability to design and evaluate a mechatronic system using a microcontroller.
CO3: Ability to identify customer need and conduct evaluation based on economic, ethical and sustainable factors for the mechatronic system.

References

1. Bolton, W., Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, 3rd edition, Addison Wesley Longman: Essex England, 2003.
2. D. G. Alciatore and M. B. Histand, Introduction to Mechatronics and Measurement Systems. 3rd edition, McGrawHill.
3. D. Shetty and R. A. Kolk, Mechatronics System Design, PWS Publishing Co., Boston, MA, 1997.
4. Godfrey C. Onwubolu, “Mechatronics: Principles and Applications”,Butterworth-Heinemann 2005.
5. R. Isermann, Mechatronic Systems: Fundamentals, Springer-Verlag: Great Britain, 2003

ENT476/3
MECHATRONIC SYSTEMS DESIGN II

Course Synopsis

This course focuses on the design of an integrated mechatronic system and it is a continuation from Mechatronic System Design I. The students are expected to design a mechatronic system to solve real engineering problems on selected predefined scope, including economic and sustainability analysis, under the guidance of project supervisor.

Course Outcomes

CO1: Ability to evaluate the design concept and requirement for a mechatronic system.
CO2: Ability to apply relevant design concept, requirement and tools for the design of a mechatronic system.
CO3: Ability to design and evaluate specific subsystems and processes in a mechatronic system.
CO4: Ability to conduct economic evaluation, ethical and sustainable analysis for the mechatronic system.

References

1. Bolton, W., Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, 3rd edition, Addison Wesley Longman: Essex England, 2003.
2. D. G. Alciatore and M. B. Histand, Introduction to Mechatronics and Measurement Systems. 3rd edition, McGrawHill.
3. D. Shetty and R. A. Kolk, Mechatronics System Design, PWS Publishing Co., Boston, MA, 1997.
4. Godfrey C. Onwubolu, “Mechatronics: Principles and Applications”, Butterworth-Heinemann 2005.
5. R. Isermann, Mechatronic Systems: Fundamentals, Springer-Verlag: Great Britain, 2003

ELECTIVE COURSES

ENT 420/4
BIOLOGICAL SYSTEM MODELING

Course Synopsis

The course aims to develop quantitative engineering models describing biological systems at the cellular and tissue scale. Students will be introduced to the process of developing engineering models of biological systems, and to use simulation software for the solution of the mathematical equations describing the system behaviour.

Course Outcomes

CO1: Ability to calculate the linear and non-linear system using ordinary differential equation (ODE).
CO2: Ability to analyze the knowledge about mathematical equation into biological system.
CO3: Ability to construct and analyze the mathematical modelling of biological system.

References

1. Alon, U. (2007). An Introduction to Systems Biology. CRC Press.
2. Klipp, E. (2005). Systems Biology in Practice. Wiley.
3. Allen, L.J.S. (2007). An Introduction to Mathematical Modelling. Prentice-Hall.
4. Edelstein-Kesher, L. (2005). Mathematical Models in Biology. SIAM.
5. Murray, J.D. (2002). Mathematical Biology. Springer.

ENT 426/4
COMPUTED TOMOGRAPHY AND APPLICATIONS

Course Synopsis

This is an advanced course to biomedical instrumentation. Students will be exposed to the knowledge of tomography systems, principles and applications. Several types of tomography systems, its theoretical concept and algorithm will be discussed. This course is related to that some clinical applications and safety aspects.

Course Outcomes

CO1: Ability to discuss, explain, analyze and judge the concept of tomography and its suitable applications.
CO2: Ability to explain, discuss and analyze the suitable reconstruction algorithm of a tomography system.
CO3: Ability to discuss, explain and analyze the measurements of projection data of a tomography system.
CO4: Ability to discuss, explain and compare the algebraic reconstruction algorithms for suitable tomography applications.

References

1. W. A. Kalender (2006), Computed Tomography; Fundamentals, System Technology, Image Quality and Applications, Wiley.
2. A. C. Kak and Malcolm Slaney (2001), Principles of Computerized Tomographic Imaging, Society of Industrial and Applied Mathematics.
3. S. C. Bushon (2000) Computed Tomography, McGraw Hill.
4. C. B. Grossman (*1991), “Magnetic Resonance Imaging and Computed Tomography of the Head and Spine”, Williams & Wilkins.
5. T. Grumme, W. Kluge, K. Kretzschmar and A. Roesler (1998), “Cerebral and Spinal Computed Tomography”, 3rd ed. Blackwell Science.

ENT431/3
REFRIGERATION AND AIR CONDITIONING

Course Synopsis

The objective of this course is to introduce a comprehensive and wide-ranging theoretical principles and practical aspects of refrigeration and air conditioning systems. The basic of thermodynamics, heat transfer and fluid mechanics that have been learned will be extended and emphasized on this course. Student will be exposed to refrigeration machines, refrigerant compressors, expansion devices and psychrometry of air-conditioning processes.

Course Outcomes

CO1: Ability to identify, describe refrigeration machines, vapour compression system, and solve problems on multipressure systems.
CO2: Ability to identify, analyze and evaluate refrigerant compressors, condensers, expansion devices and evaporators.
CO3: Ability to explain and interpret the psychrometry of air conditioning processes. Ability to analyze and evaluate cooling loads.

References

1. C.P. Arora (2001). *Refrigeration and Air conditioning*. Second Edition McGraw Hill.
2. Jeffus Larry (2004). *Refrigeration and Air conditioning*. 4th edition. Pearson/ Prentice Hall.
3. Ahmadul Ameen (2006). *Refrigeration and Air conditioning.* Prentice Hall.
4. G. F. Hundy (2008). *Refrigeration and Air conditioning*. Elsevier.
5. William C. Whitman (2009). *Refrigeration and Air conditioning technology*. 4th edition. Cengage Learning.

ENT432/3
ENERGY CONVERSION

Course Synopsis

This course offers comprehensive contents about conversion of energies which excluded from renewable energy. This course covers fossil fuel, reciprocating internal combustion engine, Wankel rotary engine, nuclear power plant and battery. This course also discuss about the contemporary issues relate to environment and pollution.

Course Outcomes

CO1: Ability to evaluate energy conversion systems based on thermo-fluid fundamental knowledge.
CO2: Ability to explain contemporaneous issues in energy systems.
CO3: Ability to judge the impact of the usage of energy to environment and pollution issues.

References

1. Goswami, D.Y. Kreith, F (2007). *Energy Conversion*. CRC Press.
2. Valone, T.F. (2005). *Practical Conversion of Zero-Point Energy*. 3rd Edition, Integrity Research Institute.
3. Leyzerovich, A. (2005). *Wet-Steam Turbines for Nuclear Power Plants.* PennWell Corp.
4. Kiameh, P (2002). *Power Generation Handbook: Selection, Application, Operation, Maintenance*. McGraw-Hill Professional.

5. Kenneth C. Weston (1992). *Energy Conversion*. PWS Pub. Co.

ENT433/3
PLASTICITY

Course Synopsis

This course is intended to serve theory plasticity in metal materials. This course is introducing the hardening plasticity, orthotropic plasticity and plasticity instability. The Application of finite elements and production processes are introduced in theory of plasticity.

Course Outcomes

CO1: Ability to apply theory of plasticity to uniform and non-uniform stress states.
CO2: Ability to analyze theory of plasticity in slip line field and in collapse of beam or structure.
CO3: Ability to select the test is related to theory plasticity and estimate plasticity occurs on materials.
CO4: Ability to estimate inelasticity buckling struts and plates, and estimate stress waves in bars.
CO5: Ability to predict theory of plasticity in production processes and apply to finite elements in theory plasticity.

References

1. D.W.A. Rees (2006). *Basic engineering plasticity: and introduction with engineering and manufacturing applications*. Elsevier Ltd.
2. Wai Fah-Chen and D.Jian Han (2007). *Plasticity for structural engineers*.

ENT434/3
IMPACT MECHANICS

Course Synopsis

This course offers comprehensive contents about reaction forces that develop during a collision and the dynamic response of structures to these reaction forces. This course develops several different methodologies for analyzing collisions between structures. This is include rigid body theory for structures that are stiff .The analytical methods combine mechanics of contact between elastic-plastic or viscoplastic bodies with dynamics of structural response.

Course Outcomes

CO1: Ability to analyze reaction forces in collinear impact.
CO2: Ability to evaluate reaction forces in impact for 2D and 3D collision.
CO3: Ability to evaluate reaction forces in impact for rigid body.

References

1. W.J Stronge (2007). *Impact Mechanics.* Cambridge University Press.
2. Norman Jones (2001). *Structural Impact.* Cambridge University Press.
3. Anthony C. Fischer (2007). *Introduction to Contact Mechanics*. Springer.

ENT435/3
ROBOTICS

Course Synopsis

This Course is designed to introduce various aspects of Robotics such as the types of robots, capabilities, characteristics, Robot Control Systems and Software, Kinematic Analysis, Principles of Inverse Kinematics, Robot Sensors and Drive mechanisms, Robot Work Dell design and Various industrial Applications.

Course Outcomes

CO1: Ability to describe the importance of various types of robots and relate them in various industrial applications.
CO2: Ability to construct and analyze the coordinate representation, transformations and path planning.
CO3: Ability to construct and analyze robot control systems for various industrial applications.
CO4: Ability to design a robot work-cell for specific industrial task and measure its validity.

References

1. Saeed B Niku (2010). *Introduction to Robotics*. John Wiley and Sons.
2. M. P. Groover (1999). *Industrial Robotics*. McGraw Hill.
3. K H low (2003). *Robotics: Principles and System Modelling*. Prentice hall.
4. Man Zhihong (2005). *Robotics*. Prentice Hall.

ENT436/3
COMPUTER AIDED MANUFACTURING

Course Synopsis

This course is fundamental knowledge of Computer Aided Design and Computer Aided Manufacturing. In this course the concept of Numerical Control Programming is introduced for milling and lathe. The proper knowledge of Computer Aided Manufacturing will be emphasized on the numerical control programming and geometric modelling techniques also are describing using solid modelling standard.

Course Outcomes

CO1: Ability to define Computer Aided Design and describe types of computer Aided Design system and numerical control programming.
CO2: Ability to describe geometric modelling techniques and numerical control.
CO3: Ability to select function of part of CNC machine and demonstrate CNC machine using numerical control programming.

References

1. Ibrahim Zeid (2007). *Mastering CAD/CAM*, Special Indian Edition 2007, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
2. Mikell P. Groover (2002). *Automation, Production Systems, and Computer-Integrated Manufacturing*. 2nd Edition, Reprint 2002, Pearson Education Asia.
3. YoramKoren (1983). *Computer control of manufacturing systems*. International Edition, McGraw Hill Book Co.

ENT461/3 RENEWABLE ENERGY

Course Synopsis

The objective of this course is to introduce the concepts of Renewable Energy to students, emphasising on the fundamentals principles, and as well as applications of some renewable energy (Biomass, Wind, Solar, and Hydrogen) and the other energy resources available today for sustainable development.

Course Outcomes

CO1: Ability to interpret and evaluate the basic concepts and principles of renewable energy technologies and energy resources available today for sustainable development.
CO2: Ability to analyze and evaluate the conversion of Biomass, Wind, Solar and Hydrogen energies to mechanical, thermal and electrical power.
CO3: Ability to discuss and evaluate energy and power in the Geothermal, Tidal, Micro Hydro and other renewable energy.
CO4: Ability to describe and evaluate the relationships of renewable energies in the field, and their environmental impact.

References

1. Gevorkian, Peter (2009). *Sustainable Energy Systems Engineering*. The McGraw Hill companies, New York.
2. GN Tiwari and MK Ghosal (2008). *Renewable Energy Resources*. Alpha Science International Ltd. Harrow, UK.
3. Tester, Drake, Driscoll, Golay and Peters (2000). *Sustainable Energy*. The MIT Press, Cambridge, Massachusetts London, England.
4. Dewulf, Van Langenhove (2006). *Renewable based technology*. John Wiley & Sons Ltd.
5. Z. Lubosny (2003). *Wind Turbine Operation in Electrical Power Systems*. Springer Verlag Berlin Heidelberg.

ENT462/3 TURBOMACHINERY

Course Synopsis

This course introduces the operating principles of different types of pumps, compressors and conventional prime movers used in power generation. Analysis and design characteristic consideration in turbomachinery is also emphasized.

Course Outcomes

CO1: Ability to explain the operating principles of different pumps, analyze their performance, select proper pump for specific application and design such a pump.
CO2: Ability to discuss the operating principles of hydraulic turbines, analyze and predict their performance and select proper turbine.
CO3: Ability to explain the operating principles of thermal turbines (steam/gas turbines), compare their usage, vary parameters to evaluate their performance.
CO4: Ability to explain the operating principles of different compressors and analyze their performance.

References

1. W.W. Peng (2008). *Fundamentals of Turbomachinery*. John Wiley & Sons.
2. Y.A. Cengel and J.M. Cimbala (2006). *Fluid Mechanics- Fundamentals and Applications*, McGraw Hill.
3. S.L. Dixon (1998). *Fluid mechanics and Thermodynamics of Turbomachinery*. 5th Ed., Pergamon, Oxford.

4. B.R. Munson, D.F. Young, and T.H. Okiishi (2006). *Fundamentals of Fluid Mechanics*. 5th Ed., John Wiley & Sons.
5. H. Cohen, GFC Rogers, and HIH Saravanamuttoo (1996). *Gas Turbine Theory*. 4th Ed., Longman.
6. C.T. Crowe, D.F. Elger, and J.A. Roberson (2005). *Engineering Fluid Mechanics*. 8th Ed., John Wiley & Sons.
7. J.F. Douglas, J.M. Gasiorek, J.A. Swaffield, and L.B. Jack (2005). *Fluid Mechanics*. 5th Ed., Pearson.

ENT463/3
ELASTICTY

Course Synopsis

The theory of elasticity is concerned with modelling the deformations of and stresses in continuous media characterized by linear relationships between stress and strain. Applied elasticity is about developing and applying geometry-based idealizations of real physical situations and structures. Comparison with solutions obtained by using elementary strength of materials in solving engineering problems will be emphasized. Practical problems will be solved and advantages of using particular methods will be illustrated.

Course Outcomes

CO1: Ability to apply the fundamental of elasticity to engineering problems, and use appropriate mathematical tools to solve mechanics problems.
CO2: Ability to select the governing equations for 3-D and 2-D solid mechanics, and estimate the critical load that a component can withstand using different failure criteria.
CO3: Ability to analyze a problem and choose any computational tools to model and analyze structural components.

References

1. Martin H. Sadd (2009). *Elasticity: theory, applications and numerics*. 2nd edition, Academic Press, London.
2. Anthony Armenakas (2006). *Advanced Mechanics of materials and applied elasticity*. Boca Raton Fla. Taylor & Francus.
3. Albrecht Bertram (2005). *Elasticity and plasticity of a large deformations: an introduction*. Springer, New York.
4. A. I Lurie, translated by A. Belyaev (2005). *Theory of Elasticity*. Springer, Berlin.
5. Arthur P. Boresi and Ken P Chong (2000). *Elasticity and plasticity of large deformations: an introduction*. 2nd edition, John Wiley and Sons, New York.

ENT464/3
FRACTURE MECHANICS

Course Synopsis

This course contains the theory of principles and application of fracture mechanics. The fracture mechanics have a wide range of engineering design applications, including the analysis of brittle fracture of low-toughness structural materials and many non-metallic, and quantitative prediction of fatigue crack growth in a wide range of engineering materials. It will emphasize on the mathematical principles of linear elastic fracture mechanics and their application to engineering design. Student will conduct laboratory work with experiments using servo hydraulic fatigue testing machines and scanning electron microscopy.

Course Outcomes

CO1: Ability to describe the principles of fracture mechanics in engineering materials and examine the related problem under dynamic load.
CO2: Ability to identify the specimen configuration to use experiment in fracture toughness testing of metals/non-metals and predict fatigue strength and fatigue life using Stress versus Number of cycles curves.
CO3: Ability to estimate fatigue crack growth in metals on the fracture surface, and evaluate fatigue crack growth experiment using CT specimen.
CO4: Ability to identify the effect of varies environment on the surface fracture and estimate corrosion fatigue in environment.
CO5: Ability to identify cleavage fracture, intergranular fracture and ductile fracture in the fractography, and calculate cohesive strength of solids.

References

1. T. L. Anderson (2005). *Fracture Mechanic Fundamentals and Applications*. 37th Edition, Taylor & Francis Groul.
2. E. E. Gdoutos (2005). *Fracture Mechanics and Introduction*. 2nd Edition, Springer.
3. R, J, Sanford (2003). *Principle of Fracture Mechanics*.1st Edition, Prentice Hall.
4. G, E, Dieter (1986). *Mechanical Metallurgy*. 3rd Edition, McGraw-Hill.

ENT465/3
RAPID ENGINEERING

Course Synopsis

This is an introductory course on several rapid engineering techniques. It combines engineering prototype design theory, reverse engineering, solid freeform technology, rapid prototyping (RP) including liquid, powder and solid based process, and rapid tooling in manufacturing and the various applications of rapid engineering.

Course Outcomes

CO1: Ability to organize the development of product prototyping design to construct the rapid prototype model.
CO2: Ability to select and describe the rapid prototyping processes for a finished product.
CO3: Ability to select the proper rapid prototyping tools and techniques in terms of hardware and software technologies to construct a finished product.

References

1. Frank W. Liou (2007). *Rapid Prototyping and Engineering Applications: A Toolbox for Prototype Development*. Vol. 210, CRC Press, Dekker Mechanical Engineering Series.
2. Kenneth Cooper (2001). *Rapid Prototyping Technology: Selection and Application*. Vol. 133, CRC Press, Dekker Mechanical Engineering Series.
3. D.T. Pham and S.S. Dimov (2001). *Rapid Manufacturing: The technologies and applications of Rapid Prototyping and Rapid Tooling*. Springer, London.
4. C. K. Chua, K. F. Leong and C. S. Lim (2003). *Rapid Prototyping: Principle and Applications*. 2nd Edition, World Scientific Publishing.

ENT466/3
DESIGN OPTIMIZATION

Course Synopsis

This course introduces the traditional non-linear optimization methods that can be used to solve a wide range of problems across all engineering disciplines. By the end of the semester the student will have gained a basic knowledge of numerical optimization algorithms and will have sufficient understanding of the strengths and weakness of these algorithms to apply them appropriately in engineering design. Students will write simple code as well as use off-the-shelf routines to gain experience and appreciation.

Course Outcomes

CO1: Ability to apply basic theoretical of optimization in practical engineering design situations.
CO2: Ability to apply mathematical constructs and theoretical tools to solve linear and non-linear design problems.
CO3: Ability to formulate the optimization problem from the constraint associated with design.

References

1. Vanderplaats, Garret N. *Numerical Optimization Techniques for Engineering Design: With Applications*. McGraw-Hill.
2. Arora, Jasbir S. *Introduction to Optimum Design*, McGraw-Hill.
3. Reklaitis, G.V., A. Ravindran, and D.M. Ragsdell, *Engineering Optimization-Methods and Applications*. John Wiley.

ENT474/3
INTELLIGENT MECHATRONIC SYSTEMS

Course Synopsis

This course introduces important concepts of Artificial Intelligence (AI) and their applications in mechatronic systems. The concepts include fuzzy logic, neural network, neuro-fuzzy, genetic algorithm and pattern recognition. The mechatronic systems encompass Industrial Automation, Industrial Robotics and Control of process systems.

Course Outcomes

CO1: Ability to organize Artificial Intelligence components in mechatronics systems.
CO2: Ability to display the concepts of pattern recognition and classification.
CO3: Ability to analyze intelligent control with optimal parameter search for complex industrial systems.
CO4: Ability to analyze simple expert system for specific requirements.

References

1. Sivanandam S N., Paulraj M., “Introduction to Artificial Neural Networks”, Second Edition, 2005, Vikas Publications.
2. Russell S.J., Norvig P., Canny J.F., “Artificial Intelligence: A Modern Approach”, Prentice Hall, 2003
3. Rajasekaran. S., Pai G.A.V., “Neural Networks, Fuzzy Logic and Genetic Algorithms”, 7th Edition, Prentice Hall

India, 2007 By Mukaidono M., Kikuchi H., “Fuzzy Logic for Beginners”, World Scientific, 2001.
4. Bolton, W., Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, 3rd edition, Addison Wesley Longman: Essex England, 2003.
5. D. Shetty and R. A. Kolk, Mechatronics System Design, PWS Publishing Co., Boston, MA, 1997

ENT482/3
MECHANICAL DESIGN PROJECT I

Course Synopsis

Mechanical design project integrates mathematics, engineering and basic sciences and complementary studies in developing elements, systems, and processes to meet specific needs. It is a creative, iterative, and often open-ended process subject to constraints which may be governed by standards or legislation to varying degrees within mechanical engineering discipline. This course will require students to work in a group environment and collaborate with other members of group to arrive at good design decisions and then to provide proper reports on these decisions upon completion. Conceptual design of the design project will be continued in ENT484/3 Mechanical Design Project II.

Course Outcomes

CO1: Ability to identify and propose concepts to solve complex mechanical engineering problem.
CO2: Ability to acquire information from a variety of sources and apply design process to develop solutions based on knowledge and constraints using engineering analysis tools and software.
CO3: Ability to evaluate solution that meets customer needs with consideration to patents/codes/ standards for a design safety/ cultural/ societal/ environmental/ and human factors.

ENT484/3
MECHANICAL DESIGN PROJECT II

Course Synopsis

This course will focus on the design of an integrated mechanical engineering project as continuation of ENT482/3 Mechanical Design Project I. The course will start with application of principle of engineering design and selection of the design project related to mechanical engineering. The students are expected to work on selected project to design a project with current issues related to public health and safety/cultural/societal/ environmental as well as the economic considerations.

Course Outcomes

CO1: Ability to design and solve complex mechanical engineering problem.
CO2: Ability to acquire information from a variety of sources and apply design process to develop solutions based on knowledge and constraints using engineering analysis tools and software
CO3: Ability to evaluate solution that meets customer and financial needs with consideration to patents/codes/ standards for a design safety/ cultural/ societal/ environmental/and human factors.
CO4: Ability to communicate effectively via written, oral presentation and demonstration of the design solution.
CO5: Ability to function in a team for the successful delivery of design project.

ENT486/3
MOBILE ROBOTICS

Course Synopsis

This course introduces the students the concepts and design of wheeled and walking robot mechanisms with a study on their kinematics and dynamics aspects. The course also introduces the principles and applications of Autonomous Guided Vehicles (AGV).

Course Outcomes

CO1: Ability to apply various locomotion systems in mobile robotic applications.
CO2: Ability to analyze the force-torque requirements of the mobile robots and select the most suitable actuator.
CO3: Ability to solve the kinematics problems for mobile robots.
CO4: Ability to apply suitable sensors and control systems for the wheeled mobile robot mechanisms.
CO5: Ability to analyze various autonomous guidance systems in mobile robotics application.

References

1. Thomas Braunl, ”Embedded Robotics – Mobile robot design and applications with embedded systems”, Springer, NY, 2006
2. H R Everett, ”Sensors for mobile robots – Theory and Application”, A K Peters Ltd, Mass, USA, 1995.
3. M P Groover, ”Automation, Production systems and Computer Integrated Manufacturing”, Prentice hall, NJ, 1990

4. Phillp John McKerrow, “Introduction to Robotics”, Addison Wesley, NY, 1998
5. Man Zhihong, ‘ Robotics”, Pearson Prentice Hall, Singapore, 2005

ENT 491/3
ROBOTIC CONTROL

Course Synopsis

The objective of this course is to impart knowledge in the application and design aspect of mechatronic system. The course topics include the applications of sensors and transducers, signal conditioning, pneumatic, hydraulic, mechanical and electrical actuators, input and output interfacing, communication systems, programmable logic controllers, microprocessors and fault analysis.

Course Outcomes

CO1: Ability to design, develop and construct industrial measurement and instrumentation systems.
CO2: Ability to design and develop industrial actuation systems.
CO3: Ability to evaluate, design and construct analog and digital control system using PLC and Microcontroller.
CO4: Ability to design, construct and evaluate simple mechatronic systems that combine electrical/ electronic and mechanical components.

References

1. Bolton, W., *Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, 3rd edition,* Addison Wesley Longman: Essex England, 2003.
2. D. G. Alciatore and M. B. Histand, *Introduction to Mechatronics and Measurement Systems*. 3rd edition, McGrawHill.
3. D. Shetty and R. A. Kolk, *Mechatronics System Design*, PWS Publishing Co., Boston, MA, 1997.
4. Godfrey C. Onwubolu, “Mechatronics: Principles and Applications”, Butterworth-Heinemann 2005.
5. R. Isermann, *Mechatronic Systems: Fundamentals*, Springer-Verlag: Great Britain, 2003.

ENT 493/3
ADVANCED CONTROL SYSTEMS
(Pre Requisite: ENT 386/3 Modern Control Engineering)

Course Synopsis

The aim of this course is to introduce state-space design, non-linear system and digital control. Students also will be exposed to other control methods, like robust control, predictive control and optimal control.

Course Outcomes

CO1: Ability to analyze the concepts of state-space design, non-linear system and digital control
CO2: Ability to derive state-space description from continuous-time and discrete-time systems.
CO3: Ability to design sate-feedback and digital controller.
CO4: Ability to evaluate Robust Control, Optimal Control methods.

References

1. J R Leigh, “Control Theory”, 2nd ed. IEE, 2004
2. Charles L. Philips, H. Troy Nagle, “Digital Control Systems Analysis and Design”, 3rd ed. Prentice Hall, 1995
3. Gene F. Franklin, J. David Powell, Micheal Workman, “Digital Control of Dynamic Systems”, 3rd ed. Addison-Wesley,1998.
4. M. Gopal, “Digital Control and State Variable Methods”, McGraw-Hill, 1997.
5. Kevin Warwick,” An Introduction to Control Systems”, 2nd ed. World Scientific, 1996

ENT 497/3
ARTIFICIAL INTELLIGENCE IN ENGINEERING

Course Synopsis

This course is designed to introduce the fundamentals of Artificial Intelligence (AI). It provides an introduction to definitions of human and artificial intelligence. The students will be exposed to fuzzy systems, artificial neural networks and evolutionary computation. At the end of this course students should know a few major techniques in AI and ability to build simple intelligent systems applied to Mechatronic Engineering.

Course Outcomes

CO1: Ability to perform analysis and examine the right AI techniques for simple applications.
CO2: Ability to perform analysis on different types of AI techniques.
CO3: Ability to design and evaluate AI techniques for Mechatronics Applications.

References

1. Negnevitsky M., (2004). *Artificial Intelligence: A guide to Intelligent System, 2nd Edition.* Addison Wesley.
2. Sivanandam S N., Paulraj M., (2005). *Introduction to Artificial Neural Networks, Second Edition.* Vikas Publications.

3. Russell S.J., Norvig P., Canny J.F., (2003). *Artificial Intelligence: A Modern Approach.* Prentice Hall.
4. Rajasekaran. S., Pai G.A.V., (2007), *Neural Networks, Fuzzy Logic and Genetic Algorithms, 7th Edition.* Prentice Hall India.
5. Mukaidono M., Kikuchi H., (2001). *Fuzzy Logic for Beginners*. World Scientific.

ENT499/3
DIGITAL SIGNAL PROCESSING & APPLICATIONS
(Pre Requisite: ENT 281/3 Signals and Systems)

Course Synopsis

This course is designed to introduce the concepts of digital signal processing and to help the students to explore the theory and applications of digital signal processing. The course also helps the students to develop the ability of analyze and manipulate digital signals.

Course Outcomes

CO1: Ability to do the analisys of analogue and digital signals in time domain.
CO2: Ability to do analysis of analogue and digital signals in frequency domain.
CO3: Ability to design digital filter in signal processing
CO4: Ability to use signal processing tools in a specific signal processing application

References

1. S.K. Mitra, ‘Digital Signal Processing: A Computer Based Approach’, Tata McGraw Hill, 2006.
2. E.C. Ifeachor and B.W. Jervis, ‘Digital Signal Processing: A Practical Approach’ Prentice Hall, Second Edition 2002.
3. Richard G. Lyons, ‘Understanding Digital Signal Processing’, Prentice Hall, Second Edition, 2004.
4. J. G. Proakis and D. G. Manolakis, ‘Digital Signal Processing: Principles, Algorithms, and Applications’, 1989.
5. Stephen W. Smith, ‘The Scientist and Engineer’s Guide to Digital Signal Processing’, California Technical Publishing, 2nd Edition, 2003.
6. John G. Proakis , ‘Digital Signal Processing’, PEARSON Fourth Edition, 2007.

Career Opportunities

Graduates in these areas will have the ability to engage in the design, research and development, consultancy, education, manufacturing, construction, maintenance, sales and management in many industries such as manufacturing, processing, automotive, aviation and shipping, mining and services, communications and building services and medical industries. Among of the firms that had offered employment opportunities to the graduates of these areas are as follows:

- Vehicle making and installation firms
- Home making appliances firms
- Electronic products firms
- Plant food processors
- Oil and gas companies
- High-tech firms
- Consultant firms
- Engineering & product development firms
- Automation system firms
- Bio-medical engineering firms
- Software development firms
- Research & development agencies
- Hospitals
- Companies, maintenance and repair firms of medical equipment
- Companies, marketing and sale firms of medical equipment
- Manufacturing industry of medical instrumentation

School of Electrical System Engineering

Programme Offered

• Diploma in Electrical Engineering
• Bachelor of Electrical System Engineering
• Bachelor of Industrial Electronic Engineering
• Bachelor of Electrical in Energy Systems Engineering
• Master of Science (Electrical System Engineering)
• Master of Science (Electrical Power Engineering)- Mixed Mode
• Doctor of Philosophy (PhD)

Address

SCHOOL OF ELECTRICAL SYSTEM ENGINEERING
Universiti Malaysia Perlis (UniMAP),
Kampus UniMAP Pauh Putra,
Tingkat 1, Blok 12,
02600 Arau, Perlis.

Tel: +6(04) 988 5611
Fax: +6(04) 988 5602

INTRODUCTION

School of Electrical System Engineering offers three programmes which are Bachelor of Electrical System Engineering, Bachelor of Industrial Electronic Engineering and Bachelor of Electrical Energy Systems Engineering. The School of Electrical System Engineering has well equipped teaching areas and laboratories. The laboratory infrastructure is highly developed, with a large number of networked PCs and power engineering workstations. These include Electronic Laboratory, Digital Electronic Laboratory, Computer Programming Laboratory, Electrical Technology Laboratory, Instrumentation Laboratory, Power System Laboratory, Electrical Machine Laboratory, Power Electronic Laboratory and Electromagnetic and Machine Design Laboratory.

Electrical System Engineering (RK23)

The Electrical System Engineering programme leading to the degree of Bachelor of Engineering (Hons)(Electrical System Engineering) has a strong focus on the preparation of engineers who can serve the needs of the electric power industry. This programme emphasize on the major fields of power engineering, which includes electrical machines, power systems and high voltage engineering. These compulsory coursesare offered to cope with the rapid change of technology in power engineering.

Fundamental subjects on electrical circuit and power engineering are taught in the first two years of study. A broad background in mathematics and computing, electric circuits and systems, analogue electronic circuits and components, digital systems, instrumentations, communications, electromagnetics and control, necessary to underpin the more advanced courses given in the subsequent years. Students undergo practical training after at the semester break of third year to gain practical knowledge from electrical power industries. Final year student project enhance practical skills and the use of innovative and creative ideas.

Industrial Electronic Engineering (RK45)

The School of Electrical Systems Engineering also offers Industrial Electronic Engineering program leading to the degree of Bachelor of Engineering (Hons)(Industrial Electronic Engineering). This program focuses on power electronic systems for industrial use with special emphasis on industrial electronic control, electrical machine and drive.

The programme consists of common courses for the first two years providing a broad background in mathematics and computing, electric circuits and systems, analogue electronic circuits and components, digital systems, instrumentations, communications, electromagnetics and control, necessary to underpin the more advanced courses given in the subsequent years. In the third and fourth year, the students will major in electrical system and power electronic system in which will provide the opportunity for in depth technical study combined with a range of courses aiming to enhance the students understanding of industrial electronic application. Students undergo practical training after at the semester break of third year to gain practical knowledge from electrical power industries.

Electrical Energy Systems Engineering (RK96)

Bachelor of Engineering (Hons) (Electrical Energy Systems Engineering) programme, focuses on technological aspects and management of electricity generation including renewable energy and alternative energy sources. One the main objective of the programme is to promote the use of renewable energy for electricity generation in Malaysia.

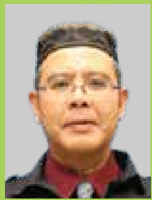
This program consists of common courses until third years of studies which providing a broad background in mathematics and computing, electric circuits and systems, analogue electronic circuits and components, digital systems, instrumentations, communications, electromagnetic, control, electrical system (generation, transmission & distribution) and power electronic. Students undergo practical training after at the semester break of third year to gain practical knowledge from electrical power industries.

In fourth year, students will be focused in their major studies which are in electrical energy system and renewable energy system subjects. This will provide the opportunity for in depth study combined with a range of courses aiming to enhance the students understanding of renewable energy applied in electrical power. In general, electrical energy system engineering programme has abroad scope, particularly in the sectors of power generation and energy renewal.

STAFF DIRECTORY

Dean
Assoc. Prof. Dr. Mohd. Fareq Bin Abd. Malek
e-mail: mfareq@unimap.edu.my

Deputy Dean
(Academic and Research)
Ir. Dr. Rosnazri Bin Ali
e-mail: rosnazri@unimap.edu.my



Deputy Dean
(Student Development and Alumni)
Dr. Muhammad Mokhzaini Bin Azizan
e-mail: mokhzainiazizan@unimap.edu.my

Chairperson of Degree Programme
(Electrical System Engineering)
Dr. Nuriziani Binti Husin
e-mail: nuriziani@unimap.edu.my

Chairperson of Degree Programme
(Industrial Electronics Engineering)
Dr. Mohd Azrik Bin Roslan
e-mail: mazrik@unimap.edu.my

Chairperson of Degree Programme
(Electrical Energy Systems Engineering)
Dr. Fijay Bin Fauzi
e-mail: fijay@unimap.edu.my

Chairperson of Diploma Programme
(Electrical Engineering)
Dr. Mohd Hafizuddin Bin Mat
e-mail: hafizuddinmat@unimap.edu.my

Chairperson of
Postgraduate Programme
Dr. Dina Maizana Maiz Ahmad
e-mail: dina@unimap.edu.my

Coordinator of Industrial Networking and Quality Management
Dr. Khor Shing Fhan
e-mail: sfkhor@unimap.edu.my

Assistant Registrar
Mrs. Ku Nurmadihah Binti Ku Yaacob
e-mail: nurmadihah@unimap.edu.my

LECTURERS

Prof. Dr. Syed Idris bin Syed Hassan
Ph.D. (Antenna Design) (Exeter University)
M.Sc. (Radar and Radio Communication Systems) (Birmingham University)
B.Sc. (Hons.) (UKM)
e-mail: syedidris@unimap.edu.my

Assoc. Prof. Dr.
Mohd Fareq bin Abd. Malek
Ph.D. (Radio Frequency, Microwave and Free Electron Maser) (Univ. of Liverpool, U.K)
M.Sc.(Eng.)Distinction (Microelectronic Systems and Telecommunications) (Univ. of Liverpool, U.K)
B.Eng. (Hons.) (Electronic and Communication Engineering) (Univ. of Birmingham, UK)
e-mail: mfareq@unimap.edu.my

Assoc. Prof. Dr.
Mohd Rozailan bin Mamat @ Ibrahim
PhD (Power Electronic & Drives) (Swansea, UK)
MSc. (Electronics) (Newcastle Upon Tyne, UK)
B.Eng. (Hons.) (Electrical) (UM)
e-mail: rozailan@unimap.edu.my

Assoc. Prof.
Shamshul Bahar bin Yaakob
M.Eng. (Artificial Intelligent) (Nagaoka University, Japan)
B.Eng.(Hons.) (Electrical Electronic Systems) (Shizuoka University, Japan)
e-mail: shamshul@unimap.edu.my

Dr. Abadal-Salam Taha HUSSAIN
Ph.D. (Mechatronic Engineering) (UniMAP)
M.Sc. (Electronics Engineering) (USTO)
B.Eng. (Hons.) (Electrical & Electronics Engineering) (RNEC)
e-mail: abadal@unimap.edu.my

Dr. Banu Poobalan
Ph.D. (Electronic Materials & Semiconductor Devices) (USM)
M.Sc. (Electronic Materials & Semiconductor Devices) (USM)
B.Eng. (Hons.) (Industrial Electronics Engineering) (UniMAP)
e-mail: banu@unimap.edu.my

Dr. Dina Maizana Maiz Ahmad
Ph.D. (Transformer Design) (UniMAP)
Magister Technic (MT) in Electrical Conservation (InstitutTeknologi Bandung (ITB), Indonesia)
B.Eng. (Hons.) (Electrical Technique) (Universiti Sumatera Utara (USU), Indonesia)
e-mail: dina@unimap.edu.my

Dr. Fijay bin Fauzi
PhD. (Thin Film Solar Cells) (SHU,UK)
M.Eng. (Electical - Mechatronic and Automatic Control) (UTM)
B.Eng. (Hons.) (Electrical) (UTM)
e-mail: fijay@unimap.edu.my

Dr. Gomesh Nair a/l Shasidharan
Ph.D Electrical Systems Engineering
M.Sc Electrical Systems Engineering
B.Sc (Hons) Industrial Electronics (UniMAP)
e-mail: gomesh@unimap.edu.my

Dr. Haziah binti Abdul Hamid
Ph.D. (High Voltage Engineering) (Cardiff University, UK)
M.Eng. (Electrical) (UTM)
B.Eng. (Hons.) (Electrical) (UTM)
e-mail: haziah@unimap.edu.my

Dr. Indra Nisja
PhD. (in Electrical Power and Energy Conversion, University Sains Malaysia)
M.Eng. (in Electrical Power Eng.) (Universiti Putra Malaysia)
Engr. (Hons.) (in Electrical Eng.) (University of Bung Hatta, Indonesia)
e-mail: indra@unimap.edu.my

Dr. Khor Shing Fhan
Ph.D. (Materials Science) (UPM)
B.Sc.with Edu. (Hons.) (Physics) (UPM)
e-mail: sfkhor@unimap.edu.my

Dr. Leong Jenn Hwai
Ph.D. (Electrical / Electronic Engineering) (University of Sheffield)
M.Sc. Degree (Electrical / Electronic Engineering) (USM)
B.Eng. (Hons.) (Electrical / Electronic Engineering) (USM)

Dr. Mahmoud A. M. Albreem
Ph.D. (Wireless and Mobile Systems) (USM)
M.Sc. (Electronic Systems Design Engineering) (USM)
B.Eng. (Electrical Engineering) (Islamic University of Gaza (IUG))
e-mail: mahmoudam@unimap.edu.my

Dr. Mohd Azrik bin Roslan
Ph.D. in Electronic and Electrical Engineering (University of Strathclyde, UK)
B.Eng in Electrical and Elctronics (UTP)
e-mail: mazrik@unimap.edu.my

Dr. Mohd Hafizuddin bin Mat
Ph.D. (Bio-Electromagnetic) (UniMAP)
B.Eng. (Hons.) (Communication Engineering) (UniMAP)
Dip. in Electronic Engineering (UTM)
e-mail: hafizuddinmat@gmail.com

Dr. Mohd Irwan Bin Yusoff
Ph.D.(Electrical System Engineering) (UniMAP)
M.Sc. (Electrical System Engineering) (UniMAP)
B.Eng. (Hons.) (Electrical System Engineering) (UniMAP)
e-mail: irwanyusoff@unimap.edu.my

Dr. Mohd Rafi Bin Adzman
D.Sc (Tech.) (Power Systems and High Voltage Eng.) (Aalto, Finland)
M.Sc. (Tech.) (Electrical Eng.) (TKK, Finland)
B.Eng. (Hons.) (Electrical Eng.) (UiTM)
Dipl. (Electrical Power Eng.) (ITM)
e-mail: mohdrafi@unimap.edu.my

Dr. Mohammad Faridun Naim Tajuddin
Ph.D. (Electrical Engineering) (UTM)
M.Eng. (Electrical Energy & Power System) (UM)
B.Eng. (Hons.) (Electrical Engineering) (UM)
e-mail: faridun@unimap.edu.my

Dr. Muhammad Irwanto Misrun
Ph.D. (Renewable Energy) (Universiti Malaysia Perlis (UniMAP))
Magister Technic(MT) (Electrical Eng.) (Gadjah Mada University, Indonesia)
B.Eng. (Hons.) (Electrical Eng.) (Medan Institute of Technology, Indonesia)
e-mail: irwanto@unimap.edu.my

Dr. Muhammad Mokhzaini Bin Azizan
Ph.D. (Transformer Design–Power Quality)(USM)
M.Sc.(Power Quality)(USM)
B.Eng.(Hons.)(UTEM)
e-mail: mokhzaini@unimap.edu.my

Dr. Muzamir bin Isa
Doctor of Science (High Voltage Eng.) (Aalto University, Finland)
M.Eng. (Elect. Eng) (KUiTTHO & FH Koln, Germany)
B.Eng.(Hons.)(Electrical -Power) (UTM)
e-mail: muzamir@unimap.edu.my

Dr. Norkharziana binti Mohd Nayan
Ph.D. Electrical Engineering, (UTM)
M.Sc. (Electrical and Electronic Engineering), USM
B.Eng. (Hons) Electrical Power, UTM
e-mail: norkharziana@unimap.edu.my

Dr. Nuriziani binti Hussin
Ph.D. (High Voltage Engineering) (University of Southampton, UK)
B.Eng. (Hons.) (Electrical Engineering) (University of Southampton, UK)
e-mail: nuriziani@unimap.edu.my

Ir. Dr. Rosnazri bin Ali
Ph.D. (Renewable Energy) (UniMAP)
M.Sc. (Electrical & Electronic Eng.) (USM)
B.Eng. (Hons.) (Electrical Engineering) (RMIT Melbourne)
e-mail: rosnazri@unimap.edu.my

Dr. Samila binti Mat Zali
Ph.D. (Electrical Energy & Power Systems) (University of Manchester)
M.Sc. (Electrical, Electronic & System) (UKM)
B.Eng. (Hons.) (Electrical, Electronic & System) (UKM)
e-mail: samila@unimap.edu.my

Dr. Syafruddin bin Hasan MT
Ph.D. (Electrical Engineering) (Universiti Malaysia Perlis, UniMAP, Malaysia)
Magister Technic (Electrical Eng.) (Institut Teknologi Bandung, ITB, Indonesia)
B.Sc. (Hons.) (Electrical Eng.) (Universitas Sumatera Utara, USU Medan, Indonesia)
e-mail: syafruddin@unimap.edu.my

Dr. Syahrul Ashikin binti Azmi
Ph.D. (Electronic & Electrical Eng.) (University of Strathclyde, UK)
M.Eng.Sc. (Electrical Power) (UNSW, Australia)
B.Sc. (Hons) (Electrical & Electronic Eng.) (UTP)

Mrs. Adawati binti Yusof
M.Eng. (Industrial Electronic and Control) (UM)
B.Eng. (Hons.) (Industrial Electronics Eng.) (UniMAP)
e-mail: adawati@unimap.edu.my

Mr. Abdul Rahim bin Abdul Razak
M.Sc. (Electrical Power) (USM)
B.Eng (Hons.) (Electrical Power) (USM)
e-mail: abdulrahim@unimap.edu.my

Mr. Ahmad Zaidi bin Abdullah
M.Eng (Electric Power System) (UNITEN)
B.Eng. (Hons.) (Industrial Electronic) (UniMAP)
Dip.in Electrical Eng. (Communication Eng.) (POLIMAS)
e-mail: zaidiabdullah@unimap.edu.my

Mrs. Ami Nurul Nazifah binti Abdullah
M.Sc. (Electrical Power System) (UPM)
B.Eng. (Hons.) (Electrical System Eng.) (UniMAP)
e-mail: nazifah@unimap.edu.my

Mrs. Azuwa binti Ali
M.Eng. (Communication & Computer) (UKM)
B.Eng. (Hons.) (Electrical & Electronics Eng.) (UTP)
e-mail: azuwa@unimap.edu.my

Ms. Farrah Salwani binti Abdullah
M.Eng. (Electrical Eng.) (UTHM)
B.Eng. (Hons.) (Electrical & Electronic Eng.) (UTHM)
e-mail: farrahsalwani@unimap.edu.my

Ms. Khatijahhusna binti Abd Rani
M.Sc. in Applied Statistic, (UTM)
B.Science (Hons) of Statistic (UITM)
e-mail: khatijahhusna@unimap.edu.my

Mrs. Mazwin binti Mazlan
M.Eng. (Industrial Electronic and Control) (UM)
B.Eng. (Hons.) (Industrial Electronics Eng.) (UniMAP)
Dip. (Electronic Eng.) (PSAS)
e-mail: mazwin@unimap.edu.my

Mr. Mohd Alif bin Ismail
M.Eng in Electrical Power (UTM)
B.Eng. Hons. In Electrical System Engineering (UniMAP)
e-mail: alifismail@unimap.edu.my

Mr. Mohd Annuar bin Mohd Isa
M.Sc. (Electrical& Electronics Eng.) (Software Testing) (USM)
B.Eng. (Hons.) (Electrical and Electronics Engineering) (USM)
e-mail: annuar@unimap.edu.my

Mr. Mohd. Asri bin Jusoh
M.Sc. (Machine Design) (UniMAP)
B.Eng. (Hons.) (Industrial Electronic) (UniMAP)
e-mail: asrijusoh@unimap.edu.my

Mr. Mohd Hafiz bin Arshad
M.Sc. in Electrical (UniMAP)
B.Eng (Hons) in Electrical System (UniMAP)
e-mail: hafizarshad@unimap.edu.my

Mr. Mohd Saufi bin Ahmad
M.Sc. (Electrical Machines & Drive) (USM)
B.Eng. (Hons.)(Electrical & Electronics Eng.)(USM)
e-mail: saufiahmad@unimap.edu.my

Mr. Mohd. Shihabudin bin Ismail
M.Sc. (Mechanical Engineering) (USM)
B.Eng. (Hons.) (Mechanical Engineering) (USM)
e-mail: mohdshihabudin@unimap.edu.my

Mr. Muhd. Hafizi bin Idris
M.Eng.(Electrical - Power)(UTM)
B.Eng.(Hons.) (Electric & Electronic Eng.) (UKM)
e-mail: hafiziidris@unimap.edu.my

Mr. Musdar bin Dahlan
M.Eng. (Signal Electronic System) (Gajah Mada University, Indonesia)
B.Eng. (Hons.) (Electric Power Engineering) (Medan Institute of Technology, Indonesia)
e-mail: musdar@unimap.edu.my

Ms. Noor Fazliana binti Fadzail
M.Sc. in Electrical Power Engineering (UniMAP)
B. Eng (Hons) in Electrical System Engineering (UniMAP)
e-mail: fazlianafadzail@unimap.edu.my

Mr. Noor Haqkimi bin Abd Rahman
M. Eng. (Industrial Electronics and Control) (UM)
B.Eng. (Hons.) (Industrial Electronics Eng.) (UniMAP)
Dip. (Electronics Engineering)(UTM)
e-mail: haqkimirahman@unimap.edu.my

Mr. Noor Hasnizam bin Hanafi
M.Eng. (Electrical) (UTHM)
B.Eng. (Hons.) (Electrical Engineering-Power) (UiTM)
Dip. (Electrical Engineering-Power) (ITM)
e-mail: hasnizam@unimap.edu.my

Mrs. Nor Ashbahani binti Mohamad Kajaan
M.Sc. (Electrical System Engineering) (UniMAP)
B.Eng. (Hons.) Industrial Electronic Engineering (UniMAP)
e-mail: ashbahani@unimap.edu.my

Mrs. Nur Fairuz Mohamed Yusof
M.Sc. (Electronic System Design Engineering) (USM)
B.Eng. (Hons.) (Electrical System Eng.) (UniMAP)
e-mail: nurfairuz@unimap.edu.my

Mrs. Nur Najihah binti Abu Bakar
M.Eng. (Electrical Engineering) (UTM)
B.Eng. (Electrical Engineering) (UTM)
e-mail: nurnajihah@unimap.edu.my

Mrs. Salsabila binti Ahmad
M.Sc (Instrumentation Eng.) (UPM)
B.Eng. (Hons.) (Electrical & Electronic) (UNITEN)
Adv. Dip. (Industrial Automation) (SHRDC)
e-mail: salsabila@unimap.edu.my

Mrs. Siti Khodijah binti Mazalan
M.Sc. (Electrical Power) (UPM)
B.Eng. (Hons.) (Electrical System) (UniMAP)
e-mail: khodijah@unimap.edu.my

Mrs. Siti Rafidah binti Abdul Rahim
M.Sc. (Electrical Eng.-Power System) (UiTM)
B.Eng. (Hons.) (Electrical Eng.-Power System) (UiTM)
Dip. in Electrical Eng. (Power) (UTM)
e-mail: rafidah@unimap.edu.my

Mr. Surya Hardi Amrin
Magister Technic (Electrical Power System) (Institut Teknologi Bandung, Indonesia)
B.Sc. (Hons.) (Electrical Eng.) (Universiti Sumatera Utara, Indonesia)
e-mail: surya@unimap.edu.my

TEACHING ENGINEERS

Ir. Mohd. Adzrie bin Hj. Radzali
M. Sc. (Electrical System Engineering, Universiti Malaysia Perlis)
B. Eng. (Hons.) (Mechanical Engineering, Multimedia University)
e-mail: mohdadzrie@unimap.edu.my

Mrs. Arizadayana binti Zahalan
MSc. (Electrical Power Engineering) (UniMAP)
B.Eng.(Hons.) (Electrical &Electronic) (USM)
e-mail: arizadayana@unimap.edu

Mr. Jimirafizi bin Jamil
B.Eng. (Hons.) (Electrical Eng.) (MMU),
Dip. (Electric Communication Eng.) (UTM)
e-mail: rafizi@unimap.edu.my

Mr. Mohd. Zulhisham bin Mohd. Radzi
Master of Electrical Engineering (UTHM)
B.Eng. (Hons.) (Electrical System Eng.) (UniMAP)
e-mail: mzulhisham@unimap.edu.my

Mr. Nor Haidar bin Hashim
B.Eng.(Hons.)(Electrical Eng. Power) (UiTM)
Dip. (Electrical Eng.) (ITM)
e-mail: norhaidar@unimap.edu.my

Mr. Syed Akhmal bin Syed Jamalil
M.Eng. (Electrical Eng.) (UTHM)
B.Eng. (Hons.) (Industrial Electronics Eng.) (UniMAP)
e-mail: syedakhmal@unimap.edu.my

STUDY LEAVE

Mr. Abdul Rahim bin Abdul Razak
M.Sc. (Electrical Power) (USM)
B.Eng. (Hons.) (Electrical Power) (USM)
e-mail: abdulrahim@unimap.edu.my

Mr. Ahmad Shukri bin Fazil Rahman
M.Sc. (Electrical) (UiTM),
B.Eng. (Hons.) (Electrical Instrument) (UiTM)
Dip. (Electrical Engineering - Electronic) (ITM)
e-mail: ahmadshukri@unimap.edu.my

Mrs. Amizah binti Mohd Ariffen
B.Eng. (Hons.) (Electrical) (UTM)
e-mail: amizah@unimap.edu.my

Mr. Azralmukmin bin Azmi
M. Eng. Electrical (Power) (UTM)
B. Eng. (Hons.) (Electrical System Eng.) (UniMAP)
Dip. (Electrical-Power) (UTM)
e-mail: azralmukmin@unimap.edu.my

Mr. Baharuddin bin Ismail
M.Sc. (Electrical & Electronic) (USM)
B.Eng. (Hons.) (Electrical) (UTM)
e-mail: baha@unimap.edu.my

YM. Engku Ahmad Rafiqi bin Engku Ariff
M.Sc. (Electrical Power Eng.), (Newcastle University, United Kingdom)
B.Sc. (Hons.) (Electrical Eng.) (Purdue University, West Lafayette, United States)
e-mail: rafiqi@unimap.edu.my

Mrs. Ernie binti Che Mid
M.Sc.(Electrical Eng.)(UM)
B.Eng.(Hons.)(Electrical Eng.)(UM)
e-mail: ernie@unimap.edu.my

Mrs. Hana binti Abdull Halim
M. Eng. (Electrical-Power) (UTM)
B. Eng. (Hons.) (Electrical and Electronics Engineering) (UTP)
e-mail: hanahalim@unimap.edu.my

Ms. Latifah binti Mohamed
M.Eng. (Electrical & Electronics) (Iwate University, Japan)
B.Eng. (Hons.) (Electrical & Electronics) (Iwate University, Japan)
e-mail: latifah@unimap.edu.my

Ms. Melaty binti Amirruddin
M. Eng. (Electrical-Power) (UTM)
B. Eng. (Hons.) (Electrical and Electronics Engineering) (UTP)
e-mail: melaty@unimap.edu.my

Mr. Mohd. Fayzul bin Mohammed
M.Eng. (Electrical Energy & Power System Eng.) (UM)
B.Eng. (Hons.) in Electric, Electronic & System (UKM)
e-mail: m.fayzul@unimap.edu.my

Mr. Muhamad Hatta bin Hussain
M.Eng. (Electrical-Electronic & Telecommunication) (UTM)
B.Eng. (Hons.) (Electrical) (UiTM)
Dip. in Electrical Eng. (ITM)
e-mail: muhdhatta@unimap.edu.my

Mr. Muhammad Shakir bin Laili
M.Eng. (Electrical-Power) (UTM)
B.Eng. (Hons.) (Electrical) (UTM)
e-mail: mshakir@unimap.edu.my

Mr. Muzaidi Othman @ Marzuki
M.Eng. (Industrial Electronic and Control) (UM)
B.Eng. (Hons.) (Electrical System Eng.) (UniMAP)
Dip. (Power Electronic and Control) (Polimas)
e-mail: muzaidi@unimap.edu.my

Mr. Nasrul Helmei bin Halim
M.Eng.(Electrical-Power)(UTM)
B.Eng.(Hons.)(Electrical System Eng.) (UniMAP)
Dip. (Electrical Engineering - Power) (UTM)
e-mail: nasrulhelmei@unimap.edu.my

Ms. Noor Ashikin binti Mohd Razali
M.Eng.(Electrical-High Voltage) (UTM)
B.Eng.(Hons.)(Electrical and Electronic Eng.)(UKM)
e-mail: ashikinrazali@unimap.edu.my

Ms. Noor Syafawati binti Ahmad
M.Sc. (Electrical System Engineering) (UniMAP)
B.Eng. (Hons.)(Electrical Engineering) (UTHM)
e-mail: syafawati@unimap.edu.my

Ms. Noor Shahida binti Jamoshid
M.Eng.(Electrical - Power)(UTM)
B.Eng.(Hons.)(Electrical)(UTM)
Dip. in Power Electrical (UTM)
e-mail: shahida@unimap.edu.my

Mr. Norjasmi bin Abdul Rahman
M.Sc.(Tech) Electronics and Electrical Eng. (Electrical Drives)(Aalto University)
B.Eng.(Hons.)(Industrial Electronic Eng.) (UniMAP)
Dip. (Electrical Engineering - Electronics) (UiTM)
e-mail: norjasmi@unimap.edu.my

Mrs. Nor Baizura binti Ahamad
M.Eng.(Industrial Electronic & Control)(UM)
B.Eng.(Hons.)(Electrical Systems Eng.)(UniMAP)
Dip. (Electrical Engineering-Technology Computer)(PSP)
e-mail: baizura@unimap.edu.my

Mrs. Nor Hanisah binti Baharudin
M.Eng.Sc. (Renewable Energy Electrical Power Systems)(Curtin)
B.Eng.(Hons.)(Electrical & Electronics)(UTP)
e-mail: norhanisah@unimap.edu.my

Mrs. Norshafinash binti Saudin
M.Eng.(Electrical-Power)(UTM)
B.Eng.(Hons.)(Electrical)(UTM)
e-mail: norshafinash@unimap.edu.my

Mrs. Nur Adyani binti Mohd. Affendi
M.Eng. (Electrical-Electronic & Telecommunication)(UTM)
B.Eng.(Hons.)(Industrial Electronic)(KUTKM)
Dip. of Electronic Communication (PUO)
e-mail: nuradyani@unimap.edu.my

Mrs. Nurhakimah binti Mohd Mukhtar
M.Eng.(Industrial Electronic & Control)(UM)
B.Eng.(Hons.)(Electrical System Eng.)(UniMAP)
e-mail: nurhakimah@unimap.edu.my

Ms. Nur Sabrina binti Md Noorpi
M. Eng. (Electrical-Power)(UTM)
B. Eng. (Hons.)(Electrical and Electronics Engineering)(UTP)
e-mail: nursabrina@unimap.edu.my

Mrs. Surina binti Mat Suboh
M.Sc.(Electrical Eng.)(Robotics & Control)(USM)
B.Eng.(Hons.)(Electrical & Electronics Eng.)(UPM)
e-mail: surina@unimap.edu.my

YM. Tunku Muhammad Nizar bin Tunku Mansur
MIEEE, Grad.IEM(Electrical)
M.Eng.Sc. (Renewable Energy Electrical Power Systems)(Curtin)
B.Eng.(Hons.)(Electrical & Electronics)(UTP)
e-mail: tunkunizar@unimap.edu.my

Mr. Zainuddin bin Mat Isa
M.Sc.(Electrical Eng.)(KUTKM)
B.Eng.(Hons.)(Electrical)(UTM)
e-mail: zainuddin@unimap.edu.my

Mrs. Zetty Nurazlinda binti Zakaria
M.Eng.(Electrical-Power)(UTM)
B.Eng.(Hons.)(Electrical)(UTM)
e-mail: zetty@unimap.edu.my

ASSISTANT ENGINEER

Mr. Ahmad Zaker bin Roslan
e-mail: ahmadzaker@unimap.edu.my

Mr. Aidil Syukri bin Shaari
e-mail: aidil@unimap.edu.my

Mr.Mohd. Azlizan bin Moh Adib
e-mail: azlizan@unimap.edu.my

Mr.Mohd. Azrin bin Che Tam
e-mail: azrin@unimap.edu.my

Mr.Mohd. Faizal bin Mohd Zahir
e-mail: faizalzahir@unimap.edu.my

Mr. Nazril bin Husny
e-mail: nazril@unimap.edu.my

Mrs. Norsyakiela binti Ramli
e-mail: syakiela@unimap.edu.my

CHARGEMAN

Mr. Azliman bin Musa
e-mail: azliman@unimap.edu.my

Mr. Shukur bin Abdullah
e-mail: shukur@unimap.edu.my

TECHNICIANS

Mr. Ahmad Saiful bin Salim
e-mail: saifulsalim@unimap.edu.my

Mrs. Mahshithah binti Mohamad
e-mail: mahshithahmohamad@unimap.edu.my

Mr. Mohamad Fuad bin Ahmad
e-mail: fuadahmad@unimap.edu.my

Mr. Mohamad Khairi bin Mohd. Zahir
e-mail: khairizahir@unimap.edu.my

Mr. Mohd. Izanne bin Harun
e-mail: izanne@unimap.edu.my

Mr. Mohd. Khairul bin Abidin
e-mail: khairulabidin@unimap.edu.my

Mrs. Roshila binti Hamzah @ Mohamed
e-mail: roshila@unimap.edu.my

Mr. Shahril Hafiz Bin Hakimin
shahrilhafiz@unimap.edu.my

Mrs. Siti Najihah binti Zakaria @ Abdullah
e-mail: sitinajihah@unimap.edu.my

ADMINISTRATIVE STAFF

Mrs. Ku Nurmadihah binti Ku Yaacob
Assistant Registrar
Tel : +6(04) 988 5603
e-mail : nurmadihah@unimap.edu.my

Mrs. Nordiana binti Jamadin
Dean's Secretary
Tel : +6(04) 988 5601
e-mail : nordiana@unimap.edu.my

Mrs. Azirah binti Baharum
Clerk
e-mail: azirah@unimap.edu.my

Mrs. Azizah binti Hassan
Clerk
e-mail: azizahhassan@unimap.edu.my

Mrs. Nurul Nadiah binti Kamarudin
Clerk
e-mail: nurulnadiah@unimap.edu.my

Mr. Muhammad Fazly bin Mansor
Office's Assistant
e-mail: mfazlym@unimap.edu.my

BACHELOR OF ENGINEERING (HONOURS) (ELECTRICAL SYSTEM ENGINEERING)

PROGRAMME OBJECTIVES (PEO)

Programme Objective 1
Graduates who are leaders in the field of electrical engineering or chosen field as demonstrated via career advancement.

Programme Objective 2
Graduates who are members of and contribute to professional society.

Programme Objective 3
Graduates who engage in life-long learning or continuous education opportunities.

Programme Objective 4
Graduates who contribute towards research and development.

Programme Objective 5
Graduates who are entrepreneurial engineers.

PROGRAMME OUTCOMES (PO)

PO1
Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in electrical engineering discipline to the solution of complex engineering.

PO2
Ability to identify, formulate and solve electrical engineering problems.

PO3
Ability to design solutions for complex engineering problems and systems, component or processes to meet desired needs.

PO4
Ability to conduct investigation into complex problems as well as to analyze and interpret data.

PO5
Ability to use techniques, skills and modern engineering tools necessary for complex engineering practices so as to be easily adaptable to industrial needs.

PO6
Understanding of the social, cultural, global and environmental responsibilities of a professional engineer.

PO7
Ability to understand entrepreneurship, the process of innovation and the need for environmental and sustainable development.

PO8
Ability to understand the professional and ethical responsibilities and commitment to the community.

PO9
Ability to function on multi-disciplinary teams.

PO10
Ability to communicate effectively on complex engineering activities with the engineering community and with society at large.

PO11
A recognition of the need for, and an ability to engage in life-long learning.

PO12
Demonstrate understanding of project management and finance principles.

BACHELOR OF ENGINEERING (HONORS)
(ELECTRICAL SYSTEM ENGINEERING)

YEAR	FIRST		SECOND		THIRD			FOURTH	
SEMESTER	I	II	III	IV	V	VI		VII	VIII
Discipline Core (96)	EET106/3 Engineering Science	EET110/3 Basic Computer Programming	EET206/3 Electric Circuit II	EET208/3 Electrical Power Technology	EET301/4 Power System Engineering	EET308/3 Power System Analysis	EIT302/4 Industrial Training	EET445/2 Final Year Project I	EET446/4 Final Year Project II
	EET108/3 Electric Circuit I	EET107/3 Digital Electronics I	EET202/3 Digital Electronics II	EET203/4 Microcontroller Systems Design	EET302/3 Control Systems Engineering	EET307/4 Power Electronics I		EET412/3 Electrical Machine Design	EET416/3 Electrical Drives
		EET109/3 Electronic Devices	EET205/4 Analog Electronics	EET207/3 Signals and Systems	EET306/4 Electrical Machines	EET304/3 Communication System Engineering		EET411/3 Power System Operation & Control	EET417/3 High Voltage Engineering
			EET204/3 Instrumentation and Measurements		EET303/3 Electromagnetic Theory	EET333/3 Engineering Team Project		EET414/3 Substation Design	
								EETXXX/3 Elective I	EETXXX/3 Elective II
Common Core (24)	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT203/3 Engineering Mathematics III	EQT271/3 Engineering Statistics	EUT442/2 Professionalism in Engineering	EET311/2 Engineering Economics			EUT444/3 Management for Engineers
		ECT111/3 Engineering Skills							
University Required (17)	UUW233/2 Islamic Civilization and Asia Civilization	UUWXXX/2 *Foundation English II		UUW212/2 University English Language		UUW322/2 Thinking Skills		UUWXXX/2 Option	
	UUW410/2 University Malay Language		UZWXXX/1 Co-curriculum	UUW224/2 Engineering Entrepreneurship					
	UUW235/2 Ethnic Relation								
	UUWXXX/1 Uniform Body	UUWXXX/1 Uniform Body							
137	16	18	17	17	17	17	4	16	15
Total Units for Graduation 137									

Elective I:EET427/3 Industrial Electronic Control or EET426/3 Power Electronics II or EET431/3 Electrical Energy System or EET432/3 Electrical Energy Utilization
Elective II: EET418/3 Power Quality or EET422/3 EMC & Compliance Engineering or EET433/3 Renewable Energy System
For UUWXXX Foundation English II, student who got Band 1 and Band 2 for MUET need to pass the Foundation English I with minimum grade C.

BACHELOR OF ENGINEERING (HONOURS) (INDUSTRIAL ELECTRONIC ENGINEERING)

PROGRAMME OBJECTIVES (PEO)

Programme Objective 1
Graduates who are leaders in the field of electrical engineering or chosen field as demonstrated via career advancement.

Programme Objective 2
Graduates who are members of and contribute to professional society.

Programme Objective 3
Graduates who engage in life-long learning or continuous education opportunities.

Programme Objective 4
Graduates who contribute towards research and development.

Programme Objective 5
Graduates who are entrepreneurial engineers.

PROGRAMME OUTCOMES (PO)

PO1
Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in electrical engineering discipline to the solution of complex engineering.

PO2
Ability to identify, formulate and solve electrical engineering problems.

PO3
Ability to design solutions for complex engineering problems and systems, component or processes to meet desired needs.

PO4
Ability to conduct investigation into complex problems as well as to analyze and interpret data.

PO5
Ability to use techniques, skills and modern engineering tools necessary for complex engineering practices so as to be easily adaptable to industrial needs.

PO6
Understanding of the social, cultural, global and environmental responsibilities of a professional engineer.

PO7
Ability to understand entrepreneurship, the process of innovation and the need for environmental and sustainable development.

PO8
Ability to understand the professional and ethical responsibilities and commitment to the community.

PO9
Ability to function on multi-disciplinary teams.

PO10
Ability to communicate effectively on complex engineering activities with the engineering community and with society at large.

PO11
A recognition of the need for, and an ability to engage in life-long learning.

PO12
Demonstrate understanding of project management and finance principles.

BACHELOR OF ENGINEERING (HONOURS)
(INDUSTRIAL ELECTRONIC ENGINEERING)

YEAR	FIRST		SECOND		THIRD			FOURTH	
SEMESTER	I	II	III	IV	V	VI		VII	VIII
Discipline Core (96)	EET106/3 Engineering Science	EET110/3 Basic Computer Programming	EET206/3 Electric Circuit II	EET208/3 Electrical Power Technology	EET301/4 Power System Engineering	EET308/3 Power System Analysis	EIT302/4 Industrial Training	EET445/2 Final Year Project I	EET446/4 Final Year Project II
	EET108/3 Electric Circuit I	EET107/3 Digital Electronics I	EET202/3 Digital Electronics II	EET203/4 Microcontroller Systems Design	EET302/3 Control Systems Engineering	EET307/4 Power Electronics I		EET427/3 Industrial Electronic Control	EET428/3 Power Electronics Drives
		EET109/3 Electronic Devices	EET205/4 Analog Electronics	EET207/3 Signals and Systems	EET306/4 Electrical Machines	EET304/3 Communication System Engineering		EET426/3 Power Electronics II	EET422/3 EMC & Compliance Engineering
			EET204/3 Instrumentation and Measurements		EET303/3 Electromagnetic Theory	EET333/3 Engineering Team Project		EET424/3 Power Electronics For Energy System	
								EETXXX/3 Elective I	EETXXX/3 Elective II
Common Core (24)	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT203/3 Engineering Mathematics III	EQT271/3 Engineering Statistics	EUT442/2 Professionalism in Engineering	EET311/2 Engineering Economics			EUT444/3 Management for Engineers
		ECT111/3 Engineering Skills							
University Required (17)	UUW233/2 Islamic Civilization and Asia Civilization	UUWXXX/2 *Foundation English II		UUW212/2 University English Language		UUW322/2 Thinking Skills		UUWXXX/2 Option	
	UUW410/2 University Malay Language		UZWXXX/1 Co-curriculum	UUW224/2 Engineering Entrepreneurship					
	UUW235/2 Ethnic Relation								
	UUWXXX/1 Uniform Body	UUWXXX/1 Uniform Body							
137	16	18	17	17	17	17	4	16	15
Total Units for Graduation 137									

Elective:EET412/3 Electrical Machine Design or EET414/3 Substation Design or EET432/3 Electrical Energy Utilization orEET431/3 Electrical Energy System
Elective II: EET418/3 Power Quality or EET417/3 High Voltage Engineering or EET433/3 Renewable Energy System
For UUWXXX Foundation English II, student who got Band 1 and Band 2 for MUET need to pass the Foundation English I with minimum grade C.

BACHELOR OF ENGINEERING (HONOURS) (ELECTRICAL ENERGY SYSTEMS ENGINEERING)

PROGRAMME OBJECTIVES (PEO)

Programme Objective 1
Graduates who are leaders in the field of electrical engineering or chosen field as demonstrated via career advancement.

Programme Objective 2
Graduates who are members of and contribute to professional society.

Programme Objective 3
Graduates who engage in life-long learning or continuous education opportunities.

Programme Objective 4
Graduates who contribute towards research and development.

Programme Objective 5
Graduates who are entrepreneurial engineers.

PROGRAMME OUTCOMES (PO)

PO1
Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in electrical engineering discipline to the solution of complex engineering.

PO2
Ability to identify, formulate and solve electrical engineering problems.

PO3
Ability to design solutions for complex engineering problems and systems, component or processes to meet desired needs.

PO4
Ability to conduct investigation into complex problems as well as to analyze and interpret data.

PO5
Ability to use techniques, skills and modern engineering tools necessary for complex engineering practices so as to be easily adaptable to industrial needs.

PO6
Understanding of the social, cultural, global and environmental responsibilities of a professional engineer.

PO7
Ability to understand entrepreneurship, the process of innovation and the need for environmental and sustainable development.

PO8
Ability to understand the professional and ethical responsibilities and commitment to the community.

PO9
Ability to function on multi-disciplinary teams.

PO10
Ability to communicate effectively on complex engineering activities with the engineering community and with society at large.

PO11
A recognition of the need for, and an ability to engage in life-long learning.

PO12
Demonstrate understanding of project management and finance principles.

BACHELOR OF ENGINEERING (HONOURS)
ELECTRICAL ENERGY SYSTEMS ENGINEERING

YEAR	FIRST		SECOND		THIRD			FOURTH	
SEMESTER	I	II	III	IV	V	VI		VII	VIII
Discipline Core (96)	EET106/3 Engineering Science	EET110/3 Basic Computer Programming	EET206/3 Electric Circuit II	EET208/3 Electrical Power Technology	EET301/4 Power System Engineering	EET308/3 Power System Analysis	EIT302/4 Industrial Training	EET445/2 Final Year Project I	EET446/4 Final Year Project II
	EET108/3 Electric Circuit I	EET107/3 Digital Electronics I	EET202/3 Digital Electronics II	EET203/4 Microcontroller Systems Design	EET302/3 Control Systems Engineering	EET307/4 Power Electronics I		EET431/3 Electrical Energy System	EET428/3 Power Electronics Drives
		EET109/3 Electronic Devices	EET205/4 Analog Electronics	EET207/3 Signals and Systems	EET306/4 Electrical Machines	EET304/3 Communication System Engineering		EET432/3 Electrical Energy Utilization	EET433/3 Renewable Energy System
			EET204/3 Instrumentation and Measurements		EET303/3 Electromagnetic Theory	EET333/3 Engineering Team Project		EET424/3 Power Electronics For Energy System	EET 417/3 High Voltage Engineering
								EETXXX/3 Elective I	
Common Core (24)	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT203/3 Engineering Mathematics III	EQT271/3 Engineering Statistics	EUT442/2 Professionalism in Engineering	EET311/2 Engineering Economics			EUT444/3 Management for Engineers
		ECT111/3 Engineering Skills							
University Required (17)	UUW233/2 Islamic Civilization and Asia Civilization	UUWXXX/2 *Foundation English II		UUW212/2 University English Language		UUW322/2 Thinking Skills		UUWXXX/2 Option	
	UUW410/2 University Malay Language		UZWXXX/1 Co-curriculum	UUW224/2 Engineering Entrepreneurship					
	UUW235/2 Ethnic Relation								
	UUWXXX/1 Uniform Body	UUWXXX/1 Uniform Body							
137	16	18	17	17	17	17	4	16	15
Total Units for Graduation 137									

UUWXXX/2 if MUET Band 3 and below is compulsory to take UUW112/2 Basic English
Elective I: EET427/3 Industrial Electronic Control or EET426/3 Power Electronics II or EET411/3 Power System Operation and Control or EET414/3 Substation Design
For UUWXXX Foundation English II, student who got Band 1 and Band 2 for MUET need to pass the Foundation English I with minimum grade C.

School of Electrical System Engineering

COURSE SYLLABUS

EET103/4
ELECTRICAL TECHNOLOGY

Course Synopsis

This course is offered to non-electrical engineering background students. This course is intended to provide students with clear understanding of the DC and AC circuits, basic principles of 3-phase AC circuits, electro-magnetism and magnetic circuits. They will also gain an understanding of the basic operating principles and performance analysis of three most commonly used electric machines, namely, transformers, dc machines, and induction motors.

Course Outcomes

CO1: Ability to analyze the DC and AC circuits by using Ohm's Law, Kirchhoff's Current Law, Kirchhoff's Voltage Law, Source Transformation and Thevenin's theorem.
CO2: Ability to calculate and analyze parameters of three phase AC system for Wye and Delta connection.
CO3: Ability to explain and apply the basic concept of magnetism and electromagnetism in DC and AC machines.

References

1. Richard J. Fowler. (2008). Electricity Principles and Applications. 7th Edition. McGraw Hill.
2. Boylestad, Robert L. (2007). Introductory Circuit Analysis. 11th Edition. Prentice Hall..
3. Hughes. (2005). Electrical and Electronic Technology. 9th Edition. Prentice Hall.
4. Charles K. Alexander & Matthew N.O.Sadiku. Fundamentals of Electric Circuits. International Third Editions, McGraw-Hill.
5. Nilsson, J.W. & Riedel. (2005). S.A., Electric Circuits. 7th Edition. Pearson Prentice Hall.

EET106/3
ENGINEERING SCIENCE

Course Synopsis

This course aims to introduce to the Electrical Engineering students the knowledge on the principles of material engineering and thermal fluid. It includes aspects related to material engineering, thermodynamics and fluid mechanics.

Course Outcomes

CO1: Ability to describe and analyze the Mechanical, Electrical and Magnetic properties of materials.
CO2: Ability to understand, apply and analyze concepts and principles of Fluid Statics, Bernoulli and Energy Equations.
CO3: Ability to understand, apply and analyze concepts and principles of First Law and Second Law of Thermodynamics.

References

1. William D. Callister, David G. Rethwisch. (2012), Fundamentals of Materials Science and Engineering: An Integrated Approach. John Wiley & Sons.
2. Yunus A. Cengel, Robert H. Turner. (2013). Fundamentals of Thermal-Fluid Sciences, 4th Edition. Int ed. McGraw-Hill.
3. William F Smith, William Fortune Smith, JavadHashemi, (2011,) Foundations of Materials Science and Engineering (SI Units), MCGRAW-HILL Higher Education,
4. Robert A. Granger, (2012). Fluid Mechanics. Courier Dover Publications.
5. Sanford Klein, Gregory Nellis, (2011), Thermodynamics, Cambridge University Press, Technology & Engineering.

EET107/3
DIGITAL ELECTRONICS I

Course Synopsis

The aim of this course is to introduce students to the basic knowledge in the digital electronics. This course focuses the introduction and discussion of the fundamental of digital circuit design and analysis. The lectures cover the following topics: Numbering System, Algebraic Switching, Boolean Function, Combinational Logic Design and Sequential Logic Design.

Course Outcomes

CO1: Ability to apply the basic principles of numbering system and Algebraic Switching in digital electronics.
CO2: Ability to design and optimizes logic circuit using Boolean functions and Karnaugh maps.
CO3: Ability to design and evaluate digital system applications using combinational and sequential logic design techniques.

References

1. Thomas L.Floyd, Digital Fundamentals (2014) 10th edition. Prentice Hall.
2. Rafikha Aliana, Norina Idris, Phak Len Eh Kan, Mohammad Nazri. (2007). Digital Electronics Design. 1st Ed. Prentice Hall.

3. Ronald J. Tocci. (2007). Digital Systems – Principles and Applications. 10th Ed. Prentice Hall.
4. Godse, Atul P. Godse, Deepali A. Godse, Gurpreet Singh Ghai. (2007). Digital Electronics. Technical Publications Pune.
5. Nigel, P.C. (1999). A First Course in Digital Electronic. 1st Ed. Prentice Hall.

EET108/3
ELECTRIC CIRCUIT I

Course Synopsis

Basically this introductory circuit course can be divided into two parts. Part I, consisting of chapter 1 through 4, is devoted to DC circuits. It covers fundamental laws and theorems, circuit analytical techniques, passive and active elements. Part 2, consisting of chapter 5 through 7, deals with AC circuits. It introduces phasors, sinusoidal steady state analysis, using previous analytical techniques under sinusoidal steady state excitation, RLC circuits, AC power calculations and power factor correction and rms values.

Course Outcomes

CO1: Ability to derive important equations and analyze DC circuits

CO2: A Ability to analyze the first and second order circuits containing passive elements, DC sources and switches using differential equations.

CO3: Ability to calculate and analyze circuits parameters containing sinusoidal steady-state sources using complex impedances and phasor representations.

References

1. Nilssen, J.W. and Riedel, S.(2008) Electric Circuits, 8th Edition, Addison Wesley.
2. Robert L. Boylestad. (2007) Introductory Circuit Analysis. 11th Ed. Prentice Hall.
3. Alexander, C.K. and Sadiku, M.N.O.(2007) Fundamental of Electric Circuits, 3rd Edition, McGraw-Hill.
4. Dorf, R.C. and Svoboda, J.A., (1996) Introduction to Electric Circuits, Wiley.
5. David E. Jhonson, (1997), Electric Circuit Analysis, Prentice Hall.

EET109/3
ELECTRONIC DEVICES

Course Synopsis

EET 109 exposes the students with basic electronic devices. It provides a depth study on the concept of PN junction, operation and characteristics of the diode. The students will be emphasized to Half wave rectifiers, Full wave rectifiers, Power Supply Filter and Regulators, Clipper and Clamper Diode circuits and Voltage Multipliers. The students also will learn about the special-purpose of Zener diode in terms of its characteristics and applications. Bipolar Junction Transistors (BJTs) and various types of Field-Effect Transistor which are Junction Field-Effect Transistor (JFET) and the Metal Oxide Semiconductor Field-Effect Transistor (MOSFET) will be introduced in this course as well.

Course Outcomes

CO1: Ability to explain and differentiate the fundamental concepts of electronic devices.

CO2: Ability to analyze the basic operations of electronic devices such as diode, BJT and various types of FET.

CO3: Ability to design and evaluate the basic biasing circuits.

References

1. Neamen Donald A. (2010). Microelectronics Circuit Analysis and Design. 4th Ed. McGraw Hill. Int. Ed.
2. Robert L. Boleystad.. (2009). Electronic Devices and Circuit Theory. 10th Ed. Prentice Hall
3. T. Robert Paynter. (2009). Introductory Electronic Devices and Circuits. 10th Ed. Prentice Hall
4. Thomas L. Floyd. (2008). Electronic Devices: Conventional Current Version. 8th Ed. Prentice Hall
5. PuspaInayat Khalid, Rubita Sudirman, Siti Hawa Ruslan. (2001). Modul Pengajaran Elektronik 1. Edisi ke-3

EET110/3
COMPUTER PROGRAMMING

Course Synopsis

One of the aspects of a good engineer is to have the capability of integrating the hardware and the software, thus an electrical engineer should be competence in programming. This course introduces basic programming using high level language (C language). The main objective of this course is to prepare the students with the ability of problem solving with programming, familiarize with the programming tools such as organization chart, flowchart and pseudo code and then to implement them by developing C program.

Course Outcomes

CO1: Ability to differentiate programming concepts and principles.
CO2: Ability to solve engineering related problems using computer programming techniques
CO3: Ability to design and evaluate computer programs by using programming techniques and tools.

References

1. Cheng, H. (2010). C for Engineers and Scientists. McGraw Hill.
2. Deitel and Deitel, Sudin, S., Ahmad, R.B. and Yacob, Y., (2006). C How To Program. Pearson-Prentice Hall.
3. Sprankle, Maureen. (2006). Problem Solving and Programing Concepts. 7th Edition. Prentice Hall.
4. Hanly, J.R. and Koffman, E.B. (2001). C Program Design for Engineers. 2nd Ed. Addison-Wesley.
5. Al Kelley, Ira Pohl. (2000). C by Dissection: The Essentials of C Programming. 4th ed. Addison-Wesley.

EET202/3
DIGITAL ELECTRONICS II

Course Synopsis

This course exposes the students to the combinational logic system design, sequential system, memory and programmable logic devices, register transfer and datapath, sequential and control as well as computer organization.

Course Outcomes

CO1: Ability to construct digital logic circuit using Register Transfer Language
CO2: Ability to analyze and convert ASM chart to logical circuit and vice versa
CO3: Ability to design a basic computer system

References

1. Logic and Computer Design Fundamentals, M.Morris Mano & Charles R.Kime, 4th edition, 2013
2. Rafikha Aliana, NorinaIdris, Phak Len Eh Kan, Mohammad Nazri. (2007). Digital Electronics Design. 1st ed. Prentice Hall
3. Ronald J. Tocci. (2007). Digital Systems – Principles and Applications. 10th ed. Prentice Hall.
4. Godse, Atul P. Godse, Deepali A. Godse, Gurpreet Singh Ghai. (2007). Digital Electronics. Technical Publications Pune.
5. Nigel, P.C. (1999). A First Course in Digital Electronics. 1st ed. Prentice Hall.

EET203/4
MICROCONTROLLER SYSTEMS DESIGN

Course Synopsis

The aims of this course is to study the PIC microcontroller architecture, its programming language and basic interfacing with input and output devices. These knowledge are gathered and applied to design a simple microcontroller based system.

Course Outcomes

CO1: Ability to illustrate and explain the basic microcontroller architecture.
CO2: Ability to analyze and write a microcontroller programming language in C program.
CO3: Ability to interface the input and output devices with microcontroller.
CO4: Ability to design and evaluate a simple microcontroller based system and present in group.

References

1. S. Katzen. (2010). The Essential PIC18® Microcontroller (Computer Communications and Networks). Springer
2. M.A Mazidi, R.D Mckinlay, and D Causey. (2008). PIC Microcontroller and Embedded Systems: Using Assembly and C for PIC18. Prentice Hall
3. B.B. Brey. (2008). Applying PIC18 Microcontroller: Architecture, Programming and Interfacing using C and Assembly. Prentice Hall
4. M Bates. (2006). Interfacing PIC Microcontrollers: Embedded Design by Interactive Simulation. Newness
5. H.W Huang. (2005). PIC Microcontroller: An Introduction to Software and Hardware Interfacing. Thomson & Delmar Learning

EET204/3
INSTRUMENTATION AND MEASUREMENT

Course Synopsis

The course is aimed at providing an overview of modern instrumentation and measurement techniques. It is divided into four main topics namely the fundamentals of electronic instrumentation and measurement systems; the working principles and application of sensors and transducers; principles and application of signal conditioning circuits including bridges, amplifiers and filters; and finally display, data acquisition and interfacing techniques.

Course Outcomes

CO1: Ability to define, describe and analyze the elements of a complete electronic instrumentation and measurement system
CO2: Ability to explain and apply the working principles of various sensors and signal conditioning/ processing techniques in instrumentation and measurements
CO3: Ability to describe and analyze display systems, data acquisition systems and computer interfacing techniques in instrumentation and measurements

References

1. H.S Kalsi.(2012). Electronics Instrumentation. Tata McGraw Hill.
2. Rajendra Prasad.(2004). Electrical Measurement and Measuring Instrument. Khanna Publishers, India.
3. Walt Jung (2005). Op Amp Applications Handbook. UK, Elsevier.
4. Wai Kai Chen (2006). Passive, Active & Digital Filters. US, CRC Press.
5. J.Park & S.Mackay (2003). Practical Data Acquisition for Instrumentation and Control Systems. 1st

EET205/4
ANALOG ELECTRONICS

Course Synopsis

This course exposes the student the basic knowledge in analog electronic. The exposure encompasses DC and AC analysis, frequency analysis and simple design of small-signal amplifiers. This course offers the students an exposure to the theory and applications of op-amp and frequency response. The basic principles of oscillator are also discussed. Furthermore, the students will also learn in depth about active filters and voltage regulators.

Course Outcomes

CO1: Ability to analyze small-signal and frequency performance of basic amplifier configurations (BJT and FET) and categorize different types of power amplifiers.
CO2: Ability to design the basic circuit of amplifier.
CO3: Ability to differentiate the feedback amplifier and design an oscillator.
CO4: Ability to explainthe operation and analyze various types of filters.
CO5: Ability to describe the operation, and design simple linear and non-linear voltage regulator circuits.

References

1. Donald A. Neamen. (2010). Microelectronics Circuit Analysis and Design. 4th Ed. McGraw-Hill.
2. Floyd, T. (2012). Electronic Devices. 9th Ed. Pearson Education, Inc.
3. Boylestad, R.L. (2009). Nashelsky, L., ‘Electronic Devices and Circuit Theory. 10th Ed. Prentice Hall.
4. Adel S. Sedra, Kenneth C. Smith. (2009). Microelectronic Circuits. 6th Ed. Oxford University Press.
5. Floyd, T. (2008). Electronic Devices. 8th Ed. Pearson Education, Inc.

EET206/3
ELECTRIC CIRCUIT II

Course synopsis

This course offers the students an exposure to the theories and concepts of the following as well as developing the skills to analyse linear electric circuits:

i) Mutual Inductance
ii) Two port network
iii) Laplace transform
iv) Frequency response of AC circuits
v) Fourier series
vi) Fourier transform

This course requires prerequisites EET 108/3 – Electric Circuit I

Course Outcomes

CO1: Ability to explain and analyze special types of circuit such as mutual inductance and two port networks.
CO2: Ability to analyze electric circuits using Laplace Transform, Fourier Series and Fourier Transform for the circuit comprising passive elements.
CO3: Ability to analyze electric circuits using Laplace Transform, Fourier Series and Fourier Transform for the circuit comprising passive elements.

References

1. Dorf, R.C., Svodoba, J.A. (2010). Introduction to electric circuits. 8th Ed. John Wiley
2. Sadiku, M. N. O, Alexander, C. K. (2009). Fundamentals of Electric Circuits. Singapore. 4th Ed. McGraw-Hill
3. Nilsson, J. W. and Riedel, S.A. (2008). Electric Circuits. 8th Ed. Prentice Hall. New Jersey

4. Irwin, J.D., Nelms, R.M. (2008). Basic Engineering Circuit Analysis. 9th Ed.. John Wiley
5. Hyat W.H., Durbin, S.M., Kimmerly, J.E. (2007). Engineering Circuit Analysis. 7th Ed. McGraw Hill

EET207/3
SIGNALS AND SYSTEMS

Course Synopsis

This course aims to introduce students about basic of signals and systems and learn how certain input to a system will produce the required output. Students will be exposed to signal spectrum concept and the method being utilized to analyze signal and its relations.

Course Outcomes

CO1: Ability to identify type and analyze waveform of the signals and its characteristics in engineering systems.
CO2: Ability to analyze signals and determine the process of the systems.
CO3: Ability to calculate and evaluate the system response using variable methods.

References

1. Charles L. Philips, John M. Parr, Eve A. Riskin, “Signals, Systems and Transforms”, 5th Ed., Prentice Hall. International Edition, (2013)
2. M.J. Roberts, “Signals and Systems, Analysis Using Transform Methods and MATLAB”, 2nd Edition, McGraw Hill International Edition, 2012
3. P Rao. (2008). Signals and Systems. Tata McGraw Hill
4. Simon Haykin, Barry Van Veen. (2005). Signals and Systems. 2nd Ed. Wiley
5. Ashok Ambardar. (1999). Analog and Digital Signal Processing. 2nd Ed.

EET208/3
ELECTRICAL POWER TECHNOLOGY

Course Synopsis

In Electrical Power Technology courses, student will be exposed to the concept of three-phase system, electromagnetism and magnetic circuit. The next part includes principles and operation of single-phase and three-phase transformer. At the end of these practical lab sessions they are asked to prepare lab report on the experiments they have carried out and submit for assessment. This course requires prerequisites EET 206/3 – Electric Circuit II

Course Outcomes

CO1: Ability to evaluate parameters of three phase system
CO2: Ability to solve electromagnetism problem and analyze its application in magnetic circuit
CO3: Ability to analyze the principles and performance of single-phase and three-phase transformer

References

1. Boylestad, Robert L. (2014). ‘Introductory Circuit Analysis’, 12th Edition, Prentice Hall
2. Theraja B.L. (2008). ‘A Text Book of Electrical Technology’, Volume II (AC & DC Machines), S.Chand & Company Ltd
3. Chapman, Stephen J. (2012). ‘Electric Machinery Fundamentals’, 7th Ed., New York: McGraw-Hill
4. Stephen D.Umans (2014).’ Fitzgerald & Kingsley Electrical Machinery’, 7th edition, McGraw-Hill
5. Edward Hughes, Ian McKenzie Smith, John Hiley, Keith Brown. (2008). ‘Electrical and Electronic Technology’, 10th Ed., Prentice Hall.

EET301/4
POWER SYSTEM ENGINEERING

Course Synopsis

This course intends to give students fair knowledge of power system engineering which covers the topics of generation, transmission and distribution systems. The sub-topics that will be emphasized are such as the per-unit system, transmission line parameters and models, load characteristics, representations of components in power system, fault and protection system.

Course Outcomes

CO1: Ability to classifytypes and operation of power system generations in groups.
CO2: Ability to solvesingle-line diagram problems using the per-unit system.
CO3: Ability to calculate and analyze the transmission line parameters and models in power system
CO4: Ability to explain and calculate load characteristics and distribution system components in power system.
CO5: Ability to explain and evaluate symmetrical fault and protection system in power system.

References

1. Duncan Glover, Mulukutla S. Sarma, Thomas J. Overbye. 2011. Power System Analysis and Design, SI Version. 5th ed. CENGAGE Learning
2. Hadi Saadat. (2004) .Int. ed. Power System Analysis. Boston: McGraw Hill

3. B.M. Weedy& B.J. Cory (2012), Electric Power System, John Wiley & Sons, 5th ed.
4. Chapman, Stephen J. (2002). Electric Machinery and Power System Fundamentals. Boston: McGraw Hill.
5. El-Hawary, M. E. (2000). Electrical Energy Systems. Boca Raton: CRC Press.

EET302/3
CONTROL SYSTEMS ENGINEERING

Course Synopsis

This is an introduction course to control systems engineering. Students will be exposed to the mathematical modeling for electrical, electro-mechanical as well as mechanical systems using block diagram, transfer functions, and signal-flow graphs. They will conduct system performance analysis in time and frequency domain. The course also covers system compensation design using PID and lead-lag controllers.

Course Outcomes

CO1: Ability to produce mathematical model from physical systems (electrical/mechanical/block diagram) by employing suitable techniques such as Mason's law, Laplace transform and etc.
CO2: Ability to analyze system's response to test inputs in time or frequency domain.
CO3: Ability to analyzecontrol system problems by utilizingcontrol system graphical tools such as root locus or bode plot.
CO4: Ability to design appropriate controller/s throughsystem compensation in performing control system analysis.

References

1. Norman S. Nise. (2011). Control System Engineering. 6th ed. John Wiley & Sons.
2. Richard C. Dorf & Robert H. Bishop. (2011). Modern Control Systems. 12th Edition. Prentice Hall.
3. Kuo B. C. Automatic Control System. 9th Edition. John Wiley & Sons.
4. Ogata K. (2009). Modern Control Engineering. 5th Ed. Prentice Hall.
5. Franklin G. F., Powell J. D. and Emani-Naeni A. (2009). Feedback Controlof Dynamic Systems System. 9th Edition. Prentice Hall.

EET303/3
ELECTROMAGNETIC THEORY

Course Synopsis

Purpose of this course is to learn the basic theory and analysis of electromagnetic. Student will be exposed to the basic concepts and effects of electrostatics and magnetostatics. Theory and application of transmission line will be introduced in this course.

Course Outcomes

CO1: Ability to explain the concept of vector analysis in electromagnetic theory
CO2: Ability to explain and analyze the concept of electrostatic
CO3: Ability to explain and analyze the concept of magnetostatic
CO4: Ability to applythe concept of electromagnetic in transmission line analysis

References

1. Principles of Electromagnetics, Matthew N.O Sadiku (2013) Fourth Edition International Version. Amazon.
2. U.A. Bakshi and A.V.Bakshi. (2007) Electromagnetic Fields. 1st Ed. Technical Publications Pune.
3. William H.Hayt, John A Buck. (2006). Engineering Electromagnetics. 6th Ed. McGraw Hill. International ed.
4. Stuart M Wentworth. (2005). Fundamentals of Electromagnetics with Engineering Applications. John Wiley
5. Fawwaz T Ulaby. (2004). Fundamentals of Applied Electromagnetics. Pearson. Prentice Hall.

EET304/3
COMMUNICATION SYSTEM ENGINEERING

Course Synopsis

This subject will cover all the basic principles and concepts of communication system including the basic elements of communications, signal analysis, amplitude modulation, angle modulations and digital modulations, as well as transmission channels and medium. In addition, introductions to signal propagations and calculations of signal to noise ratio are also introduced to relate the students with real world applications.

Course Outcomes

CO1: Ability to explain basic principles of communication systems and the essential of communication system in real world.
CO2: Ability to define and differentiate the different types of modulation.
CO3: Ability to define, calculate and analyze noise in communication system.
CO4: Ability to prepare a report in relevant topics using various resources.

References

1. Jeffrey S. Beasley, Gary M. Miller. (2008). Modern Electronic Communication. Pearson/Prentice Hall
2. William D. Stanley, John M. Jeffords. (2006). Electronic Communications: Principles and Systems.Thomson Delmar Learning
3. Paul Young. (2004). Electronics Communications Techniques. 5th Ed. Prentice Hall
4. Wayne Tomasi. (2004). Electronics Communication Systems. 5th Ed. Prentice Hall
5. Mullet. (2003). Basic Telecommunications: The Physical Layer. Thomson Learning

EET306/4
ELECTRICAL MACHINES

Course Synopsis

Primarily this Electrical Machines course can be divided into three parts. Part 1, begins by reviewing the basic concept of electromechanical conversion and its application to electrical machines. Part 2, consisting of theoretical and performance analysis of DC machines, i.e. DC motors and DC Generators. Part 3 will cover the theoretical and performance analysis of single/three-phase AC machines which consist of Induction motor and Synchronous generators and also special purpose machines.

Course Outcomes

CO1: Ability to define and explain the principle of electro-mechanical energy conversion and its application to electrical machines

CO2: Ability to determine and analyze parameters for AC and DC Machines

CO3: Ability to apply related software tools in understanding principle of electrical machines

References

1. Stephen J. Chapman, (2010). Electric Machinery Fundamentals. 5th ed., McGraw-Hill.
2. Bhattacharya S.K. (2008). Electrical Machines. 3rd ed. Tata McGraw-Hill.
3. Theraja B.L. (2007). A Text Book of Electrical Technology. Volume II (AC & DC Machines), S.Chand& Company Ltd.
4. Charles A. Gross, (2007). Electric Machines. CRS Press.
5. Wildi, T., (2005). Electrical Machine, Drives and Power System. 6th. ed, Prentice-Hall.

EET307/4
POWER ELECTRONICS I

Course Synopsis

EET307 introduces Power Electronics as a Multidisciplinary & Interdisciplinary Applications Orientated Technology emphasizing the main criterion of energy efficiency. AC-DC, AC-AC and DC-DC converter performance, including waveform analysis, is developed from theory – simulation - laboratory. EET307 introduces an awareness of Electromagnetic Compatibility (EMC) Legislation & the effects of Power Electronic Systems on Power Quality. Design aspects include understanding manufacturer's data, co-relating data to select power semiconductors and passive components, thermal management and EMC compliance.

Course Outcomes

CO1: Ability to analyse operation, applications area and the need for design efficiency of power electronic systems.

CO2: Ability to calculate and analyse parameters for power rectifier, SCR, Triac and power transistors.

CO3: Ability to analyse and evaluate AC-DC converter, AC-AC converter and DC-DC converter.

CO4: Ability to explain and calculate the design requirements of power quality related EMC compliance and thermal management of power electronic converters.

References

1. Daniel W. Hart (2011) Power Electronics. McGraw. Hill.
2. S Maniktala. (2006). Switching Power Supplies A to Z. Elsevier Newnes.
3. Muhammad H. Rashid.(2004). Power Electronics: Circuits, Devices & Applications. 3rd Ed., Pearson: Prentice-Hall.
4. Mohan, Undeland, Robbins. (2003). Power Electronics: Converters, Applications & Design. 3rd Ed., John Wiley.
5. Erickson R.W., Maksimovic D. (2001). Fundamentals of Power Electronics. 2nd Ed. Springer.

EET308/4
POWER SYSTEM ANALYSIS

Course Synopsis

This course is divided into four parts. Part I, consisting of topic introduction to power system, the main problem in power system, single-line diagram, representation of power system, bus admittance and impedance matrix. Part II, consisting of topic power flow solution by means of Gauss-Seidel, Newton-Raphson, Decoupled and Fast-Decoupled method.Part III, consisting of topic symmetrical fault, symmetrical component and unsymmetrical fault. Part IV, consisting of topic power system stability with equal area and step by step method. The students are introduced to MiPower software in the laboratory session.

Course Outcomes

CO1: Ability to calculate, analyze power flow with Gauss-Seidel, Newton-Raphson, Decoupled and Fast-Decoupled methods.
CO2: Ability to calculate, andanalyze fault current in Symmetrical and Unsymmetrical Fault.
CO3: Ability to calculate and analyze stability system by using Equal-Area method, and Step-by-Step method

References

1. Hadi Saadat, 2010. Power System Analysis. 3rd edition. PSA Publishing.
2. Professor Tom Overbye. (2004). Power System Analysis. Department of Electrical and Computer Engineering University of Wisconsin
3. D.P. Nagrath, I.J. Kothari. (2003). Modern Power System Analysis. 3rd Ed. Tata McGraw-Hill
4. Bergen, A.R., Vittal, V. (2000). Power System Analysis. Prentice Hall
5. John. J. Grainger, William D. Stevenson, Jr. (1994). Power System Analysis. McGraw-Hill

EET311/2
ENGINEERING ECONOMICS

Course Synopsis

This course introduces the economic principles and analytical tools needed to think intelligently about economic problems. The course begins by focusing on microeconomics, in which students will examine the concept and principles of individual consumer and firm behaviour. In the second part of the course deals with the thought process, concepts, methods and knowledge bases used by engineers to cost engineering projects and to evaluate the merit of making a particular investment, and to chose the best of a series of alternative investments to achieve a desired objective.

Course Outcomes

CO1: Ability to discover the fundamental ideas that economics has to offer as well as the power and relevance of micro economics to engineering profession.
CO2: Ability to analyze economics analysis that address the economic problem of how to allocate scarce resources among unlimited wants.
CO3: Ability to analyze the practical needs of the engineer towards making informed financial decisions in an engineering project.
CO4: Ability to evaluate the concept the concept of Time Value of Money.

References

1. Leland Blank & Anthony Tarquin (2012) Engineering Economy McGraw Hill. 7th Edition.
2. William A. McEachern (2005). McEachern's Economics : A Contemporary Introduction.7th Edition.
3. Chan S. Park. (2002). Contemporary Engineering Economics. 3rd Edition. Prentice Hall. New Jersey.
4. Pindyck Rubinfield. (2008). Micro Economics. 6th Edition. Prentice Hall, New Jersey.
5. Blank Tarquin (2005). Engineering Economy. 6th Edition. McGraw-Hill

EET333/3
ENGINEERING TEAM PROJECT

Course Synopsis

This course introduces the small-scaled research project that inclined towards engineering designing is necessary for each third year student. The student will be given an engineering problem (or encourage to identify on their own) and gain expertise by problem solving, investigation, research writing and effective presentation of the research outcome in the form of report and seminar.

Course Outcomes

CO1: Ability to combine engineering knowledge and solve engineering design problem in team work
CO2: Ability to design a proper process to produce creative and innovative solution.
CO3: Ability to demonstrate effective communication, report writing, presentation and entrepreneur skill.

References

Related journals, proceedings and papers in electrical and electronic engineering 2007 onward.

EET411/3
POWER SYSTEM OPERATION & CONTROL

Course Synopsis

This course aims to provide further understanding of the fundamentals of power system operation and control.

It mainly focuses on various aspects of electrical power generation such as energy source and transfer, power plant operation and characteristics, economical and optimal power generation, power system control and optimal power flow, unit commitment, interconnected power system and HVDC system.

Course Outcomes

CO1: Ability to describe, calculate and analyze energy generation, power system behavior and economics of generating costs.

CO2: Ability to calculate and analyze the optimal dispatch with transmission losses, unit commitment in thermal power plant and design power system control.

CO3: Ability to calculate and analyze interconnection system, operation of generators in parallel with large power system and Tie-line interchange between interconnected utilities.

CO4: Ability to describe basic principle of security studies, sensitivity factors and sensitivity methods.

CO5: Ability to describe, calculate and analyze the basic principles of the HVDC System.

References

1. Saadat, H. (2010) ‘Power System Analysis’. 3rd ed., PSA Publishing.
2. P.S.R. Murthy. (2011). ‘Operation and Control in Power Systems’. CRC Press, 2nd edition.
3. Sivaganaraju, (2010). ‘Power System Operation and Control’. Pearson Education India.
4. Wildi, T. (2005). `Electrical Machines, Drives, and Power System (6th Edition)`. Prentice Hall
5. Glover, J.G., Sarma,M.S., and Overbye,T (2011).`Power System Analysis and Design, Fifth Edition`. Cengage Learning.

EET412/3
ELECTRICAL MACHINE DESIGN

Course Synopsis

Basically this Electrical Machine Design course consist introduction about magnetic material, magnetic circuit, heating and cooling of electrical Machine and study about transformer design and continue with general test of the characteristic of Transformer, and the end of this topic is analysis the performance of transformer. The courses continue with study about design of rotating electrical machine and general test of the characteristic, and analysis the performance of rotating electrical machine. The end of this subject topic the student also will study about simulation of electromagnetic using FEM. To increases the understanding of electrical machine design sample case also available in this subject. The student also being exposed to practical intensive lab throughout the course.

Course Outcomes

CO1: Ability to analyze magnetic material that used to design electrical machine and magnetic circuit of electrical machine

CO2: Ability to analyze the performance, design winding and core of transformer

CO3: Ability to analyze the performance, design winding and core of rotating electrical machine

References

1. Juha Pyrhonen, TapaniJokinen, Valeria Hrabovcova. (2008). Design of rotating electrical machines. John Wiley & Sons.
2. S.V. Kulkarni, S.A. Khaparde. (2004). Transformer Engineering Design and Practical. Marcel Dekker Inc.
3. Philip Beckley. (2002). Electrical Steels for rotating machine. The institution of Electrical Engineers. ISBN 0 85296 980 5.
4. Indrajit Dasgupta. (2002). Design of Transformer. Tata McGraw-Hill Publishing Com. Lmt.
5. Jimmie J. Cathey. (2001). Electric Machines, Analysis and Design applying Matlab. McGraw-Hill Publishing Com. Lmt.

EET414/3
SUBSTATION DESIGN

Course Synopsis

This course, to introduce aspects of the fundamentals and considerations of substation design, configuration and design of busbar and safety requirement. This course describe the functions of various substation main equipments, substation auxliary included protection design against internal and external fault. The students also learn how to measure soil resistivity and resistance grounding, substation grounding design, furthermore calculation of the ground grid substation. Latter in this course, students will learn and practice how to test and to do maintenance of the substation equipment parts.

Course Outcomes

CO1: Ability to classify type of substation and explain fundamentals and considerations of substation design

CO2: Ability to describe operation, maintenance, selection and functions of substation equipments part and ability to design simple busbar
CO3: Ability to measure resistivity and grounding resistance and ability to design and analysis ground grid substation and safety requirement
CO4: Ability to identify and calculate parameters in protection system of substation equipments caused by internal and external faults.
CO5: Ability to calculate capacity and service area substation and explain testing and commissioning method of substation equipments.

References

1. John MC Donald. (2007). Electrical Power Substations Engineering. 2nd Ed. CRC Press.
2. Rao, S. (2003). Electrical Substation Engineering & Practice. Khana Publishers, New Delhi.
3. Colin Bayliss. (2002). Transmission and Distribution electrical engineering. Newness, Great Britain.
4. Garzon Ruben D. (2002). High Voltage Circuit Breaker. Marcel Decker Inc, USA.
5. H. Lee Willis. (2000). Power Distribution Planing. Dekker/CRC Press.

EET416/3
ELECTRICAL DRIVES

Course Synopsis

This course provides the student an exposure application of Power Electronics for electric motor drives. It emphasize on fundamental concepts of power electronic drives, electrical machines types and related applications. The aspects of load characteristic and matching drives to load also discussed.

Course Outcomes

CO1: Ability to differentiate and explain type of motor loads and drive requirements
CO2: Ability to justify and analyse power electronic drives parameters based on load characteristics.
CO3: Ability to explain and calculate converters parameters for power electronic drives.
CO4: Ability to design and recommend appropriate power electronic drives parameters in electrical machines application.

References

1. Bogdan Wilamowski and David Irwin (2011). Power Electronics and Motor Drives, 2nd Ed. CRC Press.
2. Gopal Dubey (2012). Fundamentals of Electrical Drives, 7th Reprint Ed. Alpha Science.
3. Muhammad Rashid (2013). Power Electronics, Circuits, Devices & Applications, 4th Ed. Prentice Hall.
4. Stephen Chapman (2012). Electric Machinery Fundamentals, 5th Ed. McGraw Hill.
5. Vedam Subrahmanyam (2011). Electric Drives Concepts and Applications, 2nd Ed. Tata McGraw Hill.

EET417/3
HIGH VOLTAGE ENGINEERING

Course Synopsis

This course will introduce the students about insulating materials and their applications, breakdown phenomena in insulating material such as solids, liquids, and gases, generation and measurement of high d.c., a.c. and impulse voltages and currents, overvoltage phenomena, insulation coordination, high voltage testing techniques and testing of apparatus and equipment.

Course Outcomes

CO1: Ability to analyze the various breakdown mechanism and applications of vacuum, liquid, solid and composite dielectrics
CO2: Ability to design and evaluate generations and measurements of high voltage AC, DC and impulse generator
CO3: Ability to analyze the over-voltage phenomena, insulation coordination in power system, types of high voltage testing for electrical apparatus and non-destructive testing of materials

References

1. High-Voltage Engineering (Fifth Edition) (2013), M.S. Naidu,V. Kamaraju, McGraw Hill Education Private Limited
2. C.L. Wadhwa. (2007). ‘High Voltage Engineering’. New Age International.
3. Subir Ray. (2004). ‘An Introduction to High Voltage Engineering’, Prentice-Hall of India.
4. E. Kuffel, W.S. Zaengl, J. Kuffel. (2000). ‘High Voltage Engineering: Fundamentals’, 2nd ed., Newness.
5. M.E. Khalifa. (2000). ‘High Voltage Enfineering: Theory and Practice’. 2nd ed. Marcel Dekker Inc.

EET418/3
POWER QUALITY

Course Synopsis

This course covers topics power quality in power system. The student is exposed to some problem in power system such as voltage sags, transient and harmonics. This courses will also covering mitigation or preventive method in power quality issue.

Course Outcomes

CO1: Ability to explain power quality disturbances and typical problems associated with power quality disturbances.
CO2: Ability to solve problems on harmonic distortion on electrical power systems.
CO3: Ability to design basic filters to reduce harmonic distortion.
CO4: Ability to explain the typical equipment that either causes or is susceptible to electrical power quality disturbances.

EET422/3
ELECTROMAGNETIC COMPATIBILITY (EMC) AND COMPLIANCE ENGINEERING

Course Synopsis

Electromagnetic Compatibility (EMC) is an essential part of good product design to ensure compliance with International Regulations and Directives. EET422 (Electromagnetic Compatibility (EMC) and Compliance Engineering) provides an awareness of the directives that manufacturers need to consider for compliant products. EET422 introduces the fundamentals of EMC concepts, circuit design methods, PCB and system layout techniques and the tools available to design compliant products. EET 422 includes EMC test and measurement methods and knowledge of commercial EMC test equipment to enhance diagnostic skills and provide EMC solutions.

Course Outcomes

CO1: Ability to demonstrate the importance of EMC directives, EMC related directives and routes to compliance.
CO2: Ability to discuss and examine an understanding of EMC basics, including interference sources, effects and solutions, common mode and differential mode interference.
CO3: Ability to differentiate EMI solution methods including filters, shielding and grounding, and able to create analytic solutions to compliance requirements.
CO4: Ability to classify EMI sources and propose solutions on practical applications including Power Electronic, analogue and digital systems.
CO5: Ability to explain and discuss EMI compliance testing procedure and able to distinguish essential test equipments including voltage sources, LISN and analyzers.

References

1. M I Montrose: E M Nakauchi. (2004). Testing for EMC Compliance: Approaches and Techniques. IEEE.
2. T Williams. (2001). EMC for Product Designers. 3rd Ed. Newnes.
3. T Williams K Armstrong. (2000). EMC for Systems and Installations. Newnes.
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5. Laszlo Tihanyi. (1995). Electromagnetic Compatibility in Power Electronics. Elsevier Science.

EET424/3
POWER ELECTRONICS FOR ENERGY SYSTEM

Course Synopsis

This course gives a detail exposure to the students on the application of power electronics for energy system. In part 1, an introduction of power quality problems that caused by the use of power electronics. Part 2 concentrate on power electronic inverter and waveform shaping techniques used in a typical energy system. Subsequently, in part 3, an introduction of uninterruptile power supplies (UPS) as one of the mitigation devices to solve power quality problems. Part 4 focus on sustainable energy system; i.e. solar energy system and energy management.

Course Outcomes

CO1: Ability explain power quality problems and differentiate their mitigation devices
CO2: Ability to analyze and evaluate inverter topologies and their performances through theoretical and simulation
CO3: Ability to analyze and evaluate the significance of sustainable energy

References

1. Daniel W. Hart (2011). Power Electronics. McGraw.Hill.
2. Ewald F. Fuchs, Mohammad A. S. Masoum. (2008). Power quality in power systems and electrical machines. Academic Press/Elsevier.
3. M. H. Rashid. (2007). Power Electronics Handbook: Devices, Circuits, and Applications - Engineering SeriesAcademic Press Series in Engineering. Academic Press.

4. G. N. Tiwari and M K Ghosal. (2005). Renewable Energy Resources. Alpha Science.
5. M. H. Rashid. (2004). Power Electronics: Circuit, Devices and Applications. Prentice Hall.

EET426/3
POWER ELECTRONICS II

Course Synopsis

Efficient Power Management Systems are essential for the proper operation of all modern electronic systems. EET423 provides an in depth study of Switched Mode Power Supplies (SMPS) and includes topology variations, operational modes and control strategies, performance analysis including the effects of parasitic elements and waveform analysis. Design aspects include understanding manufacturer's data, co-relating data to select power semiconductors and passive components, thermal management and EMC compliance.

Course Outcomes

CO1: Ability to explain and classify the Topologies, parameters of related components and thermal management in SMPS.
CO2: Ability to interpret and analyze the rectification techniques, SMPS waveforms, SMPS control strategies and modes control.
CO3: Ability to use related software tools to simulate SMPS Topologies and to determine and analyze device performance.

References

1. Pressman, Billings & Morey. (2009). Switching Power Supply Design. 3rd Ed. McGraw Hill
2. S Maniktala. (2006). Switching Power Supplies A to Z. Elsevier Newnes.
3. Muhammad H. Rashid. (2004). Power Electronics: Circuits, Devices &Applications',.3rd Ed. Pearson: Prentice-Hall.
4. Mohan, Undeland, Robbins. (2003). Power Electronics: Converters, Applications & Design. 3rd Ed. John Wiley
5. Erickson R.W., Maksimovic D. (2001). Fundamentals of Power Electronics. 2nd Ed. Springer.

EET427/3
INDUSTRIAL ELECTRONICS CONTROL

Course Synopsis

This course will have a wide explosure about industrial electronics control to the students. The course will be coverege of components, circuits, instruments, equipments and control technique used in industrial automatic systems. At beginning of this couse the topics will be covered are basic principle of industrial electronics control and interfacing devices. The interfacing devices will give wide explosure to the student regarding of operational amplifiers, signal processors, opto-electronic interface devices, transducers, detection sensors, actuator, digital to analog converter and analog to digital converter. The next part of this course will coverage the design of controller, proportional controll, proportional integral control, proportional integral derivative control, presure control and temperature control. The servo and stepper motor control design that used in a variety of industrial automation application are also covered in this course. Typical applications of these motors are rotary table control, pen positioning and precise position controll will be studied in this course. The student will be expose to programmable logic controler (PLC), PLC components, PLC programming and operational procedure. The PLC capable to perform more complex motion and process control applications.

Course Outcomes

CO1: Ability to explain And calculate Operational amplifiers, opto-electronic, signal processor, interfacing devices, transducers, detection sensors and actuator in industrial electronic control applications.
CO2: Ability to explain and calculate digital and analog controller, temperature control, flow control and its relation to industrial electronic control applications.
CO3: Ability to explain, analyze and design motor controller for industrial electronic control applications.
CO4: Ability to explain and design ladder diagram that will perform a specified operation using PLC programming in applications of industrial electronic control.

References

1. Bogdan Wilamowski and David Irwin (2011). The Industrial Electronics Handbook, 2nd Ed. CRC Press.
2. Frank Petruzella (2011). Programmable Logic Controllers, 4th Ed. McGraw Hill.
3. Khaled Kamel and Eman Kamel (2013). Programmable Logic Controllers: Industrial Control. McGraw Hill.
4. Terry Bartelt (2011). Industrial Automated Systems Instrumentation and Motion Control. Delmar Cengage Learning.
5. William Bolton (2009). Programmable Logic Controllers, 5th Ed. Newnes.

EET428/3
POWER ELECTRONICS DRIVES

Course Synopsis

This course provides the student an exposure application of Power Electronics for electric motor drives. It emphasize on fundamental concepts of power electronic drives, electrical machines types and related applications. The aspects of load characteristic and matching drives to load also discussed.

Course Outcomes

CO1: Ability to differentiate and explain type of motor loads and drive requirements.
CO2: Ability to justify and analyze power electronic drives parameters based on load characteristics.
CO3: Ability to explain and calculate converters parameters for power electronic drives.
CO4: Ability to design and recommend appropriate power electronic drives parameters in electrical machines application.

References

1. Bimal K. Bose. (2010). Power Electronics And Motor Drives: Advances and Trends. Elsevier Science. USA.
2. Wildi Theodore. (2006). Electrical Machines, Drives, and Power Systems. Pearson-Prentice Hall. New Jersey.
3. Muhammad H. Rashid. (2004). Power Electronics: Circuits, Devices and Application. Second Edition. Prentice Hall International Inc. New Jersey.
4. El-Sharkawi A. Mohamed. (2000). Fundamentals of Electric Drives. A division of Thomson Learning. USA.

EET431/3
ELECTRICAL ENERGY SYSTEM

Course Synopsis

To introduce students to the energy sources technology and develop understanding of a number of different types of energy sources whose outputs are suitable for conversion into electrical power generation.

Course Outcomes

CO1: Ability to analyze the conventional energy system and potential renewable resources
CO2: Ability to investigate and evaluate the economic, social and environmental impact in renewable energy implementation.
CO3: Ability to synthesize the transmission and distribution technology in power system and renewable energy system.

References

1. El-Hawary, M. E. (2007). Electrical Energy Systems. 2nd Ed. Taylor & Francis
2. George G. Karady and Keith E. Holbert. (2005). Electrical Energy Conversion and Transport-An Interactive Computer-Based Approach. John Wiley
3. Gilbert M. Masters. (2005). Renewable and Efficient Electric Power Systems. John Wiley & Sons
4. G. N. Tiwari and M. K Ghosal. (2005). Renewable energy resources: basic principles and applications. Alpha Science International
5. Stanislaw Sieniutycz and Alexis de Vos. (2000). Thermodynamics of Energy Conversion and Transport. Springer

EET432/3
ELECTRICAL ENERGY UTILIZATION

Course Synopsis

To introduce students to the energy efficiency and conservation in order to reduce energy costs and promote economic and environmental sustainability.

Course Outcomes

CO1: Ability to analyse energy management, standards and safety aspect of efficient electrical energy utilization
CO2: Ability to synthesize solution to problems related to demand side management and economic aspect of efficient energy equipments
CO3: Ability to design and evaluate energy saving solution based on electrical energy audits.

References

1. Joel N. Swisher, Gilberto de Martino Jannuzi, and Robert Y. Redlinger. Tools and methods for Integrated Resource Planning: Improving Energy efficiency and protecting the Environment. UNEP Collaborating Centre on Energy and Environment
2. Wayne C. Turner and Steve Doty. (2009). Energy Management Handbook. 7th Ed. Fairmont Press Inc
3. Frank Kreith and D. Yogi Goswami. (2008). Energy Management and Conservation Handbook. CRC Press
4. Gilbert M. Masters. (2004). Renewable and Efficient Electric Power Systems. John Wiley and Sons
5. Bary W. Kennedy. (2000). Power Quality Primer. McGraw Hill

EET433/3
RENEWABLE ENERGY SYSTEM

Course Synopsis

This course consists of design basic system for integration of renewable generation into electricity and calculates the potential energy for different renewable technologies. This course also introduce students with the relevant conversion, storage, network interfacing and economic assessment techniques for renewable energy systems.

Course Outcomes

CO1: Ability to analyse and design the conversion of Solar PV to electrical power, economic analysis and system performance.

CO2: Ability to analyse and design the conversion of energy from wind and hydro to electrical power, economic analysis and system performance.

CO3: Ability to analyse the conversion of energy from biomass, biogas and fuel cell to electrical power, economic analysis and system performance.

References

1. B. K. Hodge. (2009). Alternative Energy Systems. John Wiley & Sons
2. John Twidell and Anthony D. Weir. (2006). Renewable Energy Resources.Taylor& Francis
3. G. N. Tiwari and M. K Ghosal. (2005). Renewable energy resources: basic principles and applications. Alpha Science International
4. Godfrey Boyle. (2004). Renewable Energy: Power for a Sustainable Future. Oxford University Press. Oxford
5. Gilbert M. Masters. (2004). Renewable and Efficient Electric Power Systems. John Wiley & Sons

EET445/2
FINAL YEAR PROJECT I

Course Synopsis

Small-scaled research project that inclined towards designing is necessary for each final-year student. The student will be given an engineering problem (or encourage to identify on their own) and gain expertise by problem solving, investigation, research writing and effective presentation of the research outcome in the form of thesis and seminar. The area of research is mainly on Power Electronics, High Voltage, Electrical Power System & Machine Design.

EET446/4
FINAL YEAR PROJECT II

Course Synopsis

Small-scaled research project that inclined towards designing is necessary for each final-year student. The student will be given an engineering problem (or encourage to identify on their own) and gain expertise by problem solving, investigation, research writing and effective presentation of the research outcome in the form of thesis and seminar. The area of research is mainly on Power Electronics, High Voltage, Electrical Power System & Machine Design. This course requires prerequisites EET 445/2 – Final Year Project I

Career Opportunities

Electrical System Engineering, Industrial Electronicsand Electrical Energy Systems graduates will have wide range of career prospects. Electrical engineers are always at demand to the industrial/private sectors, government sectors or entities and agencies that are related to the electrical system design.

Areas that need of electrical engineers are:

- Electrical/Electronics product manufacturers
- Tenaga Nasional Berhad (TNB)
- Independent Power Plant (IPP)
- Telekom Malaysia Berhad
- Angkatan Tentera Malaysia
- Jabatan Kerja Raya
- Consultants or contractors
- Education and training (universities, polytechnics and colleges)

School of Manufacturing Engineering

Programmes Offered

• Diploma in Engineering (Manufacturing)
• Bachelor of Engineering (Hons.) (Manufacturing Engineering)
• Bachelor of Engineering (Hons.) (Product Design Engineering)
• Master of Science (Manufacturing Engineering)
• Master of Science (Product Design Engineering)
• Master of Science (Manufacturing System) Mixed Mode
• Doctor of Philosophy (Manufacturing Engineering)

Address

School of Manufacturing Engineering
Universiti Malaysia Perlis (UniMAP),
Pauh Putra Campus,
02600 Arau, Perlis

Tel.: +6(04) 988 5035
Fax: +6(04) 988 5034

INTRODUCTION

Initially, the School of Manufacturing Engineering, also known as PPKP was established with the name of the School of Manufacturing System Engineering or in short form of PPKSP on March 1, 2003. The school's new name was then proposed to School of Manufacturing Engineering and it has been approved officially by the Ministry of Higher Education dated October 30, 2004. Among the major justification for the changing the name of the school was due to the manufacturing engineering field is larger than the manufacturing systems engineering, or in other words, engineering manufacturing system is one aspect in the field of manufacturing engineering itself.

At its inception, the School of Manufacturing Engineering commenced its operation in the location of the School Complex, located at Kubang Gajah, Arau. Starting in 2004, School of Manufacturing Engineering was moved to a new location located at the Jejawi Engineering Complex along with six other schools. Then, once again this school was moved to a new location in Seberang Ramai, Kuala Perlis on 1 November 2007. Among the main factors for the second move was to accommodate the needs of the rooms for the increasing number of the academic staff, and also to facilitate communication between the non-academic staff, academic staff and students as the majority of students are placed in the residential colleges around Kuala Perlis.

In line with the development of a more rapidly growing industry and a key contributor to economic growth in Malaysia, the School of Manufacturing Engineering so far has offered two programs of study at Bachelor level, namely Bachelor of Engineering (Manufacturing Engineering) and Bachelor of Engineering (Product Design Engineering).

In general, the structure of the manufacturing engineering curriculum is designed to create a balance between technical specialization and industrial management. The entire core courses are offered in order to expose students to the important aspects of the manufacturing industry particularly to the methods for the production and an exposure to manufacturing technology. Manufacturing technologies focus on the selection of appropriate technology in the manufacturing process, taking into account several important factors such as the use of appropriate machines and the optimum process in accordance with the set standard.

Apart from that,the structure of product design engineering curriculum has been designed to create a balance between functionality and aesthetic aspects of design. The entire core courses are offered to expose students to the industry, especially the production of the design product is coordinated with the leading branded products in the world as well as an exposure the students to the manufacturing technology. Designs require the skills to create and produce consumer products by using the technology available in industrial design. An application of aesthetic values is also important to allow the product to be marketed globally.

For the Bachelor program, the number of credits needed to be completed prior the graduation requirement is 137 units of credit, where 120 unit credits include core courses, while the remaining 17 credit units of courses include the University requirements. In addition, final year students also need to carry out projects which are related to education programs, and in line with current industry requirements.

No less important, students are also required to carry out industrial training during the semester break before entering the fourth year of study. Students will be issued to undergo industrial training in the industries associated with the program of study offered. The main objective of these industrial training courses is required to complete the prospective graduates with the necessary technical knowledge in the real world of work in selected industries, when students were eligible for graduation.

In addition, the School of Manufacturing also offers a Diploma in Engineering (Manufacturing Engineering), Master of Science (Manufacturing), Master of Science (Product Design Engineering) and Doctor of Philosophy (Manufacturing Engineering). In principle, the school was founded with the goal of producing engineers who are not only skilled in specialized areas such as technical design and manufacturing, but also equipped with soft skills, entrepreneurship, languages, technology and information technology.

STAFF DIRECTORY

Dean
Assoc. Prof. Dr. Khairul Azwan Ismail
e-mail: k.azwan@unimap.edu.my

Deputy Dean
(Academic and Research)
Dr. Muhamad Saifuldin Abdul Manan
e-mail: m.saifuldin@unimap.edu.my

Deputy Dean
(Student Development and Alumni Affairs)
Dr. Mohd Zakimi Zakaria
e-mail: zakimizakaria@unimap.edu.my

Chairperson of Degree Programme
(Manufacturing Engineering)
Dr. Suhaila Hussain
e-mail: suhaila@unimap.edu.my

Chairperson of Degree Programme
(Product Design Engineering)
Dr. Mohammad Taufiq Mustaffa
e-mail: mohammadtaufiq@unimap.edu.my

Chairperson of Diploma Programme
(Manufacturing Engineering)
Dr. Ahmad Humaizi Hilmi
e-mail: humaizi@unimap.edu.my

Chairperson of Postgraduate Programme
Dr. Lee Chang Chuan
e-mail: cclee@unimap.edu.my

Coordinator for Industrial Networking and Quality Management
Dr. Mohd Sazli Saad
e-mail: sazlisaad@unimap.edu.my

Senior Assistant Registrar
YM Raja Shah Erman Raja Arifin
e-mail: rajashah@unimap.edu.my

LECTURERS

Prof. Dr. Bhuvenesh Rajamony
Ph.D. Tech. (Mech. Manufacturing Eng.) – University of Bombay, India
M.Sc. Eng. (Machine Tools Eng.) - University of Madras, India
B.Eng. (Mechanical Eng.) - University of Madurai, India
Postgraduate Dip. Eng. (Industrial Eng.) - University of Bombay, India
Tel. : +6(04) 988 5143
e-mail : bhuvenesh@unimap.edu.my

Prof. Dr. Ryspek Usubamatov
Ph.D.(Technical Sciences) - Moscow State Technical University, Russia
M.Sc. (Technical Sciences) - National Academy of Sciences, Kyrgyzstan
Dip. (Mechanical & Manufacturing Eng) - Moscow State Technical University, Russia
Tel. : +6(04) 988 5131
e-mail : ryspek@unimap.edu.my

Prof. Datin Dr. Zuraidah Mohd Zain
Ph.D. (Industrial Studies) - University of Liverpool, UK,
B.Sc. Eng. (Materials Science and Eng.) - University of Florida, USA
Tel. : +6(04) 988 5353 / +6(04) 979 8093
e-mail : zuraidah@unimap.edu.my

Assoc. Prof. Dr. Khairul Azwan Ismail
Ph.D. (Impact Mechanics) - University of Cambridge, UK
M.Sc. (Impact and Explosion Engineering) - UMIST, UK
B.Eng. (Mechanical Engineering) - UMIST, UK
Tel. : +6(04) 988 5036 / +6(04) 988 5052
e-mail : k.azwan@unimap.edu.my

Assoc. Prof. Mazelan Abdul Hamid
M.Sc. (Advanced Manufacturing) - Salford University, UK
B.Sc. (Electrical Engineering) - Seoul National University, Korea
Tel. : +6(04) 979 8100
e-mail : mazelan@unimap.edu.my

Dr. Ahmad Humaizi Hilmi
Ph.D Teknologi Pertahanan - UPNM
M.Eng. (Advanced Manufacturing Technology) - UTM
B.Eng. (Manufacturing Eng. with Management) - USM
e-mail : humaizi@unimap.edu.my

Dr. Azuwir Mohd Nor
Ph.D. Control Engineering - UniMAP
M.Sc. (Information Technology) - UUM
B.Sc. (Electrical and Computer Eng.) - Wisconsin University, USA
Tel. : +6(04) 988 5134
e-mail : azuwir@unimap.edu.my

Dr. Lee Chang Chuan
Ph.D. (Ecomaterial Design & Process Engineering) – Tohoku University, Japan
M.Sc. (Mechanical & Material Eng.) - UKM
B.Eng. (Manufacturing Eng.) - UKM
Dip. (Manufacturing Eng.) – POLIMAS
Tel. : +6(04) 988 5023
e-mail : cclee@unimap.edu.my

Dr. Mohd. Sazli Saad
Ph.D Mechanical Engineering - UTM
M.Eng. (Mechatronics & Automatic Control) - UTM
B.Eng. (Electrical Eng.) - UiTM
Dip. Mechatronics - POLIMAS
Tel. : +6(04) 988 5139
e-mail : sazlisaad@unimap.edu.my

Dr. Mohammad Taufiq Mustaffa
Ph.D. Information and Mechanical System Engineering – University of Yamanashi, Japan
M.Sc. Mechanical Systems Engineering – University of Yamanashi, Japan
B.Eng. Mechanical Systems Engineering – University of Yamanashi, Japan
Tel. : +6(04) 988 5150
e-mail : mohammadtaufiq@unimap.edu.my

Dr. Mohd. Zahiruddin Md Zain
Doctor of Engineering (Precision Engineerig) – The University of Tokyo, Japan
M.Eng. Mech. (Manufacturing) - KUiTTHO
B.Eng. (Mechanical Engineering) - Waseda University, Japan
Tel. : +6(04) 988 5009
e-mail : zahiruddin@unimap.edu.my

Dr. Mohd. Zakimi Zakaria
Ph.D. (Mechanical Engineering) - UTM
B.Eng. (Mechanical) - UTM
Tel. : +6(04) 988 5055
e-mail : zakimizakaria@unimap.edu.my

Dr. Muhammad Iqbal Muhammad Hussain
Ph.D. (Manufacturing Eng.) - UniMAP
M.Sc. (TQM) - University of the Punjab Lahore, Pakistan.
B.Eng. (TQM) - University of the Punjab Lahore, Pakistan.
Tel. : +6(04) 988 5102
e-mail : miqbal@unimap.edu.my

Dr. Muhamad Saifuldin Abdul Manan
Ph.D. (Mechanical Eng.) - University College London, UK
B.Eng. (Mechanical Eng) - University of Liverpool, UK
Tel. : +6(04) 988 5036
e-mail : m.saifuldin@unimap.edu.my

Dr. Suhaila Hussain
Ph.D. (Hydrogen Energy System) – Kyushu University, Japan
M.Sc. (Advance Mechanical Engineering)- Imperial College London
B.Eng. (Hons) Mechanical Engineering – Universiti Tenaga Nasional
Tel. : +6(04) 988 5135
e-mail : suhaila@unimap.edu.my

Dr. Noorhafiza Muhammad
Ph.D. Laser Processing – University of Manchester, UK
M.Eng. (Manufacturing Systemc) -Coventry University, UK
B.Eng. (Manufacturing Engineering with Management) Hons – USM
Tel. : +6(04) 988 5142
e-mail : noorhafiza@unimap.edu.my

Dr. Rosmaini Ahmad
Ph.D. Maintenance Engineering - USM
M.Sc. (Maintenance Engineering) - USM
Bachelor Science of Technology (Quality Control and Instrumentation) - USM
Tel. : +6(04) 988 5107
e-mail : rosmainiahmad@unimap.edu.my

Dr. Suhaimi Illias
Ph.D. (Mechanical Engineering) Saga University, Japan
M.Eng. (Mechanical Systems) - Gunma University, Japan
B.Eng. (Mechanical) - Ehime University, Japan
Tel. : +6(04) 988 5104
e-mail : suhaimi@unimap.edu.my

Mr. Mohd. Nazri Omar
M.Sc. (Ing.) Global Production Engineering - Technical University, Berlin
B.Eng. (Mechanical) Hons. - UiTM
e-mail : nazriomar@unimap.edu.my

Mr. Ahmad Nabil Mohd Khalil
M.Sc. (Manufacturing) - UniMAP
B.Eng. (Mechanical Manufacturing) – UTHM
Tel. : +6(04) 988 5094
e-mail : nabilkhalil@unimap.edu.my

Mr. Asmawi Sanuddin
M.Sc. (Mechanical Eng.) - UPM
B.Eng. (Mechanical Eng.) – UPM
Tel. : +6(04) 988 5128
e-mail : asmawi@unimap.edu.my

Mrs. Atikah Hj Awang @ Mohd Ramli
M.Sc. (Manufacturing Systems Eng.) - Warwick University, UK
B.Eng. (Mechanical Eng.) – UNITEN
Tel. : +6(04) 988 5051
e-mail : atikah@unimap.edu.my

Mr. Badrul Azmi Abdul Holed
Master. (Industrial Design) - University of Central England, UK
Bachelor of Design (Industrial Design) - UiTM Shah Alam
e-mail : badrul@unimap.edu.my

Mr. Jamali Md Sah
M.Sc. (Industrial Control Systems) - Salford University, UK
B.Eng. (Mechanical Eng.) - Salford University, UK
Tel. : +6(04) 988 5019
e-mail : jamali@unimap.edu.my

Mrs. Kartini Alir
M.Eng. Industrial Engineering - UTM
B.Eng.(Manufacturing Systems Eng.) University of Hertfordshire, UK
Diploma Technology (Production Technology) – GMI, KL
Tel. : +6(04) 988 5075
e-mail : kartini_alir@unimap.edu.my

Mr. Mohamad Shaiful Ashrul Ishak
M.Eng. (Mechanical) – UTM
B.Eng. (Mechanical Aeronautics) – UTM
Tel. : +6(04) 988 5130
e-mail : mshaiful@unimap.edu.my

Mr. Mohd. Asyraf Che Doi
M.Phil. (Mfg Eng & Operation Management) - Univ. of Nothingham
B.Sc. (Industrial Engineering) - Univ. of Missouri, US
Tel. : +6(04) 988 5114
e-mail : asyraf@unimap.edu.my

Mr. Mohd. Azaman Md Deros
M.Eng. (Manufacturing) - UM
B.Eng. (Mechanical) - USM
Tel. : +6(04) 988 5140
e-mail : azaman@unimap.edu.my

Mr. Mohd. Effendi Muhammad Suandi
Master of Art and Design (Design Technology) - UITM
Bachelor of Art and Design (Industrial Design) Hons - UITM
Tel. : +6(04) 988 5055
e-mail : effendisuandi@unimap.edu.my

Mr. Muhamad Nasir Murad
M.Eng. Mech. (Manufacturing) - KUiTTHO
B.Eng. Mech. (Manufacturing) - UTM
Dip. (Mechanical Eng.) - PUO
Cert. (Mechanical Eng.) - POLIMAS
Tel. : +6(04) 988 5086
e-mail : mnasir@unimap.edu.my

Mr. Radhwan Hussin
M.Eng. Mechanical (Advanced Manufacturing Tech.) – UTM
B.Eng. (Manufacturing) Hons – UniMAP
Tel. : +6(04) 988 5081
e-mail : radhwan@unimap.edu.my

Mrs. Sa'adah Ahmad
M.Eng. Mechanical Engineering - UM
B.Eng. Mechanical Engineering - Vandervilt University - USA
Tel. : +6(04) 988 5062
e-mail : saadahahmad@unimap.edu.my

Mrs. Sakinah Zakaria *(Cuti Tanpa Gaji)*
M.Sc. (Automation and Control Engineering) - Newcastle University, UK
B.Eng. (Electrical and Electronics Engineering) - Portsmouth University, UK
Tel. : +6(04) 988 5017 / +6(04) 988 5139
e-mail : sakinahzakaria@unimap.edu.my

Mrs. Shafizan Sharifuddin
M.Eng. (Manufacturing) - UM
B.Eng. (Manufacturing Eng. with Mgmt) - USM
Tel. : +6(04) 988 5020
e-mail : izan@unimap.edu.my

Mr. Shayfull Zamree Abd Rahim
M.Eng. (Advanced Manufacturing Tech.) - UTM
B.Eng. (Mechanical) – UTM
Tel. : +6(04) 988 5127
e-mail : shayfull@unimap.edu.my

Mr. Syamsul Syahrun Awang @ Hashim
M.Eng. (Mechanical Systems Eng.) - Gunma University, Japan
B.Eng. (Mechanical System Eng.) - Gunma University, Japan
Tel. : +6(04) 988 5008
e-mail : syamsul@unimap.edu.my

Ms. Siti Norbahiyah Mohamad Badari
M.Sc (Manufacturing Eng.)- UIAM
B.Eng. (Manufacturing Eng.) - UIAM
Tel. : +6(04) 988 5061
e-mail : norbahiyah@unimap.edu.my

Mr. Wan Abdul Rahman Assyahid Wan Ibrahim
M.Eng. (Advanced Manufacturing Tech.) - UTM
B.Eng. (Mechanical Eng.) - UTM
Tel. : +6(04) 988 5077
e-mail : warawi@unimap.edu.my

FELLOW

Mr. Ahmad Faizal Annuar
B.Eng. (Manufacturing) - UniMAP
Tel. : +6(04) 988 5095
e-mail : faizalannuar@unimap.edu.my

Mr. Mohd. Syedi Imran Mohd Dawi
M.Sc. (Manufacturing)- UniMAP
B.Eng. (Manufacturing) Hons – UniMAP
Tel. : +6(04) 988 5094
e-mail : syediimran@unimap.edu.my

Ms. Nor Amalina Muhayudin
M.Eng. (Mechanical Engineering) – Tallaght Institute of Technology
B.Eng. (Manufacturing Engineering) Hons – UniMAP
Tel. : +6(04) 988 5113
e-mail : noramalina@unimap.edu.my

TEACHING ENGINEERS

Mr. Ahmad Shauqi Amar Muhammad
B.Eng. (Manufacturing Eng.)- UniMAP
Tel. : +6(04) 988 5082
e-mail : syauqi@unimap.edu.my

Mr. Amarul Talip
B.Eng. (Electrical) - KUiTTHO
Tel. : +6(04) 988 5065
e-mail : amarul@unimap.edu.my

Mr. Leong Kean Wei
M.Sc. Manufacturing Systems - UPM
B.Eng. (Manufacturing Eng.) Hons. - UniMAP
Dip. (Mechanical Eng. Manufacturing) - POLIMAS
Tel. : +6(04) 988 5060
e-mail : kwleoong@unimap.edu.my

Mr. Mohamad Hatta Musa
B.Eng. (Mechanical Eng.) - USM
Tel. : +6(04) 988 5103
e-mail : hatta@unimap.edu.my

Mr. Mohd. Khairul Fadzly Abu Bakar
B.Eng. (Mechanical) - UTHM
Tel. : +6(04) 988 5066
e-mail : fadzly@unimap.edu.my

Mr. Mohd. Nasir Mat Saad
B.Eng. (Mechanical) - USM
Tel. : +6(04) 988 5115
e-mail : nasirsaad@unimap.edu.my

Mr. Mohd. Shuhidan Salleh
B.Eng. (Mechanical Eng.) - UiTM
Dip. (Mechatronics Eng.) - POLIMAS
Tel. : +6(04) 988 5010
e-mail : shuhidan@unimap.edu.my

Mr. Muhammad Khairy Md Naim
M.Sc. Manufacturing Systems - UPM
B.Eng. (Manufacturing) Hons - UniMAP
Tel. : +6(04) 988 5031
e-mail : mkhairy@unimap.edu.my

Mrs. Rafizah Abdul Rashid
B.Eng. (CAD/CAM) - UM
Tel. : +6(04) 988 5129
e-mail : rafizah@unimap.edu.my

Ms. Suhaireza Md Esa
M.Sc. (Manufacturing Systems Eng.) - UniMAP
B.Eng. (Mechanical Industry) – UTM
Tel. : +6(04)988 5021
e-mail : suhaireza@unimap.edu.my

ASSISTANT ENGINEERS

Mr. Narzrezal Abdul Razak
Diploma in Mechanical Engineering (Manufacturing) - Politeknik PD
Cert. in Mechanical Eng. (Manufacturing) - Politeknik JB
Tel. : +6(04) 988 5117
e-mail : narzrezal@unimap.edu.my

Mr. Mazlan Mohamad Husin
Cert. in Mechanical Eng. (Manufacturing) - POLIMAS
Tel. : +6(04) 988 5110
e-mail : mazlanhusin@unimap.edu.my

Mr. Mohamad. Jasmin Shaari
Cert. in Mechanical Eng. - Politeknik KB
Tel. : +6(04) 988 5074
e-mail : mjasmin@unimap.edu.my

Mr. Mohd. Nazri Abdul Hamid
Cert. in Mechanical Eng. (General) - POLIMAS
Tel. : +6(04) 988 5083
e-mail : nazrihamid@unimap.edu.my

Mr. Mohd. Nazry Mat Nayan
Cert. in Mechanical Eng. (Logy) - POLIMAS
Tel. : +6(04) 988 5090
e-mail : mohdnazry@unimap.edu.my

Mr. Mohd. Shukri Nordin
Cert. in Mechanical Eng. (Manufacturing) – Politeknik JB
Tel. : +6(04) 988 5032
e-mail : shukri@unimap.edu.my

Mr. Muhamad Fairuz Abdul Karim
Cert. in Mechanical Eng. (General) - POLIMAS
Tel. : +6(04) 988 5084
e-mail : fairuzkarim@unimap.edu.my

Mr. Roszi Anuar Hamid
Cert. in Mechanical Eng. (Manufacturing) - POLIMAS
Tel. : +6(04) 988 5094
e-mail : roszianuar@unimap.edu.my

TECHNICIANS

Mrs. Misni Rosli
Cert. in Mechanical Eng. (Automotive) - Politeknik KB
Tel. : +6(04) 988 5151
e-mail : misni@unimap.edu.my

Mr. Mohd. Nazmi Mohammad Radzi
Cert. in Electrical Eng. & Electronic - Politeknik Perlis
Tel. : +6(04) 988 5090
e-mail : mohdnazmi@unimap.edu.my

Mr. Rashid Ramli
Cert. in Mechanical Engineering – Politeknik Muadzam Shah
Tel. : +6(04) 988 5058
e-mail : rashid@unimap.edu.my

SKILLS ASSISTANT

Mr. Suhelmi Wi @ Senawi
Cert. in Mechanics Tech. (Electronics Industry) - ITTAR, Penang
Tel. : +6(04) 988 5001
e-mail : suhelmi@unimap.edu.my

ADMINISTRATIVE STAFFS

SENIOR ASSISTANT REGISTRAR

YM. Raja Shah Erman Raja Arifin
Master in Business Administration (MBA) - UUM
Bachelor of Accounting Hons - UNITEN
Tel. : +6(04) 988 5033
Faks : +6(04) 988 5034
e-mail : rajashah@unimap.edu.my

OFFICE SECRETARY

Mrs. Fariza Ileyna Mansor
Dip. (Secretarial Science) - PTSS
Tel. : +6(04) 988 5035
e-mail : ileyna@unimap.edu.my

ADMINISTRATIVE ASSISTANT (CLERICAL/OPERATIONAL)

Mrs. Farah Dieva Ab. Rahim
Tel. : +6(04) 988 5040
e-mail : farah@unimap.edu.my

Mr. Mohamad Zaki Kerya
Tel. : +6(04) 988 5035
e-mail : mohamadzaki@unimap.edu.my

Mr. Mohd. Izwan Ahmad Fikri
Tel. : +6(04) 988 5040
e-mail : izwanahmad@unimap.edu.my

GENERAL OFFICE ASSISTANT

Mr. Amir Hazreen Mohamad Hadzi
e-mail: amirhazreen@unimap.edu.my

STUDY LEAVES

LECTURES

Mr. Azmi Harun
M.Eng. (Manufacturing Systems) - UPM
B.Eng. (Manufacturing) - UKM
Dip. Mechanical Eng. (Manufacturing) - POLIMAS
Cert. Mechanical Eng.(Manufacturing) - Politeknik Ungku Omar
e-mail : azmiharun@unimap.edu.my

Mr. Irfan Abd Rahim
M.Sc. (Aerospace Eng.) - UPM
B.Eng. Hons (Mechanical Eng.) - KUiTTHO
Dip. (Mechanical Eng.) - POLIMAS
e-mail : irfanrahim@unimap.edu.my

Mr. Maliki Ibrahim
M.Eng. (Electrical- Electronics and Telecommunications) - UTM
B.Eng. (Electric) Hons - UiTM
e-mail : maliki@unimap.edu.my

Mr. Mohamad Ezral Baharudin
M.Sc. Mechanical Eng. (Manufacturing Systems & Automation) - USM
B.Sc. (Mechanical Eng.) Hons. - USM
e-mail : m.ezral@unimap.edu.my

Mr. Mohd. Fathullah Ghazli @ Ghazali
M.Sc. (Manufacturing Systems) - Coventry University, UK
B.Eng. (Manufacturing) - UIA
e-mail : fathullah@unimap.edu.my

Mr. Mohd. Fidzwan Md Amin Hamzas
M.Sc. (Mechanical Manufacturing) - UTHM
B.Eng. (Mechanical Eng.) - UniMAP
e-mail : fidzwan@unimap.edu.my

Mr. Mohd. Sabri Hussin
M.Sc. (Innovation and Engineering Design) - UPM
B.Eng. (Manufacturing Engineering) - UniMAP
e-mail : mohdsabri@unimap.edu.my

Mr. Mohd. Zamzuri Mohammad Zain
M.Sc. Production System Engineering - Toyohashi University Technology
B. Eng. Production System Engineering - Toyohashi University Technology
e-mail : mzamzuri@unimap.edu.my

Mr. Mokhtar Mat Salleh
M.Sc. (Manufacturing System Eng.) - Coventry University, UK
B.Eng. Hons (Mechanical) - UKM
e-mail : mokhtarms@unimap.edu.my

Mr. Muhammad Syahril Bahari
M.Sc. in Mechanical Engineering - USM
Bachelor of Mechanical Engineering (Hons) - UNITEN
e-mail : syahrilbahari@unimap.edu.my

Mrs. Nooraizedfiza Zainon
M.Sc. (Manufacturing Systems) - UPM
B.Eng. (Manufacturing Eng. with Management) - USM
e-mail : nooraizedfiza@unimap.edu.my

Mr. Norshah Afizi Shuaib
M.Sc. (Manufacturing Engineering) - UPM
B.Eng. (Mechanical Engineering) - UNITEN
e-mail : norshahafizi@unimap.edu.my

Ms. Nurul Ikhmar Ibrahim
M.Sc. (Design and Ergonomics) - Conventry University, UK
B.Eng. (Manufacturing Engineering) - UniMAP
e-mail : ikhmar@unimap.edu.my

Mrs. Roshaliza Hamidon
M.Sc. (Manufacturing Systems) - UPM
B.Eng. (Manufacturing) - UIA
e-mail : roshaliza@unimap.edu.my

Mrs. Rozie Nani Ahmad
M.Eng.Mech. (Advanced Manufacturing Technology) - UTM
B.Eng. (Mechanical Engineering) - UTM
e-mail : rozienani@unimap.edu.my

Mrs. Siti Aishah Adam
M.Sc (Innovation & Engineering Design)- UPM
B.Eng. (Manufacturing Eng. with Mgmt) - UIAM
e-mail : aishahadam@unimap.edu.my

Mrs. Ummi Noor Nazahiah Abdullah
M.Sc. (Innovation and Engineering Design) - UPM
B.Eng. (Manufacturing Eng. with Mgmt) - USM
Tel. : +6(04) 985 2233 / +6(04) 988 5008
e-mail : nazahiah@unimap.edu.my

Mr. Zailani Zainal Abidin
M.Sc. (Manufacturing System) - UPM
B.Eng. (Manufacturing) Hons. - UniMAP
Dip. Mechanical (Manufacturing Eng.) – POLIMAS
e-mail : zailani@unimap.edu.my

TEACHING ENGINEER

Mr. Nor Zaiazmin Yahaya
M.Sc. (Mechanical Eng.) – USM
B.Sc. (Mechanical Eng.) - Iowa State University, USA
e-mail: zaiazmin@unimap.edu.my

TUTORS

Mr. Muhamad Farizuan Rosli
Master of Art & Design (Design Technology) - UiTM
Bachelor of Art and Design (Hons) Industrial Design - UiTM
Diploma in Art and Design (Industrial Design) - UiTM
e-mail : farizuan@unimap.edu.my

Mr. Muhammad Aiman Ahmad Fozi
Master of Innovation & Engineering Design - UPM
Bachelor of Design Hons.(Industrial Design) - UPM
e-mail : aiman@unimap.edu.my

Mrs. Norashiken Othman
M.Sc (Innovation & Engineering Design) - UPM
Bac. Ind. Design – UPM
e-mail : norashiken@unimap.edu.my

MANUFACTURING ENGINEERING PROGRAMME

PROGRAMME OBJECTIVES (PEO)

PEO 01
Graduates who are leaders in the field of Manufacturing Engineering or chosen field as demonstrated via career advancement.

PEO 02
Graduates who are members of and contribute to professional society.

PEO 03
Graduates who engage in life-long learning or continuous education opportunities.

PEO 04
Graduates who contribute towards research and development.

PEO 05
Graduates who are entrepreneurial engineers.

PROGRAMME OUTCOMES (PO)

PO 01
Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in Manufacturing Engineering discipline to solve the complex engineering problems.

PO 02
Ability to identify, formulate and solve complex engineering problems.

PO 03
Ability to design solutions for complex engineering problems and systems, components or processes to meet desired needs.

PO 04
Ability to conduct investigation into complex problems as well as to analyze and interpret data.

PO 05
Ability to use techniques, skills and modern engineering tools necessary for complex engineering practices so as to be easily adaptable to industrial needs.

PO 06
Understanding of the social, cultural, global and environmental responsibilities of a professional engineer.

PO 07
Ability to understand entrepreneurship, the process of innovation and the need for environment and sustainable development.

PO 08
Ability to understand the professional and ethical responsibilities and commitment to the community.

PO 09
Ability to function on multi-disciplinary teams.

PO 10
Ability to communicate effectively on complex engineering activities with the engineering community and with society at large.

PO 11
A recognition of the need for, and an ability to engage in life-long learning.

PO 12
Demonstrate understanding of project management and finance principles.

CURRICULUM STRUCTURE FOR BACHELOR OF ENGINEERING (HONOURS) (MANUFACTURING ENGINEERING)

YEAR	FIRST		SECOND		THIRD			FOURTH	
SEMESTER	I	II	III	IV	V	VI		VII	VIII
Engineering Core (91)	EPT103/3 Materials	EPT161/3 Electrical Technology	EPT241/3 Solid Mechanics I	EPT228/3 Fluid Mechanics I	EPT335/3 Applied Thermodynamics	EPT312/3 Vibration and Mechanics of Machines	EIT302/4 Industrial Training	EPT445/2 Final Year Project I	EPT446/4 Final Year Project II
	EPT152/2 Engineering Drawing	EPT114/3 Statics	EPT212/3 Dynamics	EPT235/3 Thermodynamics	EPT341/3 Solid Mechanics II	EPT315/3 Machine Components Design		EPT412/3 Mechanical System Design	EPT481/3 Tools and Die Design
		EPT182/3 Manufacturing Process I	EPT261/3 Electronics	EPT281/3 Industrial Engineering	EPT383/3 Automation & Robotics	EPT386/3 Design for Manufacture		EPT447/3 Manufacturing Integrated Project	EPT495/2 Operational Research
		EPT183/2 Engineering Workshop	EPT282/3 Manufacturing Process II		EPT385/3 Metrology & Quality Control	EPT361/4 Instrumentation and Control		EPT484/2 Lean Manufacturing	EPT4XX/3 Elective**
					EPT384/3 Advanced Manufacturing Technology	EPT324/2 Heat Transfer		EPT485/2 Production Planning and Control	
Non Engineering (25)	EPT162/2 Computer Programming	EPT181/2 CAD/CAM			EPT371/2 Finite Element Analysis				
	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT203/3 Engineering Mathematics III	EQT271/3 Engineering Statistics				EUT444/3 Management for Engineers	EUT442/2 Professional Engineers
		UUT122/2 Skills and Technology in Communication							
University Required (17)	UUW233/2 Islamic & Asian Civilisations & UVW410/2 University Malay Language & UUW235/2 Ethnic Relations & UZWXXX/1 Co-Curriculum	UZWXXX/1 Co-Curriculum	UVW312/2 English for Technical Communication & UZWXXX/1 Co-Curriculum	UUW224/2 Engineering Entrepreneurship & UVWXXX/2 Option*		UUW322/2 Thinking Skills			
137	17	19	18	16	17	17	4	15	14
Total Units for Graduation 137									

PRODUCT DESIGN ENGINEERING PROGRAMME

PROGRAMME OBJECTIVES (PEO)

PEO 01
Graduates who are leaders in the field of Product Design Engineering or chosen field as demonstrated via career advancement.

PEO 02
Graduates who are members of and contribute to professional society.

PEO 03
Graduates who engage in life-long learning or continuous education opportunities.

PEO 04
Graduates who contribute towards research and development.

PEO 05
Graduates who are entrepreneurial engineers.

PROGRAMME OUTCOMES (PO)

PO 01
Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in Product Design Engineering discipline to solve the complex engineering problems.

PO 02
Ability to identify, formulate and solve complex engineering problems.

PO 03
Ability to design solutions for complex engineering problems and systems, components or processes to meet desired needs.

PO 04
Ability to conduct investigation into complex problems as well as to analyze and interpret data.

PO 05
Ability to use techniques, skills and modern engineering tools necessary for complex engineering practices so as to be easily adaptable to industrial needs.

PO 06
Understanding of the social, cultural, global and environmental responsibilities of a professional engineer.

PO 07
Ability to understand entrepreneurship, the process of innovation and the need for environment and sustainable development.

PO 08
Ability to understand the professional and ethical responsibilities and commitment to the community.

PO 09
Ability to function on multi-disciplinary teams.

PO 10
Ability to communicate effectively on complex engineering activities with the engineering community and with society at large.

PO 11
A recognition of the need for, and an ability to engage in life-long learning.

PO 12
Demonstrate understanding of project management and finance principles.

CURRICULUM STRUCTURE FOR BACHELOR OF ENGINEERING (HONOURS) (PRODUCT DESIGN ENGINEERING)

YEAR	FIRST		SECOND		THIRD			FOUTH	
SEMESTER	I	II	III	IV	V	VI		VII	VIII
Engineering Core (91)	EPT103/3 Materials	EPT161/3 Electrical Technology	EPT241/3 Solid Mechanics I	EPT228/3 Fluid Mechanics I	EPT335/3 Applied Thermodynamics	EPT315/3 Machine Components Design	EIT302/4 Industrial Training	EPT445/2 Final Year Project I	EPT446/4 Final Year Project II
	EPT152/2 Engineering Drawing	EPT114/3 Statics	EPT212/3 Dynamics	EPT235/3 Thermodynamics	EPT341/3 Solid Mechanics II	EPT324/2 Heat Transfer		EPT463/3 Automatic Control	EPT415/3 Vibration
	EPT191/2 Workshop & Studio Practice	EPT184/3 Manufacturing Technology	EPT261/3 Electronics	EPT262/2 Measurement & Instrumentation System	EPT314/3 Machine Mechanism	EPT364/3 Mechatronics		EPT427/3 Pneumatics & Hydraulics System Design	EPT495/2 Operational Research
		EPT192/3 Product Innovation		EPT293/3 Engineering Product Design I	EPT393/3 Engineering Product Design II	EPT329/3 Fluids Mechanics II		EPT448/3 Product Design Integrated Project	EPT4XX/3 Elective**
					EPT394/3 Product Ergonomic & Safety	EPT395/3 Engineering Product Design III			
Non Engineering (25)	EPT162/2 Computer Programming	UUT122/2 Skills and Technology in Communication	EPT283/2 Computer Aided Design		EPT371/2 Finite Element Analysis				
	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT203/3 Engineering Mathematics III	EQT271/3 Engineering Statistics				EUT444/3 Management for Engineers	EUT442/2 Professional Engineers
University Required (17)	UUW233/2 Islamic & Asian Civilisations & UVW410/2 University Malay Language & UUW235/2 Ethnic Relations & UZWXXX/1 Co-Curriculum	UZWXXX/1 Co-Curriculum	UVW312/2 English for Technical Communication & UZWXXX/1 Co-Curriculum	UUW224/2 Engineering Entrepreneurship & UVWXXX/2 Option*		UUW322/2 Thinking Skills			
137	19	18	17	18	17	16	4	14	14
Total Units for Graduation 137									

COURSE SYLLABUS

EPT 103/3
MATERIALS

Course Synopsis

This course introduces students to the engineering materials fundamentals including the engineering materials application, atomic bonding, crystal structure, mechanical and physical properties, corrosion mechanism, microstructural analysis, phase diagram, ferrous and non-ferrous alloys, polymer and advance materials.

References

1. William F. Smith, Javad Hashemi, 2006, Foundation of Materials Science and Engineering, Fourth edition, McGraw Hill.
2. William D. Callister, Introduction to Materials, John-Wiley & Sons.
3. Budinski, K.G, 2006, Engineering Materials Properties and Selection, 8th edition, Prentice Hall.
4. Shackeford, J.F, 2005, Introduction to Materials Science for Engineers,6th edition, Prentice Hall.
5. Mars G. Fontana, 1986, Corrosion Engineering, Third edition, McGraw Hill.

EPT 152/2
ENGINEERING DRAWING

Course Synopsis

This course introduces fundamental of engineering drawing, engineering graphic as language, basic drafting skill, applied geometry, shape description, basic dimensioning, tolerance, detail and assembly drawing based on BS308 part 1 and part 2.

References

1. Jensen C., Helsel J D., Short D R., 2007, Engineering Drawing & Design. 7th ed. Mc-Graw Hill.
2. Jensen C., Helsel J D., 1996. Fundamentals of Engineering Drawing. 4th ed. Mc-Graw Hill.
3. Kirkpatrick J M., 2003. Basic Drafting Using Pencil Sketches and AutoCAD. Prentice Hall.
4. Luzzader W. J., Duff J. M., 1993. Fundamentals of Engineering Drawing With an Introduction to Interactive Computer Graphics for Design and Production. 11th ed. Prentice Hall International.
5. Goetsch D L., Chalk W.S., Nelson J.A. Rickman R.L., 2005. Technical Drawing. 5th ed. Thomson Delmar Learning.

EPT 181/2
CAD/CAM

Course Synopsis

This course introduces the principles and application of CAD/CAM systems. It enables students to understand the theory, concept, and application of CAD/CAM as used in the industry. Students will use CAD software to illustrate parts, and CAM software to convert CAD files into numerical control (NC) codes.

References

1. P.N. Rao. *CAD/CAM Principles and Applications*. 2nd Edition.McGraw Hill. (2004)
2. Ibrahim Zeid. *Mastering CAD/CAM*. 1st Edition. McGraw Hill International Edition. (2004)
3. Farid M. Amirouche. *Principles of Computer Aided Design and Manufacturing*. 2nd Edition. Prentice Hall. (2003)
4. Chris McMahon, Jimmie Browne. *CADCAM: From Principles to Practice*. Addison Wesley Publication. (1993)
5. Chris McMahon, Jimmie Browne.. *CADCAM : Principles, Practice and Manufacturing Management*. 2nd Edition. Prentice Hall. (1999)

EPT 182/3
MANUFACTURING PROCESS I

Course Synopsis

This course introduces students to the knowledge, understanding and synthesis of the basic processes in manufacturing such as metal-casting processes, forming & shaping processes, and joining processes. In the beginning of the course, the fundamental of materials will be given, before they learn the processes in manufacturing. Students will undergo practical sessions in the workshop/lab to help in a better understanding of the subject matter.

References

1. Groover M.P., 2004. *Fundamentals of Morden Manufacturing: Materials, Processes and Systems*. Prentice Hall.
2. Kalpakjian S., 2001. *Manufacturing Engineering an Technology*, 5th Ed. Addision Wesley.
3. Schey J.A. 2000. *Introduction to Manufacturing Process*. 3rd Ed. MC Graw Hill.
4. Bruce R.G. et al. 2003. *Modern Materials & Manufacturing Process*. 3rd Ed. Prentice Hall.
5. Serope Kalpakjian, Steven R. Schmid. *Manufacturing Processes For Engineering Materials,* Fifth Edition, Pearson Education, 2009

EPT 183/2
ENGINEERING WORKSHOP

Course Synopsis

In the first part of this course, safeties aspects in the workshop will be covered, followed by fundamental measurement techniques, and use of measuring equipment such as vernier calliper, micrometer, etc., Then, various basic cutting processes, e.g. filing, chiselling, sawing, etc. will be covered. Students will be introduced to fabrication, sheet metal forming, and welding, which consists of introduction to basic knowledge of various cutting methods and hand tools, such as file, hacksaw, chisel, etc. The practices or lab sessions consist of explanations on safety practices in the workshop, fitting work, sheet metal forming, and welding processes.

The second part of the course introduces the fundamentals of measurement techniques followed by milling, lathe and grinding operations which consist of introduction to basic knowledge of various cutting tools, parts of machines and their functions, machine operations, and numerous calculations involving the operations. Students will practice conventional machining process used in the industry to transform raw material to finished products. Practical work will help student's gain effective understanding.

References

1. Steve F. Krar, Arthur R.Gill, Peter Smid. *Technology of Machine Tools*. 6th ed. McGraw Hill, 2007.
2. S. Kalpakjian, S.R. Schmid (2001). *Manufacturing Engineering and Technology.* 4th ed. Prentice Hall International.
3. Mikell P. Groover (2007), *Fundamentals of Modern Manufacturing.* 3rd ed. John Wiley & Sons, Inc.
4. E. Paul DeGarmo, J T. Black, Ronald A. Kohser (1997). *Materials and Processes in Manufacturing*. 8th ed., John Wiley & Sons, Inc.
5. *Manufacturing Engineering And Technology*, Fifth Edition, Serope Kalpakjian, Steven R. Schmid, Prentice Hall, 2005

EPT 191/2
WORKSHOP AND STUDIO PRACTICE

Course Synopsis

This course will expose the student in practicality and developing skills regarding design processes and model/prototype fabrication. Hence, topics will be focusing to product sketching techniques and model/prototype fabrication. Through the assignment given, the knowledge and skills that need by a product designer will be developing. Furthermore, this course will expose the student by studio/workshop sessions through product design assignments which emphasis on creative thinking and the production of visual in the context of design. The student will be expose trough design assignment about the concepts and methods in designing; elements of good quality product; included concepts sketching and presentation drawing; model making; understanding of engineering drawing and design documentation.

References

1. Serope Kalpakjian, Steven R. Schmid 2006. Manufacturing Engineering and Technology - 5th Edition in SI Units, Prentice-Hall.
2. John A. Schey, 2000. Introduction to Manufacturing Processes,3rd Edition, McGraw-Hill.
3. Risatti, Howord and Trapp, Kenneth R 2007. A Theory of Craft: Function and Aesthetic Expression, Kindle Edition.
4. Arie Walllert, erma Hermens, Maria F.J. Historical Painting Techniques, Materials, and Studio Practice Practice: Preprints of a Symposium, University of Leiden, the Netherlands, 26-29 June 1995 Peek Getty Publications.
5. Groover M.P., 2004. Fundamentals of Morden Manufacturing: Materials, Processes and Systems. Prentice Hall.

EPT 162/2
COMPUTER PROGRAMMING

Course Synopsis

This course introduces to Computers and Computing Fundamentals, Program Structure, Printing, Comments, Variables, Arithmetic Operations, Math Functions, Input/ Output, Control Structure, Looping, Functions, Numeric Arrays, User Friendly Interface and their application on solving engineering problems. C programming language is utilized in this course.

References

1. H. H. Tan and T. B. D'Orazio, 1999. C Programming for Engineering & Computer Science, McGraw-Hill.
2. Behrouz A. Forouzan and Richard F, Gilberg, 2001. Computer Science A Structured Programming Approach Using C, Second Edition, Brooks/ Cole.
3. Jeri R. Hanly and Elliot B. Koffman, 2002. Problem Solving & Program Design in C, 3rd Edition, Addison Wesley.
4. Elice E. Fischer, David W. Eggert and Stephen M. Ross, 2001. Applied C: An Introduction and More, McGraw-Hill.

5. Harry H. Cheng, 2010. C for Engineers and Scientists: An Interpretive Approach, McGraw Hill.

EPT 161/3
ELECTRICAL TECHNOLOGY

Course Synopsis

This course is intended to provide students with clear understanding the concepts and principles of the DC and AC circuits, basic principles of three phase ac circuits, and electromagnetism. The students will also gain an understanding of the basic operating principles of a transformer, calculate induced e.m.f, equivalent resistance, reactance and impedance, losses and transformer efficiency. At the end of the chapter, the students will understand the principles of DC Machines and three phase induction motors and do some basic calculation of losses and efficiency of DC Machines.

References

1. Edward Hughes, Electrical and Electronic Technology. 8th Edition, Prentice Hall, 2002.
2. Stephen J. Chapman, "*Electric Machinery Fundamentals*", 4th Edition, McGraw Hill, 2005.
3. Charles K. Alexander & Matthew Sadiku, "*Fundamentals of Electric Circuits*", International Edu., McGraw Hill, 2001.
4. V.K. Mehta, Principles of Electrical Engineering and Electronics.S.Chand 1996.
5. Eugene C. Lister and Robert J. Ruch, Electric Circuits and Machines. 7th Edition, McGraw-Hill 2000.

EPT114/3
STATICS

Course Synopsis

This course introduces introduction to mechanics, force vector, equilibrium of particle, force system resultants, equilibrium of rigid body, structural analysis, friction, centroids and center of gravity.

References

1. R.C. Hibbeler, 2004. Engineering Mechanics Statics SI Third Edition, Pearson Prentice-Hall, Inc.
2. R.C. Hibbeler and Peter Schiavone, 2004. Engineering Mechanics Statics – Statics Study Pack SI Third Edition, Pearson Prentice-Hall, Inc.
3. J. L. Meriam and L. Glenn Kraige, 2003. Engineering Mechanics, Statics Fifth Edition, John Wiley & Sons, Inc.
4. Ferdinand P. Beer, E. Rusell JohnsonJr and William E. Clausen, 2004. Vector Mechanics for Engineers Statics Seventh Edition. Mc-Graw Hill.
5. W. Riley, L. Sturges, D. Morris, 2007. Mechanics of Materials, John Wiley & Sons, Inc.

EPT 184/3
MANUFACTURING TECHNOLOGY

Course Synopsis

This course introduces students to industrial manufacturing technology used for converting raw materials into finished products. Various processes, machinery, and operations will be examined with emphasis placed on understanding engineering materials and processing parameters that influence design considerations, product quality and production costs.

References

1. Serope Kalpakjian, Steven R. Schmid 2006. Manufacturing Engineering and Technology - 5th Edition in SI Units, Prentice-Hall, Inc.
2. DeGarmo, Black and Kohser, 2006. Materials and Processes in Manufacturing. 9th Edition. Wiley, ISBN: 0-471-36679-X.
3. John A. Schey, 2000. Introduction to Manufacturing Processes, 3rd Edition, McGraw-Hill, Inc.
4. Schey, J.A. Introduction to Manufacturing Processes, 3rd Ed., Mc Graw Hill, 2000.
5. Bruce R.G. et al. 2003. *Modern Materials & Manufacturing Process.* 3rd Ed. Prentice Hall.

EPT 192/3
PRODUCT INNOVATION

Course Synopsis

This course starts with basic ideas about inventing which define what invention and innovation constitute. It then describes the differences between invention and non-invention criterion, areas, and invention types. In conjunction with technology, the innovation itself cannot be separated from some fundamental principles of technology such as energies and their forms, storage of energy and some general concepts that have been used over and over again in originating, developing and applying many devices and systems such as the area principles. This course also focuses on the invention process to produce novel design concepts and reverse engineering processes applied so as to improve current design concepts. As the course go on, topics on intellectual properties such as patents, trade mark, trade secret and copyright are discussed. These are important legislative documents to protect novel ideas. In addition, strategies on how to generate profits from the invention and innovation activities are covered. Presentation techniques and ethics are also studied using graphic software and materials such as panels and mock-up.

References

1. G. Kivenson, 1982, The Art and Science of Inventing, 2nd edition, Van Nostrand Reinhold.
2. M. Baxter, 1995, Product Design: Practical Methods for The Systematic Development of New Products, CRC Press.
3. P.Trott, 2002, Innovation Management and New Product Development, 2nd edition, Prentice Hall.
4. Wego Wang, 2010, Reverse Engineering: Technology of Reinvention, CRC Press.
5. M.Crawford, 2003,New Products Management, McGraw-Hill.
6. G.E. Dieter, 2000, Engineering Design, 3rd edition, McGraw Hill.
7. R.J. Eggert, 2005, Engineering Design, Prentice Hall.

EPT 241/3
SOLID MECHANICS I

Course Synopsis

This course covers deformation and internal forces that exist in a solid body when subjected to external loads. The concepts of stress, strain, and constitutive behaviors are discussed. Students are taught to solve problems of loading on solid bodies under axial, torsion, bending and buckling loading conditions. The concepts of principal stresses and strains are used to solve problems involving multi-directional loadings. Students use Mohr's Circle to solve the problems.

References

1. Hibbeler, R.C. 2005. *Mechanics of Materials*, 5th ed., Prentice Hall.
2. Raymond, Parnes. 2001. *Solid Mechanics in Engineering*, John Willey & Sons.
3. Madhukar, Vable. 2002. *Mechanics of Materials*, Oxford University Press.
4. Barber, J.R . 2001. *Intermediate Mechanics of Materials*, McGraw-Hill.
5. Pytel, Kiusalaas. 2001. *Mechanics of Materials*, 3rd ed., McGraw-Hill.

EPT 212/3
DYNAMICS

Course Synopsis

In this course, students use the concepts of mechanics in dynamic conditions. The course will be presented in two parts: kinematics, which treats only the geometric aspects of motion, and kinetics, which is the analysis of the forces causing the motion. To develop these principles, student learn the dynamics of a particle first, followed by topics in rigid-body dynamics in two and then three dimensions. Emphasis will be given on the kinematics and kinetics of a particle, planar kinematics and kinetics of a rigid body, three dimension kinematics and kinetics of a rigid body.

References:

1. Beer, F. P. & Johnston E. R. 2003. *Engineering Mechanics- Dynamics*. 4th ed. John Wiley & Son.
2. Hibbler R. C., 2007. *Engineering Mechanics- Dynamics*, Prentice Hall.
3. Bedford A. & Fowler W., 2005. *Engineering Mechanics- Dynamics*, Addison Wesley Longman.
4. Meriam J.L. , Kraige L.G., 2007. *Engineering Mechanics, Dynamics*,
5. John Wiley.
6. Ginsberg. J., 2007. *Engineering Dynamics.* 3rd Ed. New York: Cambridge University Press.

EPT 261/3
ELECTRONICS

Course Synopsis

In this course, students learn about electronic devices which include analog and digital devices. In analog devices, the topics include introduction to semiconductor, PN junction, diodes, zener diodes, bipolar junction transistor (BJT) and operational amplifier. In digital devices, the topics include introduction to binary number system, Boolean Algebra, logic gates and logic circuits, Boolean function, combinational logic circuits, sequential logic circuit and counters. Students will be exposed to the basics of electronics, operation concept, and analysis methods including the usage of electronic devices in the industry.

References

1. Floyd, T.L., *Electronic Devices*. 7th ed. Prentice Hall, Inc, 2002.
2. Floyd, T.L., *Digital Fundamentals*, 8th ed. Prentice Hall, Inc, 2002.
3. Tocci, R.J. and, Widmer, N.S., *Digital Systems: Principles and Applications.* 8thed. Prentice Hall, 2001.
4. Knight, S.A.(1996). *Electronics for Engineers*. BH Newness.
5. Floyd, T.L. (1995). *Electronics Fundamentals, Circuits, Devices & Applications.* Prentice Hall.

EPT 281/3
INDUSTRIAL ENGINEERING

Course Synopsis

This course covers processes of design of industrial engineering systems, improvement and the installation of an integrated system of people, materials, equipment, information, energy and economics. It involves knowledge of mathematical and economical sciences with the principles and methods of engineering analysis. The main objective is to solve industrial engineering problems in order to increase labour and manufacturing productivity of industrial systems. Tools which make the most effecient solutions will be focused in this course. Other topics include structure of industrial systems, labour productivity, manufacturing productivity, industrial management and plant layout.

References

1. Kalpakjian S, Schmid S.R. *Manufacturing Engineering and Technology*, 4th ed., Prentice Hall Inc. 2001
2. Manek N.J. *Industrial Engineering*, Laxmi Publications (P) LTD. 2002
3. Turner, W.C. et. al. *Introduction to Industrial and Systems Engineering*, 3rd ed., Prentice Hall, 1993.
4. Roy, R.K. *Design of Experiments Using the Taguchi Approach Canada*: John Wiley & Sons, Inc. 2001.
5. Donna C. S. Summers. *Quality*,3rd ed.,Prentice Hall, 2003.

EPT 282/3
MANUFACTURING PROCESS II

Course Synopsis

This course enables students to understand the use of conventional and modern machining processes. The course begins with an overview to both processes, followed by analyses of machine tools. This is followed by CNC programming, CNC processes, tools and control systems. Programming codes which include G, N, and M codes will be taught and student will perform geometry machining using the machines. Students will solve problems related with the programming, design and operations of CNC machines. At the end of the course, students present their individual/ group projects related to the targeted outcomes.

References

1. Serope Kalpakjian and Steven R. Schmid, *Manufacturing Engineering and Technology,* Fifth Edition, Prentice Hall, 2006
2. Jon Stenerson, Kelly Curran, *Computer Numerical Control Operation and Programming*. 3rd ed., Prentice Hall, 2007.
3. Steve Krar, Arthur Gill, Peter Smid, *Computer Numerical Control Simplified,* 1st ed., Industrial Press Inc. New York, 2001.
4. By Stephen F. Krar, Arthur Gill, *Exploring Advanced Manufacturing Technologies,* Industrial Press Inc. New York, 2003.
5. *Manufacturing Processes And Materials*, George F. Schrader, Ahmad K. Elshennawy, Lawrence E. Doyle, Society Of Manufacturing Engineers, 2000

EPT 283/2
COMPUTER AIDED DESIGN

Course Synopsis

This course focuses on developing students' skills on the basis of 3D modeling and its application in engineering by using 3D Modeling software. It includes details on 3D modeling followed by producing 2D drawing, assembly drawing, exploded drawing, surface modeling, rendering and animation.

References

1. James H. Earle, "Engineering Design Graphics", IIth ed.,Pearson Prentice-Hall, 2004.
2. Frederick E. Giesecke, Henry Cecil Spencer, John Thomas Dygdon, Alva Mitchell, Ivan , Leroy Hill, James E Novak, "Technical Drawing" 10th Ed., Prentice Hall, 2002.
3. Farid M. Amirouche, Principles of Computer Aided Design and Manufacturing Prentice Hall; 2 edition (January 22, 2004)
4. Cornelius T. Leondes , Cornelius Leondes, Computer-Aided Design,
5. Engineering, and Manufacturing: Systems Techniques and Applications, Volume II, Computer-Integra, CRC Press; 1 edition (December 12, 2000)
6. Thomas Strothotte (Author), Stefan Schlechtweg (Author) Non-Photorealistic
7. Computer Graphics: Modeling, Rendering, and Animation (The Morgan Kaufmann Series in Computer Graphics) [Hardcover] Morgan Kaufmann; 1st edition (April 26, 2002)

EPT 228/3
FLUIDS MECHANICS I

Course Synopsis

In Fluid Mechanics I, students apply basic properties of fluid and concepts of dimensional analysis on fluid flow measurement, fluid friction in pipes, and flow over immersed bodies. This course also covers analysis of hydrodynamical flow fields. It emphasizes the analysis and importance of boundary layer, ideal, and compressible flow in practical engineering applications. The course will also provide the analysis of flow through fluid machines such as pumps and turbines. At the end of the course, students should be able to apply the theory to solve problems related to flow of fluids.

References

1. J.F. Douglas, J.M. Gasiorek, J.A. Swaffield, L.B. Jack, *Fluid Mechanics,* Fifth Edition, Prentice-Hall, 2005.
2. B. R. Munson, D. F. Young and T. H. Okiishi. *Fundamentals of Fluid Mechanics.* John Wiley & Sons.
3. B.S. Massey, *Mechanics of fluids*, Chapman & Hall, London.
4. C.T., Crowe, D. F. Elger and J. A. Roberson, *Engineering Fluid Mechanics*, Eight Edition, John Wiley & Sons, 2005.
5. R.L. Mott, *Applied Fluid Mechanics*, Sixth Edition, Prentice Hall, 2006.

EPT 235/3
THERMODYNAMICS

Course Synopsis

In this course, basic concepts in thermodynamic laws used in engineering applications such as steam power plant, air-conditioning & refrigeration systems, and internal combustion engine will be covered. The course emphasizes the study of energy sources and conservation through its concept and definition. By the end of semester, students should be able to analyse mixture and the performance of compressors and heat exchangers.

References

1. Cengal Y.A. and Boles M.A., *Thermodynamics: An Engineering Approach*, 7 th Edition, McGraw-Hill Inc., New York, 2006.
2. Eastop T.D. & Mac Conkey A., *Applied Thermodynamics for Engineering Technologists*, 5 th Ed., Prentice Hall, 1993.
3. Stephen R. Turns, *Thermodynamics: Concepts and Applications ,* Cambridge University Press, 2006.
4. Michael J. Moran & Howard N. Shapiro , *Fundamentals of Engineering Thermodynamics*, 6 th Edition, Wiley, 2007.
5. Mohd Kamal Ariffin, “ Termodinamik Asas”, UTM Press, 2005. W.Z. Black and J.G.Hartley.(1996). *Thermodynamics,* English/SI Version.3rd Edition Prentice-Hall.

EPT 262/2
MEASUREMENT AND INSTRUMENTATION SYSTEM

Course Synopsis

This course introduces students to the basic principles in measurement systems including various sensing methods, instrument types and their characteristics, display and recording elements, and their applications in the measurement of temperature, pressure, force, level, and displacement, among many others.

References

1. Beckwith, T.G., Maragoni, R.D., Lienhard, J.H., Mechanical Measurement, 6th ed., Prentice Hall, 2006.
2. Bently, J. P., Priciple of Measurement System, 3rd ed., Logman, 1995
3. Figliola, R.S., Beasly, D.E., Theory and Design for Mechanical Measurements, 3rd ed. John Wiley, 2000
4. Morris, A.S., Measurement and Instrumentation Principles, 1st ed., Butterworth Heinemann, 2001
5. W.Bolton,Measurement and Instrumentation Systems, Butterworth-Heinemann; 1st Ed. edition (March 23, 1998)

EPT 293/3
ENGINEERING PRODUCT DESIGN I

Course Synopsis

This course aims to develop an understanding of customer’s needs and techniques to interpret data into product conceptual solutions that have market value. Students will learn the appropriate engineering approaches and methods to analyze user needs in conjunction with engineering science principles such as materials, statics, dynamics, solid, fluid and thermodynamics to produce conceptual solutions that fulfill customer needs. The course also focuses on the manipulation of 3D CAD based software to construct product conceptual solutions.

References

1. Rudolph J. Eggert, “Engineering Design” New Jersey: Prentice Hall, 2005
2. Karl T. Ulrich and Steven D. Eppinger, “Product Design and Development” McGraw- Hill, 2008
3. Clive L. Dym and Patrick Little, “Engineering Design: A Project Based Introduction”, John Wiley & Sons, 2008

4. Lance Bettencourt Service Innovation: How to Go from Customer Needs to Breakthrough Services, McGraw-Hill; 1st edition (May 26, 2010)
5. Turkka Kalervo Keinonen, Roope Takala Product Concept Design: A Review of the Conceptual Design of Products in Industry ,Springer; 1 edition (January 23, 2006)

EPT 312/3
VIBRATION AND MECHANICS OF MACHINES

Course Synopsis

This course is designed so that students learn the application of concepts in mechanics (statics and dynamics) to solve real world mechanical engineering problems pertaining to various machines that include belt and pulley systems, gears, flywheels and gyroscopes. Student will also learn the methods of balancing rotating masses and parts of a combustion engine. The concepts of vibration with respect to one-degree-of-freedom are also studied. At the end of this course, students should be able to solve problems related to various mechanical systems. In addition, they should be able to evaluate analytically the parameters of components of various machines under study.

References

1. Pennock Gordon R., Shigley Joseph E., Uicker John J., *Theory of Machines and Mechanisms*, OXFORD University Press, 2003
2. D. J. Inman, *Engineering Vibration*. Pearson Prentice Hall, 2001
3. S. S. Rao, *Mechanical Vibrations*. Pearson Prentice Hall, 2004
4. Che Abas Che Ismail, Mohd. Pauzi Abd. Ghani, Mohd. Yunus Abdullah, *Teori Getaran dengan Penggunaan*. Universiti Teknologi Malaysia, 1997
5. W. J. Palm, *Mechanical Vibration.* John Wiley, 2006

EPT 335
APPLIED THERMODYNAMICS

Course Synopsis

Applied Thermodynamics is designed to enhance and extend students' ability to apply thermodynamic principles, especially the first and second laws of thermodynamics, and the laws of conservation of mass, momentum and energy, to industrial systems. It covers the broad application of the theory to many engineering applications, and emphasizes the analysis of energy transfers during power generation, heating, air-conditioning and refrigeration processes. At the end of the course, students should be able to apply relevant thermodynamic and conservation principles and perform calculations to evaluate the performance of gas and vapor power cycles, various compressors, and the performance of air-conditioning, refrigeration and heat pump cycles. Students should also be able to perform thermodynamic analyses of gas mixtures and gas-vapor mixtures.

References

1. Cengal Y.A. and Boles M.A., *Thermodynamics: An Engineering Approach*, 7th Edition, McGraw-Hill Inc., New York, 2006.
2. Eastop T.D. & Mac Conkey A., *Applied Thermodynamics for Engineering Technologists*, 5th Ed., Prentice Hall, 1993.
3. Stephen R. Turns, *Thermodynamics: Concepts and Applications*, Cambridge University Press, 2006.
4. Michael J. Moran & Howard N. Shapiro, *Fundamentals of Engineering Thermodynamics,* 6th Edition, Wiley, 2007.
5. Mohd Kamal Ariffin, "Termodinamik Asas", UTM Press, 2005.
6. W.Z. Black and J.G.Hartley. (1996). *Thermodynamics*, English/SI Version.3rd Edition Prentice-Hall.

EPT 341/3
SOLID MECHANICS II

Course Synopsis

This course reviews the earlier course of Solid Mechanics I regarding axial load, torsion, bending and shear. Students will be exposed to problems of thin-walled tubes having closed cross sections and bending deformation of a straight member. The course also discusses the solution of problems where several internal loads occur simultaneously on a member's cross section. The deflection of beam problems is taught using various methods including the application of energy methods. This energy method covers the principle of conservation of energy, virtual work and Castigliano's theorem.

References

1. Hibbeler, R.C. 2005. *Mechanics of Materials,* 5th ed., Prentice Hall.
2. Raymond, Parnes. 2001. *Solid Mechanics in Engineering*, John Willey & Sons.
3. Madhukar, Vable. 2002. *Mechanics of Materials*, Oxford University Press.
4. Barber, J.R . 2001. *Intermediate Mechanics of Materials*, McGraw-Hill.
5. Pytel, Kiusalaas. 2001. *Mechanics of Materials*, 3rd ed., McGraw-Hill.

EPT 361/4
INSTRUMENTATION AND CONTROL

Course Synopsis

This course prepares students with the knowledge and skill in instrumentation and control for instrumentation systems and control engineering in manufacturing industries. Students study basic concepts of instrumentation systems, elements, transducers, instrumentation system analysis, design criteria for measuring instrument and suitable materials.
This course will enhance students' knowledge of the principals and usage of instrumentation in manufacturing industries. Students will also learn control system concepts and methods commonly used in the industries. They will be able to apply instrumentation and control techniques in manufacturing environments. In addition, they will also learn how to analyze and design simple controllers.

References

1. C. S. Rangan, G. R. Sarma, V. S. V. Mani, *Instrumentation Devices and Systems,* Tata McGraw Hill, 1994.
2. Nise, Norman S., *Control Systems Engineering*. 4th ed., USA, John Wiley & Sons, 2004.
3. R. C. Dorf, R. H. Bishop, *Modern Control System*, 11th ed., Prentice Hall, 2008.
4. K. Ogata, *Modern Control Engineering*, Prentice Hall, 4th edition, 2002.
5. W. Bolton, *Instrumentation and control*, Elsevier, 2004.

EPT 363/3
AUTOMATIC CONTROL

Course Synopsis

In this course, control systems which involve mathematical models of control system, characteristic of feedback control system, performance of feedback control system, stability of feedback control system, Root-Locus Method, and design of feedback control systems will be covered.

References

1. Benjamin C. Kou., Automatic Control System, John Willey &Sons. Inc.
2. Dorf, R.C. and Bishop, R.H., Modern Control Systems, Addison Wesley, 8th Edition, (1998)
3. Mahmud, che Mat Hadzer, Sistem Kawalan Automatik. USM (1999)
4. Ogata, K., Modern Control Engineering, 3rd Edition, Prentice Hall, (1997)
5. Farid Golnaraghi,Benjamin C. Kuo, Automatic Control Systems, Wiley; 9th edition (July 7, 2009)

EPT 381/3
TOOLS AND DIE DESIGN

Course Synopsis

This course gives an understanding to students about the concepts and principles of Tool & Die and Mould design applications. It is divided into two sections. The first section deals with Tool & Die design with include the calculation and analysis of part and die using CATIA CAD software. The second section will cover the mould design application with includes calculation and analysis using MouldFlow Software. Students need to carry out projects individually or in a team, and present the project at the end of semester.

References

1. Ivana Suchy. *Handbook of Die Design.* 2nd Edition, McGraw-Hill 2006.
2. Vukota Boljanovic J.R. Paquin. *Die Design Fundamentals*. 3rd Edition. Industrial Press Inc. 2006.
3. Szumera, Jim. *The Metal Stamping Process, Your product from concept to customer.* Industrial Press Inc. 2003.
4. David A. Smith. *Fundamentals of Pressworking*. Society of Manufacturing Engineers, Dearborn, Michigan. 1994.
5. R.G.W.Pye, *Injection Mould Design*, Logman Scientific & Technical, 4th Edition, 1991.

EPT 383/3
AUTOMATION AND ROBOTICS

Course Synopsis

This course introduces industrial automation and robotic which have been used in the industries today. Its covers topics regarding automation systems such as pneumatic, hydraulic, programmable logic control (PLC), material handling, Automated Storage/ Retrieval System (ASRS), Automated Guided Vehicles (AGV), Flexible Manufacturing System (FMS), Automated Production Lines, and Automated Assembly Lines. Students learn how to design pneumatic and hydraulic circuits manually before using programmable logic control (PLC) with FluidSIM software in the lab. The course covers an explanation of the classification of robots, robot systems, end-of-arm tooling, sensors, robot safety and robot utilisation in the industries. In addition, Combination of Modular Production System (MPS) with Automation and Robotic Systems are also discussed.

References

1. Jon Stenerson, *Industrial Automation and Process Control*., Prentice Hall, 2003.
2. James A. Rehg, Glenn J. Sartori, *Programmable Logic Controllers*, Prentice Hall. New Jersey, 2007.
3. Jon Stenerson, *Fundamentals of Programmable Logic Controllers, Sensors, and Communications*, 3rd ed., Prentice Hall, 2004.
4. Khairur Rijal Jamaludin, *Reka Bentuk Sistem Kuasa Bendalir*, Universiti Teknologi Malaysia., 2004
5. John S. Cundiff, *Fluid Power Circuits and Controls, Fundamentals and Applications*., CRC Press. 2002.

EPT 385/3
METROLOGY AND QUALITY CONTROL

Course Synopsis

This course gives an understanding about the concepts and techniques in dimensional metrology and quality control and the relationship between these fields of knowledge. Students will be exposed to dimensional metrology equipment such as the equipment used in linear measurement, angular measurement, surface measurement and coordinate measuring machine. In addition, students learn about quality control tools (7 old and new tools), sampling and reliability of engineering systems. Practical work will help students gain effective understanding.

References

1. *Metrology & Measurement*, Bewoor, Tata Mcgraw-Hill, 2009
2. *Metrology And Properties Of Engineering Surfaces*, By Evaristus Mainsah, Jim A. Greenwood, Derek G. Chetwynd, Springer, 2001
3. *Quality Control*, 8th Edition, Dale H. Besterfield, Pearson/Prentice Hall, 2008
4. *Quality Control, Reliability, And Engineering Design*, Volume 1984, Balbir S. Dhillon, Marcel Dekker, 1985
5. *Process Quality Control: Troubleshooting And Interpretation Of Data*, 4th Edition, By Ellis Raymond Ott, Edward G. Schilling, Dean V. Neubauer, American Society For Qualit, 2005

EPT 384/3
ADVANCED MANUFACTURING TECHNOLOGY

Course Synopsis

This course introduces students to advanced manufacturing technology. The content of the course covers advanced manufacturing technology such as Electrochemical Machining (ECM), EBM, LBM, micro-machining and nano-fabrications. It also covers process selections and economics of advanced machining processes. It gives students the basic skills in analysing advanced manufacturing technology and the necessary knowledge to operate and manufacture a particular product. At the end of the course, students will present a proposal to manufacture a particular component.

References

1. S. Kalpakjian, S.R.Schmid, *Manufacturing Engineering and Technology*. 5th ed., Prentice Hall International, 2006.
2. Mikell P. Groover, *Fundamentals of Modern Manufacturing*, 2nd ed. John Wiley & Sons, Inc., 2002.
3. Philip F. Ostwald, Jairo Munoz, *Manufacturing Processes and Systems*, 9th ed., John Wiley, 1997
4. E.Paul DeGarmo, J T. Black, Ronald A. Kohser, *Materials and Processes in Manufacturing*, 8th ed., John Wiley & Sons, Inc., 1997.
5. Michael Fitzpatrick, *Machining and CNC Technology*, McGraw Hill Higher Education., New York, 2005.

EPT 393/3
ENGINEERING PRODUCT DESIGN II

Course Synopsis

In the Product Design Engineering 1 course, students learnt all engineering design phases, focusing on the first two phases which are Problem Formulation and Conceptual Design. In contrast, the course Product Design Engineering 2 focuses on the next phase of Engineering Design, which is Configuration Design. Students will firstly study Product Architecture and then continue to look on the details of Design for X; such as Design for Manufacturing and Assembly, Design for Reliability and Safety, Design for Quality and Robustness, and Design for Environment. At the end of this course, students are usually required to complete a case study.

References

1. Rudolph J. Eggert, “Engineering Design” New Jersey: Prentice Hall, 2005
2. Karl T. Ulrich and Steven D. Eppinger, “Product Design and Development” McGraw- Hill, 2008
3. Clive L. Dym and Patrick Little, “Engineering Design: A Project Based Introduction”, John Wiley & Sons, 2008
4. Charles S. Wasson, System Analysis, Design, and Development: Concepts, Principles, and Practices (Wiley Series in Systems Engineering and Management), Wiley-Interscience (December 23, 2005)

5. Baxter, Mike Product design: a practical guide to systematic methods of new product development / Mike Baxter, Cheltenham: Stanley Thornes, c1995.

EPT 394/3
PRODUCT ERGONOMIC AND SAFETY

This course addresses ergonomics knowledge in product design. It explains the application of anthropometrics data in products, equipment and tool designs. Students will learn about fundamental knowledge of ergonomics, its applications in design and basic assessment tools to analyze design problems. The course also exposes students to specific considerations, needs or requirement for special populations such as the elderly or the disabled in the design. It also looks into ergonomic hazard, safety analysis & prevention, and the product safety.

References

1. Green, W. S. and Jordan, P. W., "Human Factors in Product Design", Taylor & Francis, Florida, 1999.
2. Kroemer, K. H. E, Kroemer, H. B., and Kroemer-Elbert, K. E., "How to Design for Ease and Efficiency", 2nd Edition, Prentice Hall, New Jersey, 2001
3. David L. Geotsch, Occupational Safety and Health for Technologists, Engineers and Manager, 4th Edition, 2002
4. Geaorge E. Dieter, Engineering Design, A materials and Processing Approach, 3rd Edition, university of Maryland. 2000
5. Waldemar Karwowski, Gavriel Salvendy, Advances in Human Factors, Ergonomics, and Safety in Manufacturing and Service Industries (Advances in Human Factors and Ergonomics Series), CRC Press; 1 edition (June 24, 2010)

EPT 371/2
FINITE ELEMENT ANALYSIS

Course Synopsis

The main objective of the course is to provide students with the knowledge, comprehension and analysis of some problems using finite element analysis (FEA). Topics covered in this course include introduction and brief history, element and terminology, stress and balance, boundary condition, continuity approach, mathematics approach, finite element model (FEM), linear shape function, potential energy approach, Galerkin approach, stiffness matrix formation, finite element equation, quadratic function, 2-D coaxial problems, partial element numerical metric and integration with higher order element, 2-D and 3-D framework's problems with FEA. Topics such as steady heat transfer, torsion and flow problems, finite element formulation, element mass matrix, eigen value evaluation and eigen vector by interactive method and Jacobi are also included. There will be a design project that uses finite element software.

References

1. Chandrupatla, T.R. & Belegundu, A.D. 2003. *Introduction to Finite Elements in Engineering,* 3rd Ed. Prentice Hall International.
2. Zienkiewicz, O.C. & Taylor, R.L. 2005. *The Finite Element Methods*, 6th Ed. Mc Graw Hill: NewYork.
3. Cook, R.D., Malkus D.S. & Plesha, M.E. 2001. *Concepts and Applications of Finite Element Analysis*, 4th Ed. John Wiley & Sons: New York.
4. Buchanan, G.R. 1995. *Theory and Problems of Finite Element Analysis*. Schaum's Outline Series, Mc Graw Hill: New York.
5. Huebner, K.H., Thornton, E.A. & Byrom, T.G. 1995. *The Finite Element Method for Engineers.* 3rd Ed, John Wiley & Sons: New York.

EPT 315/3
MACHINE COMPONENTS DESIGN

Course Synopsis

This course prepares students to determine structural integrity of common machine components such as fasteners, shafts, gears, springs, and bolted joints. It introduces engineering design methodology and its relationship to top-level mechanical systems. It illustrates the isolation of the critical factors from a practical engineering problem, the application of known knowledge to quantitatively formulate the critical process, the assembly of the information needed for a solution, and the proper application of the solution in practical designs. This course will show to identify the critical design parameters for any engineering component design and to manipulate them as part of the design process.

References

1. Robert C. Juvinall and Kurt M. Marshek, *Fundamental of Machine Components Design.* John Wiley & Sons, 2005
2. Shigely, J. E and Mischke, C. R., *Mechanical Engineering Design.* McGraw Hill 1989
3. M. F. Spotts, T. E. Shoup and L. E. Hornberger, *Design of Machine Elements*. Pearson Prentice Hall 2004

4. Dan F. Marghitu, *Kinematic Chains and Machine Components Design*. Academic Press 2005
5. V. B. Bhandari, *Design of Machine Elements*. Tata McGraw-Hill 2007

EPT 314/3
MACHINES MECHANISM

Course Synopsis

The course offers students knowledge of basic 3D rigid body kinematics, balancing on rotation mass, gear systems and follower, mechanism-kinematics diagramme, movement ability, position analysis, velocity and acceleration analysis. At the end of this course, students should be able to solve problems related to various mechanical systems. In addition, they should be able to evaluate analytically the parameters of components of various machines under study.

References

1. Myszka, D.H., Machines and Mechanism: Applied Kinematic Analysis, 3rd eds., Prentice Hall (2005)
2. Hannah, J. and Stephens, R.C. Mechanics of Machines. Elementary Theory and Examples, 4th eds., Edward Arnold, 1991
3. Che Abas Che Ismail,Mohd. Yunus Abdullah,Roslan Abd Rahman, “Mekanik Mesin” Universiti Teknologi Malaysia, 2003
4. Machines and Mechanisms”, OXFORD University Press, 2003
5. P.L. Ballaney, Theory of Machines and Mechanisms, Khanna Publisher 1995

EPT 364/3
MECHATRONICS

Course Synopsis

The aim of this course is to deliver the fundamental knowledge of mechatronics system. Topics covered include input device, output device, signal conditioning, input and output interfacing, networking, and fault finding analysis. Students will also learn how to design and analyse mechatronics systems using Programmable logic Control (PLC).

References

1. Bolton, W “Mechatronics Electronic Control Systems in Mechanical and Electrical Engineering”, 2rd ed., Pearson- Prentice Hall., 1999.
2. R. Iserman, “Mechatronic Systems: Fundamental”, Springer,2003.
3. W. Bolton, Mechatronics: A Multidisciplinary Approach (4th Edition) Prentice Hall; 4th edition (June 1, 2009)
4. Sabri Cetinkunt, Mechatronics, Wiley; 1st edition (January 23, 2006)
5. W. Bolton, Programmable Logic Controllers, Fifth Edition, Newnes; 5th edition (August 7, 2009)

EPT386/3
DESIGN FOR MANUFACTURE

Course Synopsis

This course introduces a method that is used to determine the suitable manufacturing processes and raw materials for a product. It also introduces the DFA methodology that helps to produce products which are correct and cost-effective for a production process and assembly requirement, for both manual assembly and also for automatic assembly processes. There are a number of design guidelines and rules in this course that can be used to develop a suitable component design according to the manufacturing process required. Students will have a group project to analyze an existing product design and then will propose a better design so that the assembly efficiency can be improved and the manufacturing cost can be reduced.

References

1. G. Boothroyd, P. Dewhurst, W. Knight, ‘Product Design for Manufacture and Assembly’, 2nd Edition, Marcel Dekker Inc., 2002.
2. G. Boothroyd, P. Dewhurst, W. Knight, ‘Product Design for Manufacture and Assembly, (Manufacturing Engineering and Materials Processing)’, Third Edition, CRC Press, 2010
3. James Bralla, ‘Design for Manufacturability Handbook’, Mc-Graw Hill, 1998
4. David M. Anderson, ‘Design for Manufacturability & Concurrent Engineering; How to Design for Low Cost, Design in High Quality, Design for Lean Manufacture, and Design Quickly for Fast Production’,CIM Press, 2004
5. R. Dixon, ‘Engineering Design and Design for Manufacturing’, Fieldstone Publishers,1995.

EPT 395/3
ENGINEERING PRODUCT DESIGN III

Course Synopsis

In this course, students will increase their skills and knowledge in designing new products. They will produce drawings using Geometry Dimensioning and Tolerance symbols in real industrial environment. Through this course, students will perform analysis on the tolerance of 3D models before they produce a prototype for a new product. The course also focuses on the methods in designing plastic products and analyses of plastic material flow inside plastic injection mould to produce plastic products. Students learn to apply and integrate knowledge and understanding of engineering science disciplines to support engineering design activities. In designing activities, students will study reliability testing for the new product development. Lastly, students will study the laws and the actual steps to acquire patents for a new product.

References

1. Injection Mould Design Engineering, David O. Kazmer
2. R.J. Crawford, "Plastic Engineering", 2nd Edition, Pergamon Press, Unted Kingdom, 1990.
3. L. Sors and I. Balazs, "Design of Plastic Moulds and Dies", Elsevier, Amsterdam, 1989.
4. Mechanical Tolerance Stackup and Analysis, Bryan R. Fischer, 2006.
5. Geometric Tolerancing Workbook.

EPT324/2
HEAT TRANSFER

Course Synopsis

The main objective of this course is to enable student to understand the concepts of conduction, convection and radiation which form the basics of heat transfer. Student will also perform theoretical calculations such as thermal conductivity, heat loss, and other important theories.

References

1. Yunus A. Cengel., 1998, *Heat transfer: A practical approach*. Mc-Graw Hill.
2. Tariq Muneer., Jorge Kubie., Thomal Grassie., 2003, *Heat transfer: A problem solving approach,* volume 1.
3. Jack Philip Holman., 2009, *Heat transfer.* Mc-Graw Hill Higher Education.
4. Adrian Bejan., 1993, *Heat transfer.* John Wiley & Sons, Inc.
5. Anthony F. Mills., 1999, *Heat Transfer.* Prentice Hall.

EPT329/3
FLUID MECHANICS II

Course Synopsis

Fluid Mechanics II will enable students to analyse hydrodynamical flow fields. To enhance understanding of fluid behavior through application of dimensional reasoning, drag and lift considerations, boundary layer theory, compressible flow theory, measurement techniques and pump and turbine theory, computational fluid dynamics and computer applications and simulations. At the end of the course, students are able to develop an appreciation of the design principles in thermo-fluid system and the ability to analyze existing thermo-fluid systems and contribute to new designs.

References

1. J.F. Douglas, J.M. Gasiorek, J.A. Swaffield, L.B. Jack, *Fluid Mechanics*, Fifth Edition, Prentice-Hall, 2005.
2. C.T., Crowe, D. F. Elger and J. A. Roberson, *Engineering Fluid Mechanics,* Eight Edition, John Wiley & Sons, 2005.
3. B. R. Munson, D. F. Young and T. H. Okiishi. *Fundamentals of Fluid Mechanics.* John Wiley & Sons.
4. R.L. Mott, *Applied Fluid Mechanics*, Sixth Edition, Prentice Hall, 2006.
5. B.S. Massey, *Mechanics of fluids*, Chapman & Hall, London.
6. Daugherty, RL, Franzini, JB & Finnemore, EJ, Fluid Mechanics with Engineering Applications, SI metric edn, McGraw-Hill. Douglas, JF, Gasiorek, JM & Swaffield, JA, Fluid Mechanics, Longman.

EPT 403/3
ADVANCED MATERIALS

Course Synopsis

In this course, students learn about recent developments of various classes of advanced materials used in applications such as aerospace, automotive, biomedical and electronic industries. It will emphasize on the important properties exhibited by metallic, polymeric, ceramics and composite materials that make them selected for high-end and advanced applications. The physical and mechanical properties of the various classes of advanced materials (super alloys, titanium and aluminum alloys, intermetallic and biomaterials) will be detailed, and so will the processing techniques associated with producing these materials. The course will also cover the latest advanced materials being developed such as nonmaterial's, shape memory alloys and other functional materials. At the end of the course students should be able to gain understanding of the physical and mechanical properties of advanced materials and apply the knowledge to select suitable materials for a given engineering application.

References

1. El-Eskandarany. S.M. (2001). *Mechanical alloying for Fabrication of advanced Engineering Materials*. Noyes Publication

2. Edelstein. A, Cammarata R.S. (1996). *Nanomaterials: synthesis, properties and application*
3. Mathew, F.L., Rawlings, R.D (1998). *Composite Materials: Engineering and Science.* Chapman & Hall.
4. James F. Shackelford, *Introduction to Materials Science for Engineers*, 7th edition, Pearson Higher Education.2009
5. R.E. Smallman, A.H.W. Ngan , *Physical Metallurgy and Advanced Materials,* 7th Edition. Butterworth-Heinemann 2007.

EPT 412/3
MECHANICAL SYSTEM DESIGN

Course Synopsis

This course incorporates elements covered in an earlier course, Machine Components Design. It completes the overall understanding mechanical system design. Topics covered include: design for installation, limit and matching, impervious, hydraulic system and pneumatic, automation, movement control. The simulation system design such as ADAMS will be introduced. Lectures and projects will cover problem solving methodology in the design, analysis, and synthesis of mechanical and thermal systems. This serves as a foundation for dealing with broad engineering projects. Emphasis will be given on creative thinking in the engineering design process in projects involving optimal conversion of resources.

References

1. Ullman D.G. 2004. *The Mechanical Design Process*, 3rd Ed. International Edition, New York, McGraw Hill.
2. Crose.N. 2000. *Engineering Design Methods, Strategies for Product Design,* 3rd Ed. Chichester, Wiley.
3. Esposito A. 2000. *Fluid Power with Applications*. New Jersey: Prentice Hall Inc.
4. Norton R.L. 2005. *Machine Design: An Integrated Approach*. 3rd ed. New Jersey: Prentice Hall Inc.
5. Clive L. Dym and Patrick Little. 2004. *Engineering Design*: A Project-Based Introduction. 2nd ed. New Jersey: Wiley.

EPT 427/3
PNEUMATICS AND HYDRAULICS SYSTEM DESIGN

Course Synopsis

This course discusses basic pneumatics, sensors, electro-pneumatics, and hydraulic technologies that are related to industrial applications. Students will study the construction and design of circuits by means of examples and exercises.

References

1. Pepperl & Fuchs, training Package Sensoric, Peppel &Fuchs, 2005
2. Croser P, Thomson J.,Basic Pnuematics textbook, 3rd edition, Festo Didactic, 2002
3. Exner H. Freitag R., Hydraulics: Basic Principle and Componets, volume 1, 3rd Edition, Bosch rexroth AG, 2002
4. Andrew Parr, Hydraulics and Pneumatics, Second Edition, Butterworth-Heinemann; 2nd edition (March 22, 1999)
5. Jay F. Hooper, Basic Pneumatics, Carolina Academic Press (May 2003)

EPT415/3
VIBRATION

Course Synopsis

The concept of vibration with respect to one-degree-of-freedom and second degree-of freedom, vibration transition, continuity system and instrumentation for measuring vibration are studied. At the end of the course, students should be able to solve problems related to various mechanical systems.

References

1. Thompson, W.T., Theory of vibration with application, 6th Edition, New Jersey, Prentice Hall, 1993.
2. Rao, S.S., Mechanical Vibration, 3rd Edition, John wiley and Sons, 1995.
3. Daniel J. Inman, Engineering Vibration (3rd Edition) Prentice Hall; 3rd edition (May 19, 2007)
4. J.P. Den Hartog, Mechanical Vibrations, Crastre Press (November 4, 2008)
5. S. Timoshenko, Vibration Problems In Engineering, 2nd Edition, Wolfenden Press; 2nd edition (November 4, 2008)

EPT 424/2
HEAT TRANSFER

Course Synopsis

The main objective of this course is to enable student to understand the concepts of conduction, convection and radiation which form the basics of heat transfer. Student will also perform theoretical calculations such as thermal conductivity, heat loss, and other important theories.

References

1. Yunus A. Cengel., 1998, *Heat transfer: A practical approach*. Mc-Graw Hill.
2. Tariq Muneer., Jorge Kubie., Thomal Grassie., 2003, *Heat transfer: A problem solving approach,* volume 1.
3. Jack Philip Holman., 2009, *Heat transfer.* Mc-Graw Hill Higher Education.
4. Adrian Bejan., 1993, *Heat transfer*. John Wiley & Sons, Inc.
5. Anthony F. Mills., 1999, *Heat transfer.* Prentice Hall.

EPT463/3
AUTOMATIC CONTROL

Course Synopsis

In this course, student will be exposed to the mathematical modeling for electrical and mechanical system using block diagram and transfer functions. In addition, they will be able to determine and analyze the characteristic, stability and performance of feedback control system in time and frequency domain. The students will also learn how to design a feedback control system.

References

1. Ogata K. (2010). Modern Control Engineering. 5th ed. Prentice Hall.
2. Norman S. Nise. (2011). Control System Engineering. 6th ed. John Wiley & Sons
3. Kuo B. C. (2010). Automatic Control System. 9th ed. John Wiley & Sons.
4. Richard C. Dorf, Robert H. Bishop (2011), Modern Control Systems, 12th ed. Prentice Hall.
5. Franklin G. F., Powell J. D. and Emani-Naeni A. (2009). Feedback Control of Dynamic Systems System. 9th ed. Prentice Hall.
6. U. A. Bakshi, S.C. Goyal, Feedback Control System, 2nd Revised ed. Technical Publication Pune.
7. Charles L. Phillips, Royce D. Harbor, Feedback Control System, 4th ed. Prentice Hall

EPT 484/2
LEAN MANUFACTURING

Course Synopsis

This course offers students to understand the concept of Lean Manufacturing. Students learn about lean philosophies and techniques used in lean manufacturing. They will also learn Value Stream Mapping (VSM) which is the heart of Lean Manufacturing solution. Lab sessions will enable students to use lean tools properly through case studies given using simulation software. At the end of this course, students are expected to be able to apply and analyse lean tools to solve appropriate problems incurred on the manufacturing shop floor.

References

1. Pascall Dennis, *Lean Production Simplified,* Productivity Press, 2002.
2. Shingo, S. *A Study of the Toyota Production System*, Revised Edition, Cambridge, 1989.
3. Taiichi Ohno, *Toyota Production System: Beyond Large-Scale Production,* Productivity Press; 1st Edition 1988.
4. Shigeo Shingo, *A Study of the Toyota Production System: From an Industrian Engineering Viewpoint*, Productivity Press; 1st Edition 1989
5. James P. Womack, Daniel T. Jones, *Lean Thinking*, Simon & Schuster, 1st Edition, 1996.

EPT 485/2
PRODUCTION PLANNING AND CONTROL

Course Synopsis

In this course, students will understand issues related to production management. At the end of the course students are able to use the appropriate tools and techniques in manufacturing and production lines. The course includes Introduction to Production Management, Demand Forecasting, Capacity Planning, Process Selection & Facility Layout, Aggregate Planning, Inventory management, Materials Requirement Planning (MRP), Production Scheduling and Supply Chain Management.

References

1. *Operations Management*, 10th Edition, William J. Stevenson Mcgraw-Hill/ Irwin, 2008
2. *Manufacturing Resource Planning (Mrp II): With Introduction To Erp, SCM and CRM* By Khalid Sheikh, Mcgraw-Hill Professional, 2003
3. *Operations Management: Providing Value In Goods And Services,* 3rd Edition, James B. Dilworth, Dryden Press, 2000
4. *Operations Management,* Jae K. Shim, Joel G. Siegel, Barron's Educational Series, 1999
5. *Operations Management* By C. Donald J. Waters, Donald Waters, Kogan Page Publishers, 1999

EPT 495/2
OPERATIONAL RESEARCH

Course Synopsis

The course is divided into deterministic and stochastic categories used in the engineering field. Both categories involve modeling of problems using tools such as simplex, tasking and transportation. The course also covers operational problems which essentially involve probability such as queuing line and simulation models. All these methods aim to arrive at an optimum solution.

References

1. F.S. Hillier and Lieberman, G.J, *Introduction To Operation Research*, 7th Ed. Mc Graw Hill, N.Y. 2001
2. H.A. Taha, *Operations Research : An Introduction***,** Prentice-Hall, New Jersey, 1997
3. H. A. Eiselt and Carl-Louis Sandblom . *Operation Research:A Model Based Approach,* 1st Edition. Springer, 2010.
4. David J. Rader, *Deterministic Operations Research : Models and Methods in Linear Optimization,* Wiley 2010.
5. Wayne L. Winston., *Operations Research: Applications and Algorithms*, 4th Edition. Duxbury Press 2003.

Career Opportunities

- Process Engineer
- Quality Engineer
- Industry Safety Engineer
- Maintenance Engineer
- Production Design Engineer
- Process Design Engineer
- Research & Development Engineer (R&D)
- Academician
- Consultancy

School of Materials Engineering

Programmes Offered

• Diploma in Metallurgical Engineering
• Bachelor of Engineering (Honours)(Materials Engineering)
• Bachelor of Engineering (Honours) (Metallurgical Engineering)
• Bachelor of Engineering (Honours) (Polymer Engineering)
• Master of Science (Materials Engineering)
• Master of Science (Polymer Engineering)
• Master of Science Mixed Mode (Polymer Engineering)
• Doctor of Philosophy

Address

SCHOOL OF MATERIALS ENGINEERING
Universiti Malaysia Perlis
Kompleks Pusat Pengajian Jejawi 2
Taman Muhibbah
02600 Jejawi, Arau
Perlis.

Tel.: +6(04) 979 8154 / 8193
Fax: +6(04) 979 8178

INTRODUCTION

Materials Engineering, Metallurgical Engineering and Polymer Engineering is related to the structure and properties of materials that have engineering applications. Materials Engineer, Metallurgical Engineer and Polymer Engineer is responsible for designing, producing, inspecting and testing of engineering materials such as metal and its alloys, semiconductors, superconductors, ceramics, polymers, plastics and composites. All three programmes emphasize learning and practical courses in all courses offered.

In accordance with the requirements of industrial and Vision 2020, a high need for professionals in Materials Engineering, Metallurgical Engineering and Polymer Engineering is required in various industries that use advanced manufacturing technology and production. Thus, this programs aims to produce human resources professional at the proficient and have strong knowledge in the field of Materials Engineering, Metallurgical Engineering and Polymer Engineering.

SCHOOL OF MATERIALS ENGINEERING VISION & MISSION

VISION

A world-class academic and research centre in the field of materials science and engineering

MISSION

To realise the country’s aspirations and contribute towards global civilization in the field of materials science and engineering

STAFF DIRECTORY

Dean
Dr. Khairel Rafezi Ahmad
e-mail: rafezi@unimap.edu.my
Tel: +6(04) 979 8190

Deputy Dean
(Academic And Research)
Dr. Muhammad Asri Idris
e-mail: asri@unimap.edu.my
Tel: +6(04) 979 8365

Deputy Dean
(Student Development and Alumni)
Dr. Luqman Musa
e-mail: luqman@unimap.edu.my
Tel: +6(04) 979 8191

Chairperson of Degree Programme
(Materials Engineering)
Dr Sharifah Shahnaz Syed Bakar
e-mail: shahnaz@unimap.edu.my
Tel: +6(04) 979 8192

Chairperson of Degree Programme
(Metallurgical Engineering)
Dr. Mohd Fitri Mohamad Wahid
e-mail: fitri@unimap.edu.my
Tel: +6(04) 979 8196

Chairperson of Degree Programme
(Polymer Engineering)
Dr. Zunaida Zakaria
e-mail: zunaida@unimap.edu.my
Tel: +6(04) 979 8154

Chairperson of Postgraduate Programme
Dr. Rozyanty Rahman
e-mail: rozyanty@unimap.edu.my
Tel: +6(04) 979 8154

Chairperson of Diploma Programme
Mr. Murizam Darus
e-mail: murizam@unimap.edu.myg
Tel: +6(04) 979 8858

Coordinator for Industrial Networking and Quality Management
Mr. Shaiful Rizam Shamsudin
e-mail: rizam@unimap.edu.my
Tel: +6(04) 979 8154

Assistant Registrar
Ms. Paulinaa Muhammed Magavarnan
e-mail: paulinaa@unimap.edu.my
Tel: +6(04) 979 8193

LECTURERS

Prof. Dr. Mohd Noor Ahmad
Ph.D. (Uni. New Castle, UK), B.Sc. (Uni. Gajah Mada, Indonesia), Dip.Ed. (UM)
mohdnoor@unimap.edu.my
Tel.: +6(04) 979 8154

Prof. Dr. Shamsul Baharin Jamaludin
Ph.D. (Uni. Leeds, UK), M.Sc., B.App.Sc. (USM)
sbaharin@unimap.edu.my
Tel.: +6(04) 979 8610

Assoc. Prof. Dr. Azmi Rahmat
Ph.D. (Uni. Nottingham, UK), M.Sc. (Uni. Ranfield, UK) B.Sc. (USM)
azmirahmat@unimap.edu.my
Tel.: +6(04) 979 8154

Assoc. Prof. Dr. Abdullah Chik
Ph.D. (UPM), M.Sc. (USM), B.Sc. (Uni. Lamar, USA)
abdullahchik@unimap.edu.my
Tel.: +6(04) 979 8154

Assoc. Prof. Ir. Dr. Salmah Husseinsyah
Ph.D., M.Sc. (USM), B.Sc. (Uni. Sumatera Utara, Indonesia)
irsalmah@unimap.edu.my
Tel.: +6(04) 979 8612

Assoc. Prof. Dr. Md Fazlul Bari
Ph.D. (USM), M.Sc., B.Sc. (Uni. Rajshahi, Bangladesh)
fazlul@unimap.edu.my
Tel.: +6(04) 979 8608

Assoc. Prof. Ir. Mohabattul Zaman S NS Bukhari
M.Sc. (UPM), B.Eng. (USM)
mzaman@unimap.edu.my
Tel.: +6(04) 979 8154

Assoc. Prof. Dr. Hakimah Osman
Ph.D., M.Sc., B.Tech. (USM)
hakimah@unimap.edu.my
Tel.: +6(04) 979 8154

Dr. Banjuraizah Johar
Ph.D., M.Sc., B.Eng. (USM)
banjuraizah@unimap.edu.my
Tel.: +6(04) 979 8154

Dr. Dewi Suriyani Che Halin
Ph.D. (UKM), M.Sc., B.Eng. (USM)
dewisuriyani@unimap.edu.my
Tel.: +6(04) 979 8154

Dr. Du Ngoc Uy Lan
Ph.D. (USM, Uni. Kyoto, Japan), M.Sc. (USM), B.Eng. (Ho Chi Minh Uni. Tech, Vietnam)
uylan@unimap.edu.my
Tel.: +6(04) 979 8921

Dr. Firuz Zainuddin
Ph.D. (UKM), M.Sc., B.Eng. (USM)
firuz@unimap.edu.my
Tel.: +6(04) 979 8668

Dr. Irwana Nainggolan
Ph.D., M.Sc. (UKM), B.Sc. (Uni. Sumatera Utara, Indonesia)
irwana@unimap.edu.my
Tel.: +6(04) 979 8935

Dr. Kahtan S Mohammed
Ph.D. (USM), M.Sc. (Uni. Manchester Inst. Sci. Tech, UK)
kahtan@unimap.edu.my
Tel.: +6(04) 979 8154

Dr. Khairel Rafezi Ahmad
Ph.D., M.Sc., B.Eng. (USM)
rafezi@unimap.edu.my
Tel.: +6(04) 979 8190

Dr. Luqman Musa
Ph.D., M.Sc., B.Sc. (USM)
luqman@unimap.edu.my
Tel.: +6(04) 979 8191

Dr. Mazlee Mohd Noor
Ph.D., (UniMAP) M.Sc., B.Eng. (USM), Dip.Eng. (UTM)
mazlee@unimap.edu.my
Tel.: +6(04) 979 8619

Dr. Mohd Nazree Derman
Ph.D., M.Sc., B.Eng. (USM)
nazree@unimap.edu.my
Tel.: +6(04) 979 8154

Dr. Mst. Noorzahan Begum
Ph.D. (UniMAP), M.Sc., B.Sc. (Uni. Rajshahi, Bangladesh)
noorzahan@unimap.edu.my
Tel.: +6(04) 979 8929

Dr. Muhammad Asri Idris
Ph.D. (Uni. New South Wales, Australia) M.Eng., B.Eng. (Uni. Ehime, Japan)
asri@unimap.edu.my
Tel.: +6(04) 979 8365

Dr. Norzilah Abdul Halif
Ph.D. (UPM), M.Sc., B.Eng. (UM)
norzilah@unimap.edu.my
Tel.: +6(04) 979 8613

Dr. Ong Hui Lin
Ph.D., M.Sc., B.Tech. (USM)
hlong@unimap.edu.my
Tel.: +6(04) 979 8154

Dr. Rozyanty Rahman
Ph.D., M.Sc., B.Tech. (USM)
rozyanty@unimap.edu.my
Tel.: +6(04) 979 8154

Dr. Sharifah Shahnaz Syed Bakar
Ph.D. (Uni. New South Wales, Australia), M.Sc., B.Eng (USM)
shahnaz@unimap.edu.my
Tel.: +6(04) 979 8192

Dr. Teh Pei Leng
Ph.D., M.Sc., B.Tech. (USM)
plteh@unimap.edu.my
Tel.: +6(04) 979 8154

Dr. Yeoh Cheow Keat
Ph.D., M.Sc. (USM), B.Eng. (UTM)
ckyeoh@unimap.edu.my
Tel.: +6(04) 979 8154

Dr. Azlin Fazlina Osman
Ph.D. (Uni. Queensland, Australia), M.Sc., B.Eng. (USM)
azlin@unimap.edu.my
Tel.: +6(04) 979 8154

Dr. Mohd Sobri Idris
Ph.D. (Uni. Sheffield, UK), M.Sc. (UniMAP), B.Eng. (USM)
sobri@unimap.edu.my
Tel.: +6(04) 977 7744

Dr. Zunaida Zakaria
Ph.D., M.Sc., B.Eng. (USM)
zunaida@unimap.edu.my
Tel.: +6(04) 979 8154

Dr. Mohamad Kahar Ab Wahab
Ph.D. (USM), M.Sc., B.Sc. (UKM)
kaharwahab@unimap.edu.my
Tel.: +6(04) 979 8154

Dr. Norsuria Mahmed
D.Sc.Tech. (Uni. Aalto, Finland), M.Sc., B.Eng. (USM)
norsuria@unimap.edu.my
Tel.: +6(04) 979 8154

Dr. Sri Raj Rajeswari Munusamy
Ph.D., M.Sc., B.Eng. (USM)
rajeswari@unimap.edu.my
Tel.: +6(04) 977 7933

Dr. Nur Farhana Hayazi
Ph.D. (Uni. New South Wales, Australia), B.Eng. (UniMAP)
farhanahayazi@unimap.edu.my
Tel.: +6(04) 979 8154

Dr. Khairul Anwar Abdul Halim
Ph.D. (Athlone Inst. Tech., Ireland), B.Eng. (UniMAP)
kanwar@unimap.edu.my
Tel.: +6(04) 979 8154

Dr. Nur Farhana Diyana Mohd Yunos
Ph.D. (Uni. New South Wales, Australia), B.Eng. (UniMAP)
farhanadiyana@unimap.edu.my
Tel.: +6(04) 979 8154

Dr. Zuraidawani Che Daud
Ph.D. (UniMAP), M.Sc., B.Sc. (USM)
zuraidawani@unimap.edu.my
Tel.: +6(04) 979 8154

Dr. Mohd Firdaus Omar
Ph.D., M.Sc., B.Eng. (USM)
firdausomar@unimap.edu.my
Tel.: +6(04) 979 8154

Dr. Nur Maizatul Shima Adzali
Ph.D. (UniMAP), M.Sc. (Uni. Sheffield, UK), B.Eng. (USM)
shima@unimap.edu.my
Tel.: +6(04) 979 4616

Dr. Mohd Fitri Mohamad Wahid
Ph.D. (Uni. New South Wales, Australia), M.Sc. (Uni. Liverpool, UK), B.Eng. (USM)
fitri@unimap.edu.my
Tel.: +6(04) 979 8196

Dr. Lim Bee Ying
Ph.D., B.Eng. (UniMAP)
bylim@unimap.edu.my
Tel.: +6(04) 979 8154

Dr. Ho Li Ngee
Ph.D. (Uni. Oita, Japan), B.Sc. (USM)
lnho@unimap.edu.my
Tel.: +6(04) 979 8154

Dr. Nor Azwin Ahad
Ph.D. (UTM), M.Sc., B.Eng. (USM)
norazwin@unimap.edu.my
Tel.: +6(04) 979 8154

Dr. Noraziana Parimin
Ph.D. (UTM), M.Sc., B.Eng. (USM)
noraziana@unimap.edu.my
Tel.: +6(04) 979 8154

Dr. Mohd Fairul Sharin Abdul Razak
Ph.D. (USM), M.Sc., B.Sc. (UPM)
fairulsharin@unimap.edu.my
Tel.: +6(04) 979 8154

Mrs. Marliza Mostapha @ Zakaria
M.Sc., B.Eng. (UniMAP),
marliza@unimap.edu.my
Tel.: +6(04) 979 8154

Mr. Ismail Ibrahim
M.Sc., B.Eng. (UniMAP), Dip.Eng. (POLIMAS)
ismailibrahim@unimap.edu.my
Tel.: +6(04) 979 8648

Mrs. Jalilah Abd Jalil
M.Eng. (Nara Inst. Sci. Tech., Japan), B.Eng. (Kyoto Inst. Tech, Japan)
jalilahjalil@unimap.edu.my
Tel.: +6(04) 979 8620

Ms. Muthmirah Ibrahim
M.Eng., B.Eng. (UTM)
muthmirah@unimap.edu.
Tel.: +6(04) 979 8154

Mr. Murizam Darus
M.Sc. (UniMAP), B.Eng. (UKM)
murizam@unimap.edu.my
Tel.: +6(04) 979 8858

Mrs. Siti Salmi Samsudin
M.Sc., B.Eng. (USM)
sitisalmi@unimap.edu.my
Tel.: +6(04) 979 8154

Mr. Suhardy Daud
M.Sc., B.Sc.Ed (UTM)
suhardy@unimap.edu.my
Tel.: +6(04) 979 8609

Mrs. Kamrosni Abd Razak
M.Sc. (UniMAP), B.Eng. (UKM)
kamrosni@unimap.edu.my
Tel.: +6(04) 979 8154

Mr. Shaiful Rizam Shamsudin
M.Sc., B.Sc. (UKM)
rizam@unimap.edu.my
Tel.: +6(04) 979 8154

Mr. Syed Nuzul Fadzli Syed Adam
M.Sc. (USM), B.Sc. (UKM)
syed.nuzul@unimap.edu.my
Tel.: +6(04) 979 8154

VOCATIONAL TRAINING OFFICERS

Mr. Ahmad Azrem Azmi
M.Sc., B.Eng. (UniMAP)
azreem@unimap.edu.my
Tel.: +6(04) 979 8154

Mr. Azmi Kamardin
M.Sc. (UniMAP), B.Sc. (Uni. Washington, USA)
azmikamardin@unimap.edu.my
Tel.: +6(04) 979 8154

Mr. Lokman Hakim Ibrahim
B.Eng. (UniMAP)
lokmanh@unimap.edu.my
Tel.: +6(04) 979 8859

Mr. Mohamed Faisol Mohamed Nor
B.Eng. (UniMAP), Dip.Eng. (PoliPD), Cert.Eng. (PoliSAS)
faisol@unimap.edu.my
Tel.: +6(04) 979 8154

Mr. Muhamad Hafiz Zan @ Hazizi
M.Sc. (UniMAP) B.Eng. (UTHM)
hafizhazizi@unimap.edu.my
Tel.: +6(04) 979 8154

Mr. Mohammad Tamizi Selimin
M.Eng. (UTHM), B.Eng. (UiTM), Dip.Eng. (UiTM)
tamizi@unimap.edu.my
Tel.: +6(04) 979 8154

Mr. Mohd Tajuddin Mohd Idris
B.Eng. (UniMAP), Dip.Eng. (Poli Ungku Omar)
tajuddin@unimap.edu.my
Tel.: +6(04) 979 8154

Mrs. Noor Azira Mohd Noor
B.Eng. (UKM)
noorazira@unimap.edu.my
Tel.: +6(04) 979 8154

Mr. Saiful Nizwan Bin Mhd Salleh
B.Eng. (UniMAP)
nizwan@unimap.edu.my
Tel.: +6(04) 979 8154

Ms. Siti Sarah Ibrahim
B.Eng. (UKM)
sitisarah@unimap.edu.my
Tel.: +6(04) 979 8154

Mr. Wan Mohd Arif Wan Ibrahim
B.Eng. (USM)
wanarif@unimap.edu.my
Tel.: +6(04) 979 8154

STUDY LEAVE

Mr. Mohd Zaheruddin Kasmuin
M.Sc., B.Eng. (USM)
zaheruddin@unimap.edu.my

Mr. Faizul Che Pa
M.Sc., B.Eng. (USM)
faizul@unimap.edu.my

Mr. Ruhiyuddin Mohd Zaki
M.Sc., B.Eng. (USM)
ruhiyuddin@unimap.edu.my

Mr. Mohd Nazry Salleh
M.Sc. (UniMAP), B.Sc. (UKM)
nazry@unimap.edu.my

Mrs. Sinar Arzuria Adnan
M.Sc. (UTM), B.Eng (UniMAP)
sinar@unimap.edu.my

Mrs. Yusrina Mat Daud
M.Sc. (UTM), B.Eng. (UniMAP)
yusrina@unimap.edu.my

Mrs. Nur Hidayah Ahmad Zaidi
M.Sc. (UniMAP), B.Sc. (UTHM)
hidayah@unimap.edu.my

Mr. Mohd Arif Anuar Mohd Salleh
M.Eng., B.Eng. (UTHM)
arifanuar@unimap.edu.my

Mrs. Salmie Suhana Che Abdullah
M.Sc., B.Eng. (Uni. Tottori, Japan)
salmie@unimap.edu.my

Mrs. Siti Hawa Mohd Salleh
M.Sc. (UKM), B.Eng. (UniMAP)
sitihawa@unimap.edu.my

Mrs. Nor Azura Abdul Rahim
M.Sc., B.Eng. (USM)
norazura@unimap.edu.my

Mrs. Haiza Haroon
M.Sc., B.Eng. (USM)
haizaharoon@unimap.edu.my

Mrs. Nurulhuda Bashirom
M.Sc. (USM), B.Eng. (UniMAP)
hudabashirom@unimap.edu.my

Ms. Rohaya Abdul Malek
M.Sc., B.Eng. (UniMAP)
rohayamalek@unimap.edu.my

Mr. Shahrizam Saad
M.Sc., B.Eng. (USM)
shahrizamsaad@unimap.edu.my

Mrs. Syarifah Nuraqmar Syed Mahamud
M.Sc., B.Eng. (UTM)
nuraqmar@unimap.edu.my

Ms. Juyana A Wahab
M.Sc., B.Eng. (UniMAP)
juyana@unimap.edu.my

Mr. Muhammad Salihin Zakaria
M.Sc., B.Eng. (UniMAP)
salihin@unimap.edu.my

Ms. Azida Azmi
B.Eng. (UM)
azida@unimap.edu.my

Mrs. Noor Mariamadzliza Mohd Nan
B.Eng. (USM)
maria@unimap.edu.my

TECHNICAL ASSISTANT

Mr. Chek Idrus Omar
idrus@unimap.edu.my
Tel.: +6(04) 979 8126

Mr. Ahmad Hadzrul Iqwan Jalaludin
hadzrul@unimap.edu.my
Tel.: +6(04) 979 8154

Mr. Ku Hasrin Ku Abdul Rahman
kuhasrin@unimap.edu.my
Tel.: +6(04) 979 8154

Mr. Mohamad Safwan Isa
safwan@unimap.edu.my
Tel.: +6(04) 979 8154

Mr. Mohd Nasir Haji Ibrahim
nasir@unimap.edu.my
Tel.: +6(04) 979 8600

Mr. Norzaidi Zainol
norzaidi@unimap.edu.my
Tel.: +6(04) 979 8154

Mr. Rosmawadi Othman
rosmawadi@unimap.edu.my
Tel.: +6(04) 979 8126

Mr. Azmi Aziz
azmiaziz@unimap.edu.my
Tel.: +6(04) 979 8126

TECHNICIAN

Mr. Mohammed Faisal Rusli
faisalrusli@unimap.edu.my
Tel.: +6(04) 979 8154

FOREMAN K1

Mr. Mohd Aizat Abdul Rahman
mohdaizat@unimap.edu.my
Tel.: +6(04) 979 8126

ADMINISTRATIVE STAFF

Ms. Paulinaa Muhammed Magavarnan
Assistant Registrar
paulinaa@unimap.edu.my
Tel.: +6(04) 979 8193

Mrs. Jasliza Johari
Personal Assistant
jasliza@unimap.edu.my
Tel.: +6(04) 979 8154

Mrs. Rosmaliza Sareh Ramli
Administrative Assistant
(Clerical/Operation)
rosmaliza@unimap.edu.my
Tel.: +6(04) 979 8197

Mr. Sazali Saad
Administrative Assistant
(Clerical / Operation)
sazali@unimap.edu.my
Tel.: +6(04) 979 8195

Mr. Saifull Akmal Nordin
Administrative Assistant
(Clerical / Operation)
saifullnordin@unimap.edu.my
Tel.: +6(04) 979 8154

Mr. Hasmizul Hashim
Office Assistant
hasmizul@unimap.edu.my
Tel.: +6(04) 979 8198

MATERIALS ENGINEERING PROGRAMME

PROGRAMME OBJECTIVES (PEO)

Programme Educational Objective 1
Graduates who are leaders in the field of materials engineering or chosen field as demonstrated through career advancement.

Programme Educational Objective 2
Graduates who are members and contribute to professional society.

Programme Educational Objective 3
Graduates who engage in lifelong learning or continuous education opportunities.

Programme Educational Objective 4
Graduates who contribute towards research and development.

Programme Educational Objective 5
Graduates who are entrepreneurial engineers.

PROGRAMME OUTCOMES (PO)

PO 01
Ability to acquire and apply knowledge of mathematics, science, engineering and in-depth technical competence in materials engineering discipline to the solution of complex engineering problem

PO 02
Ability to identify, formulate and solve complex engineering problems.

PO 03
Ability to design solutions for complex engineering problems and systems, components or processes to meet desired needs

PO 04
Ability to conduct investigation into complex problems as well as to analyze and interpret data.

PO 05
Ability to use techniques, skills and modern engineering tools necessary for complex engineering practices so as to be easily adaptable to industrial needs.

PO 06
Understanding of the social, cultural, global and environmental responsibilities of a professional engineer.

PO 07
Ability to understand entrepreneurship, the process of innovation and the need for environmental and sustainable development

PO 08
Ability to understand the professional and ethical responsibilities and commitment to the community.

PO 09
Ability to function on multi-disciplinary teams.

PO 10
Ability to communicate effectively on complex engineering activities with the engineering community and with society at large.

PO 11
A recognition of the need for, and an ability to engage in life-long learning.

PO 12
Demonstrate understanding of project management and finance principles.

CURRICULUM STRUCTURE FOR BACHELOR OF ENGINEERING (HONOURS) (MATERIALS ENGINEERING)

YEAR	FIRST		SECOND		THIRD			FOURTH	
SEMESTER	I	II	III	IV	V	VI		VII	VIII
Engineering Core	EBT151/3 Engineering Drawing	EBT109/3 Quality Control	EBT207/4 Materials Structure & Properties	EBT254/3 Transportation Phenomenon in Materials Processing	EBT317/3 Fluid Mechanics	EBT303/3 Process Control	EIT302/4 Industrial Training & Engineering Innovation	EBT405/3 Non Destructive Testing	#EBT421/3 Advanced Material Engineering OR #EBT439/3 Advanced Electronic Packaging
	EBT113/4 Electrical Technology	ECT112/3 Engineering Skills	EBT251/3 Engineering Materials Chemistry	EBT211/4 Physical Metallurgy	EBT323/4 Materials Characterization	EBT315/2 Surface Engineering		EBT402/3 Corrosion Engineering	
	EKT150/3 Computer Programming	EBT112/3 Statics	EBT252/4 Strength of Materials	EBT222/4 Fundamentals of Ceramics	EBT326/4 Polymer Properties	EBT329/3 Polymer Processing		#EBT429/3 Composite Materials OR #EBT424/3 Construction Materials	
	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EBT212/3 Dynamics	EBT253/3 Analytical Chemistry	EBT351/3 Electronic Materials Engineering	EBT324/3 Materials Thermodynamics		EBT427/3 Technical Ceramic	
			EQT203/3 Engineering Mathematics III	EQT271/3 Statistic For Engineer				EBT445/2 Final Year Project 1	EBT446/4 Final Year Project 2
								* EBT447/2 Materials Selection & Design	* EBT447/2 Materials Selection & Design
Non Engineering						EUT444/3 Management for Engineer		EUT442/2 Professional Engineer	
	UVWXXX/3 Foundation English I	UVWYYY/2 Foundation English II							
University Required	UUWXXX/2 Option Subject	UVW410/2 University Malay Language	UVW312/2 English for Technical Communication		UUW235/2 Ethnic Relation	UUW322/2 Thinking Skill			
	UZWXXX/1 Co-Curriculum	UZWXXX/1 Co-Curriculum		UZWXXX/1 Co-Curriculum	UUW224/2 Engineering Entrepreneurship	UUW233/2 TITAS			
120	16	17	19	18	18	18	4	18	9
17	English for Technical Communication, Engineering Entrepreneurship, TITAS, Ethnic Relation, Thinking Skill, University Malay Language, Co-Curiculum, Option Subjects								
Total Units for Graduation 137									

* Course begins in the first semester but total credits are given upon completion of the second semester.
# Elective Subject

METALLURGICAL ENGINEERING PROGRAMME

PROGRAMME OBJECTIVES (PEO)

Programme Educational Objective 1
Graduates who are leaders in the field of metallurgical engineering or chosen field as demonstrated through career advancement.

Programme Educational Objective 2
Graduates who are members and contribute to professional society.

Programme Educational Objective 3
Graduates who engage in life-long learning or continuous education opportunities.

Programme Educational Objective 4
Graduates who contribute towards research and development.

Programme Educational Objective 5
Graduates who are entrepreneurial engineers.

PROGRAMME OUTCOMES (PO)

PO 01
Ability to acquire and apply knowledge of mathematics, science, engineering and in-depth technical competence in metallurgical engineering discipline to the solution of complex engineering problem

PO 02
Ability to identify, formulate and solve complex engineering problems.

PO 03
Ability to design solutions for complex engineering problems and systems, components or processes to meet desired needs

PO 04
Ability to conduct investigation into complex problems as well as to analyze and interpret data.

PO 05
Ability to use techniques, skills and modern engineering tools necessary for complex engineering practices so as to be easily adaptable to industrial needs.

PO 06
Understanding of the social, cultural, global and environmental responsibilities of a professional engineer.

PO 07
Ability to understand entrepreneurship, the process of innovation and the need for environmental and sustainable development

PO 08
Ability to understand the professional and ethical responsibilities and commitment to the community.

PO 09
Ability to function on multi-disciplinary teams.

PO 10
Ability to communicate effectively on complex engineering activities with the engineering community and with society at large.

PO 11
A recognition of the need for, and an ability to engage in life-long learning.

PO 12
Demonstrate understanding of project management and finance principles.

CURRICULUM STRUCTURE FOR BACHELOR OF ENGINEERING (HONOURS) (METALLURGICAL ENGINEERING)

YEAR	FIRST		SECOND		THIRD			FOURTH	
SEMESTER	**I**	**II**	**III**	**IV**	**V**	**VI**		**VII**	**VIII**
Engineering Core	EBT151/3 Engineering Drawing	EBT109/3 Quality Control	EBT207/4 Materials Structure & Properties	EBT211/4 Physical Metallurgy	EBT311/4 Mechanical Metallurgy	EBT303/3 Process Control	EIT302/4 Industrial Training & Engineering Innovation	*#EBT405/3 Non Destructive Testing OR #EBT418/3 Welding Metallurgy*	EBT419/3 Applied Metallurgy
	EBT113/4 Electrical Technology	ECT112/3 Engineering Skills	EBT251/3 Engineering Materials Chemistry	EBT213/4 Extractive Metallurgy I	EBT317/3 Fluid Mechanics	EBT314/3 Metallurgical Thermodynamics		EBT402/3 Corrosion Engineering	EBT415/4 Metallurgical Forensic Analysis
	EKT150/3 Computer Programming	EBT112/3 Statics	EBT252/4 Strength of Materials	EBT253/3 Analytical Chemistry	EBT313/4 Metallurgical Characterization	EBT315/2 Surface Engineering		*#EBT411/3 Engineering Alloys OR #EBT414/3 Electronic Metallurgy*	EBT446/4 Final Year Project 2
	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EBT212/3 Dynamics	EBT254/3 Transportation Phenomenon in Materials Processing	EBT351/3 Electronic Materials Engineering	EBT319/3 Extractive Metallurgy II		EBT316/3 Metallurgical Design	
			EQT203/3 Engineering Mathematics III	EQT271/3 Statistic For Engineer				EBT445/2 Final Year Project 1	
Non Engineering	UVWXXX/3 Foundation English 1	UVWXXX/3 Foundation English 2				EUT444/3 Management for Engineer		EUT 442/2 Professional Engineer	
University Required	UUWXXX/2 Option Subject	UVW114/2 University Malay Language	UVW312/2 English for Technical Communication		UUW235/2 Ethnic Relation	UUW322/2 Thinking Skill			
	UZWXXX/1 Co-Curriculum	UZWXXX/1 Co-Curriculum		UZWXXX/1 Co-Curriculum	UUW224/2 Engineering Entrepreneurship	UUW233/2 TITAS			
120	**18**	**15**	**19**	**18**	**18**	**18**	**4**	**16**	**11**
17	English for Technical Communication, Engineering Entrepreneurship, TITAS, Ethnic Relation, Thinking Skill, University Malay Language, Co-Curiculum, Option Subject								
Total Units for Graduation 137									

Elective Subject
* Course begins in the first semester but total credits are given upon completion of the second semester.

POLYMER ENGINEERING PROGRAMME

PROGRAMME OBJECTIVES (PEO)

Programme Educational Objective 1
Graduates who are leaders in the field of polymer engineering or chosen field as demonstrated through career advancement

Programme Educational Objective 2
Graduates who are members and contribute to professional society

Programme Educational Objective 3
Graduates who engage in lifelong learning or continuous education opportunities

Programme Educational Objective 4
Graduates who contribute towards research and development

Programme Educational Objective 5
Graduates who are entrepreneurial engineers

PROGRAMME OUTCOMES (PO)

PO 01
Ability to acquire and apply knowledge of mathematics, science, engineering and in-depth technical competence in Materials Engineering and Polymer discipline to the solution of complex engineering problem

PO 02
Ability to identify, formulate and solve complex engineering problems.

PO 03
Ability to design solutions for complex engineering problems and systems, components or processes to meet desired needs

PO 04
Ability to conduct investigation into complex problems as well as to analyze and interpret data.

PO 05
Ability to use techniques, skills and modern engineering tools necessary for complex engineering practices so as to be easily adaptable to industrial needs.

PO 06
Understanding of the social, cultural, global and environmental responsibilities of a professional engineer.

PO 07
Ability to understand entrepreneurship, the process of innovation and the need for environmental and sustainable development.

PO 08
Ability to understand the professional and ethical responsibilities and commitment to the community.

PO 09
Ability to function on multi-disciplinary teams.

PO 10
Ability to communicate effectively on complex engineering activities with the engineering community and with society at large.

PO 11
A recognition of the need for, and an ability to engage in life-long learning.

PO 12
Demonstrate understanding of project management and finance principles.

CURRICULUM STRUCTURE FOR BACHELOR OF ENGINEERING (HONOURS) (POLYMER ENGINEERING)

YEAR	FIRST		SECOND		THIRD			FOURTH	
SEMESTER	I	II	III	IV	V	VI		VII	VIII
Engineering Core	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT203/3 Engineering Mathematics III	EBT109/3 Quality Control	EBT317/3 Fluid Mechanics	EBT303/3 Process Control	EIT302/4 Industrial Training & Engineering Innovation	EBT435/3 Polymer in Electronic Application	# EBTXXX/3 Elective
	EBT113/4 Electrical Technology	EBT 131/3 Engineering Mechanics	EBT 233/4 Plastic Materials	EBT231/4 Elastomeric Materials	EBT334/3 Polymer Testing & Characterization	EBT 333/4 Rubber Processing		EBT437/3 Polymer Composites	EBT446/4 Final Year Project 2
	EKT150/3 Computer Programming	EBT 106/4 Introduction to Polymer	EBT232/4 Polymer Synthesis	EBT 235/4 Structure & Polymer Properties	EBT 335/4 Polymer Blends	EBT337/4 Mass & Heat Transfer in Polymer		EBT441/3 Polymer Engineering Design	EBT 442/3 Polymer Engineering Integrated Design Project
	EBT105/4 Organic Chemistry	ECT112/3 Engineering Skills	EBT 238/3 Physical Chemistry	EQT271/3 Engineering Statistics	EBT336/4 Plastic Processing	EBT338/4 Latex Processing		EBT445/2 Final Year Project 1	
				EBT239/4 Thermodynamic in Polymer					
Non Eng	UVWXXX/3 Foundation English 1	UVWXXX/3 Foundation English 1				EUT444/3 Engineering for Management			EUT442/2 Professional Engineer
University Required	UUWXXX/2 Option Subject	UVW410/2 University Malay Language	UVW312/2 English for Technical Communication		UUW322/2 Thinking Skill			UUW233/2 TITAS	
	UZWXXX/1 Co-Curriculum	UZWXXX/1 Co-Curriculum	UUW235/2 Ethnic Relation		UZWXXX/1 Co-Curriculum			UUW224/2 Engineering Entrepreneurship	
120	17	18	18	18	17	18	4	15	12
17	English for Technical Communication, Engineering Entrepreneurship, TITAS, Ethnic Relation, Thinking Skill, University Malay Language, Co-Curriculum, Option Subject								
Total Units for Graduation 137									

Elective: EBT 448/3 Polymer Adhesive & Coating; EBT449/3 Environmental Friendly Polymer

COURSE SYNOPSIS

EBT 105/4
ORGANIC CHEMISTRY

Course Synopsis

This course is developed to introduce the basic concepts of organic chemistry, chemical structures and reactions, to familiar with mechanism concepts of reactions and to understand the theoretical and conceptual background of organic chemistry.

References

1. Paula, Y. B., ‘Organic Chemistry’, 4th ed., Person Education International, 2004.
2. John Mc Murry., ‘Organic Chemistry’, 6th ed., Thomson Learning, Inc., 2004.
3. Janice Gorzynski Smith, ‘Organic Chemistry, second Edition, McGraw. Hill International Edition, 2006.
4. Solomons, T.W.G, Craig B.F. 2011. Organic Chemistry, International Student Version, Tenth Edition, John Wiley & Sons, Inc.
5. Smith, Michael B.; March, J. 2007. March’s Advanced Organic Chemistry - Reactions, Mechanisms, and Structure (6th Edition), John Wiley & Sons, Inc.

EBT 106/4
INTRODUCTION TO POLYMER

Course Synopsis

The aim of this course is to introduce the basic knowledge of polymer classification, identification, properties and their application in polymer engineering.

References

1. Joel R. Fried., ‘Polymer Science and Technology’, 2nd ed., Prentice Hall Profesional Technical Reference Upper saddle River, 2003.
2. Barbara H. Stuart, ‘Polymer Analysis’, John Wiley and Sons, 2002.
3. Paul C, Michall, M. C., ‘Fundamental of Polymer Science’, CRC press, 2000.
4. Sperling, L. H., ‘Introduction to Physical Polymer Science’, 4th ed., Wiley-Interscience, 2006.

EBT 109/3
QUALITY CONTROL

Course Synopsis

Introduction to quality: Definition of quality, History of quality, Overview of quality concepts. Total Quality Management - Principles and Practices, Quality management systems - ISO 9000, GMP, Basic Quality tools, Cost of Quality, Fundamental of statistics, Fundamentals of Probability, Reliability, Control chart for variables, Control charts for attributed, Capability analysis, Lot by lot acceptance sampling by attributes, Acceptance sampling system.

References

1. Douglas C. Montgomery. (2008). Introduction to Statistical Quality Control. 6th Edition Wiley.
2. Dale H. Besterfield. (2004). Quality Control, 7th edition, Prentice Hall.
3. Juran J.M. and Gryna F.M. (1988). Juran’s Quality Control Handbook. 4th Ed. Singapore: McGraw-Hill.
4. Ishikawa K. (1986). Guide to Quality Control. 2nd Ed. Tokyo: Asian Productivity Organization.
5. Shewhart W.A. (2011). Statistical Method from the Viewpoint of Quality Control. New York: Dover Publications.

EBT 112/3
STATICS

Course Synopsis

This course involves the introduction to mechanics, force vector, equilibrium of particle, force system resultants, equilibrium of rigid body, structural analysis, friction, centroids and center of gravity.

References

1. Meriam, J. L. & Kraige, L. G. (2013). Engineering Mechanics, Statics seventh Edition. John Wiley & Sons, Inc.
2. Bedford, A.M. & Fowler, W. (2007). Engineering Mechanics: Statics & Dynamics, 5th Edition. Prentice Hall.
3. Riley, W, Sturges, L. & Morris, D. (2007). Mechanics of Materials. John Wiley & Sons, Inc.
4. Ferdinand P. B, Johnson Jr., E. R. & William E. C. (2004). Vector Mechanics for Engineers Statics Seventh Edition. Mc-Graw Hill.

EBT 113/4
ELECTRICAL TECHNOLOGY

Course Synopsis

This course is intended to provide students with clear understanding of the DC and AC circuits, basic principles of 3-phase AC circuits, electro-magnetism and magnetic circuits. They will also gain an understanding of the basic operating principles and performance analysis of three most commonly used electric machines, namely, transformers, dc machines, and induction motors.

References

1. Richard J. Fowler (2008) Electricity Principles and Applications 7th Ed. McGraw Hill
2. Boylestad, Robert L. (2007) Introductory Citcuit Analysis 11th Ed. Prentice Hall
3. Hughes (2005) Electric and Electrical Technology 9th Ed Prentice Hall
4. Charles K. Alexander & Matthew N. O. Sadiku. Fundamental of Electric Circuit, International Third Editions, McGraw Hill
5. Nilsson J. W. & Riedel S. A. (2005) Electric Circuits 7th Ed Pearson Prentice Hall

EBT 131/3
ENGINEERING MECHANICS

Course Synopsis

The main objective of this course is to expose students about basic concepts of force and resultant force. They will also learn about friction and distributed forces. Students will apply this basic knowledge to analyze the stability and equilibrium of structures such as truss and machines. In terms of dynamics, the students will learn how to solve kinematics problems for particles and rigid bodies. They will also learn solutions for kinetics problems, which can be considered by using forces acceleration method and work and energy method.

References

1. Beer, F.P., Johnston, E.R. Jr. & Eisenberg, E.R., Vector Mechanics for Engineers: Statics. 7th ed. In SI Units, Canada, McGraw-Hill, 2004.
2. Beer, F.P., Johnston, E.R. Jr. & Eisenberg, E.R., Vector Mechanics for Engineers: Dynamics. 7th ed. In SI Units, Canada, McGraw-Hill. 2004.
3. Hibbeler, R.C., Engineering Mechanics: Statics. 3rd ed., Singapore, Prentice Hall, 2004.
4. Hibbeler, R.C., Engineering Mechanics: Dynamics. 3rd ed., Singapore, Prentice Hall, 2004.
5. Meriam, J.L. & Kragie, L.G., Engineering Mechanics: Statics. 5th ed. USA, SI ver. Wiley, 2003.
6. Meriam, J.L. & Kragie, L.G., Engineering Mechanics: Dynamics. 5th ed. USA, SI ver. Wiley, 2003.

EBT 151/3
ENGINEERING DRAWING

Course Synopsis

This course will introduce student to Engineering Drawing including; **Basic Drafting Skills** - Lines and Lettering, Circles and Arcs, Basic Dimensioning, Dimensioning Circular and Common Features, Dimensioning Methods, Limits and Tolerances. **Geometry** - Beginning Geometry: Straight Lines, Polygons, Ellipse, Helix and Parabola, Geometric Symbols. **Orthographic** - Orthographic Representation, Methods of Representation, Orthographic Projection - First angle projection, Orthographic Projection - Third angle projection, Reference Arrows Layout, Identifying Symbols, Hidden Surface and Edges, Inclined Surface, Circular Features, Oblique Surface. **Pictorial Drawing** - Isometric Drawing, Nonisometric Drawing, Dimensioning isometric Drawing. **Auxiliary** - Primary Auxiliary View, Secondary Auxiliary View. **Sections** - Sectional Views, Cutting-Plane Lines, Full Sections, Section Lining, Half Sectioning. **Computer-Aided Drawing (CAD)** - AutoCAD, IronCAD, CAD Mould, Plotting/Printing

References

1. Cecil Jensen, Jay D. Helsesl and Dennis R. Short, (2008). *Engineering Drawing & Design*. 7th Edition. New York: McGraw-Hill.
2. Shah, M. B., (2005). *Engineering drawing*. New Delhi: Pearson Education.
3. Boundy, A. W., Albert William, (2002). *Engineering drawing.* Boston: McGraw-Hill.
4. Madsen D.A. (2006). Engineering Drawing and Design. 4th Ed. Stamford: Cengage Learning
5. Marelli R. and McCuistion P. (2001). Geometric Tolerancing: A Text-Workbook. 6th Ed. Singapore: McGraw Hill.

EBT 207/4
MATERIALS STRUCTURE & PROPERTIES

Course Synopsis

This course will introduce student to historical perspective, materials science and engineering, materials classification. The contents include fundamental concept of **atomic structure** and their bonding; the classification of **crystalline and non crystalline** materials and their applications; comprehensive guide for identification of **imperfection** in solids such as point defects in metals, ceramic, impurities in solids, defects in polymer, dislocations (linear defects), interfacial defects, bulk or volume defect, atomic vibrations; introduction to diffusion. Mechanical properties of materials involves **stress-strain behavior**, non elastic and elastic properties of materials, compression property, shear, fatigue, creep, and flexural strength, hardness of materials, **electrical** properties - Ohm's law, electrical conductivity, electronic and ionic conduction, electrical properties using Ohm's Law, energy band structure, conduction in terms of band and atomic bonding models, electron motion, semiconductivity, electrical conduction in materials, **thermal** properties - heat capacity, thermal expansion, thermal conductivity, thermal stresses, **magnetic** properties - diamagnetism, paramagnetisme, ferromagnetisme, antiferromagnetisme, temperature effect on the magnetic behaviour, domain and hysteresis, hard and soft magnets, superconductor and **optical** properties - electromagnetic ray, solid and light interaction, atomic and electronic interaction, optical properties of metals and non metals, refraction, reflection, absorption, transmission, applications of optical phenomena - laser, fibre optic in communication.

References

1. William D. Callister and David G. Rethwisch (2013). Materials Science and Engineering: An Introduction. 9th Ed. New York: John Wiley.
2. Smith, W.F., (1995). Principles of Materials Science and Engineerings. (Mcgraw Hill Series in Materials Science and Engineering)
3. 2nd Ed. Singapore: McGraw Hill.
4. Donald R. Askeland & Pradeep P. Phule, (2003). The Science and ngineering of Materials. 4th Ed. Thomson Brooks/Cole.
5. Brick R.M. et al. (1977). Structure and Properties of Engineering Materials. Singapore: McGraw-Hill.
6. Hayden H.W. et al. (1965). The Structure and Properties of Materials, Volume 3: Mechanical Behavior. New York: John Wiley & Sons.

EBT 211/4
PHYSICAL METALLURGY

Course Synopsis

This course will introduce student to differentiate between process or extractive metallurgy and physical metallurgy. General characteristic of metals, physical and mechanical properties of metals, atomic structure and bonding of metals. Phase transformation concepts in metals. Phase stability, categories of phase transformation, and kinetics of phase transformation. **Solidification Process** - Process of solidification and two energy involved in solidification process, distinguish between equiaxed and columnar grains. **Imperfections in Solid** - Imperfection in solid metals and deformation mechanism for metals (edge and screw dislocation, plastic and elastic deformation). Slip: concept of slip, dislocations, twins, and their role in plastic deformation of single crystal. Critical slip system in FCC, BCC and HCP single crystal. Resolved shear stress by using Schmid Law.

Brief Introduction to Phase Diagram - Binary isomorphous system and binary eutectic system, phase diagram with intermediate phase or compound. Iron- iron carbide phase diagram, microstructure development in Fe-C alloy. Basic concept, solid state reaction kinetics, multiphase transformation, microstructure changes, and Fe-C properties. **Introduction to IT Diagram** - Isothermal transformation diagram (IT) and continuous cooling transformation (CCT) diagram.

Strengthening Mechanism - Grain size reduction, Solid solution strengthening, Strain hardening, Dispersion strengthening by phase transformation, interfacial energy, age/precipitation hardening, and microstructural development in age hardening. **Hardenability** - Mechanical behaviour of Fe-C alloy, tempered martensite, hardenability, jominy test, effect of alloying to hardenability, cold work. Recovery, recrystallization and grain growth. Procedure of steel heat treatment: austenitizing, annealing, full annealing, normalizing, quenching, tempering. **Surface Heat Treatment** - Introduction, types of treatment (carburizing, nitriding, carbonitriding and cyaniding). Diffusion- steady and non steady state diffusion. **Non Ferous Alloys** - Classification, heat treatability, microstructure and general properties of aluminum alloys, copper alloys, magnesium alloys, titanium alloys, nickel alloys. **Metallography Quantitative** - Grain size by metallography quantitative, ASTM grain size number and average grain size diameter. Important of grain size on the behaviour of crystalline metals.

References

1. John E. Neely, Thomas J. Bertone, (2000). *Practical Metallurgy and Materials for Industry*.
2. L. Carl Love. (1985). *Principles of Metallurgy*. Reston.
3. Verhoeven J.D. (1975). Fundamentals of Physical Metallurgy. New York: Wiley
4. Smallman R.E. and Ngan A.H.W. (2007). Physical Metallurgy and Advanced Materials. 7th Ed. Oxford: Butterworth-Heinemann.
5. Abbaschian R. and Reed-Hill R.E. (2008). Physical Metallurgy Principles. Stamford: CL-Engineering.

EBT 212/3
DYNAMICS

Course Synopsis

Students will be introduced to the concepts of mechanics in dynamic conditions. The course is presented in two parts: kinematics, which treats only the geometric aspects of motion, and kinetics, which is the analysis of the forces causing the motion. To develop these principles, student learns the dynamics of a particle, followed by topics in rigid-body dynamics in two and then three dimensions. Emphasis will be given on the kinematics and kinetics of a particle, planar kinematics and kinetics of a rigid body, three dimension kinematics and kinetics of a rigid body.

References

1. Hibbler R. C., 2010. Engineering Mechanics- Dynamics, 12th ed. Prentice Hall.
2. Meriam J. L. & Kraige L.G., 2008. *Engineering Mechanics, Dynamics*, 6th ed. in SI Version, John Wiley & Sons, Inc.
3. Beer, F. B., Johnston, E. R. Jr. and Clausen, W. E., Vector Mechanics for Engineers: Dynamics. 8th ed. in SI Units, Canada, McGraw-Hill, 2007.

EBT 213/4
EXTRACTIVE METALLURGY I

Course Synopsis

This course will introduce student to **Mineral Processing** - Advantages of mineral processing. Crushing: definition, type of crusher and its characteristics, selection of crusher. Grinding: grinding mills, mill liners, grinding action, critical speed. Laboratory Sizing Control: Sizing methods (screening, sedimentation), sizing scales. Industrial sizing: type of industrial screening, screening efficiency. Gravity concentration: gravity concentration methods (heavy medium separation, jigging, sluicing). Magnetic and Electrostatic Separation: Principles, type of separators. Flotation: process, flotation reagents, conditioning and flotation circuits. **Hydrometallurgy** - Ore processing using hydrometallurgy method. Kinetic of heterogeneous reaction. Leaching process. Mode and leaching techniques. Solution Purification: Solvent extraction, solvent components (extraction mechanism), counter-current extraction, and application of solvent extraction in industrial worldwide. Purification of pregnant solution: ion exchange and activated carbon. **Electrometallurgy** - Galvanics: Redox reactions, Electrochemical cells, reactions, and EmF, Cell EmF, Standard EmFs and electrode potentials. Cell types. Electrolytic cells Electrowinning, Electrorefining, Electroextraction, Electroleaching, Electrosynthesis. Metal and metal compound recovery: crystallization, cementation, hydrogen gas reduction. Thermodynamic and hydrogen reduction kinetics.

References

1. A.R. Burkin, (2001). *Chemical Hydrometallurgy: Theory and principle*. London Imperial College Press.
2. Samsul Bahar Sadli, (1998). *Asas Proses Metalurgi*. Dewan Bahasa dan Pustaka, Kuala Lumpur.
3. Fathi Habashi, (1997). *Handbook of Extractive Metallurgy, Volume II.* Wiley-VCH.
4. Chiranjib Kumar Gupta, (2003). *Chemical Metallurgy.* Wiley-VCH.
5. Rosenqvist T. (2004). Principles of Extractive Metallurgy. 2nd Ed. Trondheim: Tapir Academic Press.

EBT 222/4
FUNDAMENTALS OF CERAMICS

Course Synopsis

Student will be exposed with history of ceramic. Crystal structure of ceramic including silicate structure. **Properties of Ceramic Structure** - Porosity, voids content, tensile and compression strength. **Raw Material** - Basic concept of raw materials properties and production naturally or synthetically that normally used in ceramic industry. Preparation and production of clay and characterization of clay including plasticity and heat applied. Preparation of synthetic alumina powder by Bayer process and magnesium oxide from seawater. **Forming Technique** - Fundamental concept. Powder pressing forming including isostatic, hot isostatic and cold isostatic pressing. Plastic forming including extrusion and injection molding technique. Slip casting and tape casting forming technique. Factors that influence the properties of green body of ceramic after forming. **Drying and Firing Process** - Effect of heat to the vitrification and microstructure of ceramic body. Types of kiln including periodic and continuous kiln. Shrinkage and defect after drying and firing. Theory and mechanism of sintering. Types of sintering including solid state and liquid state sintering. Solid-state sintering and microstructure changes in initial, intermediate and final stages of sintering.

References

1. Michel Barsoum, (2002). Fundamentals of Ceramics (Series in Material Science and Engineering). Taylor & Francis.
2. James S. Reed, (1995). Principles of Ceramics Processing, 2nd ed. John Wiley and Son Inc New York.

3. Allen Dinsdale diterjemah oleh Prof. Dr. Radzali Othman dan Prof. Madya Dr. Ahmad Fauzi Mohd Noor, (1993). Sains Tembikar:Bahan, Proses dan Hasilan. Penerbit USM P.Pinang.
4. Lawrence H. Van Vlack diterjemahkan oleh Zainal Arifin Ahmad (1991). Seramik Fizik Untuk Jurutera. Kuala Lumpur: Dewan Bahasa dan Pustaka.
5. Bengisu, M (2001). Engineering Materials: Engineering Ceramics. Springer, New York.

EBT 231/4
ELASTOMERIC MATERIALS

Course Synopsis

To introduce the basic knowledge of elastomeric materials on structure and properties, characterization, concept of rubber elasticity and principles of rubbers in engineering application.

References

1. Wood, P.R., ‘Mixing of Vulcanisable Rubbers and and Thermoplastic Elastomers’, Rapra Technology, 2004.
2. Ciesielski, A., ‘An Introduction To Rubber Technology’, Rapra Technology Ltd., 2001.
3. Crompton, Roy, ‘Determination of Additives in Polymers and Rubbers’, Rapra Technology, 2007.
4. McKeen, Laurence W. Permeability Properties of Plastics and Elastomers (3rd Edition) 2012, Elsevier
6. Bukhina, M.F.; Kurlyand, S.K. 2007. Low-Temperature Behaviour of Elastomers. VSP - An imprint of BRILL.

EBT 232/4
POLYMER SYNTHESIS

Course Synopsis

This course is developed to introduce the basic concepts of synthesis polymer, the use of chemical structures and reaction schemes. Familarity with mechanistic concepts. Uderstanding the theorectical and conceptual background of synthesis polymer.

References

1. Braun, D., Chandra, H. Ritter, H., ‘Polymer Synthetic, Theory and Practice’, 3rd ed. 2001, Germany.
2. Harry R.A. Frederic K.W.L, James E.M., ‘Contempory Polymer Chemistry’, 3rd ed., Person Education, 2003.
3. Braun, D., Cherdron, H., Ritter, H., ‘Polymer Synthesis: Theory and Practice: Fundamentals. Methods, Experiments’, 4th ed., Springer, 2005.
4. Odian G. 2004. Principle of Polymerization, 4th ed. City University of New York. Wiley-Inter Science

EBT 233/4
PLASTIC MATERIALS

Course Synopsis

This course is offered to introduce some basics of plastic materials: promote an understanding on structure/property relationship of plastic materials and provide some ideas on plastic material selection principles, testing and characterization

References

1. Domininghaus, H.,’Plastic for Engineers: Materials, Properties, Applications’, Hanser Pub., 2003.
2. Henry, S. Pascault, P. C., ‘Thermosetting Polymers’, Marcel Dekker,Inc., 2003.
3. Charles, A. H., ‘Modern Plastic Handbook’, Mc Graw Hill, Inc., 2000.
4. Sidney H. Goodman, ‘Handbook of Thermoset Plastics’, 2nd ed., RAPRA Tech., 2003.

EBT 235/4
STRUCTURE AND POLYMER PROPERTIES

Course Synopsis

This course is offered to provide knowledge on principles and concept of structure/property relationship of polymeric materials. This includes the understanding on concepts of viscoelasticity, transition phenomena, mechanical and thermal properties of polymers

References

1. Gottfried, W. E., ‘Polymeric Material: Structure-Properties-Applications’, Carl Hanser Verlag, 2001.
2. Sperling, L.H., ‘Introduction to Physical Polymer Science’, John Wiley and Sons, Inc., 2001.
3. Allcock, H.R., Lampe, F.W. and Mark, J.E., ‘Contemporary Polymer Chemistry’, 3rd ed., Pearson Education, Inc.: Prentice Hall, 2003.
4. Gnanou, Yves, ‘Organic and Physical Chemistry of Polymers’, Wiley Interscience, 2008.

EBT 238/3
PHYSICAL CHEMISTRY

Course Synopsis

The aim of this course is to introduce the knowledge of physical chemistry, calculate and solve problem of physical chemistry in polymeric materials.

References

1. Sperling, L. H., 'Introduction to Physical Polymer Science', 4th ed., Wiley-Interscience, 2006.
2. Gnanou, Yves, 'Organic and Physical Chemistry of Polymers', Wiley Interscience, 2008.
3. Teraoka, I. 2002. Polymer Solutions An Introduction to Physical Properties, Wiley & Sonn Inc., Publication.
4. Silbey, R.J., Alberty, R.A. & Bawendi, M.G. 2005. Physical Chemistry, Wiley & Son, Inc., Publication.

EBT 239/4
THERMODYNAMICS IN POLYMER

Course Synopsis

The aim of this course is to introduce the knowledge of thermodynamic in polymer, calculate and solve problem of thermodynamic in polymer engineering process.

References

1. Irving M. K and Robert M, R (2005), Chemical Thermodynamics, Wiley & Sons, Inc., Publication, United State (USA).
2. Myron Kaufman (2002), Principles of Thermodynamic, Marcel Dekker, Inc, New York.
3. Utracki, L.A., 'Polymer Blends', Rapra Technology, 2002.
4. Rao, Natti S.; Schumacher, Gunter (2004) Design Formulas for Plastics Engineers (2nd Edition), Hanser Publishers

EBT 251/3
ENGINEERING MATERIALS CHEMISTRY

Course Synopsis

Introduction to Thermodynamics - First law of thermodynamics, expansion and contraction of work, enthalpy, heat capacity, thermochemistry and it application in metallurgy. **Second Law of Thermodynamics** - Differentiate entropy function, cyclic process, several relations of thermodynamics which involving Gibbs Free Energy, relationship between equilibrium constant and temperature in reaction. **Reaction Kinetics** - Effect of reactants and products concentration, determination of order and velocity constant of reaction, effect of temperature for reaction, theory of absolute reaction rates for catalyst, diffusion in solid state. **Electrochemistry** - Electrolytes, electrolytic conduction, electrode potentials, galvanic cell, calculation of e.m.f. and cell potential, reduction and oxidation potential, standard electrode potential series. **Interface Phenomenon** - Surface energy and surface tensions, interfacial energy except gas/liquid interface, interfacial of three phases, absorption and colloid.

References

1. Azizan Aziz dan Kamarudin Hussin. (2000). *Pengenalan Kimia Metalurgi*. Pulau Pinang: Penerbit USM.
2. Moore, J.J. (1998). Chemical Metallurgy. 2nd Edition. London: Butterworths.
3. Fahlman B.D. (2011). Materials Chemistry. 2nd Ed. New York: Springer.
4. Allcock H.R. (2008).Introduction to Materials Chemistry. New York: Wiley.
5. West A.R. (1999). Basic Solid State Chemistry. 2nd Ed. New York: Wiley.

EBT 252/4
STRENGTH OF MATERIALS

Course Synopsis

Stress analysis, stress theory, strain analysis, strain theory, relationship of stress- strain and stress- strain temperature. Axial load, torsional loading, bend loading, bending stress, strain deflection. **Failure Criterion** - Elastic deflection failure, excessive yielding failure, fracture failure, excessive deflection failure, and progressive failure. **Statically Indeterminate Beam Analysis** - Method of integration, moment- area method, method of superposition, energy method, and plastic analysis. **Combined Loading** - Combined axial and bending load, combined axial, bending and torsion load. **Column** - Buckling of column, end-support conditions, empirical formula. **Joint** - Rivet and bolt analysis (average shear strength and tensile strength), welding, and connection analysis.

References

1. Ferdinand Beer, Jr., E. Russell Johnston, John DeWolf and David Mazurek (2014). Mechanics of Materials. 7th, McGraw Hill.
2. Hibbeler, R. C. (2013). Mechanics of Materials. 9th Edition, Prentice Hall.
3. Megson, T. H. G. (2014). Structural and Stress Analysis. 3rd Edition. Butterworth: Heinemann.

4. Shackelford, J.F. (2008). Introduction to Materials Science for Engineers. 7th Ed. New York: Prentice Hall.
5. Askeland, D.R. et al. (2010). The Science and Engineering of Materials. 6th Ed. Stamford: Cengage Learning.

EBT 253/3
ANALYTICAL CHEMISTRY

Course Synopsis

The main purpose of the Course is to provide students with a strong theoretical and practical grounding in the principles and practices of Analytical Chemistry. Basically student will learn Analytical objective, Stoichiometric Calculations, General Concept of Equilibrium, Gravimetric Analysis, Complexometric Titrations, Precipitation Reactions and Titrations, Redox and Potentiometric Titrations, Chromatographic methods and Environmental Analysis. Student will undertake Analytical Chemistry Laboratory for helping student to further develop hands-on skills.

References

1. Christian, Gary. D., (2013). Analytical Chemistry, 7th Edition. John Wiley & Sons.
2. Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch (2013). Fundamentals of Analytical Chemistry, 9th Edition. Cengage Learning.
3. Higson, Seamus. P. J., (2004). Analytical Chemistry. Oxford University: Oxford University Press.
4. David S. Hage and James R. Carr (2010). Analytical Chemistry and Quantitative Analysis 1st Edition. Prentice Hall.

EBT 254/3
TRANSPORTATION PHENOMENON IN MATERIALS PROCESSING

Course Synopsis

Heat Transfer - Fourier's law and thermal conductivity, thermal conductivity of gases, thermal conductivity of solids, thermal conductivity of liquids, thermal conductivity of bulk materials, heat transfer and the energy equation, quenching heat transfer coefficient, heat transfer coefficient in forging. **Solidification of Metals** - Solidification in sand moulds, solidification in metal moulds, continuous casting, crystal growth. **Radiation Heat Transfer** - Basic characteristic, the black radiator and emissivity, the energy distribution and the emissive power, gray bodies and adsorptivity, radiation combine with convection, radiation from gases. **Fick's Law and Diffusion in Materials** - Definition of fluxes, Fick's first law, diffusion in solids, diffusion under composition gradient effect, Darken's equation, diffusion based on temperature in solids, diffusion in ceramic materials, diffusion in semiconductor materials, diffusion in liquids, diffusion in gases. **Diffusion in Solids** - Steady state diffusion experiments, microelectronic diffusion processing, homogenization of alloys, formation of surface layers. **Mass Transfer in Fluid Systems** - Diffusion through a stagnant gas film, diffusion in moving gas stream, the mass transfer coefficient, mass transfer in chemical vapor deposition. **Interphase Mass Transfer** - Two-resistance mass transfer theory, mixed control in gas-solid reactions, iron carbonization with surface reaction and diffusion as control factor, transportation in gas phase and diffusion as control factor, silicon oxidation, alloys vaporizing during melting.

References

1. James R. Welty, Charles E. Wick, Robert E. Wilson, Gregory Rorrer. (2014). Fundamentals of Momentum, Heat Transfer and Mass Transfer. 6th Edition, John Wiley.
2. Poirier, D.R., Geiger, G.H. (1998). Transport Phenomena in Material Processing. Wiley
3. Thomson W.J. (2000). Introduction to Transport Phenomena. New York: Prentice Hall.
4. Deen W.M. (2011). Analysis of Transport Phenomena (Topics in Chemical Engineering) 2nd Edition. USA: Oxford University Press.
5. Bird R.B. (2006). Transport Phenomena. 2nd Ed. New York: John Wiley & Sons.

EBT 303/3
PROCESS CONTROL

Course Synopsis

The aim of this course is to introduce the principle of process control system, including continuous and batch control approaches; knowledge of control algorithm implementation for selected process; capability of selecting instrumentation for process control; proficiency of managing and handling project from designing to applying the process control approach into the system.

References

1. D. R. Coughanowr, S.E. LeBlanc (2009) Process System Analysis and Control, 3rd Edition, McGraw Hill International Edition.
2. D.E. Seborg, T.F. Edgar, D.A. Mellichamp (2011), Process Dynamic and Control, Wiley and Sons.

3. T. E. Martin (2000) Process Control: Designing Processes and Control System for Dynamic Performance, McGraw Hill International Edition.
4. Dorf, R.C., Bishop, R.H. (2010). Modern control system 12th Edition. Prentice Hall.
5. Johnson C.D. (2007). Process Control Instrumentation Technology 8th Edition. New York: Prentice Hall.

EBT 311/4
MECHANICAL METALLURGY

Course Synopsis

This course is designed to introduce the students various aspects of Mechanical Metallurgy such as elastic plastic behaviour, stress concept, tensile deformation of ductile metal, ductile and brittle behaviour, elastic stress-strain relations, Mohr'circle of stress, stress tensor, calculation of stresses from elastic strain, strain energy, stress concentration, finite element method. Elements of the theory of plasticity such as flow curve, true stress-strain, Von Mises yielding criterion, maximum shear stress or Tresca criterion. Plastic Deformation of Single Crystals such as concept of crystal geometry, lattice defects, deformation by slip, slip in a perfect lattice, slip by dislocation movement, critical resolved shear stress for slip, deformation by twinning, stacking faults. Dislocation theory; Burgers vector, dislocation loop, dislocation in face-centered cubic lattice, intersection of dislocation, dislocation sources, multiplications of dislocations, dislocation pile-ups. Fracture mechanics theory such as fracture toughness test, design aspects for fracture mechanics. Fatigue of metals such as effect of mean stress on fatigue, cycle stress-strain curve, low-cycle fatigue, crack propogation. Design aspects for low-cycle fatigue. Creep such as creep mechanism, design aspects for creep behaviour. Failure analysis such as techniques for failure analysis, equipments for failure analysis, metallographic sample preparation for failure analysis, excessive load, wear, wear protection, corrosion, brittle fracture at low temperature, shear fracture, failure of heat treatment, fatigue, fracture mode identification, design consideration, type of fatigue fracture.

References

1. John E. Neely, Thomas J. Bertone, (2003). *Practical Metallurgy and Materials for Industry.* 6th Edition. Prentice Hall.
2. Schaffer, Saxena, Antolovich, Sanders & Warner, (1999). *The Science and Design of Engineering Materials.* 2nd Edition. Mc Graw Hill.
3. George E. Dieter. (1988). *Mechanical Metallurgy.* SI Metric Edition.Mc-Graw Hill.
4. Meyers M.A. (1983). Mechanical Metallurgy: Principles and Applications. New York: Prentice Hall.
5. May I.L. (1981). Principles of Mechanical Metallurgy. Amsterdam: Elsevier

EBT 313/4
METALLURGICAL CHARACTERIZATION

Course Synopsis

This course is designed to expose students the basic principles of metal characterization using LM, SEM, TEM as well as the principles of crystallography, metal texture, x- ray diffraction method and follow by spectroscopic technique and analytical.

References

1. Baldev Raj, G. Amarendra, M.H. Manghnani (2007). *Advanced in Materials Characterization.* CRC Press.
2. Hammond, C (2001). *The Basic of Crystallography and Diffraction*. Oxford University Press,.
3. Elton N. Kaufmann (2003). *Characterization of Material.* John Wiley.
4. Marc De Graef (2003). *Introduction to conventional transmission electron microscopy.* Cambridge University Press.
5. Paolo Samori (2006). *Scanning Probe Microscope Betond Imaging, Manipulation of Molecules and Nanostructures.*

EBT 314/3
METALLURGICAL THERMODYNAMICS

Course Synopsis

This course is design to review of First and Second laws of thermodynamics. **Chemical Equilibrium** - Activity, equilibrium constant, Le-Chatelier's principle, chemical potential, law of mass action. Effect of temperature and pressure on equilibrium constant, Vant Hoff's isotherm. Free energy-temperature diagrams, oxygen potential and oxygen dissociation pressure. Measurement of activity, Gibb's phase rule and its applications, Free energy composition diagram. **Solution Chemistry** - Partial molar quantities, Ideal solutions, Rault's law, non ideal solutions, Gibbs-Duhem equation. Free energy of formation of solution, regular solutions. Excess thermodynamic quantities. **Electrochemistry** - Electrochemical cell, determination of thermodynamic quantities using reversible electrochemical cell, EMF cell, electrode potential, electrode potential-pH diagrams and their applications. Thermodynamics laws to metallurgical systems with special emphasis on roasting, sintering, smelting and refining processes. Introductory theoretical treatment of alloying and alloy systems. Application of thermodynamic data to phase diagram.

References

1. Ahindra Ghosh, (2004). *Textbook of Materials & Metallurgical Thermodynamics*. Prentice Hall of India.
2. R.H. Tupkary, (1995). *Metallurgical Thermodynamics.* TU Publishers, Nagpur.
3. D.R. Gaskell, (1981). *Introduction to Metallurgical Thermodynamics.* McGraw-Hill Book Co. Inc., New York.
4. Yunus A. Cengel & Michael A. Boles, (2005). *Thermodynamics: An Engineering Approach*. McGraw-Hill.
5. Eric Brian Smith, (2004). *Basic Chemical Thermodynamics.* Imperial College Press.

EBT 315/2
SURFACE ENGINEERING

Course Synopsis

This course is designed to provide an understanding of the role that surfaces play in materials behavior and to introduce the concepts of surface engineering and how surface engineering may be used to optimize a components performance and to introduce suitable techniques used to evaluate and characterize surfaces. Students will be exposed to a wide variety of topics such as common surface initiated engineering failures, physical and chemical techniques of surface protection, scope and application of conventional surface engineering techniques in engineering materials, advantages and limitation of conventional processes and testing/evaluation of surface properties.

References

1. Roberge P. (2008). Corrosion Engineering: Principles and Practice. Singapore: McGraw-Hill.
2. Jones D.A. (1995). Principles and Prevention of Corrosion. 2nd Ed. New York: Prentice Hall.
3. A.W. Batchelor, Loh Nee Lam, Andrew William Batchelor & Margam Chandrasekaran, (2000).*Materials Degradation and Its Control by Surface Engineering*. Publisher: Imperial College Press.
4. Fontana, M.G. & Greene, N.D. (1986). *Corrosion Engineering.* 3rd Ed. New York: McGraw-Hill.
5. Wranglen, Gosta. (1985). *Introduction to Corrosion and Protection of Metals*. London: Chapman & Hall.

EBT 316/3
METALLURGICAL DESIGN

Course Synopsis

Metallurgical design are create to incorporate engineering standards and realistic constrains, including most of the following considerations: economic, ethical, environmental and social. Focus on the design process, and the design method. The development of interdisciplinary teams is a high priority. The course integrates vertically and horizontally concepts from all areas of Metallurgical Engineering into a practical design project designed to train the students in the design practice. Fundamentals of the design process, specifications, decision-making, materials selection, materials process, experimental design, statistic process control and preliminary design are the focus. This course consists in the students playing the role of apprentices to design by teaming up with the interdisciplinary students in the s design projects.

References

1. George E. Dieter, (2000). *Engineering Design, a Materials and Processing Approach, Third Edition.* McGraw-Hill Company.
2. Atila Ertas and Jesse C. Jones, (1993). *The Engineering Design Process*. John Wiley & Sons, Inc.
3. Ashby M.F. and Johnson K. (2009). Materials and Design, Second Edition: The Art and Science of Material Selection in Product Design. 2nd Ed. Oxford: Butterworth-Heinemann.
4. Schaffer J.P. (1998). The Science and Design of Engineering Materials. 2nd Ed. Singapore: McGraw-Hill.
5. Pickering F.B. (1978). Physical Metallurgy and the Design of Steels. London: Applied Science Publishers.

EBT 317/3
FLUID MECHANICS

Course Synopsis

Course will be concentrate with fluid properties, fluid classification and force types in fluids. Thus, students will be learning about fluid properties in two different conditions, static and dynamic condition. Student also will learn momentum principles including basic equations for controlled system and volume, and then basic equations in differential form. The students will see in fluid application in flow topic in pipes and turbo-machine. The course also concentrates flow measurement aspect, like as tools and procedures which used in flow measurement.

References

1. Donald F. Elger, Barbara C. Williams, Clayton T. Crowe, John A. Roberson (2012). Engineering fluid Mechanics. 10th Edition. Wiley.
2. James R. Welty, Charles E. Wick, Robert E. Wilson, Gregory Rorrer. (2001). Fundamental of momentum, heat transfer, and mass transfer. 4th edition. John Wiley.
3. Munson B.R. et al. (2009). Fundamentals of Fluid Mechanics. New York: Wiley.
4. Fox R.W. et al. (2008). Introduction to Fluid Mechanics. New York: Wiley.
5. Mott R.L. (2005). Applied Fluid Mechanics. 6th Edition. New York: Prentice Hall.

EBT 319/3
EXTRACTIVE METALLURGY II

Course Synopsis

This course is designed to introduce general principle in extracting metal ore using pyrometallurgy route starting from ore treatment, drying, calcination, roasting and sintering. Type of furnace for smelting, including the detail process in smelting and refining will be explained. This course will provide student with the knowledge on the extraction of ferrous and non-ferrous metals and the impact of the pyrometallurgy on the environmental aspects.

References

1. Chiranjib Kumar Gupta, “Chemical Metallurgy”, Wiley-VCH, ISBN 3527303766 (2003).
2. Fathi Habashi, “Textbook of Pyrometallurgy” Métallurgie Extractive Québec, ISBN 2922686051 (2002)
3. Samsul Bahar Sadli, “Asas Proses Metalurgi”, Dewan Bahasa dan Pustaka, ISBN 9836256350 (1998).
4. Fathi Habashi, “Handbook of Extractive Metallurgy, Volume II”, Wiley-VCH, (1997).
5. Colin Bodsworth, “The Extraction and Refining of Metals” CRC Press ISBN 0849344336 (1994)

EBT 323/4
MATERIALS CHARACTERIZATION

Course Synopsis

This course is designed to expose students the basic principles of materials characterization using LM, SEM, TEM as well as the principles of crystallography, metal texture, x-ray diffraction method and follow by spectroscopic technique and analytical.

References

1. Hammond, C (1998). The Basic of Crystallography and Diffraction, Oxford University Press,.
2. Douglas A. Skoog & James J. Leary. (1992). Principles of Instrumental Analysis, 4th Ed. Sounders College Publishing.
3. Larry, G., Harges (1988). Analytical Chemistry: Principles and Techniques, Prentice Hall.
4. Gary, D., Cristian (1986). Analytical Chemistry, 4th Edition, John Wiley & sons.
5. John Edward Gentle (1982).Atomic Absorption Spectrometry, Elsevier.

EBT 324/3
MATERIALS THERMODYNAMICS

Course Synopsis

Summarised revision on thermodynamic; Phase transformation; Solid state-Reaction. Thermodynamic of the phase diagram; Consideration of the free energy, transformation kinetics - Thermodynamic and kinetics in the glass formation system, precipitation of the different phases at different composition from matrix.

References

1. Boris S. Bokstein, Mikhail I. Mendelev, (2005). *Thermodynamics and Kinetics in Materials Science.* Oxford University Press.
2. Svein Stolen & Tor Grande, (2004). *Chemical Thermodynamics of Materials.* John Wiley & Sons.
3. H.G. Lee, (1999). *Chemical Thermodynamics for Metals and Materials.* Imperial College Press.
4. Yunus A. Cengel & Michael A. Boles, (2005). *Thermodynamics: An Engineering Approach*. McGraw-Hill.
5. J. Susanto, (1988). *Termodinamik Gunaan: Masalah dan Contoh Penyelesaian*. Dewan Bahasa dan Pustaka.

EBT 326/4
POLYMER PROPERTIES

Course Synopsis

The course is designed to introduce to the students various properties of polymer such as thermoplastic, elastomer, thermoset, aspects of polymer physic including amorfous, semi-crystalline and crosslink of polymer, reinforcement of polymer products, mechanical properties, physical properties, characterization and analysis of polymer by using equipments.

References

1. Gottfried W.E. (2001). Polymeric Materials – Structure-Properties-Application. Hanser Gardner.
2. William D. Callister, David G. Rethwisch (2013). Materials Science and Engineering: An Introduction. 9th Edition. Wiley.
3. Vishu Shah. (2007). Handbook of Plastics Testing and Failure Analysis 3rd Edition. Wiley-Interscience.
4. Richard, C.P, (1993). Polymer Engineering Principles, Properties, Processes, Test for Design. Hanser Publication.
5. F.W. Billmeyer. (1984). Textbook of Polymer Science. John Wiley & Sons, Inc.

EBT 329/3
POLYMER PROCESSING

Course Synopsis

This course provides detail introduction to the variety of polymer materials processing, including the rheology and melt flow, equipments and important methods of polymer processing, the influence of related factors in polymer processing, the occurrence of defects due to processing and how to solve the problems.

References

1. A. Brent Strong (2006). Plastics Materials and Processing. 3rd Edition. Pearson Prentice Hall, New Jersey.
2. Sperling L. H (2005). Introduction to physical Science Polymer Science 3rd Edition. Wiley-Interscience, New York.
3. James C. Gerdeen, Harold W. Lord and Ronald A. L. Rorrer (2006). Engineering Design with Polymers and Composites, CRC Press Taylor & Francis Group, Boca Raton, London New York.
4. Samjay k. Mazumdar (2002). Composites Manufacturing: Materials, Product, and Process Engineering. CRC Press, Boca Raton, Florida.
5. Donald G. Baird and Dimitris I. Collias (1998). Polymer Processing: Principal and Design. John Willey & Son, Inc, New York

EBT 333/4
RUBBER PROCESSING

Course Synopsis

This course to enhance knowledge, fundamental and significant concepts of rubber processing and formulation, different processing techniques, and testing of raw materials and finished products which are important in handling and controlling rubber processing machines.

References

1. Gent, A. N., ‘Engineering with Rubber: How to Design Rubber Components’, 2nd ed. Hanser Publishers, 2001.
2. Mark, J. E.,’ The Science and Technology of Rubber’, 3rd ed.,Elsevier Inc., 2005.
3. Brown, R.,’ Physical Testing of Rubber’, 4th ed., Springer, 2006.
4. Rodgers, B., ‘Rubber Compounding: Chemistry and Applications’, Marcel Dekker, 2004.

EBT 334/3
POLYMER TESTING AND CHARACTERIZATION

Course Synopsis

This course introduce the basic concepts of testing and characterization, the usage of various polymer characterization equipments, understanding the analyze concept to identify and characterize the polymeric materials.

References

1. Ghottfried W. Ehrenstein, Gabriela Riedel, Pia Trawiel, ‘Thermal Analysis of Plastic’, Hanser, 2004.
2. Naranjo, Noriega, Osswald, Roland-Alteza, Sierra. Plastic Testing and Characterization. Hanser, Germany
3. Grellmann, Wolfgang; Seidler, Sabine, Polymer Testing, 2007, Hanser Publishers
4. Biron, Michel, Thermoplastics and Thermoplastic Composites (2nd Edition), 2013, Elsevier.

EBT 335/4
POLYMER BLENDS

Course Synopsis

To introduce the knowledge of polymer blend and alloys. Promote an understanding on their properties relationship and provide knowledge on characterization, selection principles and application of polymer blend and alloys.

References

1. Paul, D. R & Bucknall, C. B., ‘Polymers Blends’, John Wiley and Sons, Inc., 2000.
2. Kulshreshtha, A.K.; Vasile, C. Handbook of Polymer Blends and Composites, Volumes 1-4, 2002, Smithers Rapra Technology

3. Vasile, C.,Kulshrestha, A. K., ‘Blends and Composites’, Rapra Publisher, 2003
4. Utracki, L.A., ‘Polymer Blends’, Rapra Technology, 2002.
5. Long, Yu, ‘Biodegradable Polymer Blends and Composites From Renewable Resources’, Wiley, 2008.

EBT 336/4
PLASTIC PROCESSING

Course Synopsis

This course is to provide a detailed introduction to the processing variety of materials polymer; rheology and flow melt in polymer, equipment and the important method of polymer processing, influence of factor-factor in polymer processing, defect in current processing and solve problem.

References

1. Baird D. G, Collias D. I.,’Polymer Processing-Principles and Design’, John Wiley & Sons, Inc., 1998.
2. Andrew Ciesielski, ‘An introduction to rubber Technology’, Rapra Technology Ltd, 1999.
3. Tim A. Osswald, ‘Polymer Proccesing Fudamentals’, Hanser Publishers, 1998.
4. Strong, A. Brent, ‘Plastics: Materials and Processing’, 2nd ed., Prentice Hall, 2000.
5. Shenoy, A.V., Saini, D.R., ‘Thermopalstic Melt Rheology and Processing’, Marcel Dekker, 1996.

EBT 337/4
MASS AND HEAT TRANSFER IN POLYMER

Course Synopsis

The aim of this course is to introduce the knowledge of mass and heat transfer in polymer processing. Student will be able to describe the principles of convective mass transfer at boundry layer, mass transfer between phases, to calculate and solve the mass and heat transfer problem in polymer processing equipments such as injection molding and screw extruder and also capable to **plan and evaluate** the heat and mass transfer in conduction, convection and radiation involves during polymer processing.

References

1. James R. Welty *et all* (2007) Fundamental of momentum, Heat, and Mass Transfer, 5th Edition, Jhon Wiley & Son, Inc. USA.
2. Hans Dieter Baehr – Karl Stephan (2006) Heat and Mass Transfer 2nd Edition (revision, Springer, Germany.
3. Coulson & Richardson’s (1999) Chemical Engineering, Sixth Edition (Reprint 2009)” Fluid Flow, Heat and Mass Transfer”, Elsevier, Great Britain (UK).
4. Henning Bockhorn, Dieter Mewes, Wolfgang Peukert and Hans-Joachim Warnecke (2010) Heat and Mass Transfer – Micro and Macro Mixing: Analysis, Simulation and Numerical Calculation, Springer-Verlag Berlin Heidelberg
5. Rong Zheng, Roger I. Tanner, Xi-Jun Fan (2011) Injection Molding: Integration of Theory and Modeling Methods, Springer Heidelberg Dordrecht London New York
6. Rachid Bennacer (2007) Numerical Methods for Heat & Fluid Flow, International Conference on Computational Heat and Mass Transfer, Emerald Group Publishing Limited 0961-5539

EBT 338/4
LATEX PROCESSING

Course Synopsis

This course emphasizes on the fundamental characteristic of natural and synthetic lattices, latex compounding and processing as well as their applications in latex industries and others.

References

1. Blackley, D. C.,’Polymer Latices: Science and Technology’, 2nd Edition, Vol. 1 – 3, Chapman & Hall, 1997.
2. Warson, H. and Finch, C. A.,’Application of Synthetic Resin Latices: Fundamental Chemistry of Latices and Applications in Adhesives’, John Wiley & Sons, Ltd., 2001.
3. Dunn, David J., ‘Natural and Synthetic Latex Polymers: Market report’, Rapra Technology, 2002.
4. Vikas Mittal, ‘ Advances in Polymer Latex Technology’, Nova Science Publishers, 2009.
5. Gad, Shayne C., ‘Safety Evaluation of Medical Devices (Electronic Resources)’, 2nd ed., Marcel Dekker, 2002.

EBT 351/3
ELECTRONIC MATERIALS ENGINEERING

Course Synopsis

Elementary materials science concept, electrical and thermal conduction in solid, elementary quantum physics, modern theory of solids, semiconductor, dielectric materials and insulator, magnetic properties and superconductivity, optical properties of materials.
Electronic packaging: Fundamental of electronics packaging design, reliability, thermal management, single chip packaging and multichip packaging.

References

1. Safa Kasap (2005), Principles of Electronic Materials and Devices, 3rd Edition, McGraw-Hill Science/ Engineering/Math.
2. Rao R. Tummale (2001). Fundamentals of Microsystems Packaging. McGrawhill,.
3. Gardner, Julian W. (2001). Microsensors MEMS and Smart Devices, Wiley.
4. Harper C. (2009). Electronic Materials and Processes Handbook. Singapore: McGraw-Hill.
5. Kasap S. (2005). Principles of Electronic Materials and Devices. 3rd Ed. Singapore: McGraw-Hill.

EBT 402/3
CORROSION ENGINEERING

Course Synopsis

Student will learn corrosion and surface engineering principles. Therefore, in this subject, the student will learn electrochemistry, corrosion type, corrosion problems in industries. Electrochemistry principles, corrosion tyes, Pourbaix Diagram, Corrosion mechanism, kinetic and corrosion rate. Corrosion prevention methods, inhibitors, anodic and cathodic prevention, coating, stress corrosion cracking, selection and design, corrosion problems in industry and its solution.

References

1. Roberge P. (2008). Corrosion Engineering: Principles and Practice. Singapore: McGraw-Hill.
2. Jones D.A. (1995). Principles and Prevention of Corrosion. 2nd Ed. New York: Prentice Hall.
3. A.W. Batchelor, Loh Nee Lam, Andrew William Batchelor & Margam Chandrasekaran, (2000).*Materials Degradation and Its Control by Surface Engineering*. Publisher: Imperial College Press.
4. Fontana, M.G. & Greene, N.D. (1986). *Corrosion Engineering.* 3rd Ed. New York: McGraw-Hill.
5. Wranglen, Gosta. (1985). *Introduction to Corrosion and Protection of Metals*. London: Chapman & Hall.

EBT 405/3
NON DESTRUCTIVE TESTING

Course Synopsis

Non-destructive testing (NDT) is a method used for inspection of an internal part of materials. Identifying defects and flaws in material which could not be seen using our naked eyes is absolutely important in determining the material lasting age and the material performance. It is formerly known that the effective method of NDT is almost depending on the knowledge and skill of the person incharge. Because of that reason, this course offers several topics which covers the general NDT methods that are normally used in engineering field such as liquid penetrant, magnetic particle, eddy current, ultrasonic, and radiography technique.

References

1. B. Raj, T. Jay Kumar & M. Thavasimuthu. (2007). Practical Non-Destructive Testing 3rd Edition. Alpha Science Int'l Ltd.
2. J. S. Peter. (2002). Non-destructive Evaluation: Theory, Techniques and Applications. Marcel Dekker Incorporation, New York: USA.
3. F. Kojima, T. Takagi, S.S. Udpa and J. Pavo. (2002). Electromagnetic Non-destructive Evaluation, IOS Press. Amsterdam: Netherland.
4. Chuck Hellier. (2012). Handbook of Non-destructive Evaluation. McGraw-Hill, New York: USA.
5. E. B. Don and K. S. Roderic. (1997). Non-destructive Evaluation, A Tool in design, manufacturing, and service, CRC Press Incorporation, Boca Raton: Florida.

EBT 411/3
ENGINEERING ALLOYS

Course Synopsis

This course is designed for students to study various types of engineering alloys including apparent microstructure, microstructural changes after heat treatment, heat-treatment design and applications of engineering alloys. To study metal matrix composites and biomaterials.

References

1. William Smith.(1993). *Structure and properties of engineering alloys*. 2th Edition, McGraw Hill.
2. J. R Davis. (2001). *Alloying: Understanding the Basics.* ASM International.

3. Mathew, F.L, Rawlings, R.D. (1998). *Composite Materials: Engineering and Science*. Chapman & Hall,
4. Ronal F.G. (1994). *Principle of Composite Materials Mechanics.* McGraw-Hill.
5. Suresh, S., Mortensen, A., Needleman, A., (1993). *Fundamentals of Metal-Matrix Composite.* Elsevier.

EBT 414/3
ELECTRONIC METALLURGY

Course Synopsis

This course is designed for student to review the microelectronic packaging hierarchy, 6 levels of packaging. First and level interconnection techniques in electronic packaging hierarchy. **Die Bonding** - Die bonding material and types of metals used. Properties of each metals involved. Function of metals in die bonding. **Wire Bonding** - Wire bonding technology and bonding techniques. Metallurgy of wire bonding and its characteristic. Intermetallic compound and metallic interface. Wire bond testing concepts. Bonding issues and reliability failures. **Soldering Technology** - Solder materials and microstructures. Flux and solderability. Solder joint and intermetallic formation. Reliability and failure mechanisms. Applications and metallization in flip chip technology and tape-automated bonding. **Processing Technologies** - Metal deposition techniques commonly used in microelectronic packaging processes including evaporation, sputtering and elctro- and electroless plating which are used in the fabrication of corrosion-resistant metal pads on IC packages. Advantages and disadvantages of the technique used. Patterning process. Metal-to-metal joining process. **Package Construction** - Application of metals in base, lead frames and lids construction.

References

1. Harper C. (2009). Electronic Materials and Processes Handbook. Singapore: McGraw-Hill.
2. Kasap S. (2005). Principles of Electronic Materials and Devices. 3rd Ed. Singapore: McGraw-Hill.
3. J.H. Westbrook, R.L. Fleischer. (2000). *Magnetic, Electrical, and Optical Properties and Applications of Intermetallic Compounds*. Volume 4. Publisher: Wiley.
4. George G. Harman. (1997). *Wire Bonding in Microelectronics: Materials, Processes and Equipment*. Publisher: McGraw-Hill Professional.
5. Mayer J.W. and Lau S.S. (1989). Electronic Materials Science: For Integrated Circuits in SI and GaAs. New York: Prentice Hall.

EBT 415/3
METALLURGICAL FORENSIC ANALYSIS

Course Synopsis

This course is designed to bridge the gap between theory and practice of forensic analysis in term of metallurgical aspect. It presents a very practical approach to forensic analysis for metallurgical engineering students who interested in understanding how knowledge of forensic analysis can lead to better productivity. The forensic analysis of product/component failures is also studied from beginning to end for certain case studies that normally happen in industries. The module also provides hands-on experience on alloy forensic analysis both at during laboratory work and on site visit. Student also exposed with technical report writing technique through mini project.

References

1. Das, A. K. (1997). *Metallurgy of Failure Analysis*. McGraw-Hill. New York
2. Brooks, C.R., Choudhury, A., Brooks, C.R., (2001). *Failure Analysis of Engineering Materials*. McGraw-Hill. . New York
3. McEvily, A.J., (2002). *Metal Failures: Mechanisms, Analysis, Prevention.* John Wiley & Sons. New York
4. Mobley, R. K., (1999). *Root Cause Failure Analysis.* Butterworth-Heinemann. Woburn
5. Tawancy, H.M., Nureddin., A. U. Abbas. M., (2004). *Practical Engineering Failure Analysis.* Taylor & Francis. New York

EBT 418/3
WELDING METALLURGY

Course Synopsis

This course is designed to introduce the students to welding metallurgy principles and influencing factor in welding metallurgy selected. Therefore, students will be exposed to welding principle, metallurgical welding, welding types and welding mechanism, welding problems in varies industries and welding solutions.

References

1. Lancaster J.F. (1999). Metallurgy of Welding. 6th Ed. UK: Abington Publishing.
2. Easterling. K, (1993). *Introduction to Physical Metallurgy of Welding.* Butterworth: Heinemann.
3. Granjon H. (1991). Fundamentals of Welding Metallurgy. UK: Abington Publishing.
4. Kou. S.(1987). *Welding Metallurgy.* John Wiley & Sons.

5. Linnert G.E. (1965) Welding metallurgy;: Carbon and alloy steels. Volume 1: fundamentals. 3rd Ed. USA: American Welding Society.

EBT 419/3
APPLIED METALLURGY

Course Synopsis

This course is to introduce the students to fundamental of metal casting. Casting technology, heating and pouring. Solidification and cooling. Fluidity and fluid flow phenomena in casting processes. Casting quality and casting defects. Characterization of engineering powders. Production of metallic powders. Conventional pressing and sintering. Alternative pressing and sintering techniques. Materials and products for Powder Metallurgy. Overview of metal forming. Material behaviour. Bulk deformation process in metal working, rolling, forging, extrution bar and wire drawing. Cutting and bending operation, drawing, shear metal forming operation. Mechanics of metal cutting and chip formation. Power and energy relationship in machining.

References

1. Peter Beeley. (2001). *Foundry Technology*. 2nd Ed. Oxford:Butterworth/Heinemann.
2. John E. Neely, Thomas J. Bertone. (2000). *Practical Metallurgy and materials for Industry*.
3. J. Beddoes, M. Bibby. (1999). *Principle of Metal Manufacturing Process.* Butterworth- Heinemann.
4. Serope Kalpakjian. (1991). *Manufacturing processes for Engineering Materials.* Addison Wesley.
5. Degarmo, Black and Koser. (1988). *Material and Processes in Manufacturing.*

EBT 421/3
ADVANCED MATERIALS ENGINEERING

Course Synopsis

Introduction to advanced material (nanostructured, synthethic alloy, ODS alloy), the fabrication process of those materials and its applications also characterization techniques by using TEM, SEM, XRD and BET methods.

References

1. Smallman R.E. and Ngan A.H.W. (2007). Physical Metallurgy and Advanced Materials. 7th Ed. Oxford: Butterworth-Heinemann.
2. Hari Singh Nalwa. (2002). *Nanostructred Materials and Nanotechnology.* Academic Press,
3. El-Eskandarany. S.M. (2001). *Mechanical Alloying For Fabrication Of Advanced Engineering Materials.* Noyes Publication,
4. Bernier P, S lefrant, G Bidan. (1999). *Advance In Synthetics Metals.* Elsevier.
5. Edelstein. A, Cammarata R. S. (1996). *Nanomaterial: Synthesis, Properties And Application.*

EBT 424/3
CONSTRUCTION MATERIALS

Course Synopsis

Introduction to the basic construction materials including raw material, physical and mechanical properties, processing and construction material designs. Also introduction to construction industries in Malaysia and involvement of others organization in supervising construction industry such as JKR, CIDB, IEM, PAM, Sirim, Kementerian Perumahan dan Kerajaan Tempatan dan Pusat Khidmat Kontraktor.

References

1. Mahyudin Ramli, Teknologi Konkrit dan Pembinaan, Dewan Bahasa & Pustaka, 1991
2. R.K. Rajput (2000). Engineering Material, S. Chand & Company Ltd.
3. J. Newman, Advanced Concrete Technology: Constituent Materials, Butterworth, Heinemann, 2004.
4. Theodore Marotta, John C. Coffey, Cynthia LaFleur-Brown. Christine LaPlante (2010). Basic Construction Materials, Prentice Hall, 8th Editions.
5. Sidney Mindess, J. Francis Young, David Darwin (2002). Concrete, Prentice Hall, 2nd Edition.

EBT 427/3
TECHNICAL CERAMIC

Course Synopsis

This course is designed to exposed the students to the technical ceramic and important aspect in advance ceramic. **Electro Ceramic** - Materials and properties. Basic concept of ceramic to electro ceramic application including insulator, ceramic high frequency, piezoelectric transistor and superconductor. **Refractory** - Properties and application of different types of refractory such as silica, alumina silica, magnesit dan crome magnesit. **Ceramic Structure** - Materials and properties. Basic principles of ceramic to the aerospace, cutting tools, automobile and biomaterials applications. **Ceramic Matrix Composites** - Properties and several toughening technique. Carbon-carbon composites and hybrid composite. Processing of fiber reinforced composites including pultrusion, prepreg production process and filament winding. **Bio Ceramic** - Selection, properties and application. Basic concept of toughening and produce ceramic composite for biomaterials application. **Non Structure**

Ceramic - Materials and properties. Nonstructural application including packaging, sensor, filtering and electrical optic. **Glass -** Mechanical, optic, electric and chemical resistance properties of glass. Glass transition temperature and structure of glass including glass forming oxides, glass modifying oxides and intermidiate oxides in glasses. Properties and application of different composition of glasses such as soda lime glass, borosilicate glass and lead glasses. Production and forming methods of glasses including heating, molding, drawing or rolling and annealing.

References

1. Richard K. Ulrich, William D.Brown. (2006). Advanced Electronic Packaging. 2nd Edition. Publisher: John Wiley & Sons, Inc.
2. Rao R. Tummala. (2001). Fundamentals of Microsystems Packaging. Publisher: McGraw-Hill.
3. Charles A. Harper. (2005). Electronic Packaging and Interconnection Handbook. 3rd Edition. McGraw Hill Professional, 2005
4. Xingcun Colin Tong. (2011), Advanced Materials for Thermal Management of Electronic Packaging. Springer Series in Advanced Microelectronics.
5. Vasudeva P. Atluri, Sujit Sharan, Ching Pong Wong, Darrel Frear. (2007). Advanced Electronic Packaging, Part of MRS Proceedings, Vol 968

EBT 429/3
COMPOSITE MATERIALS

Course Synopsis

This course is focusing on the three major types of composite materials which are Ceramic Matrix Composite (CMC), Metal Matrix Composite (MMC) and Polymer Matrix Composite (PMC). Lectures cover on several important aspects of composite materials.
This includes the introductions, classifications, properties, applications and characterizations of composite materials, matrix and reinforcement phase, manufacturing and processing methods, types and influence of different reinforcement, inter-phase properties, mechanical and failure behavior, current and future potential applications of composite products.
At the end of this course, students will have a comprehensive knowledge and well understanding regarding composite materials.

References

1. John Wanberg (2012). Composite Materials: Fabrication Handbook #3. Wolfgang Productions.
2. Khairel Rafezi Ahmad, Mohd Mustafa Abdullah, Che Mohd Ruzaidi Ghazali, Shamsul Baharin Jamaludin, Mohamed Faisol Mohamed Noor, Alida Abdullah (2011) Pengenalan Bahan Komposit. Penerbitan UniMAP, 2011.
3. Krishan K. Chawla (2012). Composite Materials: Science and Engineering", Springer.
4. William F. Smith, Javad Hashemi (2010). Foundations of Materials Science and Engineering 5th Edition. McGraw-Hill Education.
5. Mathew, F.L., Rawlings, R.D. (1998). Composite Materials: Engineering and Science, Chapman & Hall.

EBT 439/3
ADVANCED ELECTRONIC PACKAGING

Course Synopsis

In this course, students will be exposed to the following components**: Introduction on the overview of microelectronic packaging** such as function of an electronic package, packaging hierarchy, and brief history of microelectronic packaging technology. The advantages, disadvantages and challenges of each of the above packages towards meeting the needs of the nanometer range, needs of new devices and market will be shared. **Thermal management**: heat transfer theory, thermal & cooling design and thermal measurement methodology that involved the software and hardware. **Package assembly and its design characteristic:** Fundamentals and process of integrated circuit (IC) assembly will be shared. This includes the three primari IC assembly technology: wirebonding, tape automated bonding (TAB) and flip chip. **The fundamentals and process of board assembly** which typically involves mounting components on wiring board and soldering thier leads to the board. Main technologies of board assembly will be shared which includes surface mount technology (SMT) and through hole assembly technology. The generic board assembly issues which relates to material will also be shared. Soldering **technology**: alloy, soldering tecnique, microstructure, interconnection, no-clean solder, lead-free solder and lead-free plating.

References

1. S.O Kasap. (2002). *Principles of Electronic Materials and Devices*. 2nd Edition. Publisher: McGraw-Hill.

2. Ken Gilleo. (2001). *Area Array Packaging Handbook*. 1st Edition. Publisher: McGraw-Hill.
3. Charles A. Harper. (2000). *Electronic Packaging and Interconnection Handbook*. 3rd Edition.Publisher: McGraw-Hill.
4. John H. Lau. (2000). *Low Cost Flip Chip Technologies for DCA, WLCSP, and PBGA Assemblies*. Publisher: McGraw-Hill.
5. John Lau, S.W. Ricky Lee. (1999). *Chip Scale Package – Design, Materials, Process, Reliability, and Applications.* Publisher: McGraw-Hill.

EBT 435/3
POLYMER IN ELECTRONIC APPLICATION

Course Synopsis

To provide knowledge of polymer application in electronic industries. This includes an understanding on the concepts of fabrication processes of various polymers in this application. Provide knowledge on characterization and selection principles of polymer in electronic application.

References

1. S. O. Kasap, 'Principles of Electronic Materials and Devices', 2nd ed., Mc Graw Hill, 2002.
2. Charles A. Harper, 'Electronic Packaging and Interconnection Handbook', 4th ed., Mc Graw Hill, 2005.
3. Manas Chandra, Salil K.Roy. 2009. Industrial Polymers, Specialty Polymers, and Their Application. CRC Press, Taylor & Francis Group

EBT 437/3
POLYMER COMPOSITES

Course Synopsis

This course will provide the concepts of polymer composites with several of fabrication techniques. This course also provides knowledge on fiber reinforcement of polymer matrices and their corresponding properties. The course includes the mechanics of composites and some composite testing methods.

References

1. Deborah, D. L. Chung, 'Composites Materials: Science and Application', Springer-Verlag, Ltd, 2003.
2. Avokali, G., 'Handbook of Composite Fabrication', Rapra Technology Limited, 2001.
3. Barbara H. Stuart, 'Polymer Analysis', John Wiley & Sons, Ltd., 2000.

EBT 441/3
POLYMER ENGINEERING DESIGN

Course Synopsis

The aim of this course is to develop knowledge on the polymer engineering design specifically for plastic injection moulding activities, dies for extrusion process and a design that involves a polymerization reactor. The generate knowledge will provide an effective skill to counter and solve the common problem approach on the fundamental basis of polymer engineering design.

References

1. M. S. Peters and K. D. Timmerhaus, Plant Design and Economics for Chemical Engineers, 4th Edition, McGraw-Hill Book Company, New York (1991).
2. Perry's Chemical Engineer's Handbook, 7th Edition, McGraw-Hill Book Company, New York (1997).
3. H. F. Rase, Chemical Reactor Design for Process Plants, Volumes I & II, J. Wiley & Sons, Inc., New York (1977).
4. Micheali, W (1992) Extrusion Dies for plastics and rubber: Design and Engineering. Munich: Hanser Publishers.
5. Michaeli, W.; Greif, H.; Kretzschmar, G.; Ehrig, F. (2001) Training in Injection Molding. Munich: Hanser Publishers
6. Rosato, D.V, Rosato, D.V, Rosato, M.G (2000) Plastic design handbook. Massachusetts: Kluwer Academic Publishers.
7. Osswald, T.A, Hernandiz-Ortiz, J. P (2006) Polymer Processing: Model and simulation. Munich: Hanser Publishers.
8. Campo, E. A (2006) The complete part design handbook: For injection molding of thermoplastics. Munich: Hanser Publishers.

EBT 442/3
POLYMER ENGINEERING INTEGRATED DESIGN PROJECT

Course Synopsis

This course contains foundation and knowledge on engineering design. Apply and practice knowledge on polymer engineering and properties, principle of polymer selection, process selection and sustainability of materials to reinforce the engineering knowledge through case study and designed capstone-project. This project is an open-ended and conceptual based (no end product).

References

1. Micheal, F. Ashby. 2010. Materials Selection in Mechanical Design. Butterworth Heneimann.
2. Pat. L. Mangonon. 1999. The Principles of Materials Selection for Engineering Design. Prentice Hall.
3. Michael Ashby 2009. Materials and Design: The Art and Science of Material Selection in Product Design. Butterworth-Heinemann
4. Michael F. Ashby and D. R. H. Jones. 2005. Engineering Materials 1: an Introduction to Properties, Applications and Design: v. 1. Butterworth-Heinemann Ltd
5. Michael F. Ashby, Hugh Shercliff, David Cebon. 2009. Materials: Engineering, Science, Processing and Design. A Butterworth-Heinemann

EBT 445/2 & EBT 446/4
FINAL YEAR PROJECT

Course Outcomes

- Able to plan and manage research project.
- Ability to apply theory that had been studied in research project.
- Able to write a technical report professionally.
- Able to present a research project professionally.

Course Synopsis

Research project will be conducted by the final year student. Objective of the project is to introduce the real problem in the field of engineering and familiarize the research method, problem solving, research publication and presentation of the effective results through thesis and seminar.

EBT 447/4
MATERIALS SELECTION AND DESIGN

Course Synopsis

This course contains foundation of knowledge on engineering design and the role of materials in it. Knowledge and understanding on Engineering Materials and their properties, Material property charts, Principles of materials selection, Process and process selection and Sustainability of Material are required to reinforce the foundation of knowledge. Practical knowledge in understanding of engineering design and selection of material will be assessed through case study and designed capstone-project. **This course begins in the first semester (Sem 7th) but total credits are given upon completion of the second semester (Sem 8th).*

References

1. Micheal, F. Ashby. (2010). Materials Selection in Mechanical Design. Butterworth Heneimann.
2. Pat. L. Mangonon. (1999). The Principles of Materials Selection for Engineering Design. Prentice Hall.
3. Michael Ashby (2009). Materials and Design: The Art and Science of Material Selection in Product Design. Butterworth-Heinemann
4. Michael F. Ashby and D. R. H. Jones. (2005). Engineering Materials 1: An Introduction to Properties, Applications and Design: v. 1. Butterworth-Heinemann Ltd
5. Michael F. Ashby, Hugh Shercliff, David Cebon. (2009). Materials: Engineering, Science, Processing and Design. A Butterworth-Heinemann

EBT 448/3
POLYMER ADHESIVE AND COATING

Course Synopsis

To introduce the basic knowledge on principles and properties of adhesion, adhesives polymer coatings. This course is focus on design formulation of adhesives and coating products, study working properties, testing and characterization and also application of them.

References

1. Mittal, K. L., Pizzi, A., ‘Handbook of Adhesive Technology’, Marcel Dekker. Inc., 2003.
2. Souheng, Wu, ‘Polymer Interface and Adhesion’, Marcel Dekker. Inc., 1982.
3. Pillard, D. A., Pocius, A. V., ‘Adhesion Science and Engineering’, vol. 1-2, Elsevier, 2002.
4. Raymond H. Fernando, Li-piin Sung, ‘Nanotechnology Applications in Coatings’, American Chemical Society, 2009.
5. Walter Brockmann, Paul Ludwiq Geil, Jurgen Klingen, K. Bernhard Schroder,Bettina Mikhail, ‘Adhesive Bonding: Materials, Applications and Technology’, Wiley-VCH, 2009.

EBT 449/3
ENVIRONMENTAL FRIENDLY POLYMER

Course Synopsis

The aim of this course is to provide the knowledge of environment friendly polymer. Solve on their issues and understand the future needs of environmental polymers and create alternative ways for handling polymer issue such as degradable polymer and polymers recycling.

References

1. Francesco La Mantia, 'Handbook of Plastics Recycling', Rapra Technology Limited, Shawbury, 2002.
2. Catia Bastioli, 'Handbook of Biodegradable Polymers', Rapra Technology limited, Shawbury, 2005.
3. Jhonson R.M. 2003. Biopolymer. Sithers Rapra, Vol 14. U.K.

Job Opportunities

Graduates with a Bachelor of Engineering (Materials Engineering), (Metallurgical Engineering) and (Polymer Engineering) have broad employment prospects either in the private sector/industry, departments in government or statutory bodies. Sectors that offer employment opportunities are as followed;

- Metal Industry.
- Polymer Industry.
- Electronic Packaging Industry.
- Materials Processing Industry.
- Automotive Industry.
- Service and Maintenance Industry.
- Engineering Fabrication Industry.
- Quality Control Department.
- Department of Engineering and Product Design.
- Research and Development Institution or Department.
- Institutions of Higher Education.
- Polytechnic / Community College.

The main careers for graduates in these THREE programmes are as followed;

- Process Engineer.
- Production Engineer.
- Manufacturing Engineers.
- Quality Control Engineer (QC).
- Quality Assurance Engineer (QA).
- Failure Analysis Engineer.
- Product Development Engineer.
- Process Development Engineer.
- Materials Development Engineer.
- Metallurgical Engineers.
- Negotiation and Site Engineer.
- Research Officer.
- Lecturer for Polytechnic / College Community.
- Teaching Engineer

School of Bioprocess Engineering

Programmes Offered

• Bachelor of Engineering (Honours)(Bioprocess Engineering)
• Bachelor of Engineering (Honours)(Biosystems Engineering)
• Master of Science (Bioprocess Engineering)
• Master of Science (Biosystems Engineering)
• Doctor of Philosophy

Address

SCHOOL OF BIOPROCESS ENGINEERING,
Universiti Malaysia Perlis (UniMAP),
Kompleks Pusat Pengajian Jejawi 3 (KPPJ3),
Kawasan Perindustrian Jejawi,
02600, Arau,
Perlis

Tel.: +6(04) 979 8751
Fax: +6(04) 979 8755
e-mail: dean_bioprocess@unimap.edu.my

INTRODUCTION

The School of Bioprocess Engineering (SBE) was first established in October 2005 after approval from the Ministry of Higher Education.

SBE currently offers two (2) Bachelor's Degree programmes namely Bachelor of Engineering (Hons.) (Bioprocess Engineering) and Bachelor of Engineering (Hons.) (Biosystems Engineering)

The fields of Bioprocess Engineering and Biosystems Engineering play a significant role in industrialized countries. Generally, the curricula are designed to enhance student's theoretical knowledge. The primary purpose is to produce holistic graduate engineers who posses not only the technical knowledge and critical skills but also equipped with skills in information technology, communication, entrepreneurship, and also ethics. Hence, the structures of the curricula are designed to deliver these important knowledge and skills.

BACHELOR OF ENGINEERING (HONOURS) (BIOPROCESS ENGINEERING)

Bioprocess Engineering is a specialization of biological processes and Biotechnology in Chemical Engineering field. It deals with the design and development of equipment and processes for the manufacturing of bio-based products such as food, feed, pharmaceuticals, nutraceuticals, chemicals, polymers, and etc, from biological materials. Bioprocess engineering is a conglomerate of mathematics, biology and chemical design,and consists of various spectrums like studying of fermentors (mode of operations etc.), large scale production of biological product, optimization of yield in the end-product and the quality of end-product and microorganism cellular-based productions.

BACHELOR OF ENGINEERING (HONOURS) (BIOSYSTEMS ENGINEERING)

UniMAP's Biosystems Engineering is considered as the biology-focused evolution of typical Agricultural Engineering programme and applies to all living organism systems with an exception of human. It is an engineering programme that "*applies and integrates knowledge in sciences, mathematics, applied biological, environmental and agricultural sciences, and engineering to solve problems and innovate solutions involving biological systems*". The curriculum structure of Biosystems Engineering encompasses courses and exposures related to disciplines in automation and emerging technologies, information technology, power and machinery, postharvest technology, structures and environment, soil and water, and sustainable agriculture.

STAFF DIRECTORY

Dean
Assoc. Prof. Dr. Muhammad Syarhabil Ahmad
e-mail: syarhabil@unimap.edu.my

Deputy Dean
(Academic And Research)
Dr. Akmal Hadi Ma'Radzi
e-mail: akmalhadi@unimap.edu.my

Deputy Dean
(Student Development and Alumni)
Dr. Farizul Hafiz Kasim
e-mail: farizul@unimap.edu.my

Chairperson of Degree Programme
(Bioprocess Engineering)
Dr. Nora Jullok
e-mail: norajullok@unimap.edu.my

Chairperson of Degree Programme
(Bioprocess Engineering)
Mrs. Rashidah Ruslan
e-mail: rashidahruslan@unimap.edu.my

Chairperson of
Postgraduate Programme
Dr. Saleha Shamsudin
e-mail: saleha@unimap.edu.my

Coordinator for Industrial Networking
and Quality Management
Dr. Sam Sung Ting
e-mail: stsam@unimap.edu.my

Assistant Registrar
Mrs. Wardah Hanim Md Nor
e-mail: wardah@unimap.edu.my

LECTURERS

Prof. Ir. Dr. Hj. Rezuwan Bin Hj. Kamaruddin
PhD (Structural and Building Environmental Engineering), Cranfield University, UK
M. Sc. (Structural Engineering), UPM
B. Eng. (Agricultural Engineering),UPM
Tel. : +6(04) 979 8026 / +6(04) 979 8822
Fax : +6(04) 9798 689 / +6(04) 979 8755
e-mail : rezuwan@unimap.edu.my

Prof Ir. Dr. Ibni Hajar Bin Rukunudin
PhD. (Agricultural Engineering), Iowa State University, USA
M App Sc. (Food Engineering), New South Wales, Australia
B Eng. (Agricultural) UPM
Tel. : +6(04) 979 8846
Fax : +6(04) 979 8755
e-mail : ibnihajar@unimap.edu.my

Prof. Dr. Awang Soh @ Yusoff Mamat
PhD (Plant Physiology), Louisiana State University, USA
B.Sc (Horticulture Science), Louisiana State University, USA
Tel. : +6(019) 905 0078
Fax : +6(04) 979 8755
e-mail : awang@unimap.edu.my

Associate Professor Dr. Dachyar Arbain
PhD (Biotechnology-Biosensor Technology), Imperial College, University of London, United Kingdom
Drs & B.sc. (Chemistry), Universiti Gadjah Mada, Yogyakarta, Indonesia
Tel. : +6(04) 979 8845
Fax : +6(04) 979 8755
e-mail : dachyar@unimap.edu.my

Associate Professor Dr. Harbant Singh
Ph. D. (Plant Virology), University of Manchester, United Kingdom
M.Sc. (Plant Pathology), Punjab Agricultural University, Ludhiana
B.Sc. (Agriculture), Punjab Agricultural University, Ludhiana
Tel. : +6(04) 979 8828
Fax : +6(04) 979 8755
e-mail : harbant@unimap.edu.my

Associate Professor Dr. Mahmad Nor Jaafar
PhD (Agronomy), Kansas State University , USA
M.Sc (Soil Physics), Kansas State University , USA
B.Sc (Agriculture), Louisana State University, USA
Tel. : +6(04) 979 8826 / +6(04) 945 6614
Fax : +6(04) 979 8755 / +6(04) 945 6603
e-mail : mahmad@unimap.edu.my

Associate Professor Dr. Mohammud Che Husain
PhD (Soil & Water Engineering), Cranfield University, UK
M.Sc. (Irrigation Water Management), Cranfield Institute of Technology, UK
B. Eng. (Agricultural Engineering), UPM
Fax : +6(04) 979 8755
e-mail : mohammudhusain@unimap.edu.my

Associate Professor Dr. Muhammad Syarhabil Ahmad
Ph.D. (Organometallic Chiral Catalysis Design and Organic Syntheses), University of Wisconsin @ Milwaukee WI, USA
B.Sc. (Chemical Engineering), Purdue University IN,USA
Tel. : +6(04) 979 8751
Fax : +6(04) 979 8755
e-mail : syarhabil@unimap.edu.my

Ir. Dr. Ayob Bin Katimon
Ph.D. (Civil Engineering), UTM
M.S. (Agricultural Engineering), Colorado State University, Fort Collins
B Eng. (Agricultural) UPM
Tel. : +6(04) 979 8820
Fax : +6(04) 979 8755
e-mail : ayobkatimon@unimap.edu.my

Dr. Farizul Hafiz Kasim
PhD., (Process Intensification), Newcastle University, UK
M.Eng. (Chemical Engineering), UTM
B.Eng. (Chemical Engineering), UTM
Tel. : +6(04) 979 8841 / 4216
Fax : +6(04) 979 8755
e-mail : farizul@unimap.edu.my

Dr. Mohd Irfan Hatim Mohamed Dzahir
PhD., DIC (Chemical Engineering), Imperial College London
M.Eng.Sc. (Alternative Fuels), UM
B.Eng. (Chemical Engineering), UTM
Tel. : +6(04) 979 8838
Fax : +6(04) 979 8755
e-mail : irfan@unimap.edu.my

Dr. Sam Sung Ting
PhD (Polymer Engineering), USM
M.Sc (Polymer Engineering), USM
B.Eng (Chemical Engineering), UTM
Tel. : +6(04) 938 2155
Fax : +6(04) 979 8755
e-mail : stsam@unimap.edu.my

Dr. Midhat Nabil Ahmad Salimi
Ph.D. (Chemical Engineering), University of Birmingham, UK
M.Sc. (Biochemical Engineering), University of Birmingham, UK
B.Eng. (Chemical Engineering), Universiti Teknologi MARA (UiTM)
Tel. : +6(04) 979 8513
Fax : +6(04) 979 8755
e-mail : nabil@unimap.edu.my

Dr. Ku Syahidah Ku Ismail
Ph.D. (Chemical Science and Engineering), Kobe University, Japan
M. Sc. (Chemical Engineering), USM
B. Eng. (Chemical Engineering), USM
Tel. : +6(04) 979 8832 / 8754
Fax : +6(04) 979 8755
e-mail : kusyahidah@unimap.edu.my

Dr. Saleha Shamsudin
Ph.D. (Bioprocess Engineering), UPM
M.Sc (Chemical Engineering), UKM
B.Eng. (Hons)(Chemical & Process Engineering), UKM
Fax : +6(04) 979 8755
e-mail : saleha@unimap.edu.my

Dr. Nora Jullok
Ph.D. (Chemical Engineering) KU Leuven, Belgium
M. Eng (Chemical Engineering), UTM
B. Eng (Chemical Engineering), UTM
Tel. : +6(04) 979 8842
Fax : +6(04) 979 8755
e-mail : norajullok@unimap.edu.my

Dr. Akmal Hadi Ma'Radzi
D. Eng (Materials Engineering), Fukui
B.Eng (Biotechnology and Applied Chemistry),Fukui
M.Eng (Biotechnology and Applied Chemistry), Fukui
Tel. : +6(04) 979 8849
Fax : +6(04) 979 8755
e-mail : akmalhadi@unimap.edu.my

Miss Khairul Farihan Kasim
M.Sc. (Biotechnology), USM
B.Sc (Biology – Botany), USM
e-mail : khairulfarihan@unimap.edu.my

Mr. Hirun Azaman Ismail
MBA (Management), Mississippi, State University, USA
BSc. (Agricultural Engineering), Mississippi, State University, USA
Fax : +6(04) 979 8755
e-mail : hirun@unimap.edu.my

Mrs. Rashidah Ruslan
M. Eng. (Agricultural and Biological), University of Florida, USA
B. Eng. (Biological and Agricultural), UPM
Tel. : +6(04) 979 4164
Fax : +6(04) 979 8755
e-mail : rashidahruslan@unimap.edu.my

Miss Munira Mohamed Nazari
M. Eng. (Mechanical Eng), UTM
B. Eng. (Manufacturing Engineering), UTeM
Fax : +6(04) 979 8755
e-mail : muniranazari@unimap.edu.my

Mrs. Samera Samsuddin Sah
M.Eng (Civil-Hydraulics and Hydrology), UTM
B.Eng (Civil Engineering), UTM
Tel. : +6(04) 979 8835
Fax : +6(04) 979 8755
e-mail : samera@unimap.edu.my

Mrs. Siti Kamariah Md Sa'at
M.Eng (Civil-Wastewater Engineering), UTM
B.Eng (Civil-Environmental), UTM
Fax : +6(04) 979 8755
e-mail : sitikamariah@unimap.edu.my

Miss Anis Atikah Ahmad
MSc. (Process Integration), Universiti Teknologi Petronas (UTP)
B. Eng. (Hons) (Chemical), Universiti Teknologi Petronas (UTP)
Fax : +6(04) 979 8755
e-mail : anisatikah@unimap.edu.my

Mrs. Syazwani Mahmad Puzi
M.Sc. (Safety, Health And Environment), UTM
B.Eng. (Chemical Engineering-Bioprocess), UTM
Tel. : +6(04) 976 8192
Fax : +6(04) 979 8755
e-mail : syazwanimahmad@unimap.edu.my

Mr. Muhammad Faiq Bin Abdullah
M.Sc. (Chemical Engineering), USM
B.Eng. (Chemical Engineering), USM
Fax : +6(04) 979 8755
e-mail : faiq@unimap.edu.my

Miss Hanna Ilyani Zulhaimi
M.Eng (Chemical), UTM
B.Eng. (Chemical), UTM
Fax : +6(04) 979 8755
e-mail : hanna@unimap.edu.my

Mr. Md Nabil Ab Adzim Saifuddin
M.Sc. (Chemical Engineering), USM
B. Eng (Chemical Engineering), USM
Tel. : +6(04) 979 8834
Fax : +6(04) 979 8755
e-mail : mdnabil@unimap.edu.my

Mrs. Hafiza Shukor
M.Sc. (Chemical Engineering), USM
B. Eng (Chemical Engineering), USM
Tel. : +6(04) 979 8593
Fax : +6(04) 979 8755
e-mail : hafizashukor@unimap.edu.my

STUDY LEAVE

Mrs. Hairul Nazirah Abdul Halim
M.Sc. (Chemical Engineering), USM
B. Eng (Chemical Engineering), USM
Fax : +6(04) 979 8755
e-mail : hairulnazirah@unimap.edu.my

Mrs. Syazni Zainul Kamal
M.Sc. (Industrial Biotechnology), USM
B.Sc. (Biotechnology), UM
Tel. : +6(04) 979 8588
Fax : +6(04) 979 8755
e-mail : syazni@unimap.edu.my

Mr. Zulfakar Mokhtar
M.Sc. (Chemical Engineering), USM
B.Eng. (Chemical Engineering), USM
Tel. : +6(04) 979 8839
Fax : +6(04) 979 8755
e-mail : zulfakar@unimap.edu.my

Miss Rahimah Othman
M.Sc (Membrane Separation Technology), UKM
B.Eng. (Hons)(Chemical & Process Engineering), UKM
Tel. : +6(04) 979 8583
Fax : +6(04) 979 8755
e-mail : rahimah@unimap.edu.my

Miss Mismisuraya Meor Ahmad
M.Sc. (Fuel Cell), UKM
B.Eng. (Hons)(Chemical & Process), UKM
Tel. : +6(04) 979 8585 / 4216
Fax : +6(04) 979 8755
e-mail : mismisuraya@unimap.edu.my

Mr. Huzairy Hassan
M.Sc. (Chemical Engineering), USM
B.Eng. (Hons) (Biochemical-Biotechnology), UIAM
Tel. : +6(04) 979 8595
Fax : +6(04) 979 8755
e-mail : huzairyhassan@unimap.edu.my

Mr. Lee Boon Beng
M. Eng. (Chemical), UMS
B. Eng. (Hons) (Chemical), UMS
Tel. : +6(04) 979 8594
Fax : +6(04) 979 8755
e-mail : bblee@unimap.edu.my

Mr. Mohamad Fahrurrazi Tompang
M. Sc. (Biotechnology Engineering), UIAM,
B. Eng. (Hons) (Biochemical-Biotechnology), UIAM
Tel. : +6(04) 979 8590
Fax : +6(04) 979 8755
e-mail : fahrurrazi@unimap.edu.my

Mrs. Siti Jamilah Hanim Mohd Yusof
M. Sc. (Chemical Engineering), UKM
B.Eng. (Chemical Engineering), UKM
Tel. : +6(04) 976 6320
Fax : +6(04) 979 8755
e-mail : jamilahhanim@unimap.edu.my

Mrs. Noor Shazliana Aizee Abidin
M. Sc. (Food Technology), USM
B. Sc. (Food Technology), USM
Tel. : +6(04) 9798584
Fax : +6(04) 9798755
e-mail : shazliana@unimap.edu.my

VOCATIONAL TRAINING OFFICERS

Mrs. Sriyana Abdullah
B. Eng (Chemical Engineering), UM
Tel. : +6(04) 979 8827
Fax : +6(04) 979 8755
e-mail : sriyana@unimap.edu.my

Mr. Ahmad Radi Wan Yaakub
B. Eng (Chemical Engineering), UTM
Tel. : +6(04) 979 8825
Fax : +6(04) 979 8755
e-mail : ahmadradi@unimap.edu.my

Miss Hafizah Mohd Johar
B. Eng (Chemical Engineering), University of Minnesota, Twin Cities, USA
Tel. : +6(04) 979 8821
Fax : +6(04) 979 8755
e-mail : hafizahjohar@unimap.edu.my

Miss. Khalilah Mohd Yusuff
B. Eng. (Hons) (Biochemical-Biotechnology), UIAM
Tel. : +6(04) 979 8835
Fax : +6(04) 979 8755
e-mail : khalilah@unimap.edu.my

Mr. Mahfuz Affif Mohd Ruslan
B.Eng (Chemical Engineering), USM
Tel. : +6(04) 979 8848
Fax : +6(04) 979 8755
e-mail : mahfuz@unimap.edu.my

Mr. Mohd Sani Jamailudin
B. Eng (Mechanical Eng), UiTM
Tel. : +6(04) 979 8825
Fax : +6(04) 979 8755
e-mail : mohdsani@unimap.edu.my

Mr. Razif Omar
B.Eng (Mechanical), UiTM
Tel. : +6(04) 979 8836
Fax : +6(04) 979 8755
e-mail : razif@unimap.edu.my

SCIENCE OFFICER

Miss Rohazita Bahari
M. Sc. (Environmental Engineering), UPM
B. Sc. (Petroleum Chemistry), UPM
Tel. : +6(04) 979 8834
Fax : +6(04) 979 8755
e-mail : rohazita@unimap.edu.my

TECHNICIANS

Mr. Mohammad Fahmi Ramli
Diploma in Mechanical Engineering
Fax : +6(04) 979 8755
e-mail : rfahmi@unimap.edu.my

Mr. Muhammad Hafizal Fazil
Certificate in Mechanical Engineering
Fax : +6(04) 979 8755
e-mail : mhafizal@unimap.edu.my

Mr. Mohd Humaidi Samsuddin
Certificate in Mechanical Engineering
Fax : +6(04) 979 8755
e-mail : humaidi@unimap.edu.my

Mr. Mohamad Fauzi Mirdukhim @ Mustapa
Certificate in Mechanical Engineering
Fax : +6(04)9798755
e-mail : fauzimustapa@unimap.edu.my

Mr. Muhamad Fairul Sawal
Certificate in Mechanical Engineering
Fax : +6(04)9798755
e-mail : fairulsawal@unimap.edu.my

Mr. Imran Ismail
Certificate in Computer & Support System
Fax : +6(04) 979 8755
e-mail : imranismail@unimap.edu.my

Mr. Mohamad Zaim Mohamad Zain
Certificate in Mechanical Engineering
Fax : +6(04) 979 8755
e-mail : zaimzain@unimap.edu.my

Mr. Rohisham Che Idrus
General Office Assistant
Tel. : +6(04) 979 8653
Fax : +6(04) 979 8755
e-mail : rohisham@unimap.edu.my

ADMINISTRATIVE STAFF

Mrs. Wardah Hanim Md Nor
Assistant Registrar
Tel. : +6(04) 979 8752
Fax : +6(04) 979 8755
e-mail : wardah@unimap.edu.my

Miss Kantirra Intra Boon Rek
Office Secretary
Tel. : +6(04) 979 8753
Fax : +6(04) 979 8755
e-mail : kantirra@unimap.edu.my

Miss Siti Julaila Helwa Hamdan
Administrative Assistant
(Clerical/Operation)
Tel. : +6(04) 979 8653
Fax : +6(04) 979 8755
e-mail : julaila@unimap.edu.my

Mrs. Nur Hanisah Abdul Rahman
Administrative Assistant
(Clerical/Operation)
Tel. : +6(04) 979 8652
Fax : +6(04) 979 8755
e-mail : hanisah@unimap.edu.my

Mr. Mohd. Raslan Tajudin
Administrative Assistant
(Clerical/Operation)
Tel. : +6(04) 979 8653
Fax : +6(04) 979 8755
e-mail : raslan@unimap.edu.my

BACHELOR OF ENGINEERING (HONOURS) (BIOPROCESS ENGINEERING)

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO 01
Graduates who are leaders in the field of chemical engineering in bioprocess or chosen field as demonstrated via career advancement.

PEO 02
Graduates who are members of and contribute to professional society.

PEO 03
Graduates who engage in life-long learning or continuous education opportunities.

PEO 04
Graduates who contribute towards research and development.

PEO 05
Graduates who are entrepreneurial engineers.

PROGRAMME OUTCOMES (PO)

PO1
Ability to acquire and apply knowledge of mathematics, science, engineering and in-depth technical competence in bioprocess/ chemical engineering discipline to the solution of complex engineering problem.

PO2
Ability to identify, formulate and solve complex engineering problems.

PO3
Ability to design solutions for complex engineering problems and systems, components or processes to meet desired needs.

PO4
Ability to conduct investigation into complex problems as well as to analyze and interpret data.

PO5
Ability to use techniques, skills and modern engineering tools necessary for complex engineering practices so as to be easily adaptable to industrial needs.

PO6
Understanding of the social, cultural, global and environmental responsibilities of a professional engineer.

PO7
Ability to understand entrepreneurship, the process of innovation and the need for environmental and sustainable development.

PO8
Ability to understand the professional and ethical responsibilities and commitment to the community.

PO9
Ability to function on multi-disciplinary teams.

PO10
Ability to communicate effectively on complex engineering activities with the engineering community and with society at large.

PO11
Recognition of the need for, and an ability to engage in life-long learning.

PO12
Demonstrate understanding of project management and finance principles.

CURRICULUM STRUCTURE FOR BACHELOR OF ENGINEERING (HONOURS) (BIOPROCESS ENGINEERING)

YEAR	FIRST		SECOND		THIRD			FOURTH	
SEMESTER	**I**	**II**	**III**	**IV**	**V**	**VI**		VII	VIII
Engineering Core (87)	ERT 105/3 Electrical Technology	ECT 112/3 Engineering Skills	ERT 213/3 Process Instrumentations	ERT 206/4 Thermodynamics	ERT 316/3 Reaction Engineering	ERT 320/3 Bioseparation Engineering	EIT 302/4 Industrial Training	ERT 445/2 Final Year Project 1	ERT 446/4 Final Year Project 2
		EKT 120/4 Computer Programming	ERT 214/4 Material and Energy Balance	ERT 215/3 Fluid Mechanics	ERT 317/4 Biochemical Engineering	ERT 321/4 Process Control & Dynamics		ERT 424/3 Bioprocess Plant Design I	ERT 428/4 Bioprocess Plant Design II
			EQT 203/3 Engineering Mathematics III	ERT 216/4 Heat & Mass Transfer	ERT 318/4 Unit operations	ERT 314/4 Bioreactor System		ERT 425/3 Good Manufacturing Practice For Bioprocess Industries	#ERT4XX/3 Elective II
					ERT 319/3 Industrial Waste Treatment	ERT 322/3 Safety & Loss Prevention		#ERT 4XX/3 Elective I	
						ERT 323/2 Simulation for Bioprocess Engineering			
Non Engineering (31)	EQT 101/3 Engineering Mathematics I	EQT 102/3 Engineering Mathematics II	ERT207/4 Analytical Chemistry	EQT 271/3 Engineering Statistics				EUT444/3 Management for Engineers	EUT442/2 Profesional Engineers
	ERT 106/3 Biochemistry	ERT107/3 Microbiology for Bioprocess Engineering							
	ERT 102/4 Organic Chemistry	ERT 108/3 Physical Chemistry							
University Required (19)	UVW 410/2 University Malay Language	UUT 122/2 Skills & Technology in Communication	UUW 224/2 Engineering Entrepreneurship	UVW 312/2 English For Technical Communication	UUW 322/2 Thinking Skills				
	UZW XXX/1 Co-Curricular Activity		UUW 233/2 Islamic & Asian Civilizations	UUW XXX/2 Option Subjects	UUW 235/2 Ethnic Relation				
		UZW XXX/1 Co-Curricular Activity	UZW XXX/1 Co-Curricular Activity						
137	16	19	19	18	18	16	4	13	14
Total Units for Graduation 137									

Elective:
Elective I : ERT 426/3 Food Engineering ,ERT427/3 Design of Experiments
Elective II : ERT 429/3 Energy from Bioresources, ERT 430/3 Pharmaceutical Process Engineering

BACHELOR OF ENGINEERING (HONOURS) (BIOSYSTEMS ENGINEERING)

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO1
Graduates who are leaders in the field of agricultural/biosystems engineering or chosen field as demonstrated via career advancement

PEO2
Graduates who are members of and contribute to professional society

PEO3
Graduates who engage in life-long learning or continuous education opportunities.

PEO4
Graduates who contribute towards research and development

PEO5
Graduates who are entrepreneurial engineers

PROGRAM OUTCOMES (PO)

PO1
Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in agricultural/ biosystems engineering discipline to the solution of complex engineering problem.

PO2
Ability to identify, formulate and solve complex agricultural/ biosystems engineering problems.

PO3
Ability to design solutions for complex engineering problems and systems, component or process to meet desired needs.

PO4
Ability to conduct investigation into complex problems, as well as to analyze and interpret data

PO5
Ability to use techniques, skills and modern engineering tools necessary for complex engineering practices so as to be easily adaptable to industrial needs.

PO6
Understanding of the social, cultural, global and environmental responsibilities of a professional engineer.

PO7
In-depth understanding of entrepreneurship, the process of innovation and the need for sustainable development.

PO8
Understanding of professional and ethical responsibilities and commitment to the community.

PO9
Ability to function on multi-disciplinary teams.

PO10
Ability to communicate effectively on complex engineering activities with the engineering community and with society at large.

PO11
Recognition of the need for, and an ability to engage in life-long learning.

PO12
Demonstrate understanding of project management and finance principles.

CURRICULUM STRUCTURE FOR BACHELOR OF ENGINEERING (HONOURS) (BIOSYSTEMS ENGINEERING)

YEAR	FIRST		SECOND		THIRD			FOURTH	
SEM	I	II	I	II	I	II		I	II
Engineering Core (92)	ERT147/3 Fundamental of Biosystems Engineering	ERT150/2 Static	ERT205/4 Fluid Mechanics Engineering	ERT246/4 Hydrology And Water Resources Engineering	ERT354/3 Soil Engineering	ERT351/3 Sustainable Agrosystems Engineering	EIT302/4 Industrial Training	ERT 445/2 Final Year Project 1	ERT446/4 Final Year Project 2
	ERT148/2 Computer Aided Engineering Design for Biosystems Engineering		ERT250/2 Dynamic	ERT254/3 Thermodynamics for Biosystems Engineering	ERT245/4 Heat And Mass Transfer in Biological Systems	ERT457/3 Design of Automation Systems		ERT461/3 Biosystems Engineering Design 1	ERT462/3 Biosystems Engineering Design 2
			ERT251/2 Strength of Materials	ERT255/3 Engineering Properties of Biological Materials	ERT350/3 Instrumentation, Measurement & Control in Biosystems	ERT356/3 Unit Operations		ERT4XX/3 Elective 1	ERT4XX/3 Elective 2
			ERT252/3 Geomatic Engineering	ERT256/2 Theory of Structures	ERT353/3 Energy & Power in Biosystems	ERT355/2 Biosystems Modelling and Simulation		ERT464/3 Design of Machine & System	EUT442/2 Profesional Engineers
			ERT253/3 Electrical & Electronics Technology	EQT 271/3 Engineering Statistics	ERT352/3 Farm Structures			ERT460/3 Controlled Environment Engineering	
								EUT444/3 Management for Engineers	
Non-Engineering Core (22)	ERT149/4 Applied Biology for Biosystems Engineering	ERT151/3 Biochemistry							
	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT203/3 Engineering Mathematics III						
		EKT150/3 Introduction to Computer Programming							
		ECT 112/3 Engineering Skills							
		UUT 122/2 Skills & Technology in Communication							
University Required (19)	UZW XXX/1 Co-Curricular Activity	UZW XXX/1 Co-Curricular Activity	UZW XXX/1 Co-Curricular Activity	UVW 312/2 English for Technical Communication	UUW 224/2 Engineering Entrepreneurship	UUW 322/2 Thinking Skills			UVWXXX/2 Option
	UVW 410/2 University Malay Language					UUW 235/2 Ethnic Relations			
	UUW233/2 Islamic & Asian Civilizations								
137	17	17	18	17	18	15	4	17	14

	Waste-to-Wealth Engineering	Soil & Water Resources Engineering	Agro Processing & Production
Elective 1 (Semester 1)	ERT466/3 Waste Management	ERT468/3 Surface Water Management	ERT456/3 Post Harvest Engineering
Elective 2 (Semester 2)	ERT467/3 Biomass Conversion Technology	ERT469/3 Groundwater Engineering	ERT470/3 Bio-products Manufacturing

COURSE SYLLABUS

ERT 102/4
ORGANIC CHEMISTRY

Course Synopsis

This course introduces the fundamental theories (atomic orbital, molecular orbital and hybridization theories) and the application of hybridization theory in reactions involving alkynes and alkenes. Then, focusing on conformational analysis of alkanes and emphasizing on the nucleophilic substitution reactions of alkylhalides. The course also covers on physical and chemical properties, and chemical reactions involving alcohol and ester, aldehyde and ketone, carboxylic acid and aromatic compound. The application of organic chemical process is discussed in terms of biofuel and biopharmaceutical production.

Course Outcomes

1. Ability to explain the basic concepts theoretically and apply the knowledge of the physical and chemical properties of each functional group.
2. Ability to explain theoretical organic chemical reactions of alkenes, alkynes and alkyhalides at molecular level.
3. Ability to demonstrate the reactions involving alcohol, ether, aldehyde, ketone, carboxylic acid and aromatic compounds.
4. Ability to formulate the knowledge of organic chemical process in industry such as production of biopharmaceuticals.

References

1. Bruice, P.Y. 2004. *Organic Chemistry.* 4th. Edition. Prentice Hall.
2. McMurry, J. 2000. Organic Chemistry 5th Edition, Brooks/Cole.
3. Solomons, T.W.G. and Fryhle, C.B. 2008. *Organic Chemistry.* 9th Ed. John Wiley.
4. Goerge, T. Austin. *Shreve's Chemical Process Industries.* 5th Edition. McGraw Hill International.
5. Bruice, P.Y. 2006. *Esential Organic Chemistry.* Pearson International Edition, Pearson Prentice Hall.
6. Groggins, P.H. 2001. *Unit Processes in Organic Chemistry Synthesis.* Tata McGraw Hill.

ERT 105/3
ELECTRICAL TECHNOLOGY

Course Synopsis

This course is intended to provide students with clear understanding of the DC and AC circuits, basic principles of 3-phase AC circuits, electro-magnetism and magnetic circuits. They will also gain an understanding of the basic operating principles and performance analysis of three most commonly used electric machines, namely, transformers, dc machines, and induction motors.

Course Outcomes

1. Ability to explain the principle elements of DC and AC circuits such as current, voltage, power, energy, nodes, branches etc.
2. Ability to analyze the DC and AC circuits by using Ohm's Law, Kirchhoff's Current Law, Kirchhoff's Voltage Law, Source Transformation and Thevenin's theorem.
3. Ability to calculate and analyze parameters of three phase AC system for Wye and Delta connection.
4. Ability to analyze the basic concept of magnetism and electromagnetism and its application in DC and AC machines.

References

1. Boylestad, Robert L. 2007. Introductory Circuit Analysis, 11th Edition, Prentice Hall.
2. Hughes, 2005. Electrical and Electronic Technology, 9th Edition, Prentice Hall.
3. Richard J. F. 2008. Electricity Principles and Applications, 7th Edition, Mc Graw Hill.
4. Charles K. A. and Matthew N.O.Sadiku. International Third Editions. Fundamentals of Electric Circuits, McGraw-Hill.
5. Nilsson, J.W. and Riedel, S.A. 2005. Electric Circuits, 7th Edition, Pearson Prentice Hall.

ERT 106/3
BIOCHEMISTRY

Course Synopsis

The topics covered in this course include the origin of life and structure of prokaryotes and eukaryotes cells, properties of water and structure, classification and function of biomolecules such as carbohydrates, lipids and amino acids. The role of proteins and enzymes in biochemistry, purification of protein, molecular biology and genetics will be featured in the course. Electron transportation, citric acid cycle and photosynthesis in biological processes will also be briefly highlighted in this course.

Course Outcomes

1. Ability to define and describe the biochemical concepts and terms associated with life.
2. Ability to differentiate the structure, classification and function of carbohydrates, lipids and nucleic acids.

3. Ability to evaluate the role of proteins in biochemistry and purification of proteins. To introduce enzymes.
4. Ability to illustrate electron transportation, citric acid cycle and photosynthesis in biological processes.

References

1. McKee, T. & McKee, J. 2003. *Biochemistry, 3rd Edition*, McGraw Hill. New York.
2. Voet D. & Voet, J.G. 2004. *Biochemistry 3rd Edition*, Wiley International Edition, New York.
3. Elliott, W.H. & Elliott, D.C. 2005. *Biochemistry 3rd Edition*. Oxford University Press
4. Campbell, M.K. & Farrell, S.O. 2006. Biochemistry 5th Edition. Belmont, CA.
5. Mathews, C.K., van Holde, K.E. & Ahern, K.G. 2000. Biochemistry 3rd Edition. Benjamin Cumming, San Francisco.

ERT 107/3
MICROBIOLOGY FOR BIOPROCESS ENGINEERING

Course Synopsis

This course covers the role of bacteria, fungi and virus in bioprocess industries. Comparison of prokaryotes and eukaryotes; microbial metabolism; microbial growth kinetics and fermentation process; and factors contributing to productivity, spoilage and preservation in food and industrial microbiology are also discussed.

Course Outcomes

1. Ability to define and describe important concepts and terminology in microbes and their metabolism.
2. Ability to demonstrate practices in microscopy, staining, sterilization, isolation and identification of bacteria and fungi.
3. Ability to define, describe and apply microbial growth in fermentation and biological process.

References

1. Prescott, L. M., Harley, J. S & A. Klein, D. A. 2005. *Microbiology*. McGraw Hill.
2. Bauman, R. 2006. *Microbiology with diseases by taxonomy 2nd Edition.* Pearson Education, Prentice Hall.
3. Cowan, M.K. 2006. *Microbiology: a systems approach 1st edition.* McGraw-Hill Higher Education.
4. Black, J.G. 2005. *Microbiology: principles and explorations 5th edition.* John Wiley, New York.
5. Waites, M.J., Morgan, N.L., Rockey, J.S. & Higton, G.H. 2001. *Industrial Microbiology: An Introduction.* Blackwell Science, United Kingdom.

ERT 108/3
PHYSICAL CHEMISTRY

Course Synopsis

This course is designed to prepare engineering students for advance knowledge in chemistry such as thermodynamics, chemical equilibria and chemical kinetics.

Course Outcomes

1. Ability to define and apply the phenomena, basic concepts, laws and principles in physical chemistry.
2. Ability to calculate and solve a problem concerning physical chemistry.
3. Ability to illustrate various fundamental laws in physical chemistry.

References

1. Atkins, P and de Paula, Julia. 2006. *Physical Chemistry*. Oxford University Press, 8th Edition.
2. Bahl, B.S.; Bahl, Arun & Tuli, G.D. 2006. *Essentials of Physical Chemistry*. S. Chand, New Delhi.
3. Paul Monk, 2004. *Physical Chemistry*, John Wiley & Sons.
4. Levine I. N. , 2002. Physical Chemistry, McGraw Hill, 5th Edition.
5. Silbey R. J., Alberty R. A., Bawendi M. G. 2005. Physical Chemistry, John Wiley & Son, Inc., 4th Edition.

ERT 206/4
THERMODYNAMICS

Course Synopsis

This course covers the concept of chemical and biochemical engineering thermodynamics. It provides the basic tools necessary for the students to be exposed to the fundamentals properties of thermodynamics and the law of thermodynamics in engineering systems. Also are provided with a comprehensive exposure to the theory as well as to the application of thermodynamics solution and the equation of state for pure and mixture fluids, the phase equilibrium and chemical reaction equilibrium calculations.

Course Outcomes

1. Ability to analyze and evaluate the fundamentals properties of thermodynamics and apply the law of thermodynamics in engineering systems.
2. Ability to calculate heat, work and other thermodynamics properties ideal fluid, solve problems for real fluids using volumetric equations of state and develop thermodynamic properties relations.

3. Ability to analyze the theory of the solution thermodynamics as well as the equation of state for pure and mixture fluids and to calculate phase equilibrium and chemical reaction equilibrium calculations.

References

1. Smith, J.M., Van Ness, H.C. and Abbort, M.M. 2005. Introduction to Chemical Engineering Thermodynamics, Seventh Edition, McGraw-Hill..
2. Cengel, Y.A. and Boles, M.A. 2007. Thermodynamics-An engineering Approach, 6th edition, McGraw-Hill.
3. Iynkaran, K., David, J. and Tandy. 2004. Basic Thermodynamics – Applications and Pollution Control, 2nd edition, Pearson Prentice Hall.
4. Daubert, Thomas, E. 1985. Chemical engineering Thermodynamics, McGraw-Hill.
5. (The book is in bahasa version available at the library, translated by Prof. Mashitah Hassan, 1990)

ERT 207/4
ANALYTICAL CHEMISTRY

Course Synopsis

This course introduces and discusses the basic principle of analytical chemistry that covers data analysis and interpretation. Basic statistics and the utilization of statistics are applied in most of the analytical methods. To introduce, discuss and apply classical analytical methods such as gravimetriy and titrimetry. This course also meant to introduce, discuss and apply modern methods in analytical chemistry such as chromatographic and spectroscopic technique.

Course Outcomes

1. Ability to analyze the correct statistical method for data analytical and to remember the steps in quantitative analysis
2. Ability to evaluate the concentration of analytes of various classical titrimetric (acid-base, complexation, redox and precipitation) and gravimetric methods for mass determination
3. Ability to evaluate modern chromatography and spectroscopic principles and to interpret and calculate the sample concentration.

References

1. Christian, G. D. 2004. Analytical chemistry. 6th ed. John Wiley & Sons, Inc.
2. Harvey, D. 2000. Modern Analytical Chemistry. McGraw-Hill.
3. Keeley, D and Haines, P. J. 2002. Analytical Chemistry. Oxford: Bios Scientific
4. Skoog, D. A., West, D. M. and Holler, F. J. 1996. Fundamentals of Analytical Chemistry. Saunders College Publication
5. David S. Hage and James R. C. 2010. Analytical Chemistry and Quantitative Analysis. First edition. Prentice Hall.
6. James Miller and Jane C Miller. 2010. Statistics and Chemometrics for Analytical Chemistry (6th Edition), Pearson Education Canada

ERT 213/3
PROCESS INSTRUMENTATIONS

Course Synopsis

The course objective is to prepare the students with the necessary skills in the process industry. The course begins with introduction to process measurements involved in the process industries, followed by introduction to fundamental of industrial valves. Students then will be taught about ISA symbology, where students will be taught with the universal symbols used in process industry. Students then will be taught how to write the identification letter as well as the tag numbers for unit operation and piping. To complete the course, students will learn how to read and develop process flow diagram (PFD) and also piping and instrumentation diagram (P & ID).

Course Outcomes

1. Ability to describe and discuss the function of different types of valves; describe and discuss the operational aspects of the valves.
2. Ability to discuss and compare the function and operational aspects of pumps, fans, blowers and compressors.
3. Ability to develop the process flow diagram by applying the ISA symbology.
4. Ability to develop the piping and instrumentation Diagram by applying the ISA symbology.

References

1. Smith, C.A. and Corripio, A. 2006. *Principles and Practice of Automatic Process Control, Third Edition,* John Wiley.
2. McCabe, W.L., Smith, J.C. and Harriott, P. 2005. *Unit Operations of Chemical Engineering, Seventh Edition,*McGraw-Hill.
3. Skousen, P.L. 2004. *Valve Handbook, Second Edition,* McGraw-Hill.
4. Perry, R.H. and Green, D.W. 1997. *Perry's Chemical Engineers' Handbook, Seventh Edition,* McGraw-Hill.
5. Murrill, P.W. 2000. *Fundamentals of Process Control Theory, Third Edition*, ISA.

6. McAvinew, T. and Mulley, R. 2005. *Control System Documentation: Applying Symbols and Identification, Second Edition,* ISA.
7. Meier, F.A., and Meier, C.A. 2004. *Instrumentation and Control Systems Documentation,* ISA.

ERT 214/4
MATERIAL AND ENERGY BALANCE

Course Synopsis

This course starts with engineering calculations. Students are taught to interpret series of data and to interpret graphs. Material balance as well as energy balance also will be covered in the course. The course will be completed with the introduction of several methods in calculating material balance and energy balance in a system.

Course Outcomes

1. Ability to solve basic engineering calculations, convert units in the same dimensions and scientifically interpret series of data.
2. Ability to identify single unit and multiple unit processes, distinguish parameters given in order to find a solution. Students are able to discuss mass balance concept and solv e material balance problems.
3. Ability to measure parameters, solve energy balance problems and discuss energy balance concepts.
4. Ability to evaluate steam tables to solve problems in a system and also analyze all possible information data given in a system to provide a solution combining of material and energy balance.

References

1. Felder, R. 2005. Elementary Principles of Chemical Processes, John-Wiley, 3rd Update Edition.
2. Himmelblau, R. 7th Edition. Basic Principles and Calculations in Chemical Engineering, Prentice Hall.
3. Bailey and Ollis. 2005. Biochemical Engineering Fundamentals, McGraw Hill, 2nd Edition.
4. Doran, M.P. 1995. Bioprocess Engineering Principles, Elsevier Science.
5. Richardson, J.F. 1994. Chemical Engineering, Volume 3, Prentice Hall.
6. Reklaitis G.V. 1983. Introduction to Material and Energy Balance, John Wiley.

ERT 215/3
FLUID MECHANICS

Course Synopsis

This course emphasizes fundamental concepts and problem-solving techniques. Topics to be covered include fluid properties, static and kinematics, control volume analysis, momentum analysis of flow system, dimensional analysis, internal flows (pipe flows), differential analysis, and external flows (lift and drag).

Course Outcomes

1. Ability to analyze the essential parameters describing a fluid system and demonstrate dimensional analysis and homogeneity.
2. Ability to calculate pressures, forces, and stability in static fluid systems and identify whether a flow is steady or unsteady, uniform or non-uniform, laminar of turbulent and flow rate in dynamic fluid system and distinguish the link between conserved quantities and the equations of fluid mechanics.
3. Ability to evaluate appropriate control volumes and surfaces for developing the equations of fluid mechanics and analyse phenomena associated with external flow.

References

1. Cengel, Cimbala. 2006. Fluid Mechanics; Fundamentals and Applications. N.Y. Mc Graw Hill.
2. Mott, R.L. 2006. Applied Fluid Mechanics, 6th Edition, Prentice Hall.
3. Crowe, C.T., Elger, D.F., Robertson, J.A. 2005. Engineering Fluid Mechanics, John Wiley, 8th Edition.
4. Bruce, R.M., Donald, F.Y. and Okishi, T.H. 1990, Fundamentals of Fluid Mechanics, John Wiley and Sons.
5. Dauglas, J.R. 1991. Fluid Mechanics, 3rd Ed., Pitman.

ERT 216/4
HEAT & MASS TRANSFER

Course Synopsis

This course covers the modes of heat transfer, which are conduction, convection and radiation, the application of the principle in various unit operations in plant. The principle of mass transfer will also be discussed. The application of mass transfer will be covered in the next course called bioseparation engineering and unit operation.

Course Outcomes

1. Ability to calculate mode of heat transferred.
2. Ability to calculate mode of mass transferred.
3. Ability to evaluate heat transfer knowledge as well as designing heat transfer equipment.

References

1. Christie J. Geankoplis. 2003. Transport Processes and Separation Process Principles: Includes Unit Operations. McGraw-Hill, Fourth Edition.
2. Holman J.P. 2001. Heat Transfer, Eighth SI, McGraw-Hill.
3. McCabe *et. al*. 2005. Unit Operations of Chemical Engineering, McGraw Hill, New York.
4. Doran M. P. 2006. Bioprocess Engineering Principles, Academic Press, London.
5. Incropera, F. P. and De Witt, D. P. 2006. *Fundamentals of heat and mass transfer*, 6th Ed, Wiley, New York.

ERT 314/4
BIOREACTOR SYSTEM

Course Synopsis

This course will provide an introduction to the fundamental ideas of the bioreactor design and operations. It will also develop students' knowledge and understanding the important principles and techniques that are used in the design and analysis of various types of bioreactor system for microbial, animal and plant cell cultures. It also covers relevant issues in bioreactor system such as scaling up/down, instrumentation and control of bioreactor as well as sterilization.

Course Outcomes

1. Ability to design and formulate fermentation media and decide on the types of carbon and nitrogen source.
2. Ability to recognize, compare and draw the schematic diagram for specific types of bioreactors.
3. Ability to design a stirred tank bioreactor according to the specific application.
4. Ability to develop scale up based on geometric similarities or constant power number.

References

1. Doran, P. M. 2006. Bioprocess Engineering Principles. London: Academic Press.
2. Shuler, M. L. and Kargi, F. 2001. Bioprocess Engineering: Basic Concepts. 2nd Ed. Upper Saddle River, NJ: Prentice Hall PTR.
3. Asenjo, J. A. and Merchuk, J. A. 1995. Bioreactor System Design. New York: Marcel Dekker Inc.
4. Najafpour, G.A. 2007. Biochemical Engineering and Biotechnology. Amsterdam: Elsevier B.V.
5. Mitchell, D. A., Krieger, N. and Berovic, M. 2006. Solid-state fermentation bioreactors: Fundamentals of design and operation. Springer Berlin Heidelberg.
6. Scragg, A. H. 1992. Bioreactors in Biotechnology: A Practical Approach. Ellis Horwood.
7. Stanbury, S.F. and Whitaker, A. 1984. Principle of Fermentation Technology. New York: Pergamon Press.

ERT 316/3
REACTION ENGINEERING

Course Synopsis

Reaction Engineering is concerned with the exploitation of reactions on a commercial scale. Its goal is to familiarize with different designs of reactors. It also emphasizes qualitative arguments, simple reactor sizing method, graphical procedures, and frequent comparison of capabilities of the major reactor types. Simple ideas are treated first, and then extended to more complex problems.

Course Outcomes

1. Ability to categorize design equation for most common industrial reactors and calculate the rate law and rate law parameters.
2. Ability to calculate Residence Time Distribution (RTD) functions in non-ideal reactors.
3. Ability to develop conversion and sizing for chemical reactors and to explain steady-state isothermal reactor.
4. Ability to evaluate the difference of catalysis and catalytic reactions.

References

1. Fogler, H. S. 2006. Elements of Chemical Reaction Engineering. 4th ed. Prentice Hall Inc. U.S.
2. Levenspiel, O. 2001.Chemical Reaction Engineering. 3rd ed. John-Wiley. U.S.
3. Davis, M. E and Davis, R. J. 2002 Fundamentals of Chemical Reaction Engineering. 1st ed. Mc Graw Hilll, U.S.
4. Fogler, H. S. 2010. Essentials of Chemical Reaction Engineering. 1st ed. Prentice Hall. U.S.
5. Salmi, T. O., Mikkola, J. P. and Warna, J. P. 2010. Chemical Reaction Engineering and Reactor Technology (Chemical Industries). CRC Press.

ERT 317/4
BIOCHEMICAL ENGINEERING

Course Synopsis

This course focuses on the interaction between chemical engineering, biochemistry, and microbiology. Mathematical representations of microbial systems are featured among lecture topics. Kinetic of growth, death and metabolism are also covered. Batch and continuous fermentation and the effect of agitation, mass transfer and enzyme technology are included. The laboratory exercises introduce students to the fundamental practices in biochemical engineering.

Course Outcomes

1. Ability to develop anzyme reactions based on its kinetics study and applied catalysis.
2. Ability to evaluate microbial system based on its metabolic pathways and kinetics study in batch and continuous cultures.
3. Ability to propose bioconversion technologies of microbial, plant and animal cell culture for the production of value-added product.

References

1. Shuler, M. L. and Kargi, F. Latest Edition. *Bioprocess Engineering: Basic Concept. 3rd Ed.* Upper Saddle River, NJ: Prentice Hall PTR.
2. Dutta, R. 2008. *Fundamentals of Biochemical Engineering.* New Delhi: Ane Books India.
3. Katoh, S. and Yoshida, F. 2009. *Biochemical Engineering: A Textbook for Engineers Chemists and Biologists*. Weinheim: Wiley-VCH Verlag GmbH & Co.
4. Nielsen, J., Villadsen, J. and Gunner L. 2011. *Bioreaction Engineering Principles*. *3rd Ed*. New York: Springer Science+Bussiness Media.
5. Najafpour, G.A. 2007. *Biochemical Engineering and Biotechnology*. Amsterdam: Elsevier B.V.

ERT 318/4
UNIT OPERATIONS

Course Synopsis

This course includes introduction to mass transfer theories and applications followed by specialized unit operations including gas absorption, distillation, adsorption, liquid-liquid extraction, solid-liquid extraction (leaching), membrane separation process, filtration and centrifugation. The theory is supported by performing laboratory experiments.

Course Outcomes

1. Ability to develop a basic design for single effect and multiple-effect evaporators, packed cooling towers.
2. Ability to develop and evaluate a basic design for gas-liquid separation and vapour-liquid separation equipment.
3. Ability to characterize solid particle, identify different types of size reduction equipment, and to apply equation for one-dimensional motion of particles through a fluid.

References

1. McCabe, W. L., Smith, J. C. and Harriott, P. 2004. Unit Operations of Chemical Engineering, McGraw-Hill.
2. Geankoplis, C.J. 2003. Transport Processes and Separation Process Principles, Prentice Hall.
3. Seeder, J.D. and Henly, E. J. 2006. Separation Process Principles, John Wiley and Son.
4. Wankat, P. C. 2006. Separation Process Engineering, Pearson Education.
5. Benitez, J. 2009. Principles and Modern Applications of Mass Transfer Operations, John Wiley and Son.

ERT 319/3
INDUSTRIAL WASTE TREATMENT

Course Synopsis

This course covers waste treatment methods that are commonly used in industries. It's introduced to the terms that are related to *waste* and how to calculate the properties such as *biological oxygen demand* (BOD), *chemical oxygen demand* (COD) and *total carbon* (TOC). From these calculations and other given information, basic unit operations involved in the treatment of waste can be design. This course also give an understanding on the processes involved in waste treatment for different industries keeping in view of the Environmental Impact Assessment (EIA), Life Cycle Assessment (LCA) and legal framework.

Course Outcomes

1. Ability to calculate the physical, chemical, and biological properties of waste material.
2. Ability to calculate and compare the treatment methods for particular waste.
3. Ability to design and evaluate various unit operations for waste treatments.
4. Ability to propose the landfill, incineration waste treatments and waste management systems.

References

1. Metcalf and Eddy. 2003. Wastewater Engineering: Treatment and Reuse, Inc, 4th Ed. (or latest edition) Mc Graw-Hill.
2. Davis, M.L. and Cornwell, D.A. 1998. Introduction to Environmental Engineering, 3rd Ed., Mc Graw-Hill.
3. Paul T. W. 2005. Waste Treatment and Disposal, 2nd Ed., John Wiley.
4. Droste, R.L. 1997. Theory and Practice of water and wastewater treatment, John Wiley.

5. Nelson, L. N. 2006. Industrial Waste Treatment, Elsevier Science & Technology Books.
6. Wang, L. K., Hung, Y.T., Lo, H.H. and Yapijakis, C. 2006. Waste Treatment in The Process Industry, Taylor and Francis.

ERT 320/3
BIOSEPARATION ENGINEERING

Course Synopsis

This course focuses on the the recovery, isolation, purification and polishing of products synthesized by biotechnological processes like r-DNA technology, conventional microbial fermentation and enzyme technology. The principles, advantages and limitations of certain purification units also discussed. At the end of this course, students are able to understand the process involved in bio separation and propose a suitable process for different types of product in integration of bio separation schemes.

Course Outcomes

1. Ability to analyze process and important parameters involved in recovery and isolation of bioproducts for selected bioseparation units.
2. Ability to evaluate process and important parameters involved in purification and polishing steps of bioproducts for selected bioseparation units.
3. Ability to propose bioseparation techniques/processes and RIPP (Recovery, Isolation, Purification and Polishing) scheme.

References

1. Harrison, R.G. Todd, P., Rudge S.R. and Petrides D.P. 2003. Bioseparations Science and Engineering, Oxford University Press.
2. Rajni Hatti-Kaul et al. 2003. Isolation and Purification of proteins (Biotechnology and Bioprocessing), Marcel Dekker Ltd.
3. Sabramanian Ganapathy. 1998. Bioseparation and Bioprocessing. A handbook, 2nd Edition, Wiley.
4. Paul, A. Belter, Clussler, E.L. and Wei-Shou Hu. 1998. Bioseparations: Downstream Processing for Biotechnology, Wiley.
5. Michael S. Verral. 1996. Downstream Processing of Natural Products, A Practical Handbook, Wiley.
6. Sivasankar, B. 2006. Bioseparations: Principles and Technique, Prentice Hall.
7. Ladisch, M. R. 2001. Bioseparations Engineering: Principles, Practice and Economics, Wiley- Interscience.

ERT 321/4
PROCESS CONTROL & DYNAMICS

Course Synopsis

This course includes an introduction to process control and dynamics, feedback controllers, control system instrumentation, overview of control system design, theoretical models, dynamic behavior of processes, PID controller design and troubleshooting. The theory is supported by performing laboratory experiments.

Course Outcomes

1. Ability to derive and develop theoretical model of chemical processes, analyze Laplace transform techniques to simplify first order and second order processes and creat transfer functions and state space models.
2. Ability to develop dynamic behavior of first and second order processes, analyze dynamic response characteristics of more complicated processes and development of empirical models from process data.
3. Ability to analyze control system instrumentation and propose feedback control system for bioprocess and chemical processes.
4. Ability to calculate and analyze dynamic behavior of closed-loop control system.

References

1. Seborg, D.E., Edgar, T.F., Mellicamp D.A. 2011. Process Dynamic and Control. John-Wiley, 3rd Edition.
2. Riggs, J.B. 2006. Chemical and Bioprocess Control. Pearson.
3. Bequette, B.W. 2003. Process Control; Modelling, Design, and Simulation. Prentice Hall.
4. Marlin, T. 2002. Process Control: Designing Processes and Control System for Dynamic Performance. McGraw-Hill.
5. Coughonowr. 2001. Process system, Analysis and Control, 3rd edition, McGraw-Hill.

ERT 322/3
SAFETY & LOSS PREVENTION

Course Synopsis

This course covers the fundamental of process safety specifically toxicology, industrial hygiene, sources model, fires and explosions as wells as relief concept design. The students are also exposed to hazard identification, risk assessment and accident investigation. The course will be concluded with biohazard and biosafety in bioprocess.
Course Outcomes

1. Ability to analyze the source, toxic release and dispersion models and evaluate the significance of the events.

2. Ability to distinguish fires and explosion as well as examine ways to prevent it.
3. Ability to evaluate relief concepts as well as calculate or sizing the relief system.
4. Ability to propose and evaluate process safety to identify the hazard and risk in the industry.

References

1. Mohanad El-Harbawi .2010. Process Safety and Loss Prevention, LAP Lambert Academic Publishing AG & Co KG.
2. Crowl, D. A., Louvar, J. F. 2002. Chemical Process Safety; Fundamentals with Applications. 2nd edition, Prentice Hall, New Jersey.
3. Mannan, S. 2005. Lee's Loss Prevention in the Process Industries: Hazard Identification, Assessment and Control, 3rd edition, Butterworth-Heinemann, Massachusetts.
4. Sanders, R. E. 2005. Chemical Process Safety; Learning From Case Histories. Elsevier Butterworth Heinemann, Third Edition. Amsterdam.
5. Dennis P. Nolan 2010. Loss Prevention and Safety Control: Terms and Definition, Saudi Aramco, Dhahran, Saudi Arabia , USA, CRC Press.

ERT 323/2
SIMULATION FOR BIOPROCESS ENGINEERING

Course Synopsis

The course covers introduction of simulation of bioprocess, material and energy balances, equipment sizing and costing, and environmental impact assessment. Students are exposed to the usage of SuperPro design software for modeling and simulation purposes. Subsequently, sustainability assessment will be introduced, emphasizing on economic and profitability analysis.

Course Outcomes

1. Ability to apply and analyze engineering calculation like mass and energy balance, stoichiometry and kinetics of the bioprocess.
2. Ability to analyze processand organize unit operation in bioprocess using simulation software.
3. Ability to analyze, collect and organize economic process data and apply environmental impact and sustainability assessment.

References

1. Heinzle, E. Biwer, A. P. and Cooney C. L. 2007. Development of Sustainable Bioprocesses: Modelling and Assessment. Wiley.
2. Dunn, Irving J., Heinzle, Elmar, Ingham, John, and Prenosil, Jiri E. 2003. Biological Reaction Engineering Dynamic Modelling Fundamentals with Simulation Examples 2nd Edition. John Wiley.
3. Shuler, M.L. 2001. Bioprocess Engineering: Basic Concepts. 2nd Edition. Prentice-Hall.

ERT 424/3
BIOPROCESS PLANT DESIGN 1

Course Synopsis

Bioprocess Engineering Design is a 2 part course covering aspects of engineering design related to open-ended design projects at professional level engineering design task in bioprocess engineering field. The design project is a team-based approach to provide capstone design experience emphasizing on the application of sciences, mathematics and engineering science acquired in earlier course work in design of projects. The scope of the course covers the knowledge on the elements in project formulation, planning/scheduling, management and communication, engineering economics including cost-benefits analysis and budgeting, critical thinking, ethics and safety in engineering design, fundamental in engineering design methodology (the process and tools) and systems engineering. Analysis of case studies pertaining to engineering issues in design.

Course Outcomes

1. Ability to differentiate between ethical and legal issues and relate how these are related to design projects in bioprocess engineering field.
2. Ability to demonstrate team work through group weekly meetings, project planning and management, analysis of case studies and class presentation.
3. Ability to analyze and assess the impact of design and engineering solutions on society and environment.
4. Ability to evaluate economic and feasibility study of a design project in bioprocess engineering.
5. Ability to compose engineering problems and alternative solutions and formulate a sound proposal in bioprocess engineering project using systematic design process.

References

1. Sinnott, R.K. 2012. Chemical Engineering Design. Vol.6, 3rd ed. Butterworth-Heinemann.
2. Seider, W.D., Seader, J.D., Lewin, D.R., Widagdo, S. 2010. Product and Process Design Principles: Synthesis, Analysis and Evaluation, 3rd Edition. John Wiley & Sons, New Jersey
3. Peters, M.S. and Timmerhaus, K.D. 2002. Plant Design and Economics for Chemical Engineers. 5th ed. McGraw-Hill, New York.

4. Douglas, J.M. The Conceptual Design of Chemical Processes. 1998. McGraw-Hill, New York.
5. Turton, Richard, Bailie, Richard C., Whiting Wallace B. and Shaeiwitz, Joseph A. 1997. Analysis, Synthesis and Design of Chemical Processes. Prentice Hall.

ERT 425/3
GOOD MANUFACTURING PRACTICE FOR BIOPROCESS INDUSTRIES

Course Synopsis

This course gives complete overview about the production facility from start of the project up to the production process and how to carry out all project steps according to the guidelines of the GMP. Topics include the background to GMP and cGMP regulations and guidelines and their relevance in the laboratory, process development and pilot plant.

Course Outcomes

1. Ability to analyze the concepts and the requirements of GMP and Validation, the Standard Operation Procedure (SOP) and Safety and Health Environment (SHE) aspects.
2. Ability to develop the GMP requirement and primary and secondary bioprocess engineering products, together with the Hazard Analysis and Critical Control Point (HACCP).
3. Ability to evaluate the utilities and services, laboratory design, process development facilities and pilot manufacturing facilities.

References

1. Nally, J.D. 2007. Good Manufacturing Practices for Pharmaceuticals, Sixth Edition, Informa Healthcare Inc, New York, USA.
2. Alli, I., Food, Quality Assurance, CRC PRESS, New York, 2004.
3. Bliesner, D.M. 2006. Establishing A Cgmp Laboratory Audit System: A Practical Guide, John Wiley & Sons, Inc., Hoboken, New Jersey.
4. Bennet, B. 2003. Pharmaceutical Production: an Engineering Guide, Institution of Chemical Engineers (IChemE), Warwickshire, UK.
5. WHO Guidelines, Quality assurance of pharmaceuticals, Good manufacturing practicesand inspection, WHO Press, World Health Organization, Geneva, Switzerland, 2007.

ERT 426/3
FOOD ENGINEERING

Course Synopsis

This course covers multidisciplinary field of applied physical sciences which combines science, microbiology, and engineering education for food and related industries. Topics to be covered include introduction to food engineering, food ingredients, nutrition, nutritional information, spoilage, food production systems, preservation processes, freezing, drying, direct-heating, radiation, extrusion and packaging.

Course Outcomes

1. Ability to differenciate types of food processing ingredients and calculate the nutrition information in food.
2. Ability to differentiate the function of food processing operations and propose a suitable system for a certain application.
3. Ability to assess the problems that involved in food engineering operations.

References

1. Singh, R. Paul and Dennis, R. H. 2009. Introduction to Food Engineering, Fourth Edition (Food Science and Technology). Academic Press. Elsevier.
2. Side, Catherine “Food Product Development: Based on Experience”, Wiley-Blackwell, 2008.
3. Barbosa-Cánovas, Gustavo V. Schmidt, Shelly Fontana, Anthony. 2008. Water Activity in Foods: Fundamentals and Applications, Wiley-Blackwell.
4. Williams, C. 2006. Improving the Fat Content of Foods, Woodhead Publishing, Limited.

ERT 427/3
DESIGN OF EXPERIMENTS

Course Synopsis

The course begins with the strategy of experimentation using appropriate statistical software. Calculation on analysis of variance is also included as well as 2^k factorial design and 2^{k-p} fractional factorial design. Further study on Response Surface Methods (RSM) such as Central Composite Design (CCD) and Box-Behnken designs for fitting a second order model. The incorporation of Design of Expert software in analyzing the chemical or biochemical process will make the students learning more effective. Finally, introduction to Taguchi approach to process optimization is discussed.

Course Outcomes

1. Ability to apply and analyze principles for designing experiment and building empirical models.
2. Ability to calculate and evaluate the analysis of variance and principles of factorial design.

3. Ability to design for fitting first order and second order model using Response Surface Methodology.

References

1. Douglas C.Montgomery. 2012. Design and analysis of experiments, 8th Edition", Wiley and Sons Inc.
2. Douglas C.Montgomery, George C.Runger. 2011. Applied Statistics and probability for engineers 5th edition", John Wiley and Sons Inc.
3. Douglas C.Montgomery. 2012. Design and analysis of experiments, International Student Version, 8th Edition", Wiley and Sons Inc.
4. Douglas C.Montgomery, George C.Runger, Norma F. Hubele. 2011. Engineering Statistics, SI Version, 5th Edition, John Wiley and Sons Inc.
5. Raymond H.Myers, Douglas C.Montgomery. 1995. Response Surface Methodology, Process and product optimization using designed experiments, John Wiley and Sons Inc.

ERT 428/4
BIOPROCESS PLANT DESIGN 2

Course Synopsis

This course requires student to work in a pre-determined group to solve a practical and industrially relevant design problem in the same way as might be expected in an industrial situation. The scope of the class is to develop and evaluate process alternatives via rigorous simulation, perform equipment sizing, optimise various process units, analyse the safety and environmental impact of the process, estimate capital and operating costs, and assess plant profitability to meet desired project needs within realistic constraint. The use of modern engineering design practices, tools and product/solution development process, trouble-shooting methodology, learn and utilise a realistic simulation of the real-world design process, engineering analysis and synthesis through their projects Knowledge integration from other Bioprocess Engineering courses is required to identify, solve, and design solution for complex engineering problems.

Course Outcomes

1. Ability to conduct engineering analysis and adeptly apply principles and tools of mathematics and science to solve multi-facetted design project to produce credible conclusions.
2. Ability to formulate and produce solutions that properly address critical issues and assumptions that are conceptually and contextually valid and meet client expectation.
3. Ability to design component, equipment, process, plant and systems in bioprocess engineering using engineering tools and design softwares for optimum performance.
4. Ability to display understanding of bioprocess engineering project and integrate the design for manufacturability, utility and sustainability.
5. Ability to write project report that conforms to engineering professional standard and to perform verbal presentation on the project.

References

1. Sinnott, R.K. 2012. Chemical Engineering Design. Vol.6, 3rd ed. Butterworth-Heinemann.
2. Seider, W.D., Seader, J.D., Lewin, D.R., Widagdo, S. 2010. Product and Process Design Principles: Synthesis, Analysis and Evaluation, 3rd Edition. John Wiley & Sons, New Jersey
3. Peters, M.S. and Timmerhaus, K.D. 2002. Plant Design and Economics for Chemical Engineers. 5th ed. McGraw-Hill, New York.
4. Douglas, J.M. The Conceptual Design of Chemical Processes. 1998. McGraw-Hill, New York.
5. Turton, Richard, Bailie, Richard C., Whiting Wallace B. and Shaeiwitz, Joseph A. 1997. Analysis, Synthesis and Design of Chemical Processes. Prentice Hall.

ERT 429/3
ENERGY FROM BIORESOURCES

Course Synopsis

This course introduces energy production that can be generated from bioresources or biomass which is an alternative way of producing energy from fossil-based fuels. This course emphasizes the use of more environmental-friendly technologies which can lead to reduction of pollution, thus sustaining the ecology system. The contents cover the characteristics of biofuels, bioresources suitable for conversion technologies, biological routes and chemical routes in producing fuels, and also the limitations of bioconversion processes.

Course Outcomes

1. Ability to differentiate the characteristics of biofuels and compare the process descriptions of various biofuel production.
2. Ability to evaluate the limitations of biofuel productions processes.
3. Ability to propose a biofuel production process from potential biological feedstocks.

References

1. Cheng, J. 2010. Biomass to Renewable Energy Processes. CRC Press.
2. Vertes, A., Qureshi, N., Blaschek, H. P. and Yukawa, H. 2010. Biomass to Biofuels: Strategy for Global Industries, John Wiley & Sons, Ltd.
3. Pandey, A. 2009. Handbook of Plant-based Biofuels, CRC Press.
4. Brown, R. C. 2003. Biorenewable Resources: Engineering New Products From Agriculture, Iowa State Press.
5. Lee, S., Speight, J. G. and Loyalka, S. K. 2007. Handbook of Alternative Fuel Technologies, CRC Press.

ERT 430/3
PHARMACEUTICAL PROCESS ENGINEERING

Course Synopsis

The course includes the principles of drug pharmacokinetics: absorption, distribution, metabolism and excretion of drugs. This course also covers the scientific and technological aspects of the designing and manufacturing of pharmaceutical products.

Course Outcomes

1. Ability to explain the basic concept of drug absorption and disposition and analyze the related pharmacokinetics.
2. Ability to evaluate the pharmaceutical engineering processes in pharmaceutical formulation and production.
3. Ability to design pharmaceutical facilities.

References

1. Bennet, B. and Cole, G. Pharmaceutical Production: An Engineering Guide. Warwickshire: Institution of Chemical Engineers (IChemE)., 2003.
2. Aulton M. E., Pharmaceutics. The science of dosage form design. 2nd Edition. London: Churchill Livingstone., 2002.
3. David J. am Ende, Chemical Engineering in the Pharmaceutical Industry: R&D to Manufacturing, New Jersey, USA: John Wiley & Sons, Inc., 2011.
4. Blacker A. John, Williams Mike T., Pharmaceutical Process Development - Current Chemical and Engineering Challenges, Royal Society of Chemistry, UK: Cambridge., 2011.
5. Anthony J. Hickey, David Ganderton. Pharmaceutical Process Engineering: 2nd Edition. New York: Informa Healthcare., 2009
6. Sambamurthy K., Pharmaceutical Engineering. New Delhi: New Age International Publishers. 2012

ERT 445/2
FINAL YEAR PROJECT 1

Course Synopsis

This course consists of lecture and independent study on the technique of conducting literature review, identification of problem statements, project objectives and research methodology. The students are guided on the proper techniques and format of thesis writing, submit the project proposal and present to the internal examiners.

Course Outcomes

1. Ability to synthesize information including standards, code of practice, journals, policies, field data, etc, relevant to the specific research to be undertaken and relate with societal and global issues.Ability to review information source then recognize, construct and justify the suitable research information.
2. Ability to analyze scenario and compose the problem statements and the research objectives of the project.
3. Ability to formulate research methodology incorporating clear fundamentals, theories and benchmarked against standard practices governing the research project.
4. Ability to prepare and defend research proposal with effective communication skills.

References

1. Donald, H. McBurney and Theresa, L. White. 2007. Research Methods, 7th Edition, Thomson Wadsworth.
2. Leo Finkelstein, Jr. 2008. Pocket Book of Technical Writing for Engineers and Scientist. 3rd Edition, McGraw Hill.
3. Rowena, M. 2006. How to write a thesis. Open University Press. England.
4. Hoang, P. 2006. Springer Handbook of Engineering Statistic. Springer-Verlang, London.
5. Bailey, S. 2003. A practical guide for students. TJ International Ltd. USA.
6. A Guide To Student Final Year Project, 2003. UniMAP.
7. Daniel Holtom and Elizabeth Fisher. 1999. Enjoy Writing Your Science Thesis or Dissertation, Imperial College Press.
8. Academic journals.

ERT 446/4
FINAL YEAR PROJECT 2

Course Synopsis

This course consists of lectures and independent study on the techniques of conducting laboratory and/or field experiments. The students are guided on the techniques and implementation of research and monitored based on the research plan, data analysis, interpretation and conclusion. The students are required to write, submit and defend their thesis to the internal examiner.

Course Outcomes

1. Ability to conduct research experiments, analyze and interpret data and deduce good conclusion.
2. Ability to use techniques and modern tools to solve research problems.
3. Ability to plan activities pertaining to research project and execute the plan to meet the required research objectives and datelines.
4. Ability to write research report that conforms to standard thesis format and performs verbal presentation.

References

1. Donald, H. McBurney and Theresa, L. White. 2007. Research Methods, 7th Edition, Thomson Wadsworth.
2. Leo Finkelstein, Jr. 2008. Pocket Book of Technical Writing for Engineers and Scientist. 3rd Edition, McGraw Hill.
3. Rowena, M. 2006. How to write a thesis. Open University Press. England.
4. Hoang, P. 2006. Springer Handbook of Engineering Statistic. Springer-Verlang, London.
5. Bailey, S. 2003. A practical guide for students. TJ International Ltd. USA.
6. A Guide To Student Final Year Project, 2003. UniMAP.
7. Daniel Holtom and Elizabeth Fisher. 1999. Enjoy Writing Your Science Thesis or Dissertation, Imperial College Press.
8. Academic journals.

COURSE SYLLABUS FOR BACHELOR OF ENGINEERING (Honours) (BIOSYSTEMS ENGINEERING)

ERT 101/3
BIOCHEMISTRY

Course Synopsis

The topics covered in this course include the structure of prokaryotes and eukaryotes cells. It also covers the analytical chemistry including stoichiometry, solutions, material balance and pH. It also covers the properties of water and structure, classification and function of biomolecules such as carbohydrates, lipids, protein, amino acids, enzymes and phytochemistry.

ERT 147/3
FUNDAMENTAL OF BIOSYSTEMS ENGINEERING

Course Synopsis

This course introduces concepts of biosystems engineering and its applications in the biosphere, the ecosystem and the biological systems involving microbes, plants and animals. The course covers systems methodologies, life cycle assessment, growth and feedback, biological models and data measurement and analysis with applications of conservation of mass and energy in determining the input , process and output components in agrosystems.

Course Outcomes

1. Ability to explain the scope of Biosystems engineering and its relevance to sustainable development.
2. Ability to illustrate systemic properties of biological systems; apply the system methodologies and engineering principles to the productivity of the biosystems.
3. Ability to analyze the physical and biological information for engineering analytical framework.
4. Ability to analyze the interfacing effect of bio and physical systems in term of efficiency of production.

References

1. Alocilja, E. C. 2000. *Principle of Biosystems Engineering*. Erndition Books. MN. ISBN 15-8692098-7
2. Saterbak, K. Y. Sen; L. V. McIntire. 2007. *Bioengineering Fundamentals.*
3. K Konopka. 2007. *System Biology*. ISBN 0824725204
4. Gardiner,D.T, Miller, R.W. 2008. Soils in Our Environment.11th edition. Pearson Education, Inc.,Upper Saddle River, New Jersey.
5. Lynch, Daniel R. 2009. Sustainable natural resource management for scientists and engineers, Cambridge University Press, New York

ERT 148/2
COMPUTER AIDED ENGINEERING DESIGN FOR BIOSYSTEMS ENGINEERING

Course Synopsis

This course introduces and elaborates designing and modeling techniques commonly used in mechanical and civil designs covering 2-D and 3-D geometry related to drafting and design of mechanical and structural components and / or systems in Biosystems Engineering. The primary software used is AUTODESK's AutoCAD and Inventor Pro.

Course Outcomes

1. Ability to apply Geometric construction techniques to create engineering drawings using CAD.
2. Ability to create completes 2-D and 3-D drawings pertaining to geometric transformations, projections and multiple views.
3. Ability to create curve, surfaces and geometric models.
4. Ability to design and investigate the behavior of parts and assemblies under load.

References

1. Ibrahim Zeid. CAD/CAM Theory and Practice, McGraw Hill International. New York. 2010.
2. David Madsen. Engineering Drawing and Design. Cengage Learning. 2011.
3. Ullman, D.G. The Mechanical Design Process. 3rd ed. McGraw-Hill. New York. 2003.
4. Dnaher, S. The Complete Guide to Digital 3D Design. ILEX. Cambridge. 2004.
5. Calmettes, J.M. Best of 3D Virtual Product Design. Page One Publishing Pte. Ltd. Singapore. 2005.
6. Hannah, B. Becoming a Product Designer. John Wiley and Sons. New York. 2004.

ERT 149/4
APPLIED BIOLOGY FOR BIOSYSTEMS

Course Synopsis

This course covers various aspects of biology which are necessary to comprehend several subjects in biosystems engineering such are agricultural structures, sustainable agrosystems engineering, biosystems engineering design, biomass conversion technology, postharvest engineering and bio-products manufacturing. The first aspect deals with basic biology which includes cell and biological diversity. The second aspect deals with plants and animals which includes their structure, growth, and development. The third aspect comprises applied microbiology which include application of microbiology in food & agriculture products enhancement.

Course Outcomes

1. Ability to illustrate and explain the cell and biological diversity.
2. Ability to differentiate plant and animal form and function.
3. Ability to categorize the role of microbes in agriculture and related industries.

References

1. Campbell, N.A., Reece,J.B. Campbell Biology, 9th Edition, Pearson Education, Inc., San Francisco,CA 94111., 2011
2. Belk C and Maier V B , Biology, Science for life with Physiology, 4th Edition, Pearson Education, Inc.,San Francisco, CA 94111., 2013
3. Gunstream S E.Explorations in basic biology 12th edition, Pearson Benjamin Cummings, San Francisco, California 94111, 2012
4. Kratz R F and Siegfried D R, Biology For Dummies ® 2nd Edition, Wiley Publishing, Inc. 2010
5. Madigan M T et.al, Brock biology of microorganisms 13th edition, Pearson Education, Inc.,publishing as Benjamin Cummings, San Francisco, CA 94111. 2012.

ERT 150/2
STATIC

Course Synopsis

The objective of this course is to evaluate problems related to concept of mechanics in static conditions. It covers topics of equilibrium force analysis of a particle in static conditions, equilibrium force analysis for rigid body, structural analysis, friction analysis, centre gravity and centroid analysis, and moment of inertia analysis.

Course Outcomes

1. Ability to evaluate problems related to static equilibrium force, concepts of mechanics and vector mechanics.
2. Ability to evaluate problems related to moment of a force, equilibrium in rigid body and forces acting on structures.
3. Ability to evaluate problems related to frictions, centre of gravity, centre of mass for a system and moment inertia of an area.

ERT 205/4
FLUID MECHANICS ENGINEERING

Course Synopsis

This course emphasizes fundamental concepts and problem-solving techniques. Topics to be covered include fluid properties, static and kinematics, control volume analysis, momentum analysis of flow system, dimensional analysis, internal flows (pipe flows), differential analysis, and external flows (lift and drag).

Course Outcomes

1. Ability to analyze the essential parameters describing a fluid system and recognize the common devices used in measuring pressure and flow rates, and turbo machineries.

2. Ability to calculate pressures, forces, and stability in static fluid systems and identify whether a flow is steady or unsteady, uniform or non-uniform, laminar of turbulent and flow rate in dynamic fluid system and distinguish the link between conserved quantities and the equations of fluid mechanics.
3. Ability to analyze appropriate control volumes and surfaces for developing the equations of fluid mechanics.

References

1. Cengel, Cimbala. 2006. Fluid Mechanics; Fundamentals and Applications. N.Y. Mc Graw Hill
2. Mott, R.L. 2006. Applied Fluid Mechanics, 6th Edition, Prentice Hall
3. Crowe, C.T., Elger, D.F., Robertson, J.A.2005. " Engineering Fluid Mechanics", John Wiley, 8th Edition
4. Bruce, R.M., Donald , F.Y. and Okishi, T.H. 1990, Fundamentals of Fluid Mechanics, John Wiley and Sons.
5. Dauglas, J.R. 1991. Fluid Mechanics, 3rd Ed., Pitman.

ERT245/4
HEAT AND MASS TRANSFER IN BIOLOGICAL SYSTEMS

Course Synopsis

This course elaborates and analyzes mechanisms by which heat is transferred from one body to another. The course covers steady state and transient heat conduction, convection, radiation, heat exchangers, and also mass transfer with special address on biological systems. Emphases are on formulation and application of respective mathematical models of heat and mass transfer across both physical and biological bodies.

Course Outcomes

1. Ability to differentiate and understanding of different modes of heat transfer and mass transfer.
2. Ability to understand and apply the principles and basic calculations of heat transfer by conduction, convection and radiation are featured.
3. Ability to apply the heat exchange equipment such as heat exchangers and single and multiple effect evaporators are also included.

References

1. Yunus A. Cengel. 2006. Heat and Mass Transfer: A Practical Approach, 3rd Ed. McGraw Hill, New York,
2. Truskey, F.A. 2004,Transport Phenomena in Biological Systems. McGraw Hill, New York.
3. Holman, J.P. 2002. Heat Transfer, 9th Ed., McGraw Hill, New York.
4. Incropera, F.P. 2002. Introduction to Heat and Mass Transfer, 4th Ed., John Wiley and Sons, New York.
5. Kreith, F. And Bohn, M.S. 2000. Principles of Heat Transfer, 6th Ed., Brooks and Cole.

ERT 246/4
HYDROLOGY AND WATER RESOURCES ENGINEERING

Course Synopsis

This course introduces principles of surface and ground water hydrology and their applications in water resources engineering. These include descriptive and quantitative applications of the hydrologic cycle, weather system, precipitation, evaporation, transpiration, surface and subsurface waters, stream flow hydrographs and flood routing. The course also covers applications of hydrologic analysis with respect to basic design procedures for on-farm water management practices.

Course Outcomes

1. Ability to apply the principles of hydrology, engineering analysis and design of water resources and implication to biosystems.

References

1. Bedient B. P; Huber W.C and Vieux B.E,. 2008 Hydrology Floodplain Analysis, 4th Ed. Prentice-Hall, Inc, Upper Saddle River, NJ 07458
2. Subramaya K.2008,Engineering Hydrology, 3rd Ed. McGraw Hill,New York,N.Y
3. DID. 2000, Urban Stormwater Management Manual for Malaysia, DID, Malaysia
4. Mays, L.W 2001, Water Resources Engineering, John Wiley & Sons, New York, N.Y
5. Ward, A.D. and Trimble, S.W. 2004, Environmental Hydrology, 2nd Ed., Lewis Publisher.

ERT 250/2
DYNAMIC

Course Synopsis

The objective of this course is to enable students to evaluate problems related to mechanics concepts in dynamic condition. This course covers topics of force and acceleration, work and energy, and also impulse and momentum for both kinematics of a particle and planar kinetics of a rigid body problems.

Course Outcomes

1. Ability to analyze problems related to rectilinear kinematics, law of motions, and also concepts mechanics and vector mechanics.
2. Ability to evaluate problems related to kinematics of particle, involving force and acceleration, work and energy, and also impulse and momentum.

3. Ability to evaluate problems related to planar kinetics or a rigid body, involving force and acceleration, work and energy and also impulse and momentum.

ERT 251/2
STRENGTH OF MATERIALS

Course Synopsis

This course covers the fundamental and behaviour of solid objects subject to mechanical forces. Topic to be covered includes analysis of stress-strain diagram, fracture at low stresses, fatique, creep and hardness. The deformation deflection, torsion, impact and plastic design will be covered in this course.

ERT 252/3
GEOMATIC ENGINEERING

Course Synopsis

This course covers geodetic, remote sensing, and geographical information systems (GIS) with emphases on basic surveying, fundamentals of remote sensing and its applications, and principles and applications of GIS in agricultural field. The students are exposed to field works to develop skill in using surveying equipments. The main topics discussed are traversing, tacheometry, mapping, calculation of areas and volumes, GIS, GPS, remote sensing and topographic survey.

Course Outcomes

1. Ability to understand the comprehensive guide to basic principles and technologies in the application of Remote Sensing Technology and geographic imformation system (GIS).
2. Ability to *interphasing* between electronics, ICT and biological systems.
3. Ability to apply computer programming in the study of biosystems such managing natural resources and productivity of farmland.

References

1. Kavanagh, B.F. 2009, Surveying: Principles and applications, 8th Ed. Prentice Hall, New York, NY.
2. Lillesand, T.M. 2007, Remote Sensing and Image Interpretations, John Wiley and Sons, New York
3. McCormack, J. 2004, Surveying, 5th Ed., John Wiley and Sons, New York, NY.
4. Bannister, A. 1992, Surveying, 6th Ed. Longman Scientific.
5. Chandra, A.M. and Ghosh, S.K. 2006, Remote Sensing and Geographical Information Systems, Alpha Science International

ERT 253/3
ELECTRICAL & ELECTRONICS TECHNOLOGY

Course Synopsis

This course covers the foundation of electricity (Ohm's law and Coulomb law) and electronic (Kirchhoff law) which including the concepts of electric and power, series and parallel wiring. Additional coverage includes the introduction of the electronic components and the application.

ERT 254/3
THERMODYNAMICS FOR BIOSYSTEMS ENGINEERING

Course Synopsis

Thermodynamics is the study of heat related to matter in motion. The First Law of Thermodynamics involves the conversion of energy from one form to another while the Second Law determines the direction of heat flow, and the availability of energy to do work. In this course, students will be studying the terminology, principles, theory, and practical application of the First and Second Law of engineering thermodynamics.

Course Outcomes

1. Ability to recognise the laws of thermodynamics for processes
2. Ability to manipulate and calculate the properties of pure substances and mixtures
3. Ability to apply the Clapeyron equation to pure substances using an analytical equation of state
4. Ability to perform phase equilibrium calculations using software and ability to perform reaction equilibrium calculations

References

1. Cengel, Y.A. and M.A.Boles, Thermodynamics-An engineering Approach, 36th edition, McGraw-Hill, 2007.
2. Smith, J.M., Van Ness, H.C., Abbott, M. M. 2005. "Introduction to Chemical Engineering Thermodynamics", 7th Edition, McGraw - Hill
3. Sandler, S., Chemical, Biochemical, and Engineering Thermodynamics, Wiley, 2006
4. Wark, K., and Richards, D.E., 1999, Thermodynamics, 6th Edition., McGraw-Hill.

5. Eastop, T.D. and McConkey, A. 2000, Applied Thermodynamics for Engineering Technologist, 4th Ed., Longman

ERT 255/3
ENGINEERING PROPERTIES OF BIOLOGICAL MATERIALS

Course Synopsis

The course is designed to introduce the properties of biological materials and to encourage students to be able to identify physical properties of materials required for analysis and design of agricultural, food and biological systems. Upon completion of the course, the student will be able to determine (measure, search, calculate, estimate) the value of a particular engineering property based on available data or experimentally measure the property based on existing methods and theories.

Course Outcomes

1. Ability to identify physical attributes of materials required for analysis and design of agricultural, food and biological systems.
2. Ability to repeat and discuss concept, techniques and calculation of thermal and rheological properties of biological materials.
3. Ability to repeat demonstrate and calculate thermal and electromagnetic properties of biological materials.
4. Ability to apply and illustrate concepts and principles of water activity, handling, strorage and moisture management of biological materials.

References

1. Sahin, S and Sumnu,S.G. 2006. *Physical Properties of Foods.* Springer Science.
2. Barbosa-Canovas G.V., Juliano.P. and Peleg, M. 2008. *Engineering Properties of Foods, in Encyclopedia of Life Support System.* (EOLSS) UNESCO.
3. Jose M.Aguilera and Peter J.Lilliford. 2008. *Food Materials Science.* Springer Verlag Berlin Heidelberg.
4. Ludger O.Figura and Arthur A.Teixera. 2007. *Food Physics: Physical Properties-Measurement and Applications.* Springer –Verlag Berlin Heidelberg.
5. Stroshine, R. 2000. Physical Properties of Agricultural Materials and Food Products, Purdue University, West Lafayette, IN.

ERT 256/3
THEORY OF STRUCTURES

Course Synopsis

This course covers functions of structures, design loads, reactions and forces systems, analysis of statically determinate structures including beams, trusses, and arches; energy methods of determining deflections of structures, influence lines and criteria for moving loads, analysis of statically indeterminate structures including continuous beams and frames. Also introduces finite element analysis for analysis of structures.

ERT 350/3
INSTRUMENTATION, MEASUREMENT AND CONTROL IN BIOSYSTEMS

Course Synopsis

The course covers the general concept of instrumentation, various measuring devices, and the manipulation, transmission, and recording of data. Reference to instrumentation use in biosystems engineering made where applicable. Students will be able to comprehend measurement standards, data analysis and calibration methods which are essential features of any measurement programme.

Course Outcomes

1. Ability to identify and differentiate and illustrate main components in instrumentation, their integration and working principle of various measurement devices.
2. Ability to differentiate and illustrate roles and features of appropriate instruments for various biosystems engineering application.
3. Ability to demonstrate the interphasing of different instrumentation and design the integration or connectivity

References

1. Nakra, B.C. and Chaudhry, K.K., *Instrumentation,Measurement and Analysis, Second Edition,* Tata McGraw Hill, 2004. (3rd edition in print)
2. Singh, S.K. *Industrial Instrumentation and Control, Third Edition,* Tata McGraw Hill, 2009.
3. Doebelin, E.O. *Measurement Systems – Application and Design,* McGraw Hill, 2004.
4. Morris, A.S. 2001. Measurements and Instrumentation Principles, 3rd Ed., Butterworth-Heinemann.
5. Figliola, R.S. and Beasley, D.E. 2005, Theory and Design for Mechanical Measurement, 4th Ed., John Wiley and Sons.

ERT 351/3
SUSTAINABLE AGROSYSTEMS ENGINEERING

Course Synopsis

This course discusses important components of sustainability for agrosystems which can be optimized through suitable application of engineering principles to reinforce the conventional wisdom of agrosystems production. Important engineering approaches invoking reviewing current practice and design will be covered. At the end of the course, student will recognized the scope of engineering that can be a sustainable factor for the farming system.

Course Outcomes

1. Ability to distinguish agrosystems practices and sustainability indicators which include soil, water, biomass and waste.
2. Ability to apply and formulate mathematical model for sustainable agrosystems
3. Ability to design components and processes of sustainable agrosystems

References

1. Lynch, Daniel R., *Sustainable natural resource management for scientists and engineers*, Cambridge University Press, New York, 2009.
2. Michel De Lara and Luc Doyen, *Sustainable management of natural resources: Mathematical models and method*, Springer-Verlag Berlin Heidelberg, 2008.
3. Mason.J., *Sustainable agriculture. 2nd ed.*, Landlinks Press, Collingwood Vic. Australia, 2003.
4. Gliessman, Stephen R., *Agroecosystem sustainability: developing practical strategies,* CRC Press, Washington, 2001.
5. Pretty. J. 2008. Sustainable Agriculture and Food, Earthscan, London, UK.

ERT 352/3
FARM STRUCTURES

Course Synopsis

This course covers planning, engineering analysis and design; and cost estimating of biosystems engineering related structures elements for agricultural buildings, greenhouses, and structures for livestocks husbandry. The student will exposed to structural design using timber, reinforce concrete, and steel.

Course Synopsis

1. Ability to plan biosystems structures layout and materials for structural elements.
2. Ability to design structural members in tension, compression, and bending.
3. Ability to estimate cost of construction of the biosystems agricultural structures.

References

1. McKenzie, W.M.C 2013. Design of Structural Elements 2nd edition. Palgrave McMillan, UK
2. Seward, D. 2009. Understanding Structures: Analysis, Materials, Design 4th Edition, Palgrave McMillan, UK
3. Arya, C. 2009. Design of Structural Elements: Concrete Steelwork Masonry and Timber Designs to British Standards and Eurocodes 3rd Edition. Taylor & Francis.
4. Mosley, B. 2006. Reinforced Concrete Design to Eurocode 2. Palgrave McMillan, UK
5. Lindley, J.A and Whitaker, J.H. 1995. Agricultural Buildings and Structures, ASAE

ERT353/3
ENERGY AND POWER IN BIOSYSTEMS

Course Synopsis

The course encompasses on the concepts of energy and power generation from mechanical devices including engine, pumps, compressor, fan and blowers. The recent technology, production processes and engineering renewable energy development for sustainability from various sources such as wind, solar, hydro power, bioethanol and biohydrogen are also discussed..

Course Outcomes

1. Ability to illustrate the working principles of the internal combustion engines.
2. Ability to analyze the performance and efficiency of different types of engines, solid and liquid mover's devices.
3. Ability to illustrate different types of renewable energy sources suitable for production and processing of biological materials.
4. Ability to differentiate biofuels, biodiesel and biogas for production and processing of biological materials.

References

1. Ayhan D. 2009 *"Green Energy and Technology"* Springer, Verlag London.
2. Aldo Viera R. 2009. *"Fundamentals of Renewable Energy"* Elsevier Inc. UK
3. Grupta H.N. .2006. "*Fundamentals of Internal Combustion Engines*" Prentice Hall of India
4. Forsthoffer' W.E. 2005. *"Forsthoffer's Rotating Equipment Handbooks Pump"* Elsevier USA
5. Pulkrabek W. W.,2004. *"Engineering Fundamentals of the Internal Combustion Engine"* Pearson Prentice Hall, UK

ERT 354/3
SOIL ENGINEERING

Course Synopsis

This course covers the engineering properties of soil and water and it application in soil-water-plant relationship for on-farm irrigation and drainage and soil and water management practices. It include design of surface, subsurface, sprinkler and micro-irrigation systems for various crop production system and hydraulic structures for soil and water conservation practices.

Course Outcomes

1. Ability to analyze soil and water relation in biosystems production.
2. Ability to design drainage size and requirement for on farm irrigation and drainage for surface and subsurface system.
3. Ability to analyze soil and water management system in erosion control and water conservation.
4. Ability to design microirrigation system and determine it efficiencies for various crops production system.

References

1. Fangmeier, D.D., Elliot, W.J., Workman, S.R, Huffman, R.L, Schwab, G.O.2006. Soil and Water Conservation Engineering 5th Edition. Thomson Delmar Learning.United State of America.
2. Gardiner, D.T, Miller, R.W. 2008. Soils in Our Environment. 11th edition. Pearson Education, Inc., Upper Saddle River, New Jersey 07458
3. Subramaya,K. 2000. Flow in Open Channel. 2nd edition. Tata McGraw Hill, Delhi, India.
4. Plaster, E.J. 2009. Soils Science and Management, 5th Ed., Delmar Cengage Learning.
5. Liu, C and Evett, J.B. 2004. Soils and Foundation, Pearson Education.

ERT355/3
BIOSYSTEMS MODELLING AND SIMULATION

Course Synopsis

The course exposes students to basic concepts of systems analysis, modeling and computer simulation of agricultural and biological systems. Students will develop ability to work on and develop dynamic models, sensitivity analysis, parameter estimation and model evaluation. An overview of applications of models in agricultural and biological systems will be given including but not limited to Decision Support Systems for Agrotechnology Transfer (DSSAT), a software application program that simulates growth, development and yield as a function of the soil-plant-atmosphere dynamics. Students will also be exposed to and develop growth models for fish as well as animals, and are required to write and present computer models in the form of group projects using Visual Basic Application (VBA) for Microsoft Excel.

ERT356/3
UNIT OPERATIONS

Course Synopsis

This course systematically presents the basic information necessary to design agricultural/food processes and the equipments needed to carry them out. It covers the most common agricultural/food engineering unit operations in detail including to obtain the desired product from the starting materials or feedstocks.

ERT 445/2
FINAL YEAR PROJECT 1

Course Synopsis

This course consists of lecture and independent study on the technique of conducting literature review, identification of problem statements, project objectives and research methodology. The students are guided on the proper techniques and format of thesis writing, submit the project proposal and present to the internal examiners.

Course Outcomes

1. Ability to synthesize information including standards, code of practice, journals, policies, field data, etc, relevant to the specific research to be undertaken and relate with societal and global issues.
2. Ability to analyze scenario and compose the problem statements and the research objectives of the project.
3. Ability to formulate research methodology incorporating clear fundamentals, theories and benchmarked against standard practices governing the research project.
4. Ability to prepare and defend research proposal with effective communication skills.

References

1. Rowena, M. 2006. How to write a thesis. Open University Press. England.
2. Hoang, P. 2006. Springer Handbook of Engineering Statistic. Springer-Verlang, London.
3. Bailey, S. 2003. A practical guide for students. TJ International Ltd. USA.
4. A Guide To Student Final Year Project. 2003. UniMAP.
5. Academic Journals

ERT 446/4
FINAL YEAR PROJECT 2

Course Synopsis

This course consists of lectures and independent study on the techniques of conducting laboratory and/or field experiments. The students are guided on the techniques and implementation of research and monitored based on the research plan, data analysis, interpretation and conclusion. The students are required to write, submit and defend their thesis to the internal examiner.

Course Outcomes

1. Ability to conduct research experiments, analyze and interpret data and deduce good conclusion.
2. Ability to use techniques and modern tools to solve research problems.
3. Ability to plan activities pertaining to research project and execute the plan to meet the required research objectives and datelines.
4. Ability to write research report that conforms to standard thesis format and performs verbal presentation.

References

1. Rowena, M. 2006. How to write a thesis. Open University Press. England.
2. Hoang, P. 200). Springer Handbook of Engineering Statistic. Springer-Verlang, London.
3. Bailey, S. 2003. A practical guide for students. TJ International Ltd. USA.
4. A Guide To Student Final Year Project. 2003. UniMAP.
5. Academic Journals

ERT 456/3
POST HARVEST ENGINEERING

Course Synopsis

This course covers moisture content in agricultural product and its methods for determination, principle of drying, theory of diffusion, and mechanisms of drying including puff drying, foam mat drying, freeze drying, calculation of drying air temperature and air flow rate, air pressure within the grain bed. The course also elaborates on different types of dryers, their performances, energy utilization and efficiency in relation to drying and dehydration of agricultural products. The course also covers types and causes of spoilage in storage, conditions for storage of perishable products, functional requirements of storage, control of temperature and relative humidities inside storage, and calculation of refrigeration load, designing conditioning of environment inside storage through natural and mechanical ventilation.

Course Outcomes

1. Ability to apply the principle of engineering in the processes involved in conveying, storing, drying, cleaning and sorting agricultural products.
2. Ability to analyse and design machines used for conveying bulk solids and liquids.
3. Ability to understand the theory and practice of drying for grain and forage crops. Moisture and quality control in storage and transport.

References

1. J. De Vries. 2001. *Securing the Harvest.* ISBN 10:0851995640.
2. K. Rajasekaran. 2002. *Crop Biotechnology.* ISBN 10:0841237662.
3. Sarah J. Risch. 2000. *Food Packaging.* 10:0841236178.
4. Stanley P. Burg. 2004 *Postharvest Physiology and Hypobaric Storage of Fresh Produce.* ISBN 10:0851998011.

ERT 457/3
DESIGN OF AUTOMATION SYSTEMS

Course Synopsis

This course covers automation and sensor technology applied in agricultural and biological systems. It also includes the components of automation system such as actuators and drivers, AC and DC motors. Topics such as control engineering application in agricultural and biological systems, and PIC microcontroller are also discussed.

Course Outcomes

1. Ability to apply principle of automation and sensor technology in agricultural and biological systems.
2. Ability to analyze the actuator component and application of an automation system in Biosystems Engineering
3. Ability to evaluate control engineering application in agricultural and biological system.
4. Ability to design automation system for agricultural and biological production systems.

References

1. Bolton, W. 2003. *Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering*. 3rd edition. Prentice Hall.
2. Francis J. Pierce; Qin Zhang. 2012. *Agricultural Automation: Fundamentals and Practices.* CRC Press/Taylor & Francis Group.
3. Eggins, B.R. 2002. *Chemical Sensors and Biosensors*. John Wiley & Sons.

4. Rafael Comeaux and Pablo Novotny. 2009. *Biosensors: Properties, Materials and Applications (Biotechnology in Agriculture, Industry and Medicine Series).* 1st edition Nova Science Pub Inc.
5. George K. Knopf, Amarjeet S. Bassi. 2007. *Smart Biosensor Technology*. CRC Press/Taylor & Francis Group.

ERT 460/3
CONTROLLED ENVIRONMENT ENGINEERING

Course Synopsis

The course covers thermal and environmental engineering design and analyses appropriate for controlled environment agricultural related production facilities for plants, animals, and aquaculture. Major topics include psychrometrics, heat and mass transfer, ventilation, cooling and heating, air distribution within controlled environment buildings.

Course Outcomes

1. Ability to analyze heat and mass transfer of plants, animals and aquaculture structures.
2. Ability to design natural and forced cooling and/or heating for plants, animals, and aquaculture structures.
3. Ability to design natural and forced ventilation for plants, animals and aquaculture structures.
4. Ability to appraise and value the existing designs and safety aspect of plant, animals and aquaculture structures through groupwork project.

References

1. Albright, L.D. 2005. Environmental Control for Plants and Animals. American Society of Agricultural and Biological Engineers, St. Joseph, MI.
2. Incropera, F.P. 2002. Introduction to Heat and Mass Transfer, 4th ed., John Wiley and Sons, New York.
3. Bartok, J. W. 2001. Energy Conservation for Commercial Greenhouses. NRAES. New York.
4. Ibrahim, D. 2003, Microcontroller Based Temperature Monitoring & Control. Newnes, Oxford.
5. Tiwari, G.N. 2003. Greenhouse Technology for Controlled Environment. Alpha Science, New York.

ERT 461/3
BIOSYSTEMS ENGINEERING DESIGN 1

Course Synopsis

Biosystems Engineering Design is a 2 part course covering aspects of engineering design related to open-ended design projects at professional level engineering design task in biosystems engineering field. The design project is a team-based approach to provide capstone design experience emphasizing on the application of sciences, mathematics and engineering science acquired in earlier course work in design of projects. The scope of the course covers the knowledge on the elements in project formulation, planning/scheduling, management and communication, engineering economics including cost-benefits analysis and budgeting, critical thinking, ethics and safety in engineering design, fundamental in engineering design methodology (the process and tools) and systems engineering. Analysis of case studies pertaining to engineering issues in design.

Course Outcomes

1. Ability to differentiate between ethical and legal issues and relate how these are related to design projects in biosystems engineering field.
2. Ability to demonstrate team work through group weekly meetings, project planning and management, analysis of case studies and class presentation.
3. Ability to analyze and assess the impact of design and engineering solutions on society and environment.
4. Ability to evaluate economic and feasibility study of a design project in biosystems engineering.
5. Ability to compose engineering problems and alternative solutions and formulate a sound proposal in biosystems engineering project using systematic design process.

References

1. Chang N.B., 2011. Systems Analysis for Sustainable Engineering: Theory and Applications (Green Manufacturing & Systems Engineering).
2. Christianson L. L. and Rohrbach R. P. 1987. Design in Agricultural Engineering. ASAE Textbook.
3. Norton, R. L. 2006. Machine Design: An Integrated Approach, Pearson Education, 3rd Edition.
4. Sharma P. C. and Aggarwal D. K. 2010. Machine Design, S.K Kataria & Sons.
5. Shigley J. E., Mischke, C. R., Brwon Jr. T. H. 2004. Standard Handbook of Machine Design, 3rd Edition, The McGraw-Hill Co. Inc.
6. Walsh R. A., 2007. Handbook of Environmental Engineering Calculations, 2nd Edition, The McGraw-Hill Co. Inc.

ERT 462/3
BIOSYSTEMS ENGINEERING DESIGN 2

Course Synopsis

This course covers topics on design aspects within related biosystems engineering thematic areas including (but not limited to) automation and emerging technologies, machine systems, postharvest technology, structures and environment, soil and water, information technology, and sustainable agriculture and cutting across several important food and industrial crops. The scope of the class is to design component, equipment, process, plant and systems to meet desired project needs within realistic constraint and to comprehend diverse and fast changing technology and open-end design problems in biosystems engineering and technology fields. The use of modern engineering design practices, tools and product/ solution development process, trouble-shooting methodology, learn and utilize a realistic simulation of the real-world design process, engineering analysis and synthesis through their projects. Knowledge integration from other Biosystems Engineering courses is required to identify, solve, and design solution for complex engineering problems.

Course Outcomes

1. Ability to conduct engineering analysis and adeptly apply principles and tools of mathematics and science to solve multi-facetted design project to produce credible conclusions.
2. Ability to formulate and produce solutions that properly address critical issues and assumptions that are conceptually and contextually valid and meet client expectation.
3. Ability to design component, equipment, process, plant and systems in biosystems engineering using engineering tools and design softwares for optimum performance.
4. Ability to display understanding of biosystems engineering project and integrate the design for manufacturability, utility and sustainability.
5. Ability to write project report that conforms to engineering professional standard and to perform verbal presentation on the project.

References

1. Chang N.B., 2011. Systems Analysis for Sustainable Engineering: Theory and Applications (Green Manufacturing & Systems Engineering).
2. Christianson L. L. and Rohrbach R. P. 1987. Design in Agricultural Engineering. ASAE Textbook.
3. Norton, R. L. 2006. Machine Design: An Integrated Approach, Pearson Education, 3rd Edition.
4. Sharma P. C. and Aggarwal D. K 2010. Machine Design, S.K Kataria & Sons.
5. Shigley J. E., Mischke, C. R., Brwon Jr. T. H. 2004. Standard Handbook of Machine Design, 3rd Edition, The McGraw-Hill Co. Inc.
6. Walsh R. A., 2007. Handbook of Environmental Engineering Calculations, 2nd Edition, The McGraw-Hill Co. Inc.

ERT 464/3
DESIGN OF MACHINE & SYSTEM

Course Synopsis

The course covers study of agricultural and other off-road vehicle with special attention to functional design requirements of various machine operations, cost analysis, machinery selection and testing. Topics also include tillage force analysis, tillage tools, mechanisms for metering and applying seed, fertilizer and pest control chemicals, harvesting methods and machinery, hydraulic and other methods of transmitting power and controlling machines, biomass cleaning, conveying of agricultural materials and crop drying. Interactions of machines with biological systems. Application of agricultural machinery for optimal selection, operation and performance, and management of farm machinery such as tractors, tillage, seeding, chemical application, biomass and grain/fruit harvesting and post harvest handling in food (grain, vegetable) and industrial/tree crops production (fruits, oil palm) systems.

Course Outcomes

1. Ability to analyze specialized components and evaluate mechanized systems for production, handling and processing of biological materials.
2. Ability to design machinery in biosystems engineering
3. Ability to compare machine components in a variety of situations and select machines for specific operations in biosystems engineering.

References

1. Claude Culpin. 2008. Farm Machinery Farm Machinery, 12th Edition, Wiley-Blackwell.
2. Kepner, R. A., Roy Bainer, and Berger, E. L. 2005. Principles of Farm Machinery, The AVI Publishing Inc.
3. Cleghorn, W. L. 2005. *Mechanics of Machines*.
4. Pennock, G. R. 2003. Theory of Machines and Mechanisms, Oxford University Press.
5. Low, K. H. 2003. Mechanics of Mechanisms, Prentice Hall.

ERT 466/3
WASTE MANAGEMENT

Course Synopsis

This course covers the sources and properties of agricultural farm and agricultural related industries waste and wastewater, and their effect on the environment. Also the physical, chemical and biological waste and wastewater treatment, disposal, utilization systems and technologies include biogas, composting and land application in relation to pollution control.

Course Outcomes

1. Ability to analyze the properties of wastes and their impact on the environment.
2. Ability to design physical, chemical and biological treatment systems of agricultural related industrial waste and wastewater
3. Ability to proposed the suitable utilization technique for environment sustainable

References

1. Metcalf and Eddy Inc. Tchobanouglous,G., Stensel, H.D., Tsuchihashi, R. And Burton, F. 2014. Wastewater Engineering: Treatment and Resource Recovery 5th Edition. McGraw Hill
2. Liu, S.X. 2007. Food and Agricultural Wastewater Utilization and Treatment. Blackwell Publishing
3. Hammer, M.J and Hammer M.J. 2005. Water and Wastewater Technology, Pearson Prentice Hall
4. Salah, M. E. 2007. Sustainable Industrial Design and Waste Management Cradle-to-cradle for Sustainable Development. Academic Press
5. Sperling, M.V. and Chernicharo CA.L. 2005. Biological Wastewater Treatment in Warm Climate Regions. IWA Publishing

ERT 467/3
BIOMASS CONSERVATION TECHNOLOGY

Course Synopsis

The course covers the technology and engineering principle of various renewable energy sources namely biomass, hydro, wind, solar, geothermal, and marine energy sources with particular focus on bio-based energy. Various type of bio-based energy are discussed in detail including bioethanol, biodiesel, biogas and biohydrogen. Several aspects namely type of raw material, type of microbes involved, production process, type of bioenergy products , together with “Biofuel Economy and Biofuel Policy”as well as current status and future prospects of renewable energy in Malaysias are also discussed

ERT 470/3
BIO-PRODUCTS MANUFACTURING

Course Synopsis

The course discusses components and facilities required for manufacturing and production of biological products. The course also covers process development and pilot plant facilities as well as the application of software for modeling and simulating of biological products production process. At the end of the course, student will have the capability to plan, design, simulate and propose scaling-up process for the development and manufacture of biological (food and agricultural) products.

Course Outcomes

1. Ability to identify and distinguish components and facilities required for the production and manufacturing of various food and agricultural products
2. Ability to plan, calculate and design processes for the manufacturing and production of food and agricultural products with emphasize on fermented products.
3. Ability to formulate and propose primary / secondary processing, and up-scaling facilities for bio products manufacturing in accordance with Good Manufacturing Practices (GMP)

References

1. McNeil, B. Practical fermentation technology, John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex, England, 2008
2. José M. Aguilera and Peter J. Lillford, Food Materials Science, Springer Science+Business Media, LLC, 2008
3. Wesselingh, J. A. Design and Development of Biological, Chemical, Food and Pharmaceutical Products, John Wiley & Sons Ltd, West Sussex, England, 2007
4. Hui., Y.H., Handbook of Food Products Manufacturing, Wiley & Sons, Inc., Hoboken, New Jersey, 2007
5. Quality assurance of pharmaceuticals: a compendium of guidelines and related materials.Vol. 2, Good manufacturing practices and inspection. – 2nd ed., WHO, 2007

Career Opportunities

Graduate from this school has a wide range of employment prospects either in private companies, industry, government departments and statutory bodies. Sectors that offer employment opportunities are as follows;

- Industrial Bioprocess
- Pharmaceutical Industry
- Food Industry
- Consultation and Research Institution such as MARDI, FRIM
- Chemical Industry
- Biotechnology Companies
- Environment Sector
- Public Sector Farming Body (FELDA, Felcra, MADA etc)
- Forestry Sector (Manufacturing & Management)
- Irrigation and Drainage
- Education Sector

School of Environmental Engineering

Address

Pusat Pengajian Kejuruteraan Alam Sekitar,
Universiti Malaysia Pelis,
Kompleks Pusat Pengajian Jejawi 3,
02600 Arau, PERLIS

Tel.: +6(04) 979 8626
Fax: +6(04) 979 8636
e-mail: nasrulhamidin@unimap.edu.my

INTRODUCTION

The School of Environmental Engineering is the seventh engineering school in UniMAP and was established in January 2006 after approval from the Ministry of Higher Education in 2005. The school currently offers two undergraduate programs namely Bachelor of Engineering (Environmental Engineering) and Bachelor of Engineering (Civil Engineering). These programs are evaluated by the Engineering Accreditation Council (EAC) and the programs have been accredited by the Board of Engineers Malaysia (BEM) in respective fields.

The Vision and Mission of the School of Environmental Engineering are stated below:

Vision
An internationally recognized academic programme

Mission
To support the nation's aspirations in industrial agenda towards environmental sustainability

Bachelor of Engineering (Hon.) (Environmental Engineering) RK07
This program is accredited by the Board of Engineers Malaysia (BEM) (Ref. No: BEM/041/0111/M (002)) and recognized by The Institution of Engineers, Malaysia (IEM), Malaysia Qualification Agency (MQA) and the Malaysia Public Services Department (JPA). The programme covers the element of chemical and environmental engineering, laws, safety and health, environmental and project management.

Bachelor of Engineering (Hon.) (Civil Engineering) RK01
This program is accredited by the Board of Engineers Malaysia (BEM) under Civil Engineering discipline (Ref. No: BEM/041/0100/M (001)). Students who follow this program will be exposed to various fields of knowledge in Civil Engineering including designing structures, concrete and steel, hydrology and hydraulic, geomatic, construction project management, IBS and materials.

Postgraduate Programmes
The School of Environmental Engineering also offers postgraduate programme to students who pursuing to continue their studies in higher levels. The school offers full or part-time study via research mode for the following programmes:

- M.Sc (Environmental Engineering)
- M.Sc (Building Engineering)
- M.Sc (Civil Engineering)
- PhD (Environmental Engineering)
- PhD (Building Engineering)
- PhD (Civil Engineering)

FACILITIES

The School of Environmental Engineering is equipped with various research and teaching instruments which can be grouped into two major fields namely chemical/environmental and civil engineering. These instruments are placed in several laboratories including:

Civil Engineering Lab:
- Concrete lab
- Highway & traffic lab
- Geotechnical lab
- Structural lab
- Construction and material testing lab

Environmental Engineering Lab
- Biological lab
- Hydro lab
- Chemical engineering lab
- Analytical lab
- Geo-environmental lab
- Air pollution lab

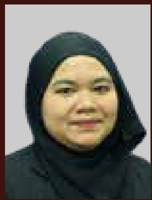
The school is embarking into consultation and laboratory services to the industries. To fulfil the industrial requirements, several of our testing and analysis facilities are accredited with SAMM MS ISO/IEC 17025 which was granted by the Department of Standard Malaysia (DSM) (Skim Akreditasi Makmal Malaysia, SAMM 581). The scope of accreditation covering the area of:

- Mechanical (e.g. Concrete compression)
- Chemical (e.g. Waste water, surface water, drinking water, groundwater)

STAFF DIRECTORY

Dean
Dr. Nasrul Bin Hamidin
Tel. (O): +6(04) 979 8630
e-mail: nasrulhamidin@unimap.edu.my

Deputy Dean
(Academic And Research)
Mr. Abdul Haqi Ibrahim
Tel. (O): +6(04) 979 8640
e-mail: haqi@unimap.edu.my



Deputy Dean
(Student Development and Alumni)
Dr. Tengku Nuraiti Binti Tengku Izhar
Tel (O): +6(04) 979 8977
e-mail: nuraiti@unimap.edu.my

Chairperson of Degree Programme
(Environmental Engineering)
Dr. Sara Yasina Binti Yusuf
Tel. (O): +6(04) 979 8983
e-mail: sarayasina@unimap.edu.my

Chairperson of Degree Programme
(Civil Engineering)
Dr. Afizah Ayob
Tel (O): 04-979 8980
e-mail: rafizah@unimap.edu.my

Coordinator for Industrial Networking and Quality Management
Dr. Norazian Mohamed Noor
Tel. (O): +6(04) 979 7769
e-mail: norazian@unimap.edu.my

Chairperson for Postgraduate Programme
Dr. Naimah Binti Ibrahim
Tel. (O): +6(04) 979 8972
e-mail: naimah@unimap.edu.my

Assistant Registrar
Ms. Norren Shariza Binti Mohamed Mokhtar
Tel. (O): +6(04) 979 8629
e-mail: norren@unimap.edu.my

LECTURERS

BACHELOR OF ENGINEERING (HONOURS) ENVIRONMENTAL ENGINEERING

Professor Dr. Mohammad Ilyas Shahabudin
PhD (Physic), MSc, BSc
FRAS, FRMELS, MIAU, MUNEP (Ozone)

Associate Professor Dr. Ong Soon An
PhD. (Env. Eng) (Oita University, Japan)
MSc. (Chemistry) (USM)
BSc. (Chemistry) (USM)
e-mail: saong@unimap.edu.my

Ir. Dr. Mohd Asri Ab. Rahim
PhD (Texas Tech.)
MSc. Civil Eng. (USM)
BSc. Civil Eng. (Texas El Paso)
e-mail: asrirahim@unimap.edu.my

Dr. Fahmi Muhammad Ridwan
PhD.(Env.Eng.)
MEng.(Env.) (Hiroshima, Japan)
BEng.(Chem.) (Sumatera Utara)
e-mail: drfahmi@unimap.edu.my

Dr. Nasrul Hamidin
PhD. (Griffith Univ., Australia)
Master of Industrial Safety Management (UKM)
BSc. (Environment) (UPM)
e-mail: nasrulhamidin@unimap.edu.my

Dr. Tengku Nuraiti Tengku Izhar
PhD. (Solid Waste Management) (USM)
MSc. (Env Eng) (USM)
BEng. (Mineral Resources) (USM)
e-mail: nuraiti@unimap.edu.my

Dr. Irnis Azura Zakarya
PhD. (Solid Waste Management) (USM)
MSc. (Env Eng) (UPM)
BTech. (Env) (USM)
e-mail: irnis@unimap.edu.my

Dr. Umi Fazara Md Ali
PhD., DIC (Chem Eng) (Imperial College)
MEng. Sc. (Chem Eng.) (UM)
BEng. (Chem Eng.) (UM)
e-mail: umifazara@unimap.edu.my

Dr. Farrah Aini Dahalan
PhD. Environmental Engineering (UTM)
MSc. Environmental Biotechnology (UPM)
BSc. (Hons.) Microbiologi (UPM)
e-mail: farrahaini@unimap.edu.my

Dr. Sara Yasina Yusuf
PhD. Environmental Engineering (UPM)
MEng.(Environmental) (UPM)
BEng. (Hons.) (Chemical) (USM)
e-mail: sarayasina@unimap.edu.my

Dr. Farah Naemah Mohd Saad
PhD. (Env.) (USM)
MSc. (Env.) (UPM)
BTech. (Env.) (USM)
e-mail: farahnaemah@unimap.edu.my

Dr. Ragunathan a/l Santiagoo
PhD. (Polymer Recycling) (USM)
MSc. (Env. Eng) (USM)
BTech. (Env.)
Cert. (Public Health)
e-mail: raguna@unimap.edu.my

Dr. Naimah Binti Ibrahim
PhD. (Chem. Eng.) (Newcastle University, UK)
MSc. (Env. Eng.) (USM)
B. App. Sci. (Analytical Chemistry) (USM)
e-mail: naimah@unimap.edu.my

Dr. Norazian Mohamed Noor
PhD (USM)
MSc. (Env. Eng.)
BEng. (Chem) (USM)
e-mail: norazian@unimap.edu.my

Dr. Wong Yee Shian
PhD. (Env. Tech) (USM)
MSc. (Env. Tech) (USM)
BTech. (Env.) (USM)
e-mail: yswong@unimap.edu.my

Mr. Saiful Azhar Bin Saad
MSc. (Env. Eng.) (UPM)
BEng. (Hons) (Chemical)
e-mail: saifulazhar@unimap.edu.my

Ms. Azlinda Abdul Ghani
MSc. (Env.) (UPM)
BTech. (Env.) (USM)
e-mail: azlindaghani@unimap.edu.myr

Mrs. Zaity Syazwani Mohd Odli
MEng. (Civil-Environmental Management) (UTM)
BSc. (Remote Sensing) (UTM)
e-mail: zaity@unimap.edu.my

Mr. Razi Ahmad
MSc. (Env.) (UniMAP)
BEng. (Chem) (UKM)
e-mail: razi@unimap.edu.my

Mr. Abdul Haqi Ibrahim
MSc. (Env. Eng) (USM)
BEng. (Mineral Resources) (USM)
e-mail: abdulhaqi@unimap.edu.my

Mrs. Ayu Wazira Azhari
MSc. (Env Mgt) (UKM)
BEng. (Mineral Resources) (USM)
e-mail: ayuwazira@unimap.edu.my

Mrs. Nabilah Aminah Lutpi
MEng. (Env) (Queensland, Australia)
BEng. (Env) (UM)
e-mail: nabilah@unimap.edu.my

Mrs. Faridah Binti Wahab
MEng. Safety, Health and Environment (UM)
BEng. (Hons.) Materials Engineering (USM)
e-mail: faridah@unimap.edu.my

Mrs. Nor Ashikin Ahmad
MSc. (Environmental Eng.) (Griffith University)
BSc. (Hons.) (Environmental Sc.) (UMS)
e-mail: ashikinahmad@unimap.edu.my

Mr. Khairuddin Md Isa
MSc. (Env) (UPM)
BEng. (Bioproses) (UTM)
e-mail: khairudin@unimap.edu.my

Dr. Nurul Huda Binti Baharuddin
Ph.D (Environmental Eng.)(UM)
MEng. (Environmental Eng.) (UPM)
BEng. (Hons) (Environmental Eng.) (UM)
e-mail: hudabaharuddin@unimap.edu.my

Dr. Abdul Latif Bin Abdul Rani
Ph.D (Env. Eng) (UniMAP)
M.Env (UPM)
B.Sc (Hons) Applied Chemistry (UiTM)
e-mail: latifrani@unimap.edu.my

Dr. Najihah Abdul Rashid
PhD Env. Eng. (UniMAP)
MSc Env. Pollution Control (Middlesex Uni)
BSc Environmental (UPM)
e-mail: najihahrashid@unimap.edu.my

Dr. Noor Ainee Binti Zainol
PhD (Solid Waste Management) (USM)
M.Sc (Env) (UPM)
B.Tech (Env) (USM)
e-mail: aineezainol@unimap.edu.my

BACHELOR OF ENGINEERING (HONOURS) CIVIL ENGINEERING

Associate Professor Ir. Shuib Sahudin
MSc. (Mechanical Eng) (Univ. College of Swansea)
BSc. (Mechanical Eng) (Sunderland Univ.)
Dip. in Mechanical Eng (UTM
MIEM, P.Eng., APEC Eng., IntPE (MY)
e-mail: shuibmie@unimap.edu.my

Ir. Dr. Muhammad Arkam Che Munaaim
PhD. (USM)
MSc. Building Technology (USM)
BEng. (Electrical) (UTM)
Dip. Elec. Engineering (Power) (UTM)
PEng, IntPE, MIEM, MIET, MIEEE, ASEAN Eng, APEC Eng, Chartered Eng (ASEAN), EMF IntPE
e-mail: arkam@unimap.edu.my

Ir. Abdul Ghapar Ahmad
MSc. (Project Management) (USM)
BEng. (Civil) (UTM)
e-mail: irghapar@unimap.edu.my

Dr. Afizah Ayob
PhD. (Env.) (USM)
MSc.(Env.) (USM)
BEng. (Civil) (USM)
e-mail: afizah@unimap.edu.my

Dr. Wan Mohd Sabki Wan Omar
PhD (Griffith University, Australia)
MEng. (Construction Eng.) (AIT)
BEng. (Civil Eng.) (UTM)
e-mail: wansabki@unimap.edu.my

Mrs. Shamshinar Salehuddin
MEng. (Civil & Structural) (UTM)
BEng. (Civil) (UTM)
e-mail: shamshinar@unimap.edu.my

Mr. Zuhayr Md. Ghazaly
MEng. (Civil) (UKM)
BEng. (Civil and Structural) (UKM)
e-mail: zuhayr@unimap.edu.my

Mr. Mohd Faiz Mohammad Zaki
MEng. (Geotechnics) (UTM)
BEng. (Civil) (UTM)
e-mail: faizzaki@unimap.edu.my

Mr. Mustaqqim Abdul Rahim
MSc (Structural Eng. and Constructions) (UPM)
BEng (Civil Eng.) (UNIMAS)
e-mail: mustaqqim@unimap.edu.my

Mrs. Mahyun Ab. Wahab
MSc. (Civil Eng.)
BEng. (Hons) (Civil Eng) (USM)
e-mail: mahyun@unimap.edu.my

Mr. Umar Hassim
MSc. (Town Planning) (USM)
BSc. (HBP)
e-mail: umar@unimap.edu.my

VOCATIONAL TRAINING OFFICERS

Mr. Nazerry Rosmady Rahmat
BEng. (Civil) (UTM)
e-mail: nazerry@unimap.edu.my

Mr. Roshasmawi Abdul Wahab
BEng. (Civil) (UTM)
e-mail: roshasmawi@unimap.edu.my

Mr. Munif Bahatin
BEng. (Civil) (UTM)
e-mail: munifbahatin@unimap.edu.my

Mrs. Siti Hasmah Abd. Hamid
BEng. (Civil) (UKM)
e-mail: sitihasmah@unimap.edu.my

Mrs. Zuraini Mohd Ideris
MSc (Env. Eng.) (UPM)
BEng. (Biochemical Eng.) (UKM)
e-mail: zuraini@unimap.edu.my

Mr. Mohd Affandi Deraman
BEng. (Chemical) (UiTM)
e-mail: mohdaffandi@unimap.edu.my

Dr. Che Zulzikrami Azner Abidin
MSc (Env. Eng.) (UPM)
BEng. (Process) (UPM)
e-mail: zulzikrami@unimap.edu.my

Ir. Musnira Mustar
BEng. (Civil) (UTM)
e-mail: musnira@unimap.edu.my

STUDY LEAVE

BACHELOR OF ENGINEERING (HONOURS) ENVIRONMENTAL ENGINEERING

Mrs. Ain Nihla Kamarudzaman
MEng. (Civil-wastewater)(UTM)
BEng. (Civil) (UTM)
e-mail: ainihla@unimap.edu.my

Mrs. Roslaili Abdul Aziz
MSc. (Env. Eng) (USM)
BSc. (Env. Tech) (UMT)
e-mail: roslaili@unimap.edu.my

Mr. Salsuwanda Selamat
MEng. (Env.) (UPM)
BEng. (Chem) (UTM)
e-mail: salsuwanda@unimap.edu.my

Mrs. Masitah Hasan
MSc. (Chem.) (USM)
BEng. (Chem) (USM)
e-mail: masitah@unimap.edu.my

Mrs. Nor Wahidatul Azura Zainon Najib
MEng. (Env.) (UKM)
BEng. (Mineral Resources) (USM)
e-mail: norwahidatul@unimap.edu.my

Ms. Wan Amiza Amneera Wan Ahmad
MEng. (Env.) (UKM)
BEng. (Env.) (UM)
e-mail: amneera@unimap.edu.my

BACHELOR OF ENGINEERING (HONOURS) CIVIL ENGINEERING

Mrs. Salwa Mohd Zaini Makhtar
MSc. (Env Eng) (USM)
BEng. (Civil)
e-mail: salwa@unimap.edu.my

Mrs. Norlia Mohd Ibrahim
MSc. (Env. Eng.) (USM)
BEng.(Civil) (USM)
e-mail: norlia@unimap.edu.my

Mrs. Roshazita Che Amat
MSc. (Mineral Resources) (USM)
BEng. (Mineral Resources) (USM)
e-mail: roshazita@unimap.edu.my

Mr. Md. Hadli Abu Hasan
MSc.(Civil Eng.) (UTM)
BEng.(Civil) (UTM)
Dip. In Civil Eng.(UiTM)
e-mail: mdhadli@unimap.edu.my

Mrs. Nur Liza Rahim
MEng. (Civil Eng.) (UKM)
BEng. (Civil & Structural) (UKM)
e-mail: nurliza@unimap.edu.my

Mrs. Syakirah Afiza Mohammed
MEng. (Civil) (UKM)
BEng. (Civil & Structural) (UKM)
e-mail: syakirahafiza@unimap.edu.my

SABATICAL LEAVE

Associate Professor Dr. Khairul Nizar Ismail
PhD. (Construction Material), (USM)
MSc. (Building Technology), (USM)
BSc. (HBP), (USM)
e-mail: nizar@unimap.edu.my

TECHNICIANS

Mr. Andi Julaini Jasni
e-mail: andijulaini@unimap.edu.my

Mr. Mohd Shukri Mohd Soid
e-mail: mohdshukri@unimap.edu.my

Mr. Mohamad Zahir Hanafi
e-mail: zahirhanafi@unimap.edu.my

Mr. Syed Ahmad Rizman Syed Kamel
e-mail: rizman@unimap.edu.my

ADMINISTRATIVE STAFFS

Ms. Norren Shariza Mohamed Mokhtar
Assistant Registrar
e-mail: norren@unimap.edu.my

Mrs. Rushaniza Idawaty Ruslan
Office Secretary
e-mail: rushaniza@unimap.edu.my

Mrs. Suzyyana Saafi Soo
Administrative Assistant (Clerical/Operation)
e-mail: suzy@unimap.edu.my

Mr. Ahmad Nazrin Hashim
Administrative Assistant (Clerical/Operation)
e-mail: nazrihashim@unimap.edu.my

Ms. Aida Liyana Ahmad
Administrative Assistant (Clerical/Operation)
e-mail: aidaliyana@unimap.edu.my

Mr. Mohd Shukri Ardzmi
General Office Assistant
e-mail: mshukri@unimap.edu.my

BACHELOR OF ENGINEERING (HONOURS) ENVIRONMENTAL ENGINEERING

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO 1
Graduates who are leaders in the field of environmental engineering or chosen field as demonstrated through career advancement

PEO 2
Graduates who are members and contribute to professional society

PEO 3
Graduates who pursue continuous education opportunities

PEO 4
Graduates who contribute through research and development

PEO 5
Graduates who are engineers and demonstrate entrepreneurial skills

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PROGRAM OUTCOMES (PO)

PO 1
Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence to the solution of complex engineering problems in an environmental/ civil engineering discipline.

PO 2
Ability to identify, formulate and solve complex engineering problems.

PO 3
Ability to design solutions for complex engineering problems and design systems, components or processes to meet desired needs.

PO 4
Ability to conduct investigation into complex engineering problems as well as to analyze and interpret data.

PO 5
Ability to use techniques, skills and modern engineering tools, necessary for complex engineering activities and practices so as to be easily adaptable to industrial needs.

PO 6
Understanding of the social, cultural, global and environmental responsibilities of a professional engineer.

PO 7
Ability to understanding entrepreneurship, the process of inno vation and the need for sustainable development.

PO 8
Understanding of professional and ethical responsibilities and commitment to the community.

PO 9
Ability to function on multi-disciplinary teams.

PO 10
Ability to communicate effectively on complex engineering activities with the engineering community and with society at large.

PO 11
Recognition of the need for, and an ability to engage in life-long learning.

PO 12
Demonstrate understanding of project management and finance principles

BACHELOR OF ENGINEERING (HONOURS) (ENVIRONMENTAL ENGINEERING)

YEAR	FIRST			SECOND		THIRD			FOURTH	
	I	II		III	IV	V	VI		VII	VIII
Engineering Core (100)	EAT 105/4 Fundamental of Electrical Engineering	EKT 120/4 Computer Programming		**EAT 213/4 Fluid Mechanics and Hydraulics**	EAT 237/3 Water Supply Engineering	**EAT 301/4 Air Pollution Engineering**	**EAT 342/3 Noise Pollution Engineering**		EAT 441/3 Environmental Remediation	EAT442/2 Engineering Management
	EAT 131/4 Environmental Chemistry	EAT 101/4 Basic Ecology		EAT 231/3 Thermodynamics *	EAT 208/3 Environmental Law, Health and Safety	**EAT 303/4 Wastewater Engineering**	EAT 343/3 Public Health and Occupational Hygiene		EUT440/3 Engineers in Society	EAT 433/3 Environmental Engineering Design
	EAT 102/4 Mechanics and Material Engineering	**EAT 104/4 Fundamental of Chemical Eng Processes**		EAT 232/3 Fundamental of Environmental Engineering	EAT 235/3 Geo environmental Engineering	EAT 341/3 Solid and Hazardous Waste Engineering	EAT 344/3 Environmental Management System		EAT461/2 Final Year Project I	EAT 462/4 Final Year Project II
		ECT 112/3 Engineering Skills	ECOLOGICAL CAMP	**EAT 233/3 Environmental Engineering Skills**		EAT 332/3 Environmental Impact Assessment	EAT 345/3 Hydrology	EIT302/4 Industrial Training	EAT XXX/3 Elective I	EAT XXX/3 Elective II
							EAT 347/4 Mass Transfer **			
Non Engineering (16)	EQT 101/3 Engineering Mathematics I	EQT 102/3 Engineering Mathematics II		EQT 203/3 Engineering Mathematics III	EQT 271/3 Engineering Statistics					
	UUT 122/2 Skills and Technology in Communication									
University Requirement (17)	UZW XXX/1 Co-curriculum	UZW XXX/1 Co-curriculum		UUW 224/2 Engineering Entrepreneurship	UVW 312/2 English for Technical Communication	UUW 233/2 Islamic and Asian Civilizations	UUW 322/2 Thinking Skills		UUW XXX/2 Option Subject	UUW 235/2 Ethnic Relations
					UVW 410/2 University Malay Language	UZW XXX/1 Co-curriculum				
133	18	19		18	16	17	18	4	13	14
TOTAL UNITS FOR GRADUATION IS 137										

ELECTIVES COURSES:

EAT XXX	COURSES WITH LAB
EATXXX	COURSES WITHOUT LAB
COURSE * IS A PRE-REQUISITE TO COURSE **	

EAT 447/3 Environmental Informatics, EAT 443/3 Built Environment,
EAT 449/3 Environmental Process Control & Instrumentation, EAT 445/3 Remote Sensing **

BACHELOR OF ENGINEERING (HONOURS) CIVIL ENGINEERING

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO 1
Graduates are leaders in the field of civil engineering or chosen field as demonstrated through career advancement

PEO 2
Graduates who are members and contribute to professional society

PEO 3
Graduates pursue continuing education opportunities

PEO 4
Graduates who contribute through research and development

PEO 5
Graduates who are engineers and demonstrate entrepreneurial skills

PROGRAM OUTCOMES (PO)

PO 1
Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence to the solution of complex engineering problems in an environmental/ civil engineering discipline.

PO 2
Ability to identify, formulate and solve complex engineering problems.

PO 3
Ability to design solutions for complex engineering problems and design systems, components or processes to meet desired needs.

PO 4
Ability to conduct investigation into complex engineering problems as well as to analyze and interpret data.

PO 5
Ability to use techniques, skills and modern engineering tools, necessary for complex engineering activities and practices so as to be easily adaptable to industrial needs.

PO 6
Understanding of the social, cultural, global and environmental responsibilities of a professional engineer.

PO 7
Ability to understanding entrepreneurship, the process of innovation and the need for sustainable development.

PO 8
Understanding of professional and ethical responsibilities and commitment to the community.

PO 9
Ability to function on multi-disciplinary teams.

PO 10
Ability to communicate effectively on complex engineering activities with the engineering community and with society at large.

PO 11
Recognition of the need for, and an ability to engage in life-long learning.

PO 12
Demonstrate understanding of project management and finance principles

School of Environmental Engineering

BACHELOR OF ENGINEERING (HONOURS) (CIVIL ENGINEERING)

YEAR	FIRST			SECOND		THIRD			FOURTH	
	I	II		III	IV	V	VI		VII	VIII
Engineering Core (100)	EAT 105/4 Fundamental of Electrical Engineering	EKT 120/4 Computer Programming	GEOMATIC CAMP	**EAT 251/3 Structural Theory ***	**EAT258/3 Building Material Engineering**	**EAT 314/4 Geotechnical Engineering ****	**EAT 360/4 Highway & Transportation Engineering**	EIT302/4 Industrial Training	EAT 455/3 Industrialized Building System	EAT 451/4 Integrated Project Design
	EAT 102/4 Mechanics and Material Engineering *	**EAT 115/4 Strength of Materials ****		**EAT 252/4 Fluid Mechanics Engineering**	EAT 237/3 Water Supply Engineering	EAT 351/3 Concrete Building Design I	EAT 354/3 Steel Building Design		EAT461/2 Final Year Project I	EAT 462/4 Final Year Project II
	EAT152/2 Engineering Geology	**EAT 112/4 Geomatic Engineering**		**EAT 212/4 Soil Mechanics ***	EAT 253/3 Structural Analysis I **	EAT 353/3 Structural Analysis II	EAT 359/3 Water Resources Engineering		EAT XXX/3 Elective I	EAT XXX/3 Elective II
		ECT 112/3 Engineering Skills		**EAT 250/3 Engineering Drawing**	**EAT 259/3 Hydraulics**	**EAT 356/4 Water & Wastewater Engineering**	EAT 352/3 Concrete Building Design II			EUT440/3 Engineers in Society
						EAT 357/3 Construction Management				
Non Engineering (16)	EQT 101/3 Engineering Mathematics I	EQT 102/3 Engineering Mathematics II		EQT 203/3 Engineering Mathematics III	EQT 271/3 Engineering Statistics					
	UUT 122/2 Skills and Technology in Communication									
University Requirement (17)	UZW XXX/1 Co-curriculum	UZW XXX/1 Co-curriculum			UVW 312/2 English for Technical Communication	UUW XXX/1 Co-curriculum	UUW 322/2 Thinking Skills		UUW 233/2 Islamic and Asian Civilizations	UUW 235/2 Ethnic Relations
							UVW 410/2 University Malay Language		UUW 224/2 Engineering Entrepreneurship	
									UUW XXX/2 Option Subject	
133	16	19		17	17	18	17	4	14	16
TOTAL UNITS FOR GRADUATION IS 138										

ELECTIVES COURSES:

EAT XXX	COURSES WITH LAB
EATXXX	COURSES WITHOUT LAB
COURSE * IS A PRE-REQUISITE TO COURSE **	

EAT 411/3 Advanced Concrete Building Design, EAT 413/3 Construction Engineering, EAT 415/3 Advanced Steel Building Design, EAT 453/3 Advanced Structural Analysis, EAT 454/3 Timber and Masonry Design, EAT 456/3 Foundation Engineering, EAT 459/3 Building Automation Systems, EAT 463/3 Environmental Law, Health & Safety, EAT 464/3 Building Services Engineering

COURSE SYLLABUS

ENVIRONMENTAL ENGINEERING PROGRAMME (RK07)

EAT101/4 BASIC ECOLOGY

Course Synopsis

The study of basic ecology in understanding nature and environment and the relationship between the organism and the environment. Students will understand the effect of global environmental changes to the environment and how to preserve the environment. The syllabus covers on ecology, ecosystems, population, community, biogeochemical cycles, global environmental changes and microbiology.

Course Outcomes

CO1: Ability to define and describe basic concept of ecology and environment.
CO2: Ability to define and describe the energy flow in ecosystems.
CO3: Ability to define and describe the relationship among the organism in ecosystems.
CO4: Ability to describe the basic concepts of soil composition, biochemistry and metabolism pathways of microorganisms in soil, water and wastewater treatment.

References

1. Smith T.M. and Smith R.L. (2006) Elements of Ecology, 6th Edition, Pearson.
2. Black, J.G. Microbiology, 7th Ed., John Wiley and Sons, Inc.
3. David, E.V. (2005) Environmental Biology for Engineer and Scientist, Wiley.

EAT 102/4 MECHANICS AND MATERIAL ENGINEERING

Course Synopsis

The aim of this course is to enable the students to learn the basic of mechanics and material engineering. In engineering mechanics portion, students will be introduced to fundamentals and principles of static and dynamics mechanics. Resultant and equilibrium of coplanar force system as well as spatial force system will be covered in static portion while kinematics and kinetics of particle in dynamics potion. In material engineering portion, the student will be also taught on structure of crystalline solids, imperfection of solid as well as strength of material.

Course Outcomes

CO1: Ability to construct free body diagram and ability to solve equilibrium problems using equilibrium theory.
CO2: Ability to determine friction and properties of sections.
CO3: Ability to solve problems which relate to kinematics and kinetics of a particle.
CO4: Ability to explain basic concepts of material strength as well as their mechanic properties.

References

1. Hibbeler, R.C. (2010) Engineering Mechanics Statics. 12th Ed. , Prentice Hall.
2. Hibbeler, R.C. (2010) Engineering Mechanics Dynamics. 12th Ed. , Prentice Hall.
3. Peter Schiavone, Hibbeler, R.C. (2010) Engineering Mechanics Statics Study Pack. 12th Ed. Prentice Hall.

EAT104/4 FUNDAMENTAL OF CHEMICAL ENGINEERING PROCESSES

Course Synopsis

This course focuses on basic chemical engineering fundamental processes that include mass balances, energy balances and heat transfer. Firstly, the introduction of chemical engineering calculation will be taught. Then, the concept of mass balances and solving problem will be imparted. Furthermore, the theory of energy balances and solving problem will be covered. Finally, the theory of heat transfer and related problem solving is also incorporated.

Course Outcomes

CO1: Ability to understand, and solve problems related to chemical engineering calculation.
CO2: Ability to solve problems on material balances.
CO3: Ability to solve calculation on energy balances.
CO4: Ability to solve calculation on heat transfer.

References

1. Felder, R.M. and Rousseau, R.W. (2000) Elementary Principles of Chemical Processes, 3rd Edition, Wiley.
2. Holman, J.P., Heat Transfer, 9th Ed. McGraw Hill.
3. Himmelblau, D.M., and Riggs, J.B., Basic Principles and Calculations in Chemical Engineering, 7th Ed., Prentice Hall.

EAT105/4
FUNDAMENTAL OF ELECTRICAL ENGINEERING

Course Synopsis

This course is intended to provide students with clear understanding of the DC and AC circuits, basic principles of 3-phase AC circuits, electro-magnetism and magnetic circuits. Students will also gain an understanding of the basic operating principles and performance analysis of three most commonly used electric machines, namely, transformers, dc machines and induction motors.

Course Outcomes

CO1: Ability to analyse the DC and AC circuits by using Ohm's Law, Kirchhoff's Current Law, Kirchhoff's Voltage Law, Source Transformation and Thevenin's theorem.
CO2: Ability to calculate and analyse parameters of three phase AC system for Wye and Delta connection.
CO3: Ability to explain and apply the basic concept of magnetism and electromagnetism in DC and AC machines.

References

1. Richard, J. Fowler. (2008) Electricity Principles and Applications, 7th Ed., McGraw Hill.
2. Boylestad, R.L. (2007) Introductory Circuit Analysis, 11th Ed., Prentice Hall.
3. Hughes (2005) Electronic Technology, 9th Ed., Prentice Hall.
4. Charles, K.A. and Matthew N.O.S. Fundamentals of Electric Circuits. International 3rd Ed., McGraw Hill.
5. Nilsson, J.W. and Riedel S.A. (2005) Electric Circuits, 7th Ed., Pearson Prentice Hall.

EAT131/4
ENVIRONMENTAL CHEMISTRY

Course Synopsis

The study of environmental chemistry is fundamental to an understanding of the natural and anthropogenic processes occurring on our planet. The course aimed to familiarize the students with qualitative and quantitative aspects of chemical and biological principles of environmental engineering and their application to pollution control. The syllabus focuses on the fundamentals of chemistry, water chemistry, atmospheric chemistry and soil chemistry.

Course Outcomes

CO1: Ability to explain basic concepts of fundamental chemistry.
CO2: Ability to define and discuss the chemical principles of water and wastewater pollution or treatment.
CO3: Ability to describe and calculate soil chemistry and chemical reactions involved.
CO4: Ability to discuss the chemistry, photochemistry and cyclic processes in atmospheres.

References

1. Sawyer C.N., Mc Carty P.L. and Perkin G.F. (2003) *Chemistry for Environmental Engineering and Science*, 5th Ed., McGraw-Hill.
2. Manahan, Stanley E. (2005) *Environmental Chemistry*, 8th Ed., Boca Raton, Fla. ; London: CRC Press.
3. Andrews, J. E. (2004) *An Introduction to Environmental Chemistry*, 2nd Ed., Malden, MA, Blackwell Science.

EAT208/3
ENVIRONMENTAL LAW, HEALTH AND SAFETY

Course Synopsis

Students will be exposed to Malaysian related laws and regulations on occupational safety and health (e.g. OSHA 1994) and environment (e.g. EQA 1974) and how to interpret the requirements stipulated under these documents. This course will also provide students the necessary information in identifying hazards, assessment and managing the risks that may be harmful to humans in the workplace.

Course Outcomes

CO1: Ability to comprehend and explain the legal requirement of environmental, safety and health laws and regulations.
CO2: Ability to describe and evaluate hazards in the workplace.
CO3: Ability to describe and evaluate the magnitude of risks on humans associated with the hazards in the workplace.
CO4: Ability to outline the management plan in managing the hazards and risks in the work place.

References

1. Goetsch, D.L. (2010) Occupational Safety and Health for Technologist, Engineers and Managers, 7th. Ed. Pearson Prentice Hall.
2. Occupational Safety and Health Act 1994 (Act 514) & Regulations and Orders, 2007 (amended at 5th April), International Law Book Services, Malaysia.
3. Environmental Quality Act & Regulations, 2006 (amended up to April), MDC Publishers Sdn. Bhd., Malaysia.

EAT213/3
FLUIDS MECHANIC AND HYDRAULICS

Course Synopsis

This course introduces the fundamental concept of fluid mechanics applied in Environmental Engineering. Topics to be covered include properties of fluids, fluid static and kinematics, Bernoulli's equation, energy equation, analysis of flow in open channel and pipeline system. The content of this course is considered as an essential element to be applied in the subsequent wastewater and water supply engineering. At the end of the course, students should be able to apply the theory to solve problems related to Environmental Engineering fluid mechanics.

Course Outcomes

CO1: Ability to define and describe the properties of fluids.
CO2: Ability to identify and analyse some fluid static and fluid dynamic theories and applications.
CO3: Ability to describe and solve problems related to fluid flow in pipeline system.
CO4: Ability to describe and solve problems related to fluid flow in open channel system

References

1. Mott, R.L. (2006) Applied Fluid Mechanics. Prentice Hall.
2. Young, D.F., Munson, B.R., Okiishi, T.H. & Huebsch, W.W. (2007) A Brief Introduction to Fluid Mechanics. Wiley Interscience.
3. Landau L.D & Lifshitz, E.M. (2004) Fluid Mechanics. Elsevier.

EAT231/3
THERMODYNAMICS

Course Synopsis

Introduction to the concept of energy and the laws governing the transfers and transformations of energy. Emphasis on thermodynamic properties and the first and second law analysis of systems and control volumes. Analysis on exergy for closed systems and control volumes.

Course Outcomes

CO1: Ability to determine pure substance behaviour and its properties at any given states.
CO2: Ability to demonstrate basic principles of thermodynamics, concepts of work interaction and heat transfer.
CO3: Ability to solve engineering problems in thermodynamics involving closed and open systems for both steady state and transient processes.
CO4: Ability to apply second law analysis methods for thermodynamic systems.

References

1. Cengel, Y.A., Boles, M.A. (2006) Thermodynamics: An Engineering Approach, McGraw-Hill Higher Education.
2. Borgnakke, C., Sonntag, R. E. (2009) Fundamentals of Thermodynamics, 7th Edition John Wiley & Sons.
3. Rajput, R.K. (2010) Engineering Thermodynamics, 3rd Edition, Jones & Bartlett Learning.

EAT232/3
FUNDAMENTAL OF ENVIRONMENTAL ENGINEERING

Course Synopsis

This course focuses on fundamental concepts of environmental engineering. Students will be exposed briefly about the main component in environmental engineering that are water, air, solid waste and noise. The definition, causes, impacts and controls of every pollution (as above) will be described briefly. Furthermore, the Environmental Quality Act (EQA) 1974, limitation and guidelines that have been applied in Malaysia will also be described in this course.

Course Outcomes

CO1: Capability of using a mass balance approach to analyze and solve environmental problems and ability to understand basic water chemistry and to describe the fundamental components of water and wastewater treatment systems in industrial and domestic sewage and related legislation.
CO2: Ability to describe or calculate solid and hazardous waste generations, characteristics and to explain how is managed and related legislation.
CO3: Ability to describe or calculate classification of pollutant and particulate, the effect of pollutants as well as global atmosphere change and related legislation.
CO4: Ability to describe or calculate the physical properties of sound, noise measurement and control and related legislation.

References

1. Mackenzie L.D. and David A.C., (2008) Introduction to Environmental Engineering 4th Edition, McGraw HillDavis M. L. and Masten S.J., Principles of Environmental Engineering. McGraw-Hill, 2004.
2. Peavy H. S., Rowe D.R. (1985) Tchobanoglous G., Environmental Engineering. McGraw-Hill.

EAT233/3
ENVIRONMENTAL ENGINEERING SKILLS

Course Synopsis

Environmental engineering skill plays an important role in environmental engineering for decision making and problem solving. The course explores the growth and the effectiveness of several sophisticated techniques in seeking reliable information and precision in many environmental engineering activities such as environmental monitoring and surveying, environmental database and information systems. Through this course the students are enabled to perform surveying tasks, utilize Geographical Information System (GIS), AutoCAD drawing and editing for aiding in decision making and problem solving in various environmental engineering disciplines as well as basic plotting using MATLAB. This course also aims to develop basic skills in using GIS, AutoCAD and MATLAB softwares.

Course Outcomes

CO1: Ability to provide knowledge and perform surveying task and procedure.
CO2: Ability to provide knowledge and practice AutoCAD and MATLAB software package.
CO3: Able to produce mapping using Geographical Information System (GIS).

References

1. Leach, James A, AutoCAD 2008 instructor: a student guide to complete coverage of AutoCAD's commands and features, McGraw-Hill Higher Education.
2. Yarwood, A, Introduction to AutoCAD 2008: 2D and 3D Design, Oxford : Elsevier/Newnes , 2007.
3. Kavanagh, B.F. (2009) Surveying Principle and Application, 8th edition, Prentice Hall.

EAT235/3
GEOENVIRONMENTAL ENGINEERING

Course Synopsis

This course presents the principles of geo-environmental engineering. It covers the chemical and geo-chemistry background of soil, rock classification, groundwater flow and contaminant fate and transport. This course also discusses the sources of contaminants and available remediation technologies which are widely used for groundwater treatment.

Course Outcomes

CO1: Ability to discuss and apply the component, concept and principle available in soil composition and properties.
CO2: Ability to utilizes and apply the knowledge of groundwater flow and transportation process in porous media.
CO3: Ability to discuss and apply the knowledge of the processes affecting the fate and transport of contaminants.
CO4: Ability to identify and utilizes the basic principles and remediation technologies available in subsurface contamination.
CO5: Ability to discuss and illustrate barriers and liner systems for contaminated land.

References

1. Hari D. Sharma and Krishna R. Reddy (2004) Geoenvironmental Engineering, John Wiley & Sons.
2. Sarsby, R. (2000) Environmental Geotechnics, Balkema, Rotterdam.
3. Kavanagh, B. F. (1996) Surveying Principles and Application, 4th Edition, Prentice Hall.

EAT237/3
WATER SUPPLY ENGINEERING

Course Synopsis

This course introduces the student of Civil and Environmental Engineering on the application of basic science and engineering knowledge to solve water supply issues. The topics to be covered include water sources, quality and demand, water treatment plant design covering water intake, pre-treatment, primary treatment and advance water treatment processes, and water distribution system analysis.

Course Outcomes

CO1: Ability to identify water sources, water quality and consumption, and to forecast water demand.
CO2: Ability to identify the technology of water treatment processes.
CO3: Ability to design water treatment unit.
CO4: Ability to describe and analyze water distribution system.

References

1. Qasim, S.R., Motley, E.M. and Zhu, G. (2000) Water Works Engineering: Planning, Design, and Operation. Prentice Hall PTR.
2. Mackenzie L. Davis (2011) Water and Wastewater Engineering, Design Principles and Practice, International Edition, McGraw Hill, Singapore.
3. The Malaysian Water Association (2000). MWA Design Guidelines for Water supply Systems, published by MWA.

EAT301/4
AIR POLLUTION ENGINEERING

Course Synopsis

This subject discuss in detail about air pollution control. As an introduction, students will be introduced to air pollution control philosophies and regulations which are relate to air pollution control in Malaysia. Meteorological aspects which control the transport of air pollutants are also discussed in this subject. Apart of that, this subject will explain and discuss the general idea on how to control air pollution, modelling the pollutant dispersion as well as designing air pollution control equipment.

Course Outcomes

CO1: Ability to discuss and analyse the behaviour of meteorological condition and their effect on air pollutant dispersion.
CO2: Ability to predict the dispersion of air pollutant/s and suggest mitigation measures.
CO3: Ability to discuss the general ideas in air pollution control.
CO4: Ability to identify and design suitable air pollution control device.

References

1. Noel De Nevers (2000) Air Pollution Control Engineering, International Edition, McGrawHill.
2. Karl B. Schnelle, Jr., Charles A. Brown. (2002) Air pollution control technology handbook CRCnetBASE, CRC Press.
3. Wayne T. Davis (2000) Air pollution engineering manual / Air & Waste Management Association, Wiley.

EAT303/4
WASTEWATER ENGINEERING

Course Synopsis

The aim of this course is to enable the students to have the comprehensive understanding on Wastewater treatment processes, including preliminary, primary, secondary and tertiary treatments. In the first part of the course, student will be introduced to the wastewater sources, flow rate, treatment standard, location and plant hydraulics. The second part will be dealing with unit processes in primary treatment such as bar rack, screen, grit removal and sedimentation basin. The following part of the course containing the biological and chemical treatment processes of wastewater. By the end of the course, the student is expected to be familiarizing with the design principles of unit processes in wastewater treatment plant, applying all the basic knowledge in wastewater treatment theory.

Course Outcomes

CO1: Ability to identify and analyze the preliminary and primary unit processes applied in wastewater treatment.
CO2: Ability to identify and analyze the secondary unit processes applied in wastewater treatment.
CO3: Ability to identify and analyze the tertiary unit processes applied in wastewater treatment.
CO4: Ability to design preliminary, primary, secondary and tertiary unit processes applied in wastewater treatment.

References

1. Mackenzie L. Davis (2011) Water and Wastewater Engineering, Design Principles and Practice, International Ediition, McGraw Hill, Singapore.
2. Metcalf and Eddy, Inc, (2004) Wastewater Engineering, Treatment and Reuse, Fourth Edition, McGraw-Hill, New York Hammer.
3. M.J, Hammer M.J. Jr. (2012) Water and Wastewater Technology, International Edition, Prentice Hall-Pearson, Ohio.

EAT 332/3
ENVIRONMENTAL IMPACT ASSESSMENTS

Course Synopsis

The aim of the course is to introduce the components and structure of an Environmental Impact Assessment (EIA) in line with Malaysian statutory requirement. This course will provide students with skills and knowledge in hazard and impact identification, prediction and evaluation of impacts and mitigation to reduce the magnitude of impacts. The scope will focuses on environmental and societies impacts on the proposed project. In achieving the objectives of this course, students will be engage in lecturers, small working groups in conducting problem based learning and writing an environmental impact assessment statement.

Course Outcomes

CO1: Ability to explain and analyze the EIA process, and compare with legal requirements in Malaysia.
CO2: Ability to outline the terms of reference in conducting Environmental Impact Assessment (EIA) and evaluate the potential impacts to the environment and society.
CO3: Ability to assess the severity of adverse effects and suggest mitigation measures and monitoring plan.
CO4: Ability to comprehend the reporting mechanisms, public participation and auditing process.

References

1. Nick Harvey and Beverley Clarke (2011) Environmental Impact Assessment: Procedures and Practices, Oxford University Press.
2. Charles H. Eccleston (2011) Environmental Impact Assessment: A Guide to Best Professional Practices, CRC Press.
3. Y. Anjaneyulu and Valli Manickam (2011) Environmental Impact Assessment Methodologies, CRC Press.

EAT 341/3
SOLID AND HAZARDOUS WASTE ENGINEERING

Course Synopsis

Students will be introduced to elements of solid waste which is Municipal solid waste characterization, waste handling, generation rate, storage, collection and transport; waste treatment and disposal methods, including biological and chemical treatment, incineration, pyrolysis, landfill and site remediation, waste minimization. Student will also be enriched with characteristic of hazardous waste, handling, storage and collection, treatment and disposal methods, physicochemical and biological methods, stabilization & various ultimate disposal options such as solidification, incineration and secure landfilling. Finally, student will be able to design a landfill with complete understanding of the characteristic of a landfill.

Course Outcomes

CO1: Ability to define and differentiate sources, composition and properties of waste and hazardous waste.
CO2: Ability to design a complete flow of waste management system.
CO3: Ability to distinguish the hazard of hazardous waste and elaborate the concept of risk assessment for hazardous waste.
CO4: Ability to decide the final disposal of waste and hazardous waste and to design an engineered final disposal facility.

References

1. Tchobanoglous, Theisen and Vigil (1993) Integrated Soild Waste Management: Principles & Management Issues, McGraw-Hill.
2. LaGrega, Buckingham & Evans (2001) Hazardous Waste Management, 2nd Edition, McGraw-Hill.
3. Cheremisinoff and Wu (1994) Hazardous Waste Management Handbook, Technology, Perception and Recycling. PTR Prentice Hall.
4. Pfeffer (1992) Solid Waste Management Engineering. Prentice Hall.
5. Vesilind P.A., Worrell W., Reinhart (2002) Solid waste engineering. Brooks/Cole.

EAT342/3
NOISE POLLUTION ENGINEERING

Course Synopsis

This course presents the basic principle and concepts of the noise pollution engineering. It covers how to tackle noise pollution problems, solutions available for noise control, how to determine noise, and how noise generated and radiated, and how it can be reduced. From the course, students will also be exposed to laws and codes governing noise and its control – Environmental Quality Act 1974, OSHA, Factories and Machinery Act 1967.

Course Outcomes

CO1: Ability to differentiate between noise and sound, able to explain and discuss the sources and effects of noise pollution.
CO2: Ability of defining the properties of sound, quantifying the noise levels and decibel as well as to characterize the noise.
CO3: Ability to develop methodologies to control noise pollution and get familiar with the statutory limits related to both ambient noise levels and noise levels at a workspace environment.

References

1. Davis, M.L. and Cornwell, D. A. (1998) Introduction to Environmental Engineering, 3rd Editions, McGraw-Hill International Editions.
2. István L. Vér, Leo L. Beranek (2006) Noise and Vibration Control Engineering: Principles and Applications, Second Edition, John Wiley and Sons.
3. Wang, L.K., Pereira, N.C., Hung, Y. T. and Li, K. H. (2004) Advanced air and noise pollution control, Handbook of environmental engineering, Humana Press Inc.

EAT343/3
PUBLIC HEALTH AND OCCUPATIONAL HYGIENE

Course Synopsis

Public health and occupational hygiene are two interrelated studies. This course is divided into two sections that cover both public health and occupational hygiene. The first section is devoted to the fundamentals of health in the tropics, water supply and sanitation, diseases transmitted by microbes, vectors and other agents. This includes introduction to pollutants and other hazards in nature and indoors. The second section is on occupational hygiene and the topics covers in this section includes introduction to safety and health of workers and public, Malaysian occupational Safety and Health Act, Environmental, quality, health and safety management.

Course Outcomes

CO1: Ability to discuss environmental health in the tropics and relate to water supply, sanitation and social practices.
CO2: Ability to asses various pollutants and other hazards in nature and indoors and identify measures to reduce pollution.
CO3: Ability to identify, evaluate and control occupational hazards.
CO4: Ability to apply OSHA information standards for safety and environmental management.

References

1. Mary-Jane Schneider (2003) *"Introduction to Public Health"* 1st edition, Jones & Bartlett Publishers, 2003.
2. Bernard J. Turnock (2009) Public health: what it is and how it works, 4th Ed., Jones and Bartlett.
3. Bernard J. Turnock (2007) Essentials of public health, Jones and Bartlett.

EAT 344/3
ENVIRONMENTAL MANAGEMENT SYSTEM

Course Synopsis

This course aims to develop an understanding of the role and implementation for ISO 14001 or Environmental Management System (EMS). The course focuses on the processes involved in ISO 14001/EMS, with a particular emphasis on technical requirements of the system, regulatory and community issues. Students will be able to interpret the requirements of ISO 14001/EMS and suggest the appropriate measures to reduce environmental degradation. Students will also be exposed to corporate environmental reporting which reflect the company commitment towards environmental conservation.

Course Outcomes

CO1: Ability to explain the environmental management and the requirements on ISO 14001 (environmental management system).
CO2: Ability to distinguish and articulate the aspect and impact of a human work processes that may resulted to adverse effect.
CO3: Ability to suggest mitigation measure and establish environmental policy in conserving the environment.
CO4: Ability to carry out environmental reporting.

References

1. Blackburn W.R. (2007) The Sustainability Handbook: the complete management guide to achieving social, economic and environmental responsibility. Earthscan, Washington.
2. Darabaris J. (2007) Corporate Environmental Management, CRC Press.
3. Sheldon, C. and Yoxon, M. (2006) Environmental Management Systems: A Step-by-Step Guide to Implementation and Maintenance. 3rd Edition, Earthscan, Sterling, VA, Earthscan.
4. Barrow C.J. (2006) Environmental Management for Sustainable Development, 2nd Edition, Routledge, New York.
5. SIRIM (2005) Environmental management systems – Requirements with guidance for use (First revision) (ISO 14001:2004, IDT). SIRIM.
6. Whitelaw K. (2004) ISO 14001: environmental system handbook. 2nd Edition, Elsevier Butterworth-Heineman, Amsterdam.

EAT 345/3
HYDROLOGY

Course Synopsis

Introduces the fundamental of hydrological process such as hydrologic cycle, atmospheric circulation, precipitation, evaporation, evapotranspiration and infiltration. Students will be introduced to equations to calculate, and equipments to measure many important hydrologic data including rainfall amount, evaporation rate and infiltration rate. Analysis will be done to look at the relationship between these values especially between rainfall, landuse, and streamflow values.

Emphasis will be given for measurement technique of flowrate in river, and usage of Rating Curve to find the relationship between water level and streamflow values. Unit Hydrograph and it's usage and it's derivation will also be included.

Course Outcomes

CO1: Ability to discuss and perform the computation for hydrological process.
CO2: Ability to compute the flood hydrographs using various hydrograph methods.
CO3: Ability to analyze and apply the frequency analysis in hydrology.
CO4: Ability to compute the flood routing.

References

1. Bedient, Huber (2012) "Hydrology & Floodplain Analysis 5th Edition". Pearson.
2. V.T. Chow, David R. Maidment, Larry W. Mays (1988) "Applied Hydrology". McGraw Hill, International Edition.
3. Viessman, Lewis (2003) "Introduction to Hydrology 5th Edition". Prentice Hall.
4. Raghunath (2007) "Hydrology: principles, analysis, design". New Age International.
5. Brutsaert.W (2005) "Hydrology: an introduction". Cambridge University Press.

EAT347/4
MASS TRANSFER

Course Synopsis

The study of mass transfer is of particular interest to environmental engineers which involves processes that move chemicals through the air, surface water, subsurface environment, or engineered systems. Transport processes move pollutants from the location at which they are generated, resulting in impacts that can be distant from the pollution source. In addition, environmental engineers make use of the contents of this course in the design of emission-control systems. In this course the lectures discuss some of the processes that transport pollutants in the environment and in engineered systems. The goals of this discussion are twofold: to provide and understanding of the processes that cause pollutant transport, and to present and apply the mathematical formulas used to calculate the resulting pollutant fluxes.

Course Outcomes

CO1: Ability to utilize the understanding of the principle of mass transfer concepts.
CO2: Ability to utilize the understanding of mass transfer operation systems.
CO3: Ability to utilize transport processes in the design of emission-control systems.
CO4: Ability to utilize the understanding of the sources, fate and transport, and the impact of chemical substances.

References

1. Warren Lee McCabe, Julian Cleveland Smith, Peter Harriott. (2005) Unit operations of chemical engineering, 7th Edition. McGraw Hill International Series.
2. Christie John Geankoplis (2014) Transport Processes & Saperation Process Principles (Includes Unit Operations, 4th Edition. Pearson.
3. Louis J. Thibodeaux (1996) Environmental chemodynamics: movement of chemicals in air, water, and soil. 2nd Edition. John Wiley & Sons.

EAT 433/3
ENVIRONMENTAL ENGINEERING DESIGN

Course Synopsis

This course will focus on the design of an integrated Environmental Engineering Project. The course will start off with the introduction of basic principle of Engineering design and selection of the design project related to Environmental Engineering. The students are expected to work on selected project to design the unit process and unit operation as well as the economic analysis under the guidance of project supervisor.

Course Outcomes

CO1: Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in an environmental engineering discipline.
CO2: Ability to identify, formulate and solve engineering problems.
CO3: Design and evaluate the specific unit process and unit operation in Environmental Engineering field
CO4: Ability to conduct investigation into problems as well as to analyze and interpret data.
CO5: Using Design Software to assist the design work e.g. WASDA and EPANET
CO6: Adopt awareness of the need for academic honesty and professional integrity and ethical responsibilities in the practice of engineering practices.
CO7: Ability to understanding entrepreneurship, the process of innovation and the need for environmental and sustainable development.
CO8: Understanding of professional and ethical responsibilities and commitment to the community.

CO9: Ability to function on multi-disciplinary teams.
CO10: Ability to communicate effectively on engineering activities with the engineering community and with society at large.
CO11: Recognition of the need for, and an ability to engage in life-long learning.
CO12: Execute economic evaluation of the selected project in Environmental Engineering field, which include capital investment and operating costs, rate of return on investment, net present value, payback period, and discounted cash flow rate of return.

References

1. Heinsohn, R.J. and Kabel, R.L (1999). *Sources, Control of Air Pollution* . New Jersey: Prentice Hall.
2. Metcalf & Eddy. (1991). *Wastewater Engineering, Treatment, Disposal and Reuse'*, 3rd edition. McGraw Hill.
3. *The Malaysian Water Association (2000). MWA Design Guidelines for Water supply Systems, published by MWA.*

EAT 441/3
ENVIRONMENTAL REMEDIATION

Course Synopsis

This course provides a general overview of the environmental remediation with emphasis on soil, groundwater and aquifer contaminants. The student will be taught about the source and behaviour of subsurface contaminants, contaminants tracer study and remediation planning. Student will also be enriched with bioremediation technologies to recover the contaminants.

Course Outcomes

CO1: Ability to illustrate the concepts of bioremediation in soil, groundwater and contaminated site treatment.
CO2: Ability to describe and analyse the characteristics of contaminants.
CO3: Ability to identify and construct appropriate strategies to remediate contaminated soil.
CO4: Ability to identify and construct appropriate strategies to remediate contaminated water.

References

1. Hari D. Sharma and Krishna R. Reddy (2004) Geoenvironmental Engineering. Wiley.
2. Pedro J.J. Alvarez and Walter A. Illman (2006) Bioremediation and natural attenuation. Wiley.
3. Mukesh Doble and Anil Kumar (2005) Bio-treatment of industrial effluents. Elsevier.

EAT 442/2
ENGINEERING MANAGEMENT

Course Synopsis

This course aims to teach students on how to apply the project management skills and economic techniques in evaluating the design and engineering alternatives. The role of engineering economics is to assess the appropriateness of a given project, estimate its value, and justify it from an engineering standpoint. At the end of the course, students will be able to identify and discuss issues and challenges faced by engineers relating to project management in the current economic scenarios.

Course Outcomes

CO1: Ability to analyze and evaluate the process of project management, develop work plans, do cost estimation and perform project evaluation.
CO2: Ability to analyze and evaluate economic scenarios and apply decision making process to engineering project and business venture.

References

1. O'Sullivan / Sheffin (2001), *Economics: Principles and Tools*, Prentice Hall.
2. R. Logeswaran, Hairul Azhar, Pau Kiu Nai and Sim Hock Kheng, *Engineers in Society,* 2nd Ed., Mc Graw Hill.
3. S. Park Chan (2008), *Fundamentals Engineering Economics*, 2nd Ed., Prentice-Hall.
4. Stanley E. P., Samuel J. M., Jack R.M, Scot M.S, Margaret M. Sutton (2008), *Project Management: Planning, Scheduling, and Controlling Projects,* John Wiley & Sons Inc. USA.

EAT 443/3
BUILT ENVIRONMENT

Course Synopsis

Introduction to knowledge and skills in elements and principles of building design that pervade the environment and therefore promoting sustainable design. Subsequently, it leads to the undertaking of a detailed and systematic exploration of the designs of energy efficient buildings; incorporating thermal control, thermal dynamics, green architecture, thermal insulation, ventilation, air-conditioning and lighting. Students will be exposed to the passive building design strategies which supporting in understanding the practical approach related to standard and GBI assessment tools. Mini project is designed to help students develop a stronger emphasis in considering in more detail the holistic design of a building, its internal environment, and the system necessary to promote sustainable development.

Course Outcomes

CO1: Ability to describe and analyze the concepts of thermal control through the building envelope adopted in Environmental Science.
CO2: Ability to analyze heat exchange mechanisms and evaluate the thermal interactions in building.
CO3: Ability to construct skills in designing a building with respect to the energy efficiency and sustainability.
CO4: Ability to select and evaluate the methods of active and passive design approaches in a physical building environment.

References

1. Norazian Mohamed Noor et al. (2009) Introduction to Environmental Engineering, 1st Ed., Penerbit UniMAP.
2. Davis M.L. and Cornwell D.A. (2008) Introduction to Environmental Engineering, 4th Ed., McGraw-Hill.
3. MS1525:2007 Code of Practice of Energy Efficiency and Use of Renewable Energy for Non-Residential Buildings (First Revision).
4. GBI Design Reference Guide (GBI Malaysia) for IEB and INC for Non-Residential Buildings.

EAT 445/3
REMOTE SENSING

Course Synopsis

Remote sensing is the acquisition of information about an object or phenomenon, without making physical contact with the object. This course emphasizes the understanding of the remote sensing foundation and principle as well as the use of remote sensor data, image interpretation and processing techniques. Specifically, this includes introduction to electromagnetic energy, satellite and sensor also its applications. The characteristic of various system embrace passive and active remote sensing also discussed.

Course Outcomes

CO1: Ability to understand basic concept of remote sensing.
CO2: Ability to convert and analyze environmental data by using digital image processing software.
CO3: Ability to characterized and utilizes the various system of remote sensing.

References

1. Lilesand, T.M., Keifer, R.W. & Chipman, J.W (2007) Remote Sensing and Image Interpretation, 6th Edition, John Wiley & Sons.
2. John R. Jensen (1996) Introductory Digital Image Processing, 2rd edition, Prentice Hall.
3. Sabins, F. (1997) Remote Sensing – Principles and Interpretation, W.H. Freeman and Co., New York.
4. Mather, Paul M. (2004), Computer processing of Remotely-Sensed Images, Wiley.

EAT 447/3
ENVIRONMENTAL INFORMATICS

Course Synopsis

Environmental informatics plays an important role in environmental decision making. Environmental informatics investigates the development of effective techniques to deliver comprehensive and reliable information for environmental research, management and public awareness. This assimilates expertise and technologies and promotes interaction between fields such as environmental monitoring, environmental databases and information systems, geographical information systems, numerical simulation modelling, knowledge-based systems, internet exploitation, data visualisation, human-computer interaction, information theory and public understanding of science. Great potential now exists to adopt the holistic perspective offered by Environmental Informatics to address the pressing problems surrounding environmental information in the world today. From this course, students will be at the forefront of these developments.

Course Outcomes

CO1: To provide knowledge and understanding of concerns of environmental pollutants and monitoring systems
CO2: To provide knowledge on database management and technique to evaluate and collate raw data
CO3: Able to transform environmental data into decision making information by using statistical analysis and simulation modelling tools
CO4: To raise awareness of the students to the existing environmental risk problems.

References

1. Nicholas M.Avouris and Page (2008), Environmental Infromatics: Methodology and Applications of Environmental Infromatics Processing.
2. Lorenz M. Hilty (2006), Environmental informatics, Elsevier.
3. Jorge Marx Gómez, Michael Sonnenschein, Martin Müller (2007), Information Technologies in Environmental Engineering: ITEE 2007 - Third International ICSC Symposium.

EAT 449/3
ENVIRONMENTAL PROCESS CONTROL & INSTRUMENTATION

Course Synopsis

The aim of this course is to enable the students to gain the conceptual understanding on Process Control and Instrumentation applied in Environmental Engineering. In the first part of the course, student will be introducing to common control system and instrumentation related to Environmental Processes. The second part will be consisting of process dynamics modeling, transformation of model into mathematical equation and solving the model by Laplace transform. The following part of the course containing the Characteristics, Forms, Modes, performances and tuning of Proportional-Integral-Derivative (PID) Control. By the end of the course, the student is expected to be familiarizing with control system in Environmental Engineering field. The application of the control system in Environmental Engineering will be introduce to the student at the last part of the course.

Course Outcomes

CO1: Ability to understand the concept of process control and instrumentation.
CO2: Ability to develop and solve dynamics model of chemical and biological processes related to environmental engineering.
CO3: Ability to analyze and design the control system for chemical and biological processes related to environmental engineering.
CO4: Ability to apply the process control strategies of typical chemical and biological process related to environmental engineering.

References

1. J. B. Riggs and M. N. Karim (2007) “Chemical and Bio-Process Control”, 3rd Ed, Pearson International Edition.
2. Coughanowr & Koppel (1991) “Process System Analysis and Control”, McGraw Hill, 1991
3. Stephanopoulos, G. (1984) Chemical Process Control : An Introduction to Theory and Practice, Prentice Hall Inc., New York.

EAT 461/2
FINAL YEAR PROJECT I

Course Synopsis

This an individual research project in connection with a special engineering problem and under the guidance of an academic staff. The project undertaken may fall under one of the following areas: Mathematical analysis, experimental tests, computer simulation, hardware and/software development, to their field of interest. At the end of the project, each student prepares an engineering report, presents and demonstrates findings and results of the project work.

Course Outcomes

CO1: Ability to modulate and utilize academic knowledge and practical experience in conducting an academic project.
CO2: Ability to think objectively, analytically and critically in identifying and solving problem in systematic manner. Ability to create innovative/ commercialization.
CO3: Ability to work independently in conducting and completing an academic project.
CO4: Ability to present the proposal and final product orally and graphically.

References

1. Donald H. McBurney and Teresa L. White, (2007). Research Methods, 7th Edition, Thompson Wadsworth.
2. Daniel Holtom & Elizaberth Fisher, (1999). Enjoy Writing Your Science Thesis or Disertation, Imperial College Press.
3. Leo Finkelstein, Jr., (2008). Pocket ook og Technical Writing for Engineers and Scientist. 3rd Edition, McGraw Hill.

EAT 462/4
FINAL YEAR PROJECT II

Course Synopsis

This subject is the continuity of Final Year Project I. In this course students will conduct an experimental task which has been planned during the Final Year Project I. Students also will be completing their thesis report during this subject. In this course, students will be also exposed to journal writing.

COURSE SYLLABUS

CIVIL ENGINEERING PROGRAMME (RK01)

EAT 102/4
MECHANICS AND MATERIAL ENGINEERING

Course Synopsis

The aim of this course is to enable the students to learn the basic of mechanics and material engineering. In engineering mechanics portion, students will be introduced to fundamentals and principles of static and dynamics mechanics. Resultant and equilibrium of coplanar force system as well as spatial force system will be covered in static portion while kinematics and kinetics of particle in dynamics potion. In material engineering portion, the student will be also taught on structure of crystalline solids, imperfection of solid as well as strength of material.

Course Outcomes

CO1: Ability to construct free body diagram and ability to solve equilibrium problems using equilibrium theory.
CO2: Ability to determine friction and properties of sections.
CO3: Ability to solve problems which relate to kinematics and kinetics of a particle.
CO4: Ability to explain basic concepts of material strength as well as their mechanic properties.

References

1. Hibbeler, R.C. (2010) Engineering Mechanics Statics. 12th Ed. , Prentice Hall.
2. Hibbeler, R.C. (2010) Engineering Mechanics Dynamics. 12th Ed. , Prentice Hall.
3. Peter Schiavone, Hibbeler, R.C. (2010) Engineering Mechanics Statics Study Pack. 12th Ed. Prentice Hall.

EAT105/4
FUNDAMENTAL OF ELECTRICAL ENGINEERING

Course Synopsis

This course is intended to provide students with clear understanding of the DC and AC circuits, basic principles of 3-phase AC circuits, electro-magnetism and magnetic circuits. Students will also gain an understanding of the basic operating principles and performance analysis of three most commonly used electric machines, namely, transformers, dc machines and induction motors.

Course Outcomes

CO1: Ability to analyse the DC and AC circuits by using Ohm's Law, Kirchhoff's Current Law, Kirchhoff's Voltage Law, Source Transformation and Thevenin's theorem.
CO2: Ability to calculate and analyse parameters of three phase AC system for Wye and Delta connection.
CO3: Ability to explain and apply the basic concept of magnetism and electromagnetism in DC and AC machines.

References

1. Richard, J. Fowler. (2008) Electricity Principles and Applications, 7th Ed., McGraw Hill.
2. Boylestad, R.L. (2007) Introductory Circuit Analysis, 11th Ed., Prentice Hall.
3. Hughes (2005) Electronic Technology, 9th Ed., Prentice Hall.
4. Charles, K.A. and Matthew N.O.S. Fundamentals of Electric Circuits. International 3rd Ed., McGraw Hill.
5. Nilsson, J.W. and Riedel S.A. (2005) Electric Circuits, 7th Ed., Pearson Prentice Hall.

EAT112/4
GEOMATIC ENGINEERING

Course Synopsis

In this course student will be introduce basic surveying involved in engineering. Starting from linear measurement on plane. Students will do leveling after they learn 2 different data logging. With their knowledge in tapping and leveling, they have to do traversing and tachymetry. From all the data they have, student will ask to transform all the data to map using engineering drawing and autoCAD. Lastly, students will be test in real work, in geomatic camp.

Course Outcomes

CO1: Ability to understand basic concept of geomatic.
CO2: Ability to perform surveying task and procedures.
CO3: Ability to provide knowledge and practice with the latest geomatic engineering equipments.

References

1. Barry Kavanagh (2009), Surveying Principles and Applications. Pearson.
2. Ghilani Wolf., Elementary Surveying, An Introduction to Geomatics, Twelfth Edition, Pearson International Edition.

3. N N Basak., Surveying and Levelling, McGraw Hill.
4. Ab. Hamid Mohamed, Asas Ukur Kejuruteraan, Penerbit Universiti Teknologi Malaysia.

EAT115/4
STRENGTH OF MATERIALS

Course Synopsis

The aim of this course is to enable students focused on strength of material which begins with the concept of stress and strain. The concept of axial load, torsion, and bending are also discussed. The stress results from combined loadings will be covered in this course, as well as the concepts for transforming multiaxial states of stress and in similar manner, the methods for strain transformation. Besides that the buckling of column also will be exposed to the student.

Course Outcomes

CO1: Ability to determine the stresses, strains and deformation of members in simple one-dimensional elastic system.
CO2: Ability to analyze torque-loaded member and evaluate the values and distribution of bending and shear stresses in beam section.
CO3: Ability to apply stress caused by combined loadings and buckling of column.
CO4: Ability to calculate stresses on inclined plane using Mohr's Circle.

References

1. R.C Hibbeler' (2014) "Mechanics of Materials" ,9th Ed, Prentice Hall.
2. Ferdinand P. Beer, E. Russell Johnston Jr., John T. DeWolf. (2004) "Mechanics of Materials". 3rd Edition. McGraw Hill.
3. Megson, T.H.G.(2002) "Structural and Stress Analysis", Butterworth: Heinemann.

EAT152/3
ENGINEERING GEOLOGY

Course Synopsis

This course provides the fundamental aspects of physical geology, structural geology and engineering geology for civil engineering works. Principles of engineering geology will be focus in areas of applied geology and rock mechanics. At the end of the course, students should be able to comprehend and apply the relevant principle of geology in civil engineering structures.

Course Outcomes

CO1: Ability to discuss the principles of engineering geology and differentiate the types of rock.
CO2: Ability to describe weathering process in rock mass and geological structures including its discontinuities.
CO3: Ability to discuss and evaluate the strength of rock mass. Ability to describe the state of stresses in rock mass.
CO4: Ability to discuss ground investigation and recommend stabilization method for rock mass.

References

1. C. W. W. Ng, N. Simons and B. Menzies (2008) 'A Short Course in Geology for Civil Engineers', Thomas Telford Publishing.
2. F.G.H. Blyth and M. H. de Freitas (2005) 'A Geology for Engineers', Elsevier Butterworth-Heinemann.
3. F. G. Bell (2007) 'Engineering Geology', Elsevier Ltd.

EAT212/4
SOIL MECHANICS

Course Synopsis

The course introduces the students with the basic and background of the properties and behavior of soil deposits and the applications of soil mechanics theory. It includes brief introduction on geological and physical characteristics of soils. Also includes identification, classification and description of soil for engineering purposes. Application of mechanics on soil such as phase relationship, compaction, permeability and seepage, stresses and effective stresses, shear strength and consolidation are also covered.

Course Outcomes

CO1: Ability to identify, classify and differentiate the different types of soil and rock including their properties.
CO2: Ability to discuss the seepage and permeability concept and solve problem involving flow nets.
CO3: Ability to solve calculation problem using mechanics involving physical properties, compaction and effective stress.
CO4: Ability to employ the shear strength theory to determine shear strength parameters of soils.
CO5: Ability to explain the process of consolidation and solving problems using one-dimensional consolidation theory.

References

1. R. F. Craig (1997) 'Soil Mechanics', E & FN Spon.
2. M. Budhu (1999) 'Soil Mechanics & Foundations', Wiley.

3. J.H Atkinson (1993) 'An introduction to the mechanics of soils and foundation, through critical state soil mechanics', McGraw Hill.

EAT 250/3
BUILDING ENGINEERING DRAWING

Course Synopsis

The course equips students with the basic computer-aided drawing skill for general engineering drawing, and especially the drawing for Building engineering profession. This includes the structural plan, cross section drawing and structural detailing. Through lectures, students will learn the basic characteristics of professional civil engineering drawing and computer-aided drawing program. Through hands-on sessions using drawing software packages, this course enables the students to have first hand practice on the drawing for some idealized and actual projects. Mini project cover several disciplines of building engineering profession will be integrated through a series of these hand-on sessions. Moreover, students will learn about bill of quantity through drawing from industry.

Course Outcomes

CO1: Ability to convey with sketching, manual and computer-aid-drawing application.
CO2: Ability to interpret architectural drawing and construct into structural drawing propose; to identify structural layout.
CO3: Ability to relate the basic engineering drafting to the actual construction via graphical presentation.
CO4: Ability to calculate bill of quantity that used in tendering in construction industry.

References

1. Gary R Bertoline, Eric N Wiebe (2003) "Technical Graphics Communication", 3rd ed., McGraw-Hill.
2. Zurflieh, Thomas P. (2005), AutoCAD 2004: 3D drawing and solid modeling, Prentice Hall.
3. Shawna Lockhart (2005) A tutorial Guide to AutoCAD 2005, Prentice Hall.

EAT251/3
STRUCTURAL THEORY

Course Synopsis

This course provides students with a clear and through presentation of the theory and application of structural analysis as it applies to beams, trusses and frames. It introduces analysis of statically determinate structures for beams, trusses and frames. Beside that, It also introduces deflections using geometrical method for the beams and also virtual work method for trusses, beams, and frames. Cables and arches also will be discussed at the end of this course.

Course Outcomes

CO1: Ability to identify the statically determinate and indeterminate structures.
CO2: Ability to analyze and illustrate the support and internal loading developed in determinate structure.
CO3: Ability to analyze the internal forces in cable and arch.
CO4: Ability to determine the deformation of determinate structure.

References

1. Hibbeler, R.C. (2009), "Structural Analysis", Seventh Edition, Prentice-Hall.
2. Kassimali, A. (1999) "Structural Analysis", Second Edition, PWS.
3. Hibbeler, R.C., Reddy C.S. (2005), "Mechanics of Material", Prentice-Hall.

EAT252/4
FLUID MECHANICS ENGINEERING

Course Synopsis

This course provides student knowledge in the patterns of movement of fluid particles. By the end of this subject student will be expected to understand the basic characteristics of fluid mechanics and fluid statics, be able to analyze the hydrostatics and basic hydrodynamics in fluid. Student also will be able to analyze and differentiate between the flow in pipe and flow in open channels. In this subject, student will be introduced to the Darcy-Weisbach equation, Moody diagram, Energy losses in pipelines, Minor losses, Multiple pipe systems.

Course Outcomes

CO1: Ability to understand and analyze the basic characteristics of fluid mechanics and fluid statics.
CO2: Ability to analyze the hydrostatics and basic hydrodynamics in fluid.
CO3: Ability to analyze the flow in pipe and flow in open channels.
CO4: Ability to analyze Darcy-Weisbach equation, Moody diagram, Energy losses in pipelines, Minor losses, Multiple pipe systems.

References

1. Duncan, W.J., Thom, A.S. & A.D. Young. (1970) Mechanic of fluids, 2nd Edition. London.
2. Yunus A. Cengel & John M. Cimbala (2010) Fluid Mechanics : Fundamental and Applications. 2nd Edition. McGraw Hill.
3. Frank M. White (2003) Fluid Mechanics. 5th Edition. McGraw Hill.
4. Bruce R Munson, Donald F Young, Theodore H Okiishi (2002) Fundamentals of Fluid Mechanics. 4th Edition. John Wiley & Sons.
5. Robert, L.M. (2000) Applied Fluid Mechanics. 5th Edition. Prentice Hall.

EAT237/3
WATER SUPPLY ENGINEERING

Course Synopsis

This course introduces the student of Civil and Environmental Engineering on the application of basic science and engineering knowledge to solve water supply issues. The topics to be covered include water sources, quality and demand, water treatment plant design covering water intake, pre-treatment, primary treatment and advance water treatment processes, and water distribution system analysis.

Course Outcomes

CO1: Ability to identify water sources, water quality and consumption, and to forecast water demand.
CO2: Ability to identify the technology of water treatment processes.
CO3: Ability to design water treatment unit.
CO4: Ability to describe and analyze water distribution system.

References

1. Qasim, S.R., Motley, E.M. and Zhu, G. (2000) Water Works Engineering: Planning, Design, and Operation. Prentice Hall PTR.
2. Mackenzie L. Davis (2011) Water and Wastewater Engineering, Design Principles and Practice, International Edition, McGraw Hill, Singapore.
3. The Malaysian Water Association (2000). MWA Design Guidelines for Water supply Systems, published by MWA.

EAT253/3
STRUCTURAL ANALYSIS I

This course provides student with understanding of influence lines for statically determinate structures and approximate analysis of statically indeterminate structures. Student also will be introduce with beam, trusses and plane frame analysis using slope deflection and moment distribution methods. This course requires pre-requisites EAT 251/3 – Structural Theory.

Course Outcomes

CO1: Ability to analyze of statically determine structures for beam, trusses and frame using influence line method.
CO2: Ability to analyze of statically indeterminate structures for beam, trusses and frame using approximate analysis.
CO3: Ability to analyze structures using the displacement method of analysis by developing the slope deflection equation.
CO4: Ability to analyze structures using the displacement method of analysis by applying the method of moment distribution.

References

1. Hibbeler, R.C. (2009) “Structural Analysis”, Seventh Edition, Prentice-Hall.
2. Kenneth, M. Leet. (2008) “Fundamentals of Structural Analysis”. Third Edition. McGraw-Hill.
3. Reddy C.S. (1996), “Basic Structural Analysis”, Tata McGraw Hill Publishing Co.

EAT258/3
BUILDING MATERIALS ENGINEERING

Course Synopsis

This course exposes students to different types of construction materials in building engineering. It covers type and function of cement, function of aggregates in concrete, water, admixtures, properties of fresh and hardened concrete, concrete mix design, manufacturing concrete on site. Properties and application of timbers, types and characteristics of bricks and blocks, ferrous and non-ferrous metals, and other current materials in the construction industry are also discussed.

Course Outcomes

CO1: Ability to identify and differentiate the different types of engineering material.
CO2: Ability to explain the basic science and engineering fundamentals pertaining to characteristic of the constituents of concrete and its influence to fresh and hardened concrete properties.
CO3: Ability to analyze the basic science and engineering fundamentals pertaining to other construction material namely

steel, timber, bricks and bitumen and differentiate its influence to their properties.

CO4: Ability to apply the knowledge gain above for various application related to civil engineering work and discuss the innovations, new applications and new construction material for sustainable development.

References

1. Edward Ellen and Joseph Iano (2008) "Fundamental of Building Construction: Materials and Methods", Fourth Edition. Wiley.
2. Bjorn Berge (2009) "Ecology of Building Materials". Second Edition. Architectural Press.
3. H. Zhang (2010) "Building Materials in Civil Engineering". Wood head Publishing Limited.

EAT 259/3
HYDRAULICS

Course Synopsis

This course builds on the fundamentals given in Fluid Mechanics and reinforces students' understanding of the behaviour of fluids, through the study of the flow of water in typical civil engineering applications. The course covers the study of steady incompressible flow in pipelines and pipe networks, uniform and non uniform flow in open channels, dimensional analysis and similitude and hydraulics machinery.

Course Outcomes

CO1: Ability to analyze and design the steady flow in pipeline.

CO2: Ability to analyze and design steady flow in open channel.

CO3: Ability to analyze and design hydraulics machine systems and/or undertake a dimensional analysis of a physical system incorporating many variables.

References

1. Marriott, M. (2009) Civil Engineering Hydraulics, 5th Edition, Wiley Blackwell.
2. Chadwick, A., Morfett, J. and Borthwick, M. (2013) Hydraulics in Civil and Environmental Engineering, 5th Edition, CRC Press, New York
3. Kay, M. (2006) Practical Hydraulics. 2nd Edition. E & FN Spon, London.
4. Chow, V.T. (2009) Open-Channel Hydraulics, The Blackburn Press.
5. Houghtalen, R.J. , Osman Akan, A., and Hwang, N.H.C. (2009) Fundamentals of Hydraulic Engineering Systems, 4th Edition, Prentice Hall.

EAT 314/4
GEOTECHNICAL ENGINEERING

Course Synopsis

This course provides further discussion and explanation related to soil engineering. The topics cover in this course includes site investigation, bearing capacity and design of shallow foundation and pile foundation, lateral earth pressure, and slope stability. At the end of the course, students should be able to apply theory and practical to solve problem related to geotechnical engineering.

Course Outcomes

CO1: Ability to discuss issues in geotechnical engineering and explain site investigation methods.

CO2: Ability to analyze soil bearing capacity and design for shallow foundations and pile foundations.

CO3: Ability to analyze active and passive pressure according to Rankine's and Coulomb's theories.

CO4: Ability to analyze the stability of the slope in term of factor of safety.

References

1. Das, B.M. (2010) 'Principles of Geotechnical Engineering', Cengage Learning.
2. Das, B.M. (2007) 'Principles of Geotechnical Engineering', Thomson.
3. Gofar, N. & Kassim, K.A. (2007) 'Introduction to Geotechnical Engineering', Prentice Hall.

EAT351/3
CONCRETE BUILDING DESIGN I

This course is designed to provide the student with a understanding of the limit state design concept and analysis of sections for bending; to provide a basic understanding of standard methods of analysis and design of reinforced concrete behaviour (including an understanding of capabilities and limitations); and to ability to analyze and design reinforces concrete structural elements. Among the topics discussed are objectives and methods of design, code of practice, analysis and design of sections for moment, design for shear, checking for deflection and cracking, durability and detailing requirements. Design of simply supported, continuous beams and cantilever beam, design of one way and two way restrained and simply supported slab and design a column. The syllabus is cover ultimate and serviceability limit state. Design resistance typical structural element and detailing.

Course Outcomes

CO1: Ability to calculate limit state design concept and analysis of sections for bending.
CO2: Ability to design and predict reinforcement bar for simply supported and continuous beam and illustrate beam detailing.
CO3: Ability to design reinforced concrete slab for one way and two way slab and illustrate slab detailing.
CO4: Ability to design reinforced concrete column and illustrate column detailing.

References

1. Mosley, W.H. Bungey, J.H. and Hulse, R. (2007) *Reinforced Concrete Design to Eurocode 2.* 6th Ed., Palgrave Macmillan.
2. W.M.C. McKenzie (2004) *Design of Structural Elements*. Palgrave Macmillan.
3. IStructE (1985). *Manual for the Design of Reinforced Concrete Building Structures*. The Institution of Structural Engineer.

EAT353/3
STRUCTURAL ANALYSIS II

Course Synopsis

This course provides student with understanding of matrix analysis for statically indeterminate structures using flexibility and stiffness methods. Non prismatic members are also included in the analysis. Student also will be introduced with the structural modeling using finite element method. Structural modeling and analysis using commercial structural analysis software are emphasized.

Course Outcomes

CO1: Ability to analyze the statically indeterminate beam, trusses and frame by applying the force or flexibility method.
CO2: Ability to analyze and solve indeterminate structural problems for prismatic and non- prismatic members.
CO3: Ability to analyze the statically indeterminate beam, trusses and frame by using the stiffness method.
CO4: Ability to derive the finite elements equation and apply in analysis of structures.

References

1. Hibbeler, R.C. (2009) “Structural Analysis”, Seventh Edition, Prentice-Hall.
2. Liu, G.R. and Quek S.S. (2003) The Finite Element Method: A Practical Course, Butterworth-Heinemann.
3. Kenneth, M. Leet. (2008) “Fundamentals of Structural Analysis”. Third Edition. McGraw-Hill.

EAT356/4
WATER & WASTEWATER ENGINEERING

Course Synopsis

This course is an overview of engineering approaches to protecting water quality with an emphasis on fundamental principles. Theory and conceptual design of systems for treating municipal wastewater and drinking water are discussed, as well as reactor theory, process kinetics, and models. Physical and biological processes are presented, including sedimentation, filtration, biological treatment and disinfection. Finally, there is discussion of engineered and natural processes for wastewater treatment.

Course Outcomes

CO1: Ability to describe and analyse the theory and concept in water processing, and solve the problems related to the process involved.
CO2: Ability to analyse and design the process/systems process of drinking water processing.
CO3: Ability to describe and analyse the theory and concept in wastewater treatment and solve the problems related to the treatment involved.
CO4: Ability to analyse and design the process/ systems of wastewater treatment.

References

1. Mark J. Hammer, Mark J. Hammer, Jr. (2005) Water and Wastewater Technology. Prentice Hall.
2. Mackenzie Davis (2011). Water and Wastewater Engineering: Design Principles and Practice. McGraw Hill.
3. Metcalf and Eddy (2005) Wastewater Engineering: Treatment and Reuse. McGraw Hill.

EAT 357/3
CONSTRUCTION MANAGEMENT

Course Synopsis

This course is designed to provide students with the knowledge of subject area; ability to apply tools in a project environment; demonstrate competence in learning and evidence generating to sustain competency. The syllabus comprises scope management including project authorization, scope definition, control and finalization.

Cost management including project costing, resource planning, budgeting and controlling financial completion are also emphasized. In addition, this course will also expose students to the time management including activity sequencing, duration estimating, scheduling, progress control, monitoring and forecasting.

Course Outcomes

CO1: Ability to discuss and describe the general project management principles of construction industry.
CO2: Ability to describe three major components in project management (planning, execution and project evaluation).
CO3: Ability to use project planning and scheduling technique available in construction management.
CO4: Ability to analyze the project cash flow requirements, project monitoring, and control.

References

1. Kraig K., Clifford J. S., Christine M. F., & Richard E. M. (2009) “Construction Management Fundamentals”, Second Edition, McGraw Hill Construction.
2. Gido & Clements. (2003) “Successful Project Management”, Second Edition. Thomson, South-Western.
3. Jack R. Meredith & Samuel J. Mantel, Jr. (2000), “Project Management: A Managerial Approach”, Fourth Edition. John Wiley.

EAT352/3
CONCRETE BUILDING DESIGN II

Course Synopsis

This course is designed to provide the student with ability to analyze and design advanced reinforces concrete structural elements. Among the topics discussed are objectives and methods of design, code of practice, analysis and design of sections for moment, design for shear, checking for deflection and cracking, durability and detailing requirements. Calculation for design includes pre-stressed concrete, foundation, reinforce concrete frame and retaining wall.

Course Outcomes

CO1: Ability to design prestressed concrete and illustrate the detailing.
CO2: Ability to design and predict reinforcement bar for foundation and illustrate foundation detailing.
CO3: Ability to design retaining wall and illustrate retaining wall detailing.
CO4 Ability to design and analysis reinforced concrete frame.

References

1. Mosley, W.H. Bungey, J.H. and Hulse, R. (2007) *Reinforced Concrete Design to Eurocode 2.* 6th Ed., Palgrave Macmillan.
2. W.M.C. McKenzie (2004) *Design of Structural Elements*. Palgrave Macmillan.
3. IStructE (19850 *Manual for the Design of Reinforced Concrete Building Structures*. The Institution of Structural Engineer.

EAT354/3
STEEL BUILDING DESIGN

Course Synopsis

This course provides a basic understanding of behavior and design of steel members, connections and structures. At the end of this unit, students should be familiar with the behavior of steel structures; in particular the various forms of buckling and failure, particularly those associated with tension, bending, shear compression, combined actions and connections; have a working knowledge of Eurocode, and be competent in designing a simple structure to Eurocode. The syllabus comprises the behavior of steel members and structures - properties of cross-sections, local buckling, elastic beams, plastic beams, tension members, compression members, effective lengths and elastic in-plane frame buckling, local and lateral buckling of beams, in-plane bending of beam columns, lateral buckling of beam-columns, biaxial bending of beam-columns, bolted and welded connections

Course Outcomes

CO1: Ability to design axially loaded member without and/or with associate combination axial load and bending.
CO2: Ability to design flexural members.
CO3: Ability to design steel structures joints.

References

1. Trahair, N.S., Bradford, M.A., Nethercot, D.A., and Gardner, L. (2008) “The Behaviour and Design of Steel Structures to EC3”, Taylor & Francis.

2. Martin, L.H., and Purkiss, J.A (2008) “Structural Design of Steelwork to EN 1993 and EN 1994” 3rd Edition, Butterworth-Heinemann.
3. Luis Simões da Silva, Rui Simões, Helena Gervásio (2010) “Design of Steel Structures: Eurocode 3: Design of Steel Structures. Part 1-1: General Rules and Rules for Buildings.” The European Convention for Constructional Steelwork.
4. Wald, F., Tan, K.H., and Chiew, S.P. (2011) “Design of Steel Structures with Worked Examples” Research Publishing.

EAT 359/3
WATER RESOURCES ENGINEERING

Course Synopsis

This course is designed to expose students the engineering principles involved in analyzing and managing the quantity and quality of water in natural and developed systems. The student is exposed to the different phases in Water Resources viz planning, collection of relevant data on water resources and also on National Water Policy. Reservoir planning, management and economic analysis aspects are covered in detail.

Course Outcomes

CO1: Ability to evaluate and costruct design of water resources systems utilizing the basic principles of the hydrologic cycle and the watershed.
CO2: Ability evaluate surface water and groundwater flow for applications in water well development.
CO3: Ability to measure water resources needs for further basin development plan, reservoir and stream flow routing.
CO4: Ability to evaluate the design of stormwater management and pollutant loads for watershed and water quality analysis.

References

1. Larry W. M. (2005) “Water Resources Engineering”, John Wiley & Sons, NJ.
2. Linsley R.K. and Franzini J.B. (2000) “Water Resources Engineering”, McGraw-Hill Inc.
3. Philip B. B., Wayne C.H., Baxter, E.V. (2013) “Hydrology and Floodplain Analysis”, Pearson, England

EAT 355/3
HIGHWAY & TRANSPORTATION ENGINEERING

Course Synopsis

The goal of this course is to give knowledge, understanding and synthesis in highway engineering which covers topics on traffic, road and highway. The sub-topics discussed are characteristics of drivers, pedestrians, vehicles and road, fundamentals of traffic flow, including volume, speed and density, traffic engineering studies, geometric design of road, two and multi-lanes highway. Students will be taught briefly on materials related to asphalt, bitumen and concrete, flexible and rigid pavements.

Course Outcomes

CO1: Ability to understand traffic flow fundamentals and relationship between volume, speed and density.
CO2: Ability to understand the transportation planning process, forecast travel demand and design highway drainage structures.
CO3: Ability to understand soil bearing test, material used in pavement, and design flexible pavement.
CO4: Ability to design rigid pavement.

References

1. Traffic and Highway Engineering, Fourth Edition, Nicholas J. Garber and Lester A. Hoel, (2009) Cengage Learning
2. Traffic Engineering Design, Principles and Practice, Second edition, 2005, Elsevier Butterworth-Heinemann
3. AASHTO Guide For Design Of Pavement Structures, 1993, American Association Of State Highway And Transportation Officials

EAT 455/3
INDUSTRIALISED BUILDING SYSTEM

Course Synopsis

This course is designed to expose students to the concepts of IBS which includes the advantages and disadvantages using IBS in Construction, Roadmap of IBS and the usage of IBS. It also highlighted the concept of Score Calculation and submission, Principal of Modular Coordination in IBS and concepts of buildibility. Joints and tolerances will also be discussed. Enhancement through mini project and hands-on will be done to further strengthen their knowledge on subject matter.

Course Outcomes

CO1: Ability to classify the concept of IBS modern construction technology.
CO2: Ability to evaluate the Principle of Score calculation and its submissions.

CO3: Ability to decide Concept of Modular Coordination in IBS, Joints and Tolerances.
CO4: Ability to discusss precast concrete building design.

References

1. Sarja (2010) “Open and Industrialized Building”. Taylor & Francis.
2. Abraham Warzaski (2005) “Industralised and Automated Building Systems: A Managerial Approach”. Second Edition. Tylor & Francis Group.
3. Albert G. H. Dietz (1971) “Industrialized Building Systems for Housing”. The MIT Press.

EAT 451/3 INTEGRATED PROJECT DESIGN

Course Synopsis

The civil engineering capstone senior design course involves all seniors in their last semester before graduation and is titled “Integrated Project Design.” It is illustrate in the course as analysis, design and planning of a building engineering design project; an integrated and realistic group project involving as much as possible all major aspects of civil engineering profession. This course is the culminating activity in the civil engineering program.

Course Outcomes

CO1: Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in civil engineering discipline.
CO2: Ability to identify, formulate and solve civil engineering problems.
CO3: Ability to design sub-structure, structure and infra-structure to meet desired needs.
CO4: Ability to investigate and interpret raw data, borelog, topographic map, architectural drawing, etc.
CO5: Ability to use techniques, skills and modern engineering tools necessary for engineering practices.
CO6: Ability to demonstrate/ understand the social, cultural, global and civil responsibilities of a professional engineer.
CO7: Ability to demonstrate/ understand entrepreneurship, the process of innovation and the need for sustainable development of the environment.
CO8: Ability to understand the professional and ethical responsibilities and commitment to the society.
CO9: Ability to function on multi-disciplinary teams.
CO10: Ability to communicate effectively.
CO11: Ability to understand the need for, and engage in life-long learning.
CO12: Demonstrate understanding of project management and finance principles.

References

1. Merritt, F. S., and Ricketts, J.T. (2001) “Building design and construction handbook”, Sixth Edition, McGraw-Hill.
2. Chen, W.F., and Richard Liew, J.Y. (2003) “Civil Engineering Handbook”, CRC Press.
3. Reynolds, C.E. and Steedman J.C., and Threlfall, A.J. (2008) “Reinforced Concrete Designer’s Handbook”. 11th Ed., E & FN Spoon.
4. Reynolds, C.E. and Steedman J.C. (1992) “Examples of the Design of Reinforced Concrete Buildings to BS8110”, 4th Ed., E & FN Spoon.
5. Department of Irrigation and Drainage Malaysia (2000) “Urban Stromwater Management Manual for Malaysia” Department of Irrigation and Drainage Malaysia.
6. Bowles, J.E. (1996) “Foundation Analysis and Design”, 5th Ed, McGraw-Hill.
7. Nunnally, S.W. (2007) “Construction method and management”, Pearson Prentice Hall.
8. Riley, M and Cotgrave, A. (2004) “Construction Technology 2: Industrial and Commercial Building”, Palgrave Macmillan.

EAT 461/2 FINAL YEAR PROJECT I

Course Synopsis

This an individual research project in connection with a special engineering problem and under the guidance of an academic staff. The project undertaken may fall under one of the following areas: Mathematical analysis, experimental tests, computer simulation, hardware and/software development, to their field of interest. At the end of the project, each student prepares an engineering report, presents and demonstrates findings and results of the project work.

Course Outcomes

CO1: Ability to modulate and utilize academic knowledge and practical experience in conducting an academic project.
CO2: Ability to think objectively, analytically and critically in identifying and solving problem in systematic manner. Ability to create innovative/ commercialization.

CO3: Ability to work independently in conducting and completing an academic project.
CO4: Ability to present the proposal and final product orally and graphically.

References

1. Donald H. McBurney and Teresa L. White, (2007). Research Methods, 7th Edition, Thompson Wadsworth.
2. Daniel Holtom & Elizaberth Fisher, (1999). Enjoy Writing Your Science Thesis or Disertation, Imperial College Press.
3. Leo Finkelstein, Jr., (2008). Pocket ook og Technical Writing for Engineers and Scientist. 3rd Edition, McGraw Hill.

EAT 462/4
FINAL YEAR PROJECT II

Course Synopsis

This subject is the continuity of Final Year Project I. In this course students will conduct an experimental task which has been planned during the Final Year Project I. Students also will be completing their thesis report during this subject. In this course, students will be also exposed to journal writing.

EAT 411/3
ADVANCED CONCRETE BUILDING DESIGN

Course Synopsis

This course provides additional knowledge on the aspect of reinforced concrete structural elements. As a continuation to the Concrete Building Design 1 and 2, the topics discussed include analysis and design of ribbed, waffle and flat slabs, water retaining structures, walls, corbel and Nibs. Methods of deflection calculation, design of elements for torsion and analysis and design of raft foundation are also covered.

Course Outcomes

CO1: Ability to analysis and design ribbed, waffle or flat slabs.
CO2: Ability to analyze and design torsion members.
CO3: Ability to analyze and design water retaining structures.
CO4: Ability to analyze and design raft foundation and deflections checking.

References

1. Hibbeler, R.C. (2009) “Structural Analysis”, Seventh Edition, Prentice-Hall.
2. Liu, G.R. and Quek S.S. (2003) The Finite Element Method: A Practical Course, Butterworth-Heinemann.
3. Kenneth, M. Leet. (2008) “Fundamentals of Structural Analysis”. Third Edition. McGraw-Hill.

EAT 413/3
CONSTRUCTION ENGINEERING

Course Synopsis

The construction sector is a major part of the total civil engineering and building industry. Construction projects range in size from the small to the very large (such as the construction of a hydroelectric power scheme or a freeway system). However, all projects share the common factors of utilizing workers, machines and materials, and of requiring organization and control. The graduate engineer must, therefore, be familiar with the range of construction equipment and techniques in common use, and must be able to plan and direct construction works. The course covers the areas of construction techniques, construction management and concrete technology.

Course Outcomes

CO1: Ability to discuss and describe the general project construction principles.
CO2: Ability to describe major components in project construction.
CO3: Ability to describe of the techniques of construction operations, planning and management.
CO4: Ability to understanding & describe of the design, construction and maintenance of buildings and built facilities and the management techniques used for these processes.

References

1. Peurifoy, RL, Schexnayder, CJ & Shapira, A (2006), *Construction planning, equipment and methods*, 7th edn, McGraw Hill, Boston.
2. Gido & Clements. (2003) “Successful Project Management”, Second Edition. Thomson, South-Western.
3. Brand, RE (1975), *Falsework and access scaffolds in tubular steel*, McGraw Hill, London.

EAT 415/3
ADVANCED STEEL BUILDING DESIGN

Course Synopsis

This course provides additional knowledge on the aspect of steel structural elements. As a continuation to the Steel Building Design, the topics discussed include design of plated structures and composite structures. Portal Frame analysis and design also covered. And also design consideration and design concept of cold-formed steel structures.

Course Outcomes

CO1: Ability to analyze and design plated structures.
CO2: Ability to analyze and design composite structures.
CO3: Ability to analyze and design portal frame.
CO4: Ability to analyze and design cold-formed steel structures.

References

1. Martin,L, Purkiss,J (2008). Structural Design of Steelwork to EN 1993 and EN 1994, Third Edition, Butterworth.
2. Trahair, NS, Bradford, MA, Nethercot, DA, Gardner L. (2008) The Behaviour and Design of Steel Structures to EC3. Fourth Edition. Taylor & Francais.
3. Lam, D, Ang, TC, Chiew, SP (2004) Structural Steelwork. Design to limit state theory. Third Edition. Elsevier.

EAT 453/3
ADVANCED STRUCTURAL ANALYSIS

Course Synopsis

This course provides students with basic knowledge of the finite element method (FEM) in structural analysis and response of the systems under dynamic excitation. For the finite element method this course explains the fundamental of the FEM and procedure to develop FEM equation. The fundamental of the FE will be utilized in the development of FEM equation for 2 dimensional solid models. The plasticity of the structural member also discussed and analyzed in this course. Moreover, the students will be introduced and exposed to the structural dynamic. For that purpose two basic topics in structural dynamic (i.e. equation of motion and response of single degree of freedom system under free vibration) will be covered in this course.

Course Outcomes

CO1: Ability to derive finite element equation.
CO2: Ability to analyze the 2 dimensional solid model using finite element method.
CO3: Ability to analyze moment capacity for the structural member.
CO4: Ability to derive the equation of motion for single degree of freedom system.

References

1. G.R. Liu and S.S. Quek (2003) “The Finite Element Method: A practical course”. 1st edition. Butterworth-Heinemann.
2. K. Chopra (2007) “Dynamics of Structures”, Pearson Prentice Hall.
3. James G MacGregor and James K Wight (2005) “Reinforced Concrete Mechanics and Design” 4th Edition, Pearson Prentice Hall.

EAT 454/3
TIMBER AND MASONRY DESIGN

Course Synopsis

This course provide student knowledge in engineering material(timber and masonry). Emphasis of this course is to introduce students to timber and masonry as structural member. Student will be able to design timber joint using nail and other mechanical fasteners, design unreinforced and reinforced masonry structural elements and structures and will be able to analyze serviceability and ultimate capacity design; seismic response; resistance and design.

Course Outcomes

CO1: Ability to design wood columns and bending members.
CO2: Ability to design timber joint using nail and other mechanical fasteners.
CO3: Ability to design unreinforced and reinforced masonry structural elements and structures.
CO4: Ability to analyze serviceability and ultimate capacity design; seismic response; resistance and design.

References

1. Dayaratnam, P. (1997) “Brick and Reinforced Brick Structures”, Oxford & IBH Publishing House.
2. Abdy Kermani (1999), ‘Structural Timber Design’ Wiley-Blackwell, - Technology & Engineering
3. Jack Porteous, Abdy Kermani (2007) ‘Structural Timber Design’, John Wiley And Sons.

EAT 456/3
FOUNDATION ENGINEERING

Course Synopsis

This course provides further discussion and explanation related to foundation engineering. The topics cover in this course includes mat foundations, drilled-shaft foundations, retaining walls, foundations on difficult soils, and soil improvement. At the end of the course, students should be able to apply theory and practical to solve problem related to foundation engineering.

Course Outcomes

CO1: Ability to calculate soil bearing capacity and design for mat and drilled-shaft foundations.

CO2: Ability to analyze the stability and design of retaining walls.
CO3: Ability to discuss and analyze foundations on difficult soils for collapsible and expansive soils.
CO4: Explain soil improvement method.

References

1. Das, B.M. (2011) 'Principles of Foundation Engineering', Cengage Learning.
2. Das, B.M. (2007) 'Principles of Geotechnical Engineering', Thomson.
3. Das, B.M. (2004) 'Principles of Foundation Engineering', Thomson.

EAT 459/3
BUILDING AUTOMATION SYSTEM

Course Synopsis

This course will introduce student to building management system which is used to refer to a wide range of computerized building control systems. Through this course, student will be able to learn about BAS communication standards, internet technologies and their applications in BASs, control and optimization of air- conditioning systems, control and optimization of central chilling systems and lighting- control systems security and safety control systems. At the end of the course, the students should be able to analyze and evaluate BASs systems.

Course Outcomes

CO1: Ability to analyze building automation system communication standards.
CO2: Ability to evaluate internet technologies and their applications in BAS.
CO3: Ability to evaluate control and optimization of air- conditioning systems control and optimization of central chilling systems.
CO4: Ability to design and evaluate lighting- control systems and security and safety control systems.

References

1. Shengwei W. (2000) "Intelligent System And Building Automation", Spon Press.
2. Ogata, K. (2002) "Modern Control Engineering", 4th Ed. Prentice Hall.
3. Gopal, M. (2002) "Control Systems: Principles and Design", 2nd Ed. Tata McGraw-Hill.

EAT463/3
ENVIRONMENTAL LAW, HEALTH AND SAFETY

Course Synopsis

Students will be exposed to Malaysian related laws and regulations on occupational safety and health (e.g. OSHA 1994) and environment (e.g. EQA 1974) and how to interpret the requirements stipulated under these documents. This course will also provide students the necessary information in identifying hazards, assessment and managing the risks that may be harmful to humans in the workplace.

Course Outcomes

CO1: Ability to comprehend and explain the legal requirement of environmental, safety and health laws and regulations.
CO2: Ability to describe and evaluate hazards in the workplace.
CO3: Ability to describe and evaluate the magnitude of risks on humans associated with the hazards in the workplace.
CO4: Ability to outline the management plan in managing the hazards and risks in the work place.

References

1. Goetsch, D.L. (2010) Occupational Safety and Health for Technologist, Engineers and Managers, 7th. Ed. Pearson Prentice Hall.
2. Occupational Safety and Health Act 1994 (Act 514) & Regulations and Orders, 2007 (amended at 5th April), International Law Book Services, Malaysia.
3. Environmental Quality Act & Regulations, 2006 (amended up to April), MDC Publishers Sdn. Bhd., Malaysia.

EAT464/3
BUILDING SERVICES ENGINEERING

Course Synopsis

This course is designed to provide students with an understanding of specification, design, installation and management of all building services equipment inside a buildings. Due to the complexity of modern engineering services in buildings, the role of Civil Engineers is become more important. In addition, the need to provide an internal environment that balances the comfort needs of the occupants with the functional requirements of the building calls for engineers with a wide range of knowledge and skills involving a multidisciplinary technical knowhow. Student will be able to assess the principles application and procedures related to building services (Mechanical & Electrical) system in modern buildings that is important for Civil Engineers.

Course Outcomes

CO1: Ability to describe and discuss the importance of building services in building design with respect to sustainability in modern buildings.

CO2: Ability to evaluate the choice of building services components and approach for better buildings design and operational during building life cycle.

CO3: Ability to evaluate the Mechanical & Electrical distribution systems in modern buildings and problems related to design, operation and maintenance.

References

1. Chatterton, David V. (2007) Building Services Engineering, Hardback, Publisher Taylor & Francis Ltd.
2. David, V. Chatterton (2000) Building Services Engineering, Taylor & Francis.
3. MS1525:2007 Code Of Practice On Energy Efficiency And Use Of Renewable Energy For Non-Residential Buildings (First Revision).
4. MS IEC 60364-1:2007: Low Voltage Electrical Installation. LS-1 Electrical Installation Standard, Public Works Department, Malaysia.

Career Opportunities

Employment prospects and the career of the graduates are broad because they are trained by multi discipline which involves civil, environmental, chemistry and project management. The graduates with Environmental Engineering and Civil Engineering degrees have employment prospects that increasingly widespread in the public and private sectors. The sectors that offer the careers are:

- Oil and gas industry
- Petrochemical industry
- Water treatment and waste water industries
- Solid waste and hazardous waste industries
- Processing and manufacturing industries
- Research & development institution
- Environmental and civil consultation group
- Government agencies such as Jabatan Alam Sekitar, Jabatan Pengairan dan Saliran and Jabatan Kerja Raya
- Building / construction industry
- Education and training institution
- Non-governmental organization (NGOs)

Main career to this programme graduate were as follows:

- Environmental engineer
- Civil engineer
- Structural engineer
- Site engineer
- Environmental research officer / executive
- Process engineer
- Occupational safety, health and environmental engineer
- Sales engineer
- QA/QC engineer
- Pollution control engineer
- Process / production engineer

School of Human Development and Technocommunication (iKOM)

Programmes Offered

• **Bachelor of New Media Communication (Hons.)**

Address

SCHOOL OF HUMAN DEVELOPMENT AND TECNOCOMMUNICATION (iKOM)

Universiti Malaysia Perlis (UniMAP)
Kompleks Pusat Pengajian UniMAP (Blok B)
Jalan Kangar - Arau
02600 Jejawi, Arau, Perlis

Tel.: +6(04) 979 8384
Fax: +6(04) 979 8175

INTRODUCTION

School of Human Development and Technocommunication (iKOM) is a new faculty which has been upgraded from a Centre for Communication Technology and Human Development (PTKPI). In the year 2014, IKOM advanced forward as a faculty upon the approval of the Ministry of Education to offer a new program, the Bachelor of New Media Communications. It will also continue to serve as a Service Center that manages the university courses for UniMAP.

VISION

Committed to be the center of the development of social science, communication, information technology, and soft skills in competitive international arena.

MISSION

iKOM will form intellectual humanity, personality, superiority, creativity and innovativeness. It will also create competitiveness and competency through the observation of knowledge and soft skills with quality education, rooted in the aspirations of the University.

STAFF DIRECTORY

Dean
Assoc. Prof. Dr. Hj. Huzili Hussin
Tel: +6(04) 979 8173
e-mail: huzili@unimap.edu.my

Deputy Dean
(Academic and Research)
Dr. Hanum Hassan
Tel: +6(04) 979 8357
e-mail: hanum@unimap.edu.my

Deputy Dean
(University Courses)
Dr. Shuhairimi Abdullah
Tel: +6(04) 979 8159
e-mail: shuhairimi@unimap.edu.my

Deputy Dean
(Student's Affairs & Alumni)
Ms. Nur Salimah Alias
e-mail: salimah@unimap.edu.my

Chairperson of Degree Programme
(University Courses)
Mr. Hassad Hassan
e-mail: hassad@unimap.edu.my

Chairperson of Degree Programme
(New Media Communication)
Mrs. Adila Ismail
Tel: +6(04) 979 8890
e-mail: adilaismail@unimap.edu.my

Chairperson of Postgraduate Programme
Mrs. Siti Norayu Mohd Basir
Tel: +6(04) 976 6470
e-mail: norayu@unimap.edu.my

Coordinator for Industrial Networking And Quality Management
Ms. Nurul Ashikin Abdul Halim
Tel: +6(04) 979 8893
e-mail: nashikin@unimap.edu.my

Assistant Registrar
Mrs. Noor Zeita Othman
Tel: +6(04) 979 8169
e-mail: zeita@unimap.edu.my

Administrative Officer
(UniMAPfm)
Ms. Marzura Mat Arid
Tel: +6(04) 988 5464
e-mail: marzura@unimap.edu.my

ACADEMIC STAFF DIRECTORY

Datin Paduka Prof. Datuk Dr. Hjh. Ramlah Adam
Ph.D Sejarah (UM)
Master Sejarah (UM)
Sarjana Muda Sastera (Sejarah) (UM)
e-mail: ramlahadam@unimap.edu.my

Prof. Dr. Salleh Abd. Rashid
Ph.D Sport Psychology (Manchester)
M.Ed Health & Fitness (Victoria University, Manchester),
B.Ed Physical Education (USM)
e-mail: salleh@unimap.edu.my

Prof. Dr. Asiah Sarji
Ph.D Penyiaran/ Komunikasi (UKM)
M.Sc Filem/Penyiaran (Syracuse Universiti, New York)
B. Bahasa dan Kesusasteraan Melayu (UKM)
e-mail: asiahsarji@unimap.edu.my

Prof. Dr. Rosnah Ismail
Ph.D Psychology (UMS)
M.A Guidance & Counseling (Durham Universiti, UK)
B.Sc. Food & Nutrition (Louisiana State University, USA)
B.Sc. Health Science (San Jose State Universiti California, USA)
e-mail: rosnah@unimap.edu.my

Assoc. Prof. Dr. Hj. Huzili Hussin
Ph.D Counseling Psychology (USM)
M. Ed (Counseling) (UM)
B.A (Hons), Social Science, (UM)
e-mail: huzili@unimap.edu.my

Assoc. Prof. Abdul Aziz Mahmuddin
M.Sc Corporate Comm (UPM)
B.A. Creative and Descriptive Writing (UM)
e-mail: abdulaziz@unimap.edu.my

Assoc. Prof. Razli Ahmad
M.Sc. HRD (UPM)
BSWM (Hons) (UUM),
e-mail: razli@unimap.edu.my

Assoc. Prof. Hj. Nor Azmi Johari
M.Sc. Management (UUM)
B.A. Bahasa Asing (UPM)
e-mail: azmijohari@unimap.edu.my

Assoc. Prof. Dr. Azizan Bahari
Ph.D (Sociology of Comparative Labour Studies) (Warwick)
M.A (Industrial Relations) (Warwick)
B.A (Social Welfare) (Wisconsin)
Diploma Management Sc. (INTAN)
e-mail: azizanbahari@unimap.edu.my

Assoc. Prof. Mohamed Murray Hunter
Master of Organisation Behaviour, Swinburne University of Technology, Australia
Dip. Of Perfumery, Plymouth University
e-mail: murray@unimap.edu.my

Dr. Hanif Suhairi Abu Bakar
Ph.D Communication (UUM)
M.Sc. Information Management (UiTM)
B. Mass Communication (Advertising) (ITM)
e-mail: hanifsuhairi@unimap.edu.my

Dr. Shuhairimi Abdullah
Ph.D. Islamic Studies (Islamic Entrepreneurs) (USM)
M.A.Islamic Laws, (UM)
B.Syariah (Islamic Laws) (UM)
e-mail: shuhairimi@unimap.edu.my

Dr. Hanum Hassan
Ph.D. Komunikasi (UUM)
MA Komunikasi (USM)
B. Komunikasi (Pemujukan) (USM)
e-mail: hanum@unimap.edu.my

Dr. Syed Zulkarnain Syed Idrus
Ph.D Computer Science and Applications (Universite’ de Caen Basse-Normandie)
M.Sc (Computer Engineering) (UniMAP)
B.Sc. (Information Systems Engineering), UMIST, UK
BTEC National Diploma (IT Applications), North Trafford College, UK
e-mail: syzul@unimap.edu.my

Dr. Amani Ali Elmetwaly Ali Ibrahim
Ph.D. Syariah dan Kehakiman (USIM)
M.A Syariah (Cairo University)
B.A Undang-undang (Cairo University)
Diploma Bahasa Arab Azhar Uni
e-mail: amaniali@unimap.edu.my

Dr. Lt. Abdul Jalil Ramli
Ph. D Sastera (USM)
B.A. (Hons) Sastera (USM)
M.A. Sastera (USM)
e-mail: jalil@unimap.edu.my

Dr. Noormaizatul Akmar Ishak
M.Sc Information Management, (UiTM)
B.Eng Electronic (University of Leeds, UK)
e-mail: maizatul@unimap.edu.my

Mr. Maskor Bajuri
M.A Economy (UKM)
B.A Syariah (Economic) (UM)
e-mail: maskor@unimap.edu.my

Mr. Muhammad Izmer Yusof
Sarjana Pengajian Strategi dan Hubungan Antarabangsa (UUM)
Sarjana Muda Sains Pemutusan (Minor Sains Politik) (UUM)
e-mail: izmer@unimap.edu.my

Mrs. Junainor Hassan
M.Sc. Psychology Counselling (UUM)
B.Sc. Hons Social Science Majoring in Communication Studies (UNIMAS)
Diploma in Office Management & Technology (UiTM)
e-mail: junainor@unimap.edu.my

Mrs. Suzana Sulaiman
Ijazah Sarjana Sains Pengajian Strategik (UUM)
Ijazah Sarjana Muda Pengurusan Hal Ehwal Antarabangsa (UUM)
e-mail: suzanasulaiman@unimap.edu.my

Mrs. Siti Norayu Mohd Basir
Ijazah Sarjana Sains Pengajian Strategik (UUM)
Ijazah Sarjana Muda Pengurusan Hal Ehwal Antarabangsa (UUM)
e-mail: norayu@unimap.edu.my

Mr. Hassad Hassan
MBA in Entrepreneurship (UiTM)
B.A. (Hons) Degree in Marketing (UiTM)
e-mail: hassad@unimap.edu.my

Ms. Zainab Nazar Khalil Wafi
E M.Sc (Computer Engineering. UniMAP
BSc. Computer Science, Almustasiriya University Baghdad
e-mail: zainabwafi@unimap.edu.my

Mrs. Adila Ismail
M.Sc. Information Management (UiTM)
B.Sc. Information Management (Records Management) (UiTM)
e-mail: adilaismail@unimap.edu.my

Mr. Edzham Armin Abdul Rahim
M.A Communication (USM)
B.Ed TESL (UiTM)
e-mail: edzham@unimap.edu.my

Ms. Nur Salimah Alias
Sarjana Pendidikan (Pendidikan Psikologi) (UTM)
Sarjana Muda Psikologi (Industri& organisasi) (UTM)
e-mail: salimah@unimap.edu.my

Mr. Mohd Kasturi Nor Abd Aziz
M.A Sastera (Persejarahan & Sejarah Malaysia) USM
B.A (Hons) Sastera (Sejarah dan Arkeologi) USM
e-mail: kasturi@unimap.edu.my

Mrs. Nur Azila Azahari
M.Sc Information Technology, UKM
B.Sc. Information Technology, UUM
e-mail: nurazila@unimap.edu.my

Ms. Wan Nor Ashiqin Wan Ali
M.Sc Networking (UiTM)
B.Sc. Information Technology (UUM)
e-mail: ashiqinali@unimap.edu.my

Mr. Jamsari Jamaluddin
MSc. Management (UUM)
Sarjana Muda (Hons) Komunikasi (USM)
e-mail: jamsari@unimap.edu.my

Mrs. Nor Syamimi Mohamed Adnan
Master of Educational in Psychology (IIUM)
Bachelor of Mathematical Science (IIUM)
e-mail: syamimiadnan@unimap.edu.my

Mr. Ameer Fuhaili Mohamad Hashim
M.Sc Instruksi Multimedia (USM)
B. Multimedia (Hons) Virtual Reality (MMU)
e-mail: ameerfuhaili@unimap.edu.my

Mr. Tengku Kastriafuddin Shah Tengku Yaakob
Master in Corporate Communication (UPM)
Degree in Mass Communication (Advertising) (ITM)
e-mail: kastriafuddin@unimap.edu.my

Mrs. Suhana Abdul Mutalib
Sarjana Pentadbiran Perniagaan (UUM)
Ijazah Sarjana Muda Ekonomi (Kepujian) (UKM)
e-mail: suhanamutalib@unimap.edu.my

Mr. Mohd Izwan Izhar Haris
Master in Public Management (UUM)
Bachelor in Music (Composition & Audio Technology) (UiTM)
e-mail: mohdizwan@unimap.edu.my

Ms. Nurul Ashikin Abdul Halim
M.Sc Managerial Communication (UUM)
Ijazah Sarjana Muda (Kepujian) Seni Layar (UiTM)
e-mail: nashikin@unimap.edu.my

Mrs. Norhudi'in Danu
M.A Sejarah Asia Tenggara (USM)
B. Dakwah & Kepimpinan Dalam Pengurusan Islam (UKM)
e-mail: norhudin@unimap.edu.my

Mrs. Noor Salwani Hussin
B. Syariah & Sains Politik (UM)
e-mail: noorsalwani@unimap.edu.my

Mrs. Azizah Abdullah
B.A Pengajian Islam Dan Bahasa Arab(Al-Azhar Mesir)
e-mail: azizahabdullah@unimap.edu.my

STUDY LEAVE

Pn Nor'izah Ahmad
MSc. (Corporate Communication) (UPM)
B. Mass Communication (Public Relations) (ITM)
e-mail: izah@unimap.edu.my

Mr. Mohammad Rezal Hamzah
MSc. Corporate Communication (UPM)
B. Economics (UUM)
e-mail: rezal@unimap.edu.my

Mr. Ahmad Fahmi Mahamood
M.Sc (Communication Technology) (UPM)
B. Corporate Communication (UPM)
e-mail: fahmi@unimap.edu.my

Mrs. Husna Afifi Mohd Yusoff
M.sc Information Management (UiTM)
Bach. Of Public Management (Honours) (UUM)
e-mail: husnaafifi@unimap.edu.my

FELLOW SLAB

Mr. Mohd Azri Mohd Nasaruddin
Ph.D. Al-Quran dan Sunnah (USIM)
Ijazah Sarjana Muda Pengajian Al-Quran dan Sunnah (UIAM)

Mr. Abdul Rahman Abdul Manaf
M.Sc Managerial Communication (UUM)
B.Mass Communication (Broadcasting) (UiTM)

Mrs. Aida Shakila Ishak
Ph.D Psikologi Kaunseling (UniMAP)
Sarjana Kaunseling (USM)
Ijazah Sarjana Muda Sains Kemasyarakatan (USM)

Mrs. Nurul Naimah Rose
Ph.D Kaunseling (USM)
M.Ed. (Kaunseling) (UIA)
B. Human Sciences (Sociology & Anthropology) (UIA)

ADMINISTRATIVE STAFF

Mrs. Noor Zeita Othman
Assistant Registrar
Tel. : +6(04) 979 8169
e-mail : zeita@unimap.edu.my

Mrs. Ropidah Ahmad
Assistant Engineer
Tel. : +6(04) 979 8893
e-mail : ropidah@unimap.edu.my

Mrs. Nor Hazliza Ibrahim
Secretary
Tel. : +6(04) 979 8384 / 8389
e-mail : hazliza@unimap.edu.my

Mrs. Suriani Ismail
Admin Assistant
Tel. : +6(04) 979 8171
e-mail : suriani@unimap.edu.my

Mr. Rosman Ramli
Admin Assistant
Tel. : +6(04) 979 8176
e-mail : rosman@unimap.edu.my

Mrs. Norain Abdullah
Admin Assistant
Tel. : +6(04) 979 8177
e-mail : norainabdullah@unimap.edu.my

Mr. Mohd Abul Fathi Zaiyadi Hussain
Admin Assistant
Tel. : +6(04) 979 8177
e-mail : abulfathi@unimap.edu.my

Mr. Roseffandi Darus
Office Assistant
Tel. : +6(04) 979 8176
e-mail : roseffandi@unimap.edu.my

COUNSELING CENTRE STAFF

Mrs. Wan Saniah Wan Yahya
Psychology Officer
Tel. : +6(04) 979 8303
e-mail : wansaniah@unimap.edu.my

Mrs. Nur Aimi Muslim
Psychology Officer
Tel. : +6(04) 979 8321
e-mail : nuraimi@unimap.edu.my

Mrs. Azieda Azizan
Admin Assistant
Tel. : +6(04) 979 8304
e-mail : azieda@unimap.edu.my

Mrs. Shahrulni Liza Husin
Customer Service
e-mail : liza@unimap.edu.my

UniMAPfm STAFF

Ms. Marzura Mat Arid
Administrative Officer
Tel. : +6(04) 988 5464
e-mail : marzura@unimap.edu.my

Mr. Mohd Nazaruddin Majid
Assistant Engineer
Tel. : +6(04) 988 5449
e-mail : nazaruddinmajid@unimap.edu.my

Mr. Tengku Mohd Fadli Tengku Hamzah
Assistant Publication Officer
Tel. : +6(04) 988 5448
e-mail : tengkufadli@unimap.edu.my

Mrs. Hasmira Hashim
Assistant Administrative Officer
Tel. : +6(04) 988 5448
e-mail : hasmira@unimap.edu.my

BACHELOR OF NEW MEDIA COMMUNICATION (HONS) RA72
PROGRAMME OBJECTIVES (PEO)

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

The goal of the program offering a Bachelor of New Media Communication (Hons) is to produce graduates with knowledge and skills in communication, new media, management and competitive entrepreneurial, innovative, creative and consistent with the needs of industry.

PROGRAMME OUTCOMES (PO)

PO 01
Able to master the knowledge in the field of communication, new media, and organizational management.

PO 02
To master practical skills and technical knowledge related to communication and media.

PO 03
Able to practice the values of an ethical life, integrity, and social accountability.

PO 04
Able to practice the values, attitudes, and behaviors that conform to the characteristics of professionalism.

PO 05
Able to work and practice effective communication within the team.

PO 06
Ability to think critically and creatively to solve actual problems scientifically.

PO 07
Managerial skills by practicing entrepreneurial characteristics.

PO 08
Ability to manage information and practice of lifelong learning.

PO 09
To have killed practice characteristics of good leadership.

CURRICULUM STRUCTURE
BACHELOR OF NEW MEDIA COMMUNICATION (HONS.) (RA72)

YEAR	FIRST		SECOND		THIRD		
SEMESTER	I	II	III	IV	V	VI	
Discipline Core	KUW101/3 Introduction to Communication Theory	KUW 102/3 Interpersonal Communication in New Media	KUW 201/3 Small Group Communication	KUW 301/3 New Media and Cross Cultural Communication	KUW 401/3 Public Relations and New Media	KUW 404/3 Event Management	INDUSTRIAL TRAINING
	KUW 103/3 Public Speaking	KUW 114/3 New Media and Society	KUW 211/3 Digital Photography	KUW 302/3 Integrated Marketing Communication	KUW 402/3 Managerial Communication	KUW 405/3 Seminar on New Media Communication	
	KUW111/3 Writing for New Media	KUW 115/3 Visual Communication	KUW 212/3 Graphic Design for New Media	KUW 311/3 Digital Video Production	KUW 403/3 Ethics and Law in New Media Communication		
	KUW 112/3 Principles of Communication Network	KUW 116/3 Principles of Human Computer Interface		KUW 312/3 Web Design and Development	KUW 411/3 Digital Media Production		
	KUW 113/3 Introduction to New Media				KUW 412/3 Animation for Integrated Media		
Common Core			KUW 301/3 Research Method	KUW 302/3 Data Reasoning		KUT 441/4 Final Year Project	
			KUW 319/3 Social Psychology				
Elective Core		KUW 121/3 Innovative and Creative Skills	KUW 221/3 New Era Management	KUW 321/3 Invention Skills	KUW 322/3 Electronic Entrepreneurship	KUW 421/3 Strategic and Performance Management	
University Required	*Foundation English	*English for General Purposes	UVW313/2 English for Academic Purpose	UUW 3XX/2 Foreign Language	UUW 4XX/2 Foreign Language		
	UUW 410/2 Bahasa Melayu Universiti	UUW 235/2 Ethnic Relations	UZW 1XX/1 KO-K	UUW 322/2 Thinking Skills			
	UUW 233/2 Tamadun Islam dan Tamadun Asia	UZW 1XX/1 KO-K					
	UZW 1XX/1 KO-K						
120	20	20	21	22	20	13	6

TOTAL UNITS FOR GRADUATION 122
*** Exemptions are subjected to the terms and regulations**

COURSE SYLLABUS

KUW 101/3
INTRODUCTION TO COMMUNICATION THEORY

Course Synopsis

This course aims to give students the theories of communication. Focus is given to the establishment and development of theories and concepts of communication. Apart from discussing the various types of basic theories in communication, the focus will also be given to the theories of communication: interpersonal, group, organization, society, and technology. Overall, this course introduces students about the establishment, change and development theories have communication theory..

References

1. Baran, J.B. & Davis, D.K. (2010) Mass Communication Theory: Foundations, Ferment and Future. 6th ed. Singapore: Wardsworth Cencage Learning
2. Bryant, J. & Zillman, D. () Media Effects: Advances in Theory and Research. Mahwah, New Jersey: Lawrence Erlbaum Associates
3. Holmes, D. (2005) Communication Theory: Media, Technology and Society. Thousand Oaks: SAGE
4. Woods, J.T. (2011) Communication Mosaics: An Introduction to the Field of Communication. Singapore: Wardsworth Cencage Learning
5. Biagi, S. (2009). Media Impact: An Introduction to Mass Media. London: Wadsworth.
6. Dominick, J. R. (2010). The Dynamics of Mass Communication Media in Transition. NewYork: McGraw-Hill.
7. Rosenberry, J & Vicker, L. A. (2009). Applied Mass Communication Theory A Guide For Media Practitioners. Boston: Pearson/ Allyn and Bacon
8. Stanley, J.B. & Dennis, K.D. (2009). Mass Communication Theory: Foundations, Ferment and Future (2nd Ed.). Belmont: Wadsworth.

KUW 111/3
WRITING FOR NEW MEDIA

Course Synopsis

This course aims to expose students to the skills and application method of writing in new media. Students will be able to know the difference in writing, interactive on-line with the traditional method of writing. This course will help improve students' ability to comprehend concepts related to new media writing methods that can be used in the context of the organization.

References

1. Anne Wysocki (2004) Writing New Media: Theory and Applications for Expanding the Teaching of Composition; Utah State University Press; 1 edition
2. Robert L. Hilliard (2011) Writing for Television, Radio, and New Media (Broadcast and Production) Wadsworth Publishing; 10 edition
3. Martin Lister, Jon Dovey, Seth Giddings and Iain Grant (2009) New Media: A Critical Introduction; Routledge; 2 edition
4. Nicholas Gane (2008) New Media: The Key Concepts; Berg Publishers; English Ed edition
5. Lev Manovich (2002) The Language of New Media (Leonardo Books); The MIT Press

KUW 112/3
PRINCIPLES OF COMMUNICATION NETWORKS

Course Synopsis

This course provides an introduction to and overview of the field of principles of communication networks (PCN). PCN is all about the network architecture, link and access technologies. It also a combination of several network layers, services. This course also will explain about the traffic and switch architecture as well as the network security. It integrates theories and methodologies from computer and network communications with many other areas, course readings will span current theory and practice in the communication networks. Students will work on both individual and team projects to design, implement and evaluate the principles of communication networks.

References

1. Principles of Data Communications and Network Security: Practice Orientation, Brian Shin PhD, Montezuma Publishing, 2013 (ISBN-10: 0-7442-2427-6; ISBN-13: 978-0-7442-2427-6)
2. Larry L. Peterson and Bruce S. Davie "Computer Networks: A Systems Approach (5th ed)", Morgan Kaufmann, 2011
3. Andrew S. Tanenbaum, Computer Networks (5th ed), Pearson, 2011.
4. Data and Computer Communications (10th Edition), William Stallings, Prentice Hal, 2013l

KUW 113/3
INTRODUCTION TO NEW MEDIA

Course Synopsis

This course provides a survey of modern cyber culture, including various forms of human communication mediated by the creative application of computer technology, and the developments that have enabled this exploding phenomenon. This course studies the history, theory, and practice of new media in today's networked society; the implications of the convergence of technology and convergence of disciplines; and the societal implications of the new connectedness. Second generation web-based media such as social communities, blogs, wikis, personal web pages will be examined.

Main references supporting the course

1. Levinson, Paul. (2012). New New Media. 2nd edition. US: Allyn & Bacon, Inc.
2. Nayar, Pramod K. (2010). An introduction to new media and cybercultures. Chichester: Wiley-Blackwell.
3. Hui, Wendy Kyong Chun & Keenan, Thomas. (2006). New media, old media: a history and theory reader. New York; London: Routledge.
4. Lister, Martin et. al. (2003). New Media: A Critical Introduction. London: Routledge.

KUW 102/3
INTERPERSONAL COMMUNICATION IN NEW MEDIA

Course Synopsis

This course aims to expose the students to the skills of interpersonal communication in the context of new media. This course will help to improve the students' ability to comprehend the concepts related to interpersonal communication that can be used in the context of organizations, small groups as well as individual level. Students will also be exposed to conflict management skills and interpersonal relationship skills.

References

1. Steven. A. Beebe, Susan J. Beebe, & Mark V. Redmond. (2014). Interpersonal Communication: Relating to others (7th edition). Pearson, Education Inc.
2. Joseph A. DeVito. (2014). The Interpersonal Communication Book (13th edition). Pearson, Education Inc.
3. Owen Hargie and David Dickson. (2011). Skilled Interpersonal Communication: Research, Theory, And Practice (5th edition); Routledge.
4. Julia T. Wood.(2009). Communication in Our Lives (5th edition) Wadsworth Cengage Learning
5. Michael Tomasello. (2008). Origins of human communication; Massachusetts Institute of Technology, London England
6. Richard Ellis. (2009). Communication Skills Stepladders to Success for the Professional (2nd ed); Gutenberg Press, Malta

KUW 103/3
PUBLIC SPEAKING

Course Synopsis

This course provides both theoretical basis and practical instruction to speaking effectively in public. Areas covered include; topic selection, audience analysis, speech preparation and organization, support of speeches with credible research, strategic and creative language use, effective listening and delivery skills, and common types of public speeches. At the end of this course, students should be able to demonstrate the speaking and to be effective communicators in academic settings, workplace and community.

References

1. Cheryl Hamilton (2012). Essentials of Public Speaking (Fifth Edition). Boston, MA, USA: Wadsworth, Cengage Learning.
2. Jo Sprague, Douglas Stuart dan David Bodary (2010). The Speaker's Handbook (Ninth Edition). Boston, MA, USA: Wadsworth, Cengage Learning.
3. Abdul Mua'ti @ Zamri Ahmad (2008). *Panduan Pengucapan Awam* (Edisi Kedua). Dewan Bahasa & Pustaka, Kuala Lumpur.
4. Clella Iles Jaffe (2013). Public Speaking: Concepts & Skills for a Diverse Society (Seventh Edition). Boston, MA, USA: Wadsworth, Cengage Learning.
5. Steven A. Beebe dan Susan J. Beebe (2012). Public Speaking: An Audience-Centered Approach (8th Edition). Boston, MA: Pearson Education, Inc..
6. Boston, MA: Pearson Education, Inc.
7. Sprague, J., Douglas, S. & David B. (2010). *The Speaker's Handbook* (Ninth Edition). Boston, MA, USA: Wadsworth, Cengage Learning.

KUW 114/3
NEW MEDIA AND SOCIETY

Course Synopsis

This course aims to enhance students' knowledge, understanding of the philosophy of communication and new media development in the community. The discussion led to the function and roles of new media in influencing people's lives. Students are also exposed how new media is able to disseminate information to the public. In addition, this course also reviews the rapid development of new media such as radio, television, online news, social media, blogs and technology gadgets nowadays. It also analyzes the impact of new media in the media industry, especially to local communities and abroad.

References

1. Vivian, J (2012). The Media of Mass Communication (Eleventh Edition). Amazon.com: Barnes & Noble.
2. Barrie, G & Machin, D (2009). Media audiences. London: SAGE Publishing Ltd.
3. Carroll, Craig E (2011). Corporate reputation and the news media: agenda-setting within business news coverage in developed, emerging, and frontier markets. New York: Routledge.
4. Dominick, J.R (2010). The Dynamics of Mass Communication Media in Transition. New York: McGraw Hill.
5. Gali, E (2010). *Transitioned media (electronic resource; a turning into the digital realm.* New York: Springer.
6. Jones, Paul (2011). Key concepts in media and communications. Los Angeles: SAGE Publishing Ltd.
7. Juliana Abdul Wahab. (2012). Media, Komunikasi dan Wacana Globalisasi di Malaysia. Pulau Pinang: USM

KUW 115/3
VISUAL COMMUNICATION

Course Synopsis

This course will guide the students understand the basic principles of visual communication and relationship with publishing products either in print or on the move. This course also explains the importance of visual communication in human life. This course will guide students to produce projects that are visually more meaningful. Students will be guided in understanding various concepts of visual perspective view, the history of visual communication and its development, its importance from the perspective of different cultures and their application in a publication. This course will help students to become more critical and sensitive in the use of color, layout, design and selection of tones in attracting attention and leave a meaning to the audience.

References

1. Burrough, Xtine & Martin, Paul. (2013). Visual communication on the web. New York: Routledge.
2. Manghani, Sunil. (2013). Image studies: Theory and practice. London; New York: Routledge.
3. Williams, Rick & Newton, Julianne. (2007). Visual communication: integrating media, art and science/ Rick Williams and Julianne Newton. New York: Lawrence Erlbaum Associates.
4. Smith, K.L., Moriarty, K., Barbatsis, G., & Kenny, K. (Penyt.) (2010). Handbook of Visual Communication: Theory, Methods, and Media. Routledge: Mahwah New Jersey.
5. Jamieson, H. (2007). Visual Communication. More than Meets the Eyes.Bristol, United Kingdom.
6. Martin, P., Ross, S.D. (2003) Images that Injure. Pictorial Stereotypes in the Media. Praeger: Westport Connecticut.

KUW 116/3
PRINCIPLES OF HUMAN COMPUTER INTERFACE

Course synopsis

This course provides an introduction to and overview of the field of human-computer interaction (HCI). HCI is an interdisciplinary field that integrates theories and methodologies from computer science, cognitive psychology, design and many other areas. The course readings will span current theory and practice in interface specification, design and evaluation, as well as current and classic research papers in HCI. Students will work on the individual assignment and team projects to design, implement and evaluate computer interfaces. They should be able to explore the HCI in their projects and present their works.

References

1. Alan Dix, Janet Finlay, Gregory D. Abowd and Russell Beale (2004), Human Computer Interaction, 3rd Edition, Prentice Hall
2. Yvonne Rogers, Helen Sharp, and Jenny Preece (2011), Interaction Design: Beyond Human-Computer Interaction (3rd edition), Publisher: Wiley
3. Wilbert O. Galitz (2007), The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques (3rd Edition), Publisher: Wiley
4. David Benyon, Phil Turner, and Susan Turner (2005), Designing Interactive Systems: People, Activities, Contexts, Technologies, Publisher: Addison Wesley

5. Ben Shneiderman (1998), Designing the User Interface: Strategies for Effective Human-Computer Interaction (3rd Edition), Publisher: Addison Wesley Longman
6. Jenny Preece, Yvonne Rogers, Helen Sharp, David Benyon, Simon Holland and Tom Carey (1994), Human-Computer Interaction, Publisher: Addison Wesley

KUW 121/3
INNOVATIVE AND CREATIVE SKILLS

Course Synopsis

This course aims to improve students understanding and knowledge of the theory and processes related to creative and innovative thinking. Foundation of the course is to processes relevant to problem solving that encourages the use of problem solving tools.

References

1. Tom Kelleys. The Ten Faces of Innovation. Doubleday (2005)
2. Tom Kelleys. The Art of Innovation. Doubleday (2001)

KUW 201/3
SMALL GROUP COMMUNICATION

Course Synopsis

The course aims to give students an understanding of the concepts and theories of small group communication. Our focus is on the core skills of communicating in small groups, build problem-solving groups, build interpersonal relationships in small groups, lead small groups, and handling conflict in small groups. Overall this course introduces students to the knowledge and skills related to the formation, operation and problem-solving in small groups to use communication skills in small groups.

References

1. John F. Cragan, Chris R. Kasch dan David W. Wright (2009). Communication in Small Groups: Theory, Process, Skills (7th. Edition). Boston, MA, USA: Wadsworth Cengage Learning.
2. J. Dan Rothwell (2013). In Mixed Company: Communicating in Small Groups and Teams (8th. Edition). Boston, MA, USA: Wadsworth Cengage Learning.
3. Scott A. Myers dan Carolyn M. Anderson (2008). The Fundamentals of Small Group Communication. Thousand Oaks, California: Sage Publication, Inc..
4. John O. Burtis dan Paul D. Turman (2006). Group Communication Pitfalls. Thousand Oaks, California: Sage Publication, Inc..
5. Stephen E. Kohn dan Vincent D. O'Connell (2007). 6 Habits of Highly Effective Teams. Franklin Lakes, NJ: Career Press.
6. Thomas E. Harris dan John C. Sherblom (2008). Small Group and Team Communication (4th. Edition). Boston, MA: Pearson Education, Inc..
7. R. Scott Tindale et. Al. (Editors) (2002). Theory and Research on Small Groups. New York: Kluwer Academic Publishers

KUW 211/3
DIGITAL PHOTOGRAPHY

Course Synopsis

The course is offered as a compulsory course with aims to take and compose photographs using Single Lens Reflects (SLR) cameras and later edit and manipulate them in digital form. It is a practical learning course (i.e. taking, and manipulating images). Photo editing software such as Adobe Photoshop are taught to the students.

References:

1. Dave Huss, (2004). How to do Everything with Digital Photography. McGraw Hill.
2. Gus Wylie, (1990). The Complete Photographer. Pyramid Books, London: Octopus Publishing Group.
3. Dennis P. Curtain, (2006). A short course in using your digital camera. http://www.shortcourses.com.

KUW 212/3
GRAPHIC DESIGN FOR NEW MEDIA

Synopsis

This course introduces students to the fundamentals of graphic design by participating in lectures and critiques, completing design projects homework and class assignment. In this course, student will exposed with design strategies and graphics software to make sure student capable to solving design problems with creative process and be able to produce highly creative project.

References:

1. Graphic Dsign Essentials: Skills, Software and Creative Strategies, Joyce Walsh Macario, 2009.
2. Color Messages and Meanings, Leatrice Eiseman, Graphix Press, 2006.
3. Graphic Design: A User's Manual, Adrain Shaughnessey, 2009

KUW 301/3
RESEARCH METHODOLOGY

Course Synopsis

This course aims to expose students to research methods in the social sciences. This course will help improve the ability of students to understand the concepts related to research methodology that can be used in scientific training.

References

1. Ranjit Kumar .(2010). Research Methodology: A Step-by-Step Guide for Beginners; Sage Publications Ltd; Third Edition.
2. John W. Creswell .(2008). Research Design: Qualitative, Quantitative, and Mixed Methods Approache; Sage Publications Ltd; Third Edition.
3. Uwe Flick (2011). Introducing Research Methodology: A Beginner's Guide to Doing a Research Project; Sage Publications Ltd.
4. William Lawrence Neuman (2006) Basics of Social Research: Qualitative and Quantitative Approaches (Allyn & Bacon; 2 Edition.

KUW 319/3
SOCIAL PSYCHOLOGY

Course Synopsis

This course focuses on social psychology and its use in helping the community. The scope of this course is more geared towards the use of social psychology in the development of society.

References

1. Aronson, E, Wilson, T.D. and Arkert, R.M. (1997) Social Psychology. Longman
2. Baron, R.A., Byrne, D and Johnson, B.T (1998) Exploring Social Psychology. Allyn and Bacon.
3. Hogg, M.A. and Vaughn, G.M. (1998) Social Psychology. Prentice Hall.
4. Penington, D. C., Gillen, K. and Hill, P. (1999) Social Psychology. Arnold.
5. Lesko, W. A. (2000) Readings in Social Psychology. Allyn and Bacon

KUW 221/3
NEW ERA MANAGEMENT

Course synopsis:
This course aims to provide interfaith understanding to students about the concepts and principles proficiency to take care of the organization. In general this course focuses on the management of environmental recognition, design, management, lead and oversees and monitors the organization.

References

1. Daft, Richard L. (2012). *New Era Management* (10th Edition). Mason, OH, USA: South-Western, Cengage Learning.
2. Chuck Williams (2011). *Management*. Mason, OH, USA: South-Western, Cengage Learning.
3. Ricky W. Griffin (2012). *Fundamentals of Management* (6th Edition). Mason, OH, USA: South-Western, Cengage Learning.
4. John R. Schermerhorn (2011). *Management* (11th Edition). Hoboken, New Jersey: John Wiley & Sons, Inc.
5. Thomas S.Bateman dan Scott A. Snell (2004). *Management: The New Competitive Landscape* (6th Edition). New York: McGraw-Hill Companies, Inc.
6. Jeffrey A Miles (2012). *Management and Organization*. San Francisco, CA: Jossey-Bass.

KUW 301/3
NEW MEDIA AND CROSS CULTURAL COMMUNICATION

Course Synopsis

This course aims to expose students to cross-cultural communication skills. This course will help improve the ability of students to understand the concepts associated with cross-cultural communication that can be used in the context of organizations, small group and dyad level. Students will be exposed to strategies to improve cross-cultural communication competence.

References

1. Judith Martin, Thomas Nakayama. (2009); Intercultural Communication in Contexts; McGraw-Hill Humanities/ Social Sciences/Languages; 5 edition
2. Fred Edmund Jandt and Fred E. Jandt .(2009). An Introduction to Intercultural Communication: Identities in a Global Community. Sage Publications, Inc; Sixth Edition edition
3. James William Neuliep. (2011). Intercultural Communication: A Contextual Approach; Sage Publications, Inc; Fifth Edition edition
4. Myron W. Lustig .(2009). Intercultural Competence: Interpersonal Communication Across Cultures; Allyn & Bacon; 6 edition
5. Judith N. Martin. (2010). Experiencing Intercultural Communication: An Introduction; McGraw-Hill Humanities/Social Sciences/Languages; 4 edition

KUW 302/3
INTEGRATED MARKETING COMMUNICATION

Course Synopsis

This course emphasizes the principles of management in planning and implementation, control strategies of corporate communications and public organizations of their marketing communications efforts. Marketing goods and services of the organization is seen in a broad context. The course focused on the integration of all elements of marketing communication view this practice as a separate and independent. The ability of a computer-based information technology, software applications and interactive media were also emphasized. At the end of the course students will be able to achieve the objectives of marketing communications organization through a systematic planning concept of brand management and integrated marketing communications strategy.

References

1. Tuckwell, K.J. (2011). Integrated Marketing Communication: Strategic Palnning Perspectives. Canada: Pearson.
2. Kenneth E. C. & Baack, D. (2011). Integrated Advertising, Promotion & Marketing Communications (5th ed.). Prentice Hall
3. Biagi, S. (2009). Media Impact: An Introduction to Mass Media. London: Wadsworth.
4. Dominick, J. R. (2010). The Dynamics of Mass Communication Media in Transition. NewYork: McGraw-Hill.
5. Rosenberry, J & Vicker, L. A. (2009). Applied Mass Communication Theory A Guide For Media Practitioners. Boston: Pearson/Allyn and Bacon.
6. Stanley, J.B. & Dennis, K.D. (2009). Mass Communication Theory: Foundations, Ferment and Future (2nd Ed.). Belmont: Wadsworth.

KUW 311/3
DIGITAL VIDEO PRODUCTION

Course Synopsis

This course focuses on the principles, processes and methods of single-camera digital video production. Lectures will focus on the terms and concepts related to the management of the production and publication process. The lecture will explain the research methodology in publishing, publishing proposal preparation methods, format and method of writing the script and every method of digital video production process including aspects of filming, editing and final mix of the various elements to be included in the publication. At the end of the course students can produce a short publication in the genre of documentaries, public service announcements and advertisements.

References

1. Linaschke, J. (2011) Introducing Final Cut Pro X: Learn by Video. Format: DVD-ROM (48 pages). http://www.Campus books .com/books/books/specialty.
2. Rabiger, M. (2005). Directing the Documentary. (Ed.5). Focal Press: Berlington MA
3. Tomaric, J. (2007). The Power Filmmaking Kit: Make Your Professional Movie on a Next-to-Nothing Budget. The Textbooks.Com
4. Wise, M. (1989). Film and Video Financing. California: Michael Wiese Productions

KUW 312/3
WEB DESIGN AND DEVELOPMENT

Course Synopsis

This course explores alternative methods of web design, including typography, imaging, and advanced asset management. Upon completion of this course, students use the web page user interface program to effectively create pages with well-structured HTML content. Emphasis is placed on the design of multi page layout for various types of web sites. Through hands-on projects, the student learns to navigate through the program, while understanding complex issues.

References

1. Web Development and Design Foundations with HTML5, 6/E Terry Felke-Morris, Harper College, 2012.
2. Basics of Web Design: HTML5 & CSS3 Terry Felke-Morris, Harper College, 2011.
3. Writing for the Web: Creating Compelling Web Content Using Words, Pictures, and Sound, Lynda Felder, 2011.
4. Programming the World Wide Web, 7/E, Robert W. Sebesta, University of Colorado, Colorado Springs, 2012.
5. From Idea to Web Start-up in 21 Days: Creating bacn.com, Jason Glaspey and Scott Kveton. 2010.

KUW 302/3
DATA REASONING

Course Synopsis

This course aims to expose students to the method of data analysis. This course will help improve students' ability to summarize interpretation, analyze and manipulate data, particularly in the context of the social sciences in general, and communication and new media in particular.

References

1. Arthur Aron, Elaine N. Aron and Elliot Coups .(2010). Statistics for The Behavioral and Social Sciences: A Brief Course (5th Edition) Prentice Hall
2. Perry R. Hinton (2004) Statistics Explained: A Guide for Social Science Students, 2nd
3. Edition; Routledge Alan Agresti and Barbara Finlay (2008) Statistical Methods for the Social Sciences (4th Edition) Prentice Hall
4. Frederick J. Gravetter & Larry B. Wallnau .(2012). Statistics for the Behavioral Sciences; 9 edition Wadsworth Publishing;
5. Paul D. Allison .(1998). Multiple Regression : A Primer (Undergraduate Research Methods & Statistics in the Social Sciences) Sage Publications

KUW 321/3
INVENTION SKILLS

Course Synopsis

This course focuses on the management of creativity and innovation in business today. Students will be exposed to the concepts and processes of creativity and innovation. Students will also be exposed to the opportunities and challenges in creating ideas, products and services in a creative and innovation in line with today's business challenges. The approach will be used including lectures, self-assessment, preparation and presentation projects.

References

1. Tom Kelleys. The Ten Faces of Innovation. Doubleday (2005)
2. Harvard Business Review Staff, *Managing Creativity and Innovation*. (2009). United Kingdom: Harvard Business Review Press.
3. Ceserani, J. and Greatwood, P. (1995). *Innovation and creativity*. London: Kogan Page.
4. Frederick, H.H., Kuratko, D.F, & Hodgetts, R.M. (2007). *Entrepreneurship: Theory, process & practice.* Australia: Thomson Publication.
5. Hisrich, R.D., Peters, M.P, & Shepherd, D.A. (2008). *Entrepreneurship, 7th edition*. Singapore: Mc Graw Hill Companies.

KUW401/3
PUBLIC RELATIONS AND NEW MEDIA

Course Synopsis

This course focuses on the assessment of the tactical and strategic implications of digital technology for organizations. Course content includes an examination of the potential of digital technologies for public relations campaigns, the particular challenges of online communication and the planning, management and evaluation of interactive communication campaigns. There is an analysis of the PR challenges and implications of the growing online news media industry as well as an assessment of the potential impact and possible responses to such issues as online activism, citizen journalism and the blogging explosion.

References

1. Seitel, Frasier (2011). The Practice of Public Relations (11th ed.). Upper Saddle, New Jersey: Pearson.

2. Newsom, D., Turk, J.V. and Kruckerberg, D. (2010). This is PR: The Realities of Public Relations (9th ed.). Belmont, CA: Wadsworth.
3. Cutlip, M.S., Center, H.A. and Broom, M.G. (2009). Effective Public Relations (10th ed). New Jersey: Prentice Hall.
4. Breakenridge, D., (2008). PR 2.0 - New Media, New Tools, New Audiences. Pearson Education. United States of America.
5. Kelleher, T. (2007)., Public Relations Online (1st ed.). Sage Publication, Inc.

KUW 402/3
MANAGERIAL COMMUNICATION

Course Synopsis

This course aims to expose students to the communication skills of management. This course will help improve the ability of students to understand the concepts associated with the management of communication that can be used in the context of organizations, small group and dyad level. Students are exposed to conflict management skills, problem solving and decision making in the context of the organization

References

1. Geraldine Hynes. (2010). Managerial Communication: Strategies and Applications; McGraw-Hill/Irwin; 5 edition
2. Mary M. Munter. (2011). Guide to Managerial Communication (9th Edition) Prentice Hall

3. Raman, Meenakshi and Prakash Singh, Business communication, Oxford University Press, 2006.
4. Raman Meenakshi and Sangeeta Sharma. 2004. Technical Communication. New Delhi: Oxford University Press.
5. Ober Scot. 2004. Contemporary Business Communication, Fifth Edition. New Delhi: Biztantra

KUW 411/3
DIGITAL MEDIA PRODUCTION

Course Synopsis

This course introduces students to the fundamentals of digital multimedia design and production, animated graphics, interactivity and digital imaging. In this course, learning computer applications and being creative within the field are equally important. It is significant to understand how conceptual studies and technical solutions will support each other during digital media production processes.

References

1. William G. Nickels (2008) Understanding Business. Edition 6. Irwin McGraw-Hill.
2. AB Aziz Yusof (2011). Engineering Entrepreneurship, Selangor, Malaysia: Pearson
3. 2. AB Aziz Yusof (2000). Usahawan dan Pengukuhan Jaringan Rakan Niaga, Kedah, Malaysia: Penerbit UUM.
4. Barringger, Bruce R & Ireland, R. Duane (2008). Entrepreneurship: Succesfully Launching New Ventures, 2nd edn, New Jersey: Prentice Hall.
5. Kuratko, Donald F (2009). Introduction to Entrepreneurship, 8th edn, Canada: South Western.
6. Khalidah Khalid, Business Management: A Malaysian Perspective, 1st edn, Shah Alam: Oxford Fajar Sdn. Bhd.

KUW 412/3
ANIMATION FOR INTEGRATED MEDIA

Course Synopsis

This course provides the students with the familiarization of the Macromedia Flash. It also will cover the fundamental programming concepts in addition the flash environment. The course also covers principles of interface design, measurement as it applies to embedded items, and requires the writing of an instructional design document. Students finishing this course will have at least one completed fully functional Flash project for their portfolios demonstrating a strong knowledge of the tool and a good foundation in the Action Script language as the tools and the language apply to instructional design.

References

1. Option A: Flash CS3 [Computer software]. (2007). Adobe. ($249 student/teacher version through Adobe website)
2. Option B: Creative Suite 3 Web Standard [Computer software]. (2007) Adobe. ($399 student/ teacher version through Adobe website) Has Flash, Dreamweaver, Fireworks, and Contribute. There are several flavors of the Creative Suite as well, including packages that include Photoshop and Illustrator.

KUW 322/3
ELECTRONIC ENTREPRENEURSHIP

Course Synopsis

This course aims to improve understanding and knowledge about the theories and processes associated with the business. The course is kepadaproses-relevant processes related to information technology applications expose potential students of IT in the business world, as well as master students with business skills. It also includes step-by-step formation of the business.

References

1. William G. Nickels (2008) Understanding Business. Edition 6. Irwin McGraw-Hill.
2. AB Aziz Yusof (2011). Engineering Entrepreneurship, Selangor, Malaysia: Pearson
3. ABAziz Yusof (2000). Usahawan dan Pengukuhan Jaringan Rakan Niaga, Kedah, Malaysia: Penerbit UUM.
4. Barringger, Bruce R & Ireland, R. Duane (2008). Entrepreneurship: Succesfully Launching New Ventures, 2nd edn, New Jersey: Prentice Hall.
5. Kuratko, Donald F (2009). Introduction to Entrepreneurship, 8th edn, Canada: South Western.
6. Khalidah Khalid, Business Management: A Malaysian Perspective, 1st edn, Shah Alam: Oxford Fajar Sdn. Bhd.

KUW 421/3
STRATEGIC AND PERFORMANCE MANAGEMENT

Course Synopsis

This course aims to provide interfaith understanding to students about the concepts and process management of strategies and achievement. In the strategic management of aspects, this course touches aspects environmental analysis, determination methodological findings and terraces strategy, formulation of strategic objectives, strategic method map creation, and the determination of measuring achievement of strategic objectives, and strategic initiatives. In the maintenance aspect of achievement, this course explains the docking between strategic design and achievement, method of measure achievement, method of workers and develop the achievements of workers.

References

1. Michael A. Hitt, R. Durane Ireland dan Robert E. Hoskisson (2011). *Strategic Management* (Ninth Edition). Mason, OH, USA: South-Western Cengage Learning.
2. Herman Aguinis (2009). *Performance Management* (Second Edition). Upper Saddle River, New Jersey: Pearson Education, Inc.
3. Harvard Business School (2005). *Strategy: Create and Implement the Best Strategy for Your Business.* Boston, Massachusetts: Harvard Business School Publishing Corporation.
4. Richard F. Gerson dan Robbie G. Gerson (2006). *Positive Performance Improvement: A New Paradigm for Optimizing Your Workforce*. Mountain View, CA: Davies-Black Publishing.
5. Robert S. Kaplan dan David P. Norton (1996). *The Balanced Scorecard: Translating Strateghy Into Action*. Boston, Massachusetts: Harvard Business School Publishing Corporation.
6. Andy Neely, Chris Adams and Mike Kennerley (2002). *The Performance Prism: The Scorecard for Measuring and Managing Business Success*. Great Britain: Pearson Education Limited.

KUW 403/3
EVENT MANAGEMENT

Course Synopsis

This course is designed to help students improve their leadership and operation required to manage a successful event. This course provides an ‘overview’ for event management techniques and strategies needed to manage the event.

References

1. Van der Wagen (2007). Event Management for Tourism, Cultural, Business and Sporting Events. 3rd ed. Australia: Pearson
2. Supovitz, F. (2005). The Sports Event Management and Marketing Playbook. John Wiley & Sons, Inc.
3. Silvers, J.R. (2004). Professional Event Coordination. John Wiley & Sons, Inc.
4. Goldblatt, J. (2005). Special Events: Twenty-First Century Global Event Management. (5th ed.) Wiley Publication
5. Allen, J. et.al (2005). Festival and Special Event Management (3rd ed.) Wiley Publication

KUW 404/3
ETHICS AND LAW IN NEW MEDIA COMMUNICATION

Course Synopsis

This course aims to improve understanding and knowledge about the policy and the law and ethics related to the communications and new media. The focus of the course is to the law and ethics relevant to the field of communications and new media. It also includes an introduction to the basic laws of Malaysia.

References

1. Suhaini Muda dan Ahmad Shamsul Abd Aziz, (2007). Undang-undang Komunikasi.
2. Kuala Lumpur: Pearson Prentice Hall.
3. Cyber laws of Malaysia. Petaling Jaya: International Law Book Services.
4. Abdul Aziz Bahri. (2008). Perlembagaan Malaysia teori & praktis. Shah Alam: Arah Pendidikan.
5. Aun, W. M. (2005). The Malaysian Legal System. Petaling Jaya: Pearson.
6. Kamal Halili Hassan. (1990). Penulis dan Undang-undang. Dewan Bahasa dan Pustaka. Kuala Lumpur.
7. Mohd Safar Hasim, (2002). Mengenali Undang-undang Media dan Siber. Kuala Lumpur: Utusan Publications & Distributors Sdn. Bhd.
8. Rau. P, SampathKumar, T. J & Kayveas. M. (2006). General principle of the Malaysia legal system. Petaling Jaya: International Law Book Service.
9. Safinaz Mohd Hussein, 2002. Undang-undang Komunikasi dan Multimedia. Kuala Lumpur: Prentice Hall.

KUW 405/3
SEMINAR ON NEW MEDIA COMMUNICATION

Course Synopsis

This course aims to expose students to the issues in regards to new media communication. In addition, students are exposed to the latest research related to new media in a variety of perspectives. This course will help improve students' ability to understand the challenges of communication in traditional and new paradigms in the context of new media.

References

1. Leah A Lievrouw & Sonia Livingstone (2006) Handbook of New Media: Student Edition; Sage Publications Ltd.
2. Martin Lister, Jon Dovey, Seth Giddings , Iain Grant , Kieran Kelly; (2009); New Media: A Critical Introduction; Routledge; 2 edition.
3. Nicholas Gane and David Beer (Oct 28, 2008) New Media: The Key Concepts; Berg Publishers; English Ed edition
4. 4. Robert I. Berkman and Christopher A. Shumway (2003) Digital Dilemmas: Ethical Issues for Online Media Professionals (Media and Technology); Wiley-Blackwell
5. John V. Pavlik & Shawn McIntosh (2010) Converging Media: A New Introduction to Mass Communication; Oxford University Press, USA; 2 edition.

KUT 441/4
FINAL YEAR PROJECT

Course Synopsis

This course aims to explain issues related to the field of communications, new media and entrepreneurship. Through this course the student is able to contribute their knowledge related to the field. Scope for each selected topic will increase further the understanding and development of something that science and specific methodologies related fields studied. The investigation is controlled by students and supervised by the central lecturer this study.

References

1. Alan Agresti and Barbara Finlay (2008) Statistical Methods for the Social Sciences (4th Edition) Prentice Hall
2. Arthur Aron, Elaine N. Aron and Elliot Coups .(2010). Statistics for The Behavioral and Social Sciences: A Brief Course (5th Edition) Prentice Hall
3. Earl R. Babbie (2010).The Basics of Social Research; Wadsworth Publishing; 5 edition.
4. Frederick J. Gravetter & Larry B. Wallnau .(2012). Statistics for the Behavioral Sciences; 9 edition Wadsworth Publishing;
5. John W. Creswell .(2008). Research Design: Qualitative, Quantitative, and Mixed Methods Approache; Sage Publications Ltd; Third Edition.
6. Paul D. Allison .(1998). Multiple Regression: A Primer (Undergraduate Research Methods & Statistics in the Social Sciences) Sage Publications
7. Perry R. Hinton (2004) Statistics Explained: A Guide for Social Science Students, 2nd Edition; Routledge
8. Ranjit Kumar .(2010). Research Methodology: A Step-by-Step Guide for Beginners; Sage Publications Ltd; Third Edition.
9. Uwe Flick (2011). Introducing Research Methodology: A Beginner's Guide to Doing a Research Project; Sage Publications Ltd.
10. William Lawrence Neuman (2006) Basics of Social Research: Qualitative and Quantitative Approaches (Allyn & Bacon; 2 Edition.

EIT 302/4
INDUSTRIAL TRAINING

Course Synopsis

The course will expose students to the technical and application aspects as well as other organizational aspects such as company organization structure, company operation, department function, work procedure, safety procedure, management, communication, technical skills, project management and presentation. The students are also required to submit their log book and report at the end of the Industrial Training. Overall, the course is a practical-based course.

References

1. UniMAP Industrial Training Guideline
2. UniMAP Industrial Training Log Book

JOB OPPURTUNITIES

1. Public Relations Executives/ MarComm
2. Corporate Communications Executives
3. Interactive Designer
4. Event Manager

UNIVERSITY COURSES

UUW224/2
ENGINEERING ENTREPRENEURSHIP

Course Synopsis

The objective of this course is to expose students to the basic knowledge of entrepreneurship and basic business management. It consists of the characteristic of entrepreneurship, the model to develop business, development of business proposal, economic analysis, sources of funding and the management of entrepreneurship technology.

References

1. Kathleen Allen, 'Entrepreneurship for Scientists and Engineers', International Edition, Pearson, 2010.
2. Mohani Abdul, Kamarulzaman Ismail, Zainal Abidin Mohamed and Abdul Jumaat Mahajar, 'Pembudayaan Keusahawanan', Prentice Hall, 2008.
3. Peggy A, Lambing and Charles R. Kuehl, 'Entrepreneurship', 4th Edition, Pearson, 2007.
4. Rosli Mahmood, et. all, 'Prinsip-prinsip Keusahawanan: Pendekatan Gunaan', 2nd Edition, Cengage Learning, 2010.
5. William G. Sullivan, Elin M. Wicks and James T. Luxhoj, 'Engineering Economics', 13th Edition, Pearson, 2006.

UUW233/2
ISLAMIC & ASIAN CIVILISATIONS

Course Synopsis

This course discusses the basic concepts of knowledge civilization. In addition students are also exposed to the universal Islamic values as a result of a clash of Asia civilizations. It also creates a Malaysian society that respects for religion belief and also cultural system are practiced.

References

1. Shuhairimi Abdullah, Abdul Jalil Ramli, Noor Salwani Hussin, Siti Aisyah Mohd Nor, Maskor Bajuri, Mohd Mizan Mohammad Aslam , Ku Halim Ku Ariffin. (2011). Tamadun Islam dan Tamadun Asia, Pearson Malaysia Sdn Bhd,Selangor.
2. Azizan Baharuddin, Osman Bakar, Zaid Ahmad. (2009). *Modul Pengajian Tamadun Islam & Tamadun Asia*, Penerbit Universiti Malaya: Kuala Lumpur
3. Azizan Baharuddin, (2005). *Peradaban menurut Perspektif Islam*. Kuala Lumpur : Pusat Dialog Peradaban, Universiti Malaya.
4. Bertrond Fort. (2005). *One Year of Culture and Civilizations Dialogue 2003/2004*. Singapore Asia-Europe Foundation.
5. Zaid Ahmad. (2005) *"Ibnu Khaldun's Approach in Civilizational Studies in Massino Companini, Studies on Ibn Khaldun, Corso Milano Italy:* Polimetrica International Scientific Publisher.

UUW235/2
ETHNIC RELATIONS

Course Synopsis

This course focuses on discussion of basic concepts of ethnic relations and emphasis is given to the plural society in Malaysia. This course will guide students to evaluate and discuss issues related to ethnic relations around them (living on campus) and ethnic relations in Malaysia.

References

1. A.Aziz Deraman (2005), *Masyarakat dan Kebudayaan Malaysia*, Kuala Lumpur: Dewan Bahasa dan Pustaka
2. Abdul Aziz Bari. (2000). Perlembagaan Malaysia: Asas-asas dan Masalah. Kuala Lumpur: Dewan Bahasa dan Pustaka
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UUW322/2
THINKING SKILLS

Course Synopsis

The aim of this course is to develop and enhance students' thinking skills in helping them make decision and resolve issues. Generally, there are two main ideas of thinking skills which are mostly acquired. They are creative thinking and critical thinking. The introduction the soft skills of the main idea in thinking skill concepts such as logical thinking, creative thinking, critical thinking; it is hoped that students can acquire creative and innovative ways with better judgement in resolving issues, especially pertaining to career andself development.

References

1. Butterworth & Thwaite., 'Thinking Skills. 4th ed. UK', Cambridge University Press, 2005.
2. Chong Hoe, Lok.,'Pemikiran Kritis dan Logik. Pulau Pinang', Universiti Sains Malaysia Printing, 2003.
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5. Wright, Larry.,'Critical Thinking: An Introduction to Analytical Reading and Reasoning'. USA:Oxford University Press, 2001.

UUT122/ BUW122/2
SKILLS AND TECHNOLOGY IN COMMUNICATION
(FOR ENGINEERING AND BUSINESS STUDENTS)

Course Synopsis

The purpose of this course is to expose students to communication and information technology. This course introduces students to the basic aspects of human. Students are introduced to motivation, knowledge and skills as tools for competent communication. The first part of the course discusses the basic process in effective communication such as perception, verbal and non-verbal communication, listening skills, basic communication models and information acquisition. The second part deals with competency in communication in the contexts of interpersonal communication, communication in organisation, small group communication, internet communication, basic skills for presentation and intercultural communication.

References

1. Devito, J.A.,'Human communication: The Basic Course'. 9th Ed', Pearson Education Inc, 2003.
2. Devito, J.A.,'The Interpersonal Communication Book'. 12th Edition, Pearson Education Inc, 2009.
3. Pearson, J. Nelson, p. Titsworth, S. Harter, L.,' Human Communication 2nd Edition',New York: McGraw Hill, 2006.
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6. Pearson, Compiled by Nor'izah Ahmad, Mohammad Rezal Hamzah & Aida Sharmila Wati Wahab, 2011.

BUW 123/3
BUSINESS COMMUNICATION
(FOR BUSINESS STUDENTS ONLY)

Course Synopsis

This course applies the communication tools and analysis to business management issues. It also focuses on developing students' ability in problem solving, by using negotiation concepts and communication elements in business environment. The module emphasizes on the patterns and principles of business communication, multicultural and global communication management, communication technology and its trends in business settings, organizational and managerial communication as well as preparation in the formal writing and oral presentation.

References

1. Bovee, C. and V. Thill, J., 'Business Communication Essentials', 4th Edition,) Prentice Hall; 4th Edition, 2009.
2. Krizan, Merrier, Logan, Williams, 'Business Communication'. Thomson - South Western, 2009.
3. Locker, K. and Kaczmarek, S., 'Business Communication: Building Critical Skills', McGraw-Hill/Irwin; 4th Edition, 2008.
4. Marry Ellen Guffey, Bertha Du-Babcock, 'Essentials of Business Communication', Thomson Publishing. 2007

5. Marry Ellen Guffey, 'Business Communication: Process and Product', South-Western College Pub; 6th Edition, 2007.

EUT442/2
PROFESSIONAL ENGINEERS (FOR ENGINEERING STUDENTS ONLY)

Course Sypnosis

This course aims to explain the main concepts in engineering ethics, risk management and occupational safety and health as well as to expose the students to basic of law in the engineering context. The materials will be of introductory nature to enable engineers to appreciate factors that have to be taken into account in decision-making. At the end of the course, students will be able to identify and discuss issues and challenges faced by engineers relating to engineering ethics, risk management and to understand the legal requirements related to engineering field.

References

1. Charles B. Fleddermann, "Engineering Ethics", Prentice Hall 3rd Edition.
2. Lee Mei Pheng, "General Principles of Malaysian Law", Fajar Bakti 3rd Edition, 1998.
3. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, 2005.
4. Registration of Engineers Act 1967 and Registration of Engineer Regulation 1990.
5. R. Logeswaran, Hairul Azhar, Pau Kiu Nai and Sim Hock Kheng, "Engineers in Society", Mc Graw Hill 2nd Edition.

EUT444/3
MANAGEMENT FOR ENGINEERS (FOR ENGINEERING STUDENTS ONLY)

Course Sypnosis

This course aims to teach students on how to apply project management skills when undertaking projects and To provide basic tools of engineering economy to enable the students to carry out professional quality economic evaluations. At the end of the course, students will be able to identify and discuss issues and challenges faced by engineers relating to project management in the current economic scenarios.

References

1. Stanley E. P., Samuel J. M., Jack R. M, Scot M. S. and Margaret M. S., "Project Management: Planning, Scheduling, and Controlling Projects", John Wiley & Sons, 2008.
2. William G. Sullivan, Elin M. Wicks and James Luxhoj, "Engineering Economy", Prentice Hall, 2005.
3. S. Kant Vajpayee, "Fundamental of Economic for Engineering Technologist and Engineers", Prentice Hall, 2001.
4. G. J. Thuesen and W. J. Fabrycky, "Engineering Economy", Prentice Hall, 2001.

Centre for International Languages (CIL)

Address

CENTRE FOR INTERNATIONAL LANGUAGES (CIL)
Universiti Malaysia Perlis (UniMAP)
No. 5&7, Jalan Kangar-Alor Setar,
Taman Pengkalan Asam,
01000 Kangar, Perlis.
Malaysia.

Tel..: +6(04) 976 7385
Fax: +6(04) 976 7386

CENTRE FOR INTERNATIONAL LANGUAGES

The Centre for International Languages (CIL) or Pusat Bahasa Antarabangsa, is formerly known as the Department of International Languages (DIL). Established on March 1, 2013, the Centre focuses on providing students and staff of Universiti Malaysia Perlis, and the community within its vicinity, with great opportunities to learn languages.

CIL currently provides language courses which are a requirement for students enrolled in all UniMAP programmes, at both diploma and undergraduate degree levels. It caters to the needs of the ever-growing number of students who seek to be proficient not only in Bahasa Melayu and English, but also in a third language of their choice. Apart from Bahasa Melayu and English, other languages offered at CIL are Arabic, German, Japanese, Korean, Mandarin, Russian and Thai.

CIL places priority in equipping UniMAP students with language skills and competencies which are imperative in this era of knowledge and innovation-based economy. In addition, through our language courses, we sharpen 21st century skills in our students and clients, in supporting and nurturing them to be enterprising individuals who will be able to contribute positively in the world of work. Amongst others, the skills include being creative and innovative, adaptable, being able to work in a team, being effective communicators and are good in problem solving. The team at CIL also support students' learning through the provision of language advisory services, and are ever willing to serve in ensuring that our students and clients get the best from what we have to offer.

STAFF DIRECTORY

Director
Prof. Dr. Harshita Aini Binti Haroon (A.M.K)
e-mail: harshita@unimap.edu.my

Deputy Director
Ms. Liew Khe Li
e-mail: klliew@unimap.edu.my

Programme Chairperson for University Language Courses
Ms. Wan Safuraa Wan Osman
e-mail: wansafuraa@unimap.edu.my

Programme Chairperson for International English Course
Mrs. Ina Suryani Ab Rahim
e-mail: inasuryani@unimap.edu.my

Coordinator for Industrial Networks and Quality Management
Mrs. Zaliza Zubir
e-mail: zaliza@unimap.edu.my

Coordinator for Translation and Language Services Unit
Mrs. Nor Suhaila Che Pa
e-mail: suhailachepa@unimap.edu.my

Assistant Registrar
Mrs. Afifah Azmi
e-mail: afifah@unimap.edu.my

ACADEMIC STAFF DIRECTORY

LECTURERS

Prof. Dr. Harshita Aini Binti Haroon (A.M.K)
Phd (Leeds)
M.A Lings and Info Processing (Leeds)
B.Ed (Hons.) TESOL (UK)
Tel. : +6(04) 976 4551
e-mail : harshita@unimap.edu.my

Assoc. Prof. Dr. Syaharom Bin Abdullah
Phd (UPSI)
M.Sc Ed. (NIU)
B.A (English) (NIU) Penilaian Pendidikan
Sijil TESOL (UM) Pengukuran
Sijil Perguruan (MPPPP) Pengujian
e-mail : syaharom@unimap.edu.my

Prof. Datuk Syed Omar Bin Syed Mohamad Al Saggaf
M.A NES (Near Eastern Studies) TAFL. (University of Michigan, Ann Arbor, USA)
B.A Syariah (Madinah Islamic University, Saudi Arabia)
e-mail : syedomar@unimap.edu.my

Mejar (Kehormat) Dato' Alim Panglima Prof. Madya Haji Mat Jahya Bin Haji Hussin
Ijazah Sarjana (MA)(USM)
BA (Hons) Syariah Islamiyyah, (Universiti Al-Azhar, Kaherah Mesir)
Diploma Fatwa, Kementerian Keadilan, (Darul Ifta' Mesir)
e-mail : matjahya@unimap.edu.my

Dr. Ku Mohd Nabil Bin Ku Hamid @ Ku Ismail
Phd Social Linguistics, (Kyushu University, Japan)
M. Art, (Kyushu University, Japan)
B. Ed. (Hons), Teaching Japanese as a Second Language, (Hirosyima University, Japan)
Sijil Perguruan (MPPPP)
Diploma Kemanusiaan
e-mail : kmnabil@unimap.edu.my

Mrs. Ina Suryani Ab Rahim
M. Sc Computing (Bridging) (De Monfort University)
B. Ed (Hons) TESL, Minor in Linguistic and Literature (UKM)
e-mail : inasuryani@unimap.edu.my

Mrs. Sharmini Abdullah
M.A Linguistics and English Language Teaching (USM)
B. Ed ELT (University of Surrey, UK)
e-mail : sharmini@unimap.edu.my

Mr. Shafiq Hizwari Bin Md. Hashim
M. Ed English Language Teaching (UUM)
B. Hsc English Language and Literature (IIUM)
e-mail : shafiq@unimap.edu.my

Ms. Liew Khe Li
M.A Applied Linguistics (UUM)
B. Ed (Hons) TESL (UM)
e-mail : klliew@unimap.edu.my

Ms. Wan Safuraa Binti Wan Osman
M. Ed TESL (UKM)
B. Ed (Hons) TESL (UKM)
e-mail : wansafuraa@unimap.edu.my

Mrs. Zaliza Binti Zubir
M.A Bahasa Melayu Kontemporari (UUM)
Ijazah Bahasa dan Linguistik Melayu (UPM)
Diploma Pengajian Melayu (IBMM)
e-mail : zaliza@unimap.edu.my

Mrs. Nor Suhaila Binti Che Pa
M.A Bahasa Melayu Kontemporari (UUM)
B.A (Hons) Translation and Interpretation (USM)
e-mail : suhailachepa@unimap.edu.my

Mrs. Chuthamas Chittithaworn
MBA (UUM)
B. Hsc (Prince of Songkla)
e-mail : chuthamas@unimap.edu.my

Ms. Rongdara Rochanahasadin
MTEIL, Master of Arts in Teaching English as an International Language
MBA, Marketing
BA English
e-mail : rongdara@unimap.edu.my

Mrs. Siti Nurul Jannah Binti Fital
Master Bahasa Melayu (UPM)
Bac. Sastera Bahasa & Linguistik Melayu (UPM)
e-mail : jannah@unimap.edu.my

Mrs. Nazifah Binti Hamidun
M. Ed Curriculum & Instruction (UUM)
B.Ed (Hons) TEYL (UUM)
e-mail : nazifahhamidun@unimap.edu.my

Mrs. Sri Kandy Putri Naru Binti Abdul Hamid Naru
M.A Applied Linguistics (UUM)
B.Hsc English Language and Literature (IIUM)
e-mail : srikandy@unimap.edu.my

Mr. Ahmad Hifzurrahman Bin Ridzuan
M.A Applied Linguistics (UUM)
B.Ed (Hons) TESL (UiTM)
Tel. : +6(04) 976 7387
e-mail : hifzurrahman@unimap.edu.my

Mr. Faharol Bin Zubir
M.A Applied Linguistics (UUM)
B.Ed (Hons) TESL (UiTM)
e-mail : faharol@unimap.edu.my

Ms. Wang Jing
M.A in Linguistic (DONGEUI Univercity, Pusan, Korea)
B.A in Business English (Xinjing Univercity, Xinjiang, China)
e-mail : wjing@unimap.edu.my

Ms. Kamila Abdulkadirova
M.A (Linguistics English Language) (The Uzbek State University of World Languages)
B.A (Philology English Language)(The Uzbek State University of World Languages)
e-mail : kamila@unimap.edu.my

Ms. Farah Adilah Binti Abu Bakar
M. Ed TESL (UPM)
B. Ed (Hons) TESL (UNISEL)
e-mail : farahadilah@unimap.edu.my

Ms. Afifah Hanani Binti Yusuf
M. Ed English Language Teaching (UUM)
B.A (Hons) Literature in English (UKM)
e-mail : afifahhanani@unimap.edu.my

LANGUAGE INSTRUCTORS

Mrs. Suhaidah Binti Said
M.A Bahasa Melayu (USM)
Bac. Sastera (UPM)
e-mail : suhaidah@unimap.edu.my

Mrs. Zuhairah Idrus
M. Contemporary Malay Language Studies (UUM)
B. (Hons) Malay Studies (UM)
e-mail : zuhairah@unimap.edu.my

Mrs. Tengku Zadora Binti Tengku Ahmad Zainal Abideen
M.A English Language Studies (UKM)
B. Ed (Hons) TESL (UiTM)
e-mail : zadora@unimap.edu.my

Mr. Nole Redentor O. Aclan
M.Ed Educational Administration
B.A in English Education
e-mail : nole@unimap.edu.my

Mrs. Sharifah Anis Zarith Binti Syed Dziauddin
M.A Applied Linguistics (UUM)
Bac. in English Literature (UKM)
e-mail : aniszarith@unimap.edu.my

Mr. Azrie Bin Ibrahim
M.Hsc Arabic Linguistic Studies (IIUM)
B.Hsc Arabic Language Studies (IIUM)
e-mail : azrie@unimap.edu.my

Mr. Hassan Bin Hj. Arshad
B.A Bahasa & Terjemahan (Al-Azhar)
Dip. Edu (Al-Azhar)
e-mail : hassan@unimap.edu.my

Mr. Wan NorHaizar Bin Harun
B.Ed (Hons) TESL (UiTM)
e-mail : haizar@unimap.edu.my

Mr. Mohd Azrizal Bin Mohd Salleh
B.Ed (Hons) TESL (UiTM)
e-mail : azrizalsalleh@unimap.edu.my

Mrs. Nurul Syazwani Binti Zulkifli
Bac. Sastera Bahasa & Linguistik Melayu (UPM)
e-mail : nsyazwani@unimap.edu.my

Mrs. Sareepa Je-Arwae
B.A Arabic Language and Literature (IIUM)
e-mail : sareepa@unimap.edu.my

Ms. Juliana Bt Ahmad
Bac. Bahasa Melayu & Sosio-Budaya Melayu (UM)
e-mail : julianaahmad@unimap.edu.my

Ms. Nur Farhinaa Binti Othman
B.Hsc English Language International and Literature (IIUM)
e-mail : nurfarhinaa@unimap.edu.my

Mrs. Yuziana Binti Yasin
B. Ed (Hons) TESOL (USM)
e-mail : yuziana@unimap.edu.my

Ms. Nur Adila Bt Hakimi
B. Ed (Hons) TESL (UiTM)
e-mail : adilahakimi@unimap.edu.my

Mr. Mohd Syamril Aklmar Bin Chek Kassim
Ijazah Sarjana Muda (Kepujian) Bahasa Gunaan (Bahasa Melayu Komunikasi Profesional)(UiTM)
e-mail : syamril@unimap.edu.my

Mr. Mohamad Zaki Bin Abdul Halim
Ijazah Sarjana Muda Pengajian Melayu (UM)
e-mail : zakihalim@unimap.edu.my

Ms. Faten Khalida Binti Khalid
B. Hsc English Language and Literature (IIUM)
e-mail : faten@unimap.edu.my

Mr. Jasin Bin Abd Halim
B.Ed (Hons) TESL (UiTM)
e-mail : jasinhalim@unimap.edu.my

Mr. Alex Iskandar Rutowski
Physician, Doctor of Medicine
Crimea State Medical University
e-mail : alex@unimap.edu.my

Mr. Muhammad Bazli Bin Mahmood
B.A Translation and Interpretation (USM)
e-mail : bazlimahmood@unimap.edu.my

Mrs. Zaleha Binti Mat Aman
B.A (Hons) Languages and Linguistics (UM)
e-mail : zaleha.m@unimap.edu.my

Mr. Wisam Mohammed Ameen
B.A English Language and Literature
(Al Isra University, Jordan)
e-mail : wisam@unimap.edu.my

Ms. Katrina Mae D. Avena
B.A English major in Creative Writing
(University of the Philippines)
e-mail : katrina@unimap.edu.my

Ms. Jonasyl Aubrey dR. Auxtero
B.A English major in Creative Writing
(University of the Philippines)
e-mail : jonasyl@unimap.edu.my

Ms. Bao Liyang
B.A Applied Linguistic (Chinese as Second Language for Foreigners)
(Yunnan University)
e-mail : baoliyang@unimap.edu.my

VISITING TUTOR

Mr. Robert E. Litowski
TESOL Instructor Diploma (teacher training), Malaysia
TESOL Diploma, Malaysia
Certificate IV in TESOL (Teaching English to Speakers of Other Languages), Sea English Academy, Queensland
Business Development Program, Delloite and Touche, Saskatoon, Canada
ISO Quality Management Program Orientation, Quality Management Institute, Saskatoon
Diploma of Technology – Electrical Engineering Technology, Saskatchewan Technical Institute – Moose Jaw, Saskatchewan, Canada
e-mail : robert.e@unimap.edu.my

Ms. Chelsea Pittman
B.A in English Literature
(The College of William & Mary, Williamsburg, Virginia, USA)
e-mail : chelsea@unimap.edu.my

Ms. Grace Elizabeth Victoria Oxley
B.A in Urban Policy Affairs & Culture
(The College of William & Mary, Williamsburg, Virginia, USA)
e-mail : grace@unimap.edu.my

STAFF ON STUDY LEAVE

Mrs. Rozilawati Mahadi
M.A Applied Linguistics
B.A Pengajian B. Inggeris (UKM)
e-mail : rozilawati@unimap.edu.my

Ms. Noor Asliza Abdul Rahim
M.A Bahasa Melayu (USM)
Bac. Sastera (UPM)
e-mail : asliza@unimap.edu.my

NON ACADEMIC STAFF

Mr. Khairul Hisham Jamalludin
Karyawan Tamu
e-mail : khairulhisham@unimap.edu.my

ADMINISTRATIVE STAFF

Mrs. Afifah Bt Azmi
Assistant Registrar
Tel. : +6(04) 976 7391
e-mail : afifah@unimap.edu.my

Mrs. Liyana Binti Abdul Halim @ Selvaratnam
Secretary
Tel. : +6(04) 976 4571
e-mail : liyanahalim@unimap.edu.my

Mr. Reynold @ Reynold Wong
Administrative Assistant
Tel. : +6(04) 976 7385
e-mail : reynold@unimap.edu.my

Ms. Saidatul Shima Binti Shobre
Administrative Assistant
Tel. : +6(04) 976 4001
e-mail : saidatulshima@unimap.edu.my

Mr. Mohd Faiz Bin Marzuki
Office Assistant
Tel. : +6(04) 976 7385
e-mail : mohdfaiz@unimap.edu.my

UNIVERSITY REQUIRED COURSES

UVW110/2
BASIC MALAY LANGUAGE (ONLY FOR INTERNATIONAL STUDENTS)

Course Synopsis

The aim of this course is to develop students' ability to use the language effectively for purposes of practical communication. The course is based on the linked language skills of listening, reading, speaking and writing, and these are built on as students' progress through their studies. The syllabus also aims to offer insights into the culture and civilization of countries where the language is spoken, thus encouraging positive attitudes towards language learning.

Prerequisite

This course is to be registered by all International students **EXCEPT** students from countries where the Malay Language is used as their national language or spoken language, e.g. students from Indonesia, Brunei and Singapore.

References

1. Hawkins, Joyce M. (Ed). (2006). *Kamus dwibahasa Oxford Fajar Inggeris – Melayu Melayu – Inggeris* (edisi keempat). Selangor: Oxford Fajar Sdn. Bhd.
2. Noor Asliza Abdul Rahim, Abdul Jalil Ramli, Zuhairah Idrus & Suhaidah Said (2009). *Modul bahasa Melayu asas*. Perlis: Universiti Malaysia Perlis.
3. Othman Puteh, Talib Abdullah & L. Shirley (2009). Kamus bergambar (edisi kelima). Selangor: Oxford Fajar Sdn. Bhd.
4. Suhaidah Said, Nor Suhaila Che Pa, Noor Asliza Abdul Rahim, Zuhairah Idrus & Abdul Jalil Ramli (2012). *Modul bahasa Melayu asas (edisi kedua)*. Perlis: Unit Penerbitan UniMAP.
5. Zarina Othman, Roosfa Hashim & Rusdi Abdullah (2012). *Modul komunikasi bahasa Melayu antarabangsa*. Bangi: Penerbit Universiti Kebangsaan Malaysia.

UVW410/2
UNIVERSITY MALAY LANGUAGE

Course Synopsis

The objective of the course is to expose students to the four language skills: listening, speaking, reading and writing. The listening and speaking skills are merged, and focus is given not only on forms and functions, but also on pronunciation. The reading and writing skills; on the other hand, emphasize on accuracy and grammar, structure and semantics (meaning). Topics for essay writing provide opportunity for students to explore analysis processes, syntax and elaboration.

Prerequisite

- NIL

References

1. Anwar Ridhwan & Lai Choy. (2008). *Kamus kata berimbuhan DAYA*. Selangor: Penerbitan Minda (M) Sdn.Bhd.
2. Asmah Haji Omar. (2006). *Panduan wacana akademik teori dan penerapan.* Kuala Lumpur: Dewan Bahasa dan Pustaka.
3. Dewan Bahasa dan Pustaka. (2005). *Kamus Dewan (edisi ke-4)*. Kuala Lumpur: Dewan Bahasa dan Pustaka.
4. N.A. Salleh. (2009). *Cara mudah mengenal pasti kesalahan lazim dalam bahasa Melayu*. Selangor: Perintis Books Sdn. Bhd.
5. Nik Safiah Karim, Farid M. Onn, Hashim Hj.Musa & Abdul Hamid Mahmood. (2006). *Tatabahasa Dewan* (edisi baharu). Kuala Lumpur: Dewan Bahasa dan Pustaka.
6. Samsudin Wahab. (2008). *Surat, minit mesyuarat, dokumen perniagaan dan laporan*. Kuala Lumpur: PTS Professional Publishing Sdn.Bhd.
7. Sulaiman Masri, Abdullah Yusof & Mohd Ra'in Shaari. (2007). *Bahasa Melayu: Dimensi pengajaran dan pembelajaran.* Kuala Lumpur: Utusan Publications & Distributors Sdn Bhd.

UVW312/2
ENGLISH FOR TECHNICAL COMMUNICATION (ONLY FOR STUDENTS IN ENGINEERING AND ENGINEERING TECHNOLOGY PROGRAMMES)

Course Synopsis

This course is designed to prepare engineering and other technical disciplinary students to achieve confidence in extracting, evaluating and synthesizing information with a view to write good technical documents. Various theories of technical communication will be introduced throughout this course.

Students will learn how to prepare technical documents as well as on how to write clearly and concisely. Students will also be exposed to primary and secondary research, techniques of analyzing and interpreting different information and applying functional organization in report writing. At the end of the semester, students are required to formally present their research report orally.

Prerequisite

Students must have either one of these qualifications:
a) Pass Foundation English with minimum grade C
b) Obtained at least a MUET Band 4
c) Obtained TOEFL 525 / IELTS 5.5 and above
d) UniMAP Diploma graduates who have passed Diploma English 1 and 2 with minimum grade C

References

1. Blicq, R., & Moretto. (2004). Technically Write (6th Ed.). Upper Saddle River, New Jersey: Pearson.
2. Ingre, D. (2003). Survivor's guide to technical writing. Mason, OH: South Western.
3. Lannon, J. M., & Gurak, L. J. (2011). Technical Communication (12th Ed.). United States: Pearson.
4. Shafiq Hizwari Md. Hashim, Loo Shih Min, Liew Khe Li & Sri Kandy Putri Naru Abdul Hamid Naru. (2012). Technical Communication for University Students. Kuala Lumpur, Malaysia: Pearson Malaysia.
5. Smith-Worthington, D., & Jefferson, S. (2011). Technical writing for success (3rd Ed.). United States: South-Western Cengage Learning.

UVW313/2
ENGLISH FOR ACADEMIC PURPOSES (ONLY FOR STUDENTS IN BUSINESS AND NEW MEDIA COMMUNICATION PROGRAMMES)

Course Synopsis

Using a learner-centred approach, this course is aimed at preparing business students to improve their general academic writing skills by familiarising them with the fundamentals of academic writing. By the end of the semester, students are required to produce an argumentative essay individually, with topics that are related to their respective disciplines. Students are required to conduct library research; both printed and online material such as books, journals, periodicals etc. Apart from that, students are also required to apply the correct form of APA citation style in their essays. Although the primary focus of the course is on writing, this course also provides substantial activities on reading and speaking. Students are required to present their topics orally by the end of the semester.

Prerequisite

Students must have either one of these qualifications:
a) Pass Foundation English with minimum grade C
b) Obtained at least a MUET Band 4
c) Obtained TOEFL 525 / IELTS 5.5 and above
d) UniMAP Diploma graduates who have passed Diploma English 1 and 2 with minimum grade C

References

1. Bailey, S. (2011). *Academic writing: A handbook for international students*. (2nd ed.). NY, USA: Routledge.
2. Barry, M. (2011). *Steps to academic writing*. Cambridge, UK: Georgian Press.
3. Brandt, C. (2009). *Read, research and write: Academic skills for ESL students in higher education*. Wiltshire, UK: SAGE Study Skills Series
4. Chin, P., Koizumi, Y., Reid, S., Sean Wray,. & Yamazaki, Y. (2011). *Academic writing skills:*
5. *Student's book 1*. Cambridge, UK: Cambridge University Press.
6. Cox, K., & Hill, D. (2011). *EAP now! English for academic purposes students' book*. (2nd ed.). NY, USA: Pearson/ Longman.
7. Rogers, L. (2011). *DELTA academic objectives: Writing skills coursebook*. ?: Delta Publishing.
8. Soles, D. (2009). *The essential of academic writing*. (2nd ed.). Boston, USA: Wadsworth Cengage Learning.

OPTIONAL COURSES

UVW112/2
FOUNDATION ENGLISH

Course synopsis

This course covers the major aspects of reading, writing, speaking and listening competence and it also includes sub-skills of grammar and dictionary skill. This course is designed to enhance students' English language proficiency and communicative ability. This course will adopt a learner-centered approach to help students attain good command of the English language.

Prerequisite

All **students** must register for this course **EXCEPT**:

a) Those who have obtained Band 4 and above for Malaysian University English Test (MUET)
b) Those who obtained TOEFL 525 / IELTS 5.5 and above
c) UniMAP Diploma graduates who have passed Diploma English I and II with minimum grade C.

References

1. Azar, B.S. (2003) *Fundamentals of English grammar* (3rd Edition). Englewood Cliffs, N.J.: Prentice Hall.
2. Elder, J. (2008). *Exercise your college reading skills*. New York: McGraw Hill.
3. Fuchs, M., Bonner, M., & Westheimer, M. (2000). *Focus on grammar: An intermediate course reference and practice. (*2nd Edition*).* New York: Longman.
4. Langan, J. (2008). *College writing skills* (7th Edition). Singapore: McGraw Hill.
5. *Macmillan English dictionary for advanced learners.* (2011) (2nd ed.). Oxford, United Kingdom: Macmillan Publishers Limited. (Original work published 2002).
6. Reid, J. M. (2000). *The process of composition (*3rd Edition). New York: Longman.

UVW114/2
MANDARIN I

Course Synopsis

This course is designed to introduce students to Mandarin language. The course will cover listening, speaking, reading and writing in spoken and written Mandarin. The students will be introduced to Pin Yin which will help them to pronounce accurately. They will be able to read and understand short and simple sentences and able to write simple Chinese characters with the help of Pin Yin. Students will also learn short and simple common daily expressions.

Prerequisite

Students who register **MUST NOT** have any formal qualifications in the language at PMR/SPM level; **and MUST NOT** have followed any education system which uses the language as the medium of instruction.

References

1. Lo, J. & Yih,E. (2009). *Go! Chinese*. Singapore: Cengage Learning Asia Pre Ltd.
2. Lai, S. Y. & Lim, Y. L. (2010). *Shenghuo Huayu! An Introductory Course to the Chinese Language*. Singapore: Cengage Leaning Asia Pre Ltd.
3. Qin, H. (2011). *A Dictionary of Everyday English Metaphors (English-Chinese).* Beijing: Peking University Press.
4. Zhou, X. K. (2009). *Dr.Zhou's Rhymes For Learning Chinese-Book1*, Beijing: Peking University Press.
5. Xu, J. L. (2008). Jia *You! Chinese for the Global Communication, Vol.1*. Singapore: Cengage Learning Asia Pre Ltd.

UVW214/2
MANDARIN II

Course Synopsis

At this level students of Mandarin Language 2 will be introduced to simple use of grammar. Students will able to read and understand longer sentences and conversations. They will learn to write longer sentences with the help of Pin Yin. Students will be introduced to different social contexts through the topics covered as well as introduced to shorts Mandarin songs.

Prerequisite

Pass Mandarin I with minimum grade C.

References

1. Lo, J. & Yih, E. (2009). *Go! Chinese*. Singapore: Cengage Learning Asia Pre Ltd.
2. Lai, S. Y. & Lim, Y. L., (2010). *Shenghuo Huayu! An introductory course to the Chinese Language*. Singapore: Cengage Leaning Asia Pre Ltd.
3. Qin, H. (2011). *A dictionary of everyday English metaphors (English-Chinese).* Beijing: Peking University Press.
4. Zhu, X. K. (2009). *Dr.Zhou's rhymes for learning Chinese-Book2*, Beijing: Peking University Press.
5. Xu, J. L., (2008). Jia *You! Chinese for the global communication, Vol.1*. Singapore: Cengage Learning Asia Pre Ltd.

UVW314/2
MANDARIN III

Course Synopsis

At this level, students of Mandarin Language 3 will be introduced to basic business Mandarin language used in business. Students will be able to read short paragraphs with the help of Pin Yin and able to respond to questions from short paragraphs. Students will also able to write longer sentences with the appropriate Chinese stroke order.

Prerequisite

Pass Mandarin II with minimum grade C.

References

1. Lo, J., & Yih, E. (2009). Go*! Chinese, Singapore*: Cengage Learning Asia Pre Ltd.
2. Lai, S. Y. & Lim, Y. L. (2010). *Shenghuo Huayu! An introductory course to the Chinese Language*. Singapore: Cengage Leaning Asia Pre Ltd.
3. Liu, M. (2007). *BBC basic business Chinese.* Beijing: Peking University Press.
4. Qin, H. (2011). *A dictionary of everyday English metaphors (English-Chinese).* Beijing: Peking University Press.
5. Xu, J. L. (2008). Jia *You! Chinese for the global communication (Vol.2).* Singapore*:* Cengage Learning Asia Pre Ltd.

UVW414/2
MANDARIN IV

Course Synopsis

At this level, students of Mandarin Language 4 are expected to gain more vocabulary from what they have learned from Mandarin III. The topics covered will expose students to practice Mandarin language in business contexts. Students will be able to read and write longer sentences with appropriate grammar and Chinese stroke order without the help of Pin Yin. Students should also be able to hold a conversation in Mandarin especially for business purposes.

Prerequisite

Pass Mandarin III with minimum grade C.

References

1. Lo, J. & Yih, E. (2009). Go*! Chinese, Singapore*: Cengage Learning Asia Pre Ltd.
2. Lai, S. Y. & Lim, Y. L. (2010), *Shenghuo Huayu! An Introductory Course to the Chinese Language*. Singapore: Cengage Leaning Asia Pre Ltd.
3. Liu, M. (2007). *BBC Basic Business Chinese.* Beijing: Peking University Press.
4. Qin, H., (2011). *A Dictionary of Everyday English Metaphors (English-Chinese).* Beijing: Peking University Press.
5. Xu, J. L., (2008). Jia *You! Chinese for the Global Communication, Vol2.* Singapore*:* Cengage Learning Asia Pre Ltd.

UVW115/2
THAI I

Course Synopsis

This course is designed for students who have no background in Thai language. The course will cover listening, speaking, reading and writing in spoken and written Thai. The students will be introduced to Thai phonetic transcriptions which will help them to pronounce with the correct tone, read and understand short and simple sentences. Students will be able to write simple words and sentences in Thai script. They will also learn short and simple daily expressions.

Prerequisite

Students who register **MUST NOT** have any formal qualifications in the language at PMR/SPM level; **and MUST NOT** have followed any education system which uses the language as the medium of instruction.

References

1. Becker, B. P. (2003). *Thai for beginners.* Bangkok: Paiboon Publishing.
2. Becker, B.P. (2003). *Improving your Thai pronounciation.* Bangkok: Paiboon Publishing.
3. Ponmanee, S, (2000), *Learn to Read Thai.* Chiangmai: Thaigreat.
4. Tontraseney, W. (1981). *Bahasa Thai,* Kuala Lumpur: Universiti Malaya.
5. Wiworn Kasavatana-Dohrs. (2007). *Everyday Thai for beginners.* Silkworn Book.

UVW215/2
THAI II

Course Synopsis

At this level, students will be introduced to simple use of the grammar. Students will learn to read and understand longer sentences and conversations about daily activities. They will learn to write longer sentences with the help of phonetic transcription. Throughout the course, students will have more understanding about Thai culture and practices.

Prerequisite

Pass Thai I with minimum Grade C.

References

1. Becker, B. P. (2003). *Thai for Beginners.* Bangkok: Paiboon Publishing.
2. Ponmanee, S, (2000), *Learn to Read Thai.* Chiangmai: Thaigreat.
3. Becker, B.P, (2003), *Improving Your Thai Pronunciation.* Bangkok: Paiboon Publishing.
4. Wiworn Kasavatana-Dohrs (2007) *Everyday Thai for beginners.* Silkworn Book.
5. Tontraseney, W, (1981), *Bahasa Thai.* Kuala Lumpur: Universiti Malaya.

UVW315/2
THAI III

Course Synopsis

This course will expand the use of vocabulary relating to social contexts and introduce its use in business contexts .student will be able to read longer dialogues and paragraphs relating to social and simple business contexts. Students will learn to write complex sentences to produce dialogues relating to topics learned. At this level the phonetic transcription will be used only when necessary.

Prerequisite

Pass Thai II with minimum Grade C.

References

1. Becker, B. P. (2003). *Thai for Beginners.* Bangkok: Paiboon Publishing.
2. Ponmanee, S, (2000). *Learn to Read Thai.* Chiangmai: Thaigreat.
3. Becker, B.P, (2003). *Improving Your Thai Pronounciation.* Bangkok: Paiboon Publishing.
4. Wiworn Kasavatana-Dohrs. (2007). *Everyday Thai for beginners.* Silkworn Book.
5. Tontraseney, W, (1981). *Bahasa Thai,* Kuala Lumpur: Universiti Malaya.

UVW415/2
THAI IV

Course Synopsis

At this level, students are exposed to vocabulary closely related to business contexts. The topics covered will provide students with practice using Thai language in business contexts. Students will be able to read and write longer dialogues and short paragraphs with the correct use of grammar without the help of phonetic transcription. Students should be able to hold a conversation in Thai especially for business purposes.

Prerequisite

Pass Thai III with minimum Grade C.

References

1. Becker, B. P. (2003). *Thai for Beginners.* Bangkok: Paiboon Publishing.
2. Ponmanee, S. (2000). *Learn to Read Thai.* Chiangmai: Thaigreat.
3. Becker, B.P, (2003). *Improving Your Thai Pronounciation.* Bangkok: Paiboon Publishing.
4. Tontraseney, W, (1981). *Bahasa Thai.* Kuala Lumpur: Universiti Malaya.
5. Wiworn Kasavatana-Dohrs. (2007). *Everyday Thai for beginners.* Silkworn Book.

UVW116/2
ARABIC I

Course Synopsis

This course is designed for beginners with no prior knowledge of Arabic Language. The course covers listening, speaking, reading and writing skills. Students will be exposed to Arabic characters and correct pronunciation. Students will be able to read and understand short sentences and dialogues. They will learn basic grammar to enable them to write simple sentences in Arabic.

Prerequisite

Students who register **MUST NOT** have any formal qualifications in the language at PMR/SPM level; **and MUST NOT** have followed any education system which uses the language as the medium of instruction.

References

1. Abdullah Sulaiman Al-Jarbuk, Tammam Hassan Umar, Mahmud Kamil al-Naqah,
2. Abdullah Kamil Al-Abadi, Ali Muhammad Al-Fiqqi & Rusydi Ahmad Taimah (1984). Taklimu al-Lughah al-Arabiyyah Lighairi al-Natiqin Biha, Al-Mamlakah al-Arabiyyah al-Saudiyyah. Jamiah Ummu al-Quran.
3. Muhammad Roihan Hasbullah M.A (Hj.) (2002). Perbualan bahasa Arab untuk peringkat rendah dan menengah. Kuala Lumpur: Pustaka Syuhada.
4. Sekumpulan guru-guru Bahasa Arab (1987). Al-Jadid al-Lughati al-Araabiyyah Li al-Sanah al-Ula al-Ikdadiyah. Gombak Utara Selangor: Pustaka Markiland.
5. Bahasa Arab 1 (2002). Bahagian Bahasa Arab, Universiti Sains Malaysia (Pusat Bahasa & Terjemahan).
6. Zaid Al-Hamid (2001). Pelajaran bahasa Arab untuk semua. Kuala Lumpur: Speedy Self Study System.
7. Fuad Ifram al-Bustaniy (1986). Al-Munjid Al-Tullab. Beirut, Lubnan: Darul Syarq.
8. Lingua Phone (2000). London: Lingua Phone Institut Limited.

UVW216/2
ARABIC II

Course Synopsis

At this level, students will learn basic vocabularies. Students will be exposed to more basic grammar and sentence structures. They will also learn to read and write longer sentences and conversations about daily activities. These will further develop students' listening, speaking, reading and writing skills.

Prerequisite

Pass Arabic I with minimum Grade C.

References

1. H. Ridlo. Masduki (Prof.Dr.), H.Chatibul Umam (Prof. Dr.) H. Moh. Matsna (Dr.) (2000). العربية لطلاب الجامعة . Kuala Lumpur: Darul Ulum Press.
2. Nuhammad Akram Saaduddin (at all), (1990). : العربية الفصيحةالقلم للناطقين بغيرها وبها . Kuala Lumpur: Fajar Ulung Sdn. Bhd. L.B.C. Publishers International Book Centre.
3. Ishak Mohd. Rejab (Prof. Madya Dr.) (1987). Kursus bahasa Arab (Bahagian 11). Kuala Lumpur: Yayasan Dakwah Islamiah Malaysia (YADIM).
4. Ali al-Jarim, Mustafa Amin (1966),النحو الواضح فى قواعد اللغة العربية, Mesir.
5. Elias A. Elias & Ed. E. Elias (n.d.), القاموس العصري, عربي - انكليزي Mesir.
6. Institut Agama Islam Negeri (IAIN), Sharif Hidayatullah, Jakarta, (1977), العربية بالنماذج. Jakarta, Indonesia: Bulan Bintang, (Penerbit dan Penyebar buku-buku Teks).
7. Lingua Phone (2000). London: Lingua Phone Institut Limited.
8. Sono Cairo Audio, VIDEO CD, (t.t.), تعليم اللغة العربية للمتحدثين بالانجليزية , Cairo Egypt.
9. Syed Umar al-Sagaf, Muhamad Khalil Hj. Ahmad dan Mohd. Abdul Rahim, Mohd. Abdul Rahman (2000), اللغة العربية الاتصالية , Kuala Lumpur: Dewan Bahasa dan Pustaka.
10. Universiti Putra Malaysia (t.t.), مذكرة اللغة العربية للمستوى الثالث , Fakulti Bahasa Moden dan Komunikasi.
11. Mustaffa Abdullah (terjemahan oleh Siti Rohaya Sarnap & Siti Sujinah Sarnap (2000). Cara mudah belajar bahasa Arab. Sinagpore: JAHABERSA & CD.
12. Al-said Muhmmad Badawi (Dr.), (1983), تعليم اللغة العربية لغير الناطقين بها , Tunisia
13. Hassan Bin Hj. Arshad (2000), BAHASA ARAB (al-Qawaid dan al-Maqalah) Universiti Sains Malaysia (Pusat Bahasa & Terjemahan).

UVW316/2
ARABIC III

Course Synopsis

This course will expand the use of vocabulary relating to daily activities and social contexts. Students will be introduced to use vocabularies learned to produce complete sentences in communication. Students will be able to read longer dialogues and paragraphs relating to daily activities and social contexts. Students will also learn more various grammar items to write complex sentences and dialogues relating to topics learned.

Prerequisite

Pass Arabic II with minimum Grade C.

References

1. Mahmud Ismail As-sini (Dr.) (1993). العربية للناشئين : منهج متكامل لغير الناطقين بالعربية . Arab Saudi : Darul Ma'arif Mamlakah.
2. Nuhammad Akram Saaduddin (et al.) (1990). العربية الفصيحةالقلم للناطقين بغير ها وبها . Kuala Lumpur: Fajar Ulung Sdn. Bhd. L.B.C. Publishers International Book Centre.

3. Ishak Mohd. Rejab (Prof. Madya Dr.). (1987). Kursus Bahasa Arab (Bahagian 11). Kuala Lumpur: Yayasan Dakwah Islamiah Malaysia (YADIM).
4. Ali al-Jarim, Mustafa Amin (1966). النحو الواضح فى قواعد اللغة العربية .Mesir.
5. Linguaphone: Rakaman kaset dan buku panduan (1990). London: Linguaphone Institute Limited, St Giles House.
6. Sohair Abdul Moneim Sery (1997). Kursus Bahasa Arab (Arabtone). Selangor: Anglophone (Malaysia). Sdn. Bhd.
7. Penterjemah: Siti Rohani (2000). Cara mudah belajar Bahasa Arab. Malaysia: Jahabersa Sdn. Bhd.

UVW416/2
ARABIC IV

Course Synopsis

At this level, students will use expanded vocabulary and focus on producing longer and grammatically correct sentences. Students will be exposed to read longer paragraphs relating to different social and religious contexts. Students are also engaged in writing more complex and longer sentences relating to the topics learned.

Prerequisite

Pass Arabic III with minimum Grade C.

References

1. Ahmad Hassan Ziyat (n.d.). تاريخ الأدب العربي , Darul Kutub Misriyyah, Mesir.
2. Batras Al-Bustaniy (1989). العرب أدباء. دار النذير: بيروت , Darul Nazir, Beirut
3. Abdul Rahman Al-Barquni (1979). Darul Kitab, Beirut ديوان المتنبي. بيروت شرح : دار الكتاب
4. Syauqi Dhaif (n.d.).البارودى رائد الشعر الحديث , Darul Ma'arif, Kaherah, Mesir.
5. Subhi Soleh (1960). دراسات فى فقه اللغة Darul 'Ilmi Malayin, Beirut.
6. Ali Abdul Wahid Wafi (1945). فقه اللغة Darul Nahdhah, Mesir
7. Imil Badi' Ya'kub (1982). العربية وخصائصها فقه اللغةDarul 'Ilmi Malayin, Beirut.

UVW117/2
JAPANESE I

Course Synopsis

Designed for beginners with no prior knowledge of Japanese Language, this course covers listening, speaking, reading and writing skills. Students will learn to write 2 types of Japanese Writing System, Hiragana and Katakana. Students will be engaged to classroom interactions, practising daily greetings and simple conversations. Students will be introduced to basic elements of the Japanese culture through the topics covered.

Prerequisite

Students who register **MUST NOT** have any formal qualifications in the language at PMR/SPM level; **and MUST NOT** have followed any education system which uses the language as the medium of instruction.

References

1. Ku Mohd Nabil. (2010). *Modul Bahasa Jepun II*. Pusat Kemahiran Komunikasi dan Keusahawanan, Universiti Malaysia Perlis.
2. The Association For Overseas Technical Scholarships.(1998). *Minnna no Nihongo 1*, Tokyo: 3A Corporation.
3. The Association For Overseas Technical Schorlarships.(1997). *Shin Nihongo no Kiso1* (Asian Edition).
4. Hirai, E. & Miwa, S.(2000). *Minna no Nihongo 1* BunkeiRenshuuTyou, Tokyou: 3A Corporation.
5. Miyagi, S. & Mitsui, A.(1997). *Everyday listening in 50 days*: Tokyo: Bonjinsha Corporation The Association For Overseas Technical Scholarship(Aots),' Shin Nihongo-No Kiso 1', Standard Question, 3A Corpration, 1993.

UVW217/2
JAPANESE II

Course Synopsis

Students will be exposed to new vocabulary and will begin to use simple sentences in spoken and written Japanese. They will be introduced to simple grammatical and sentence structures. Students will learn how to read and write short sentences. Basic elements of the Japanese culture will be also taught in the topics covered throughout the course.

Prerequisite

Pass Japanese I with minimum Grade C.

References

1. Ku Mohd Nabil. (2010). *Modul Bahasa Jepun II*. Pusat Kemahiran Komunikasi dan Keusahawanan, Universiti Malaysia Perlis.

2. Hirai, E. & Miwa, S.(2000). *Minna no Nihongo 1*BunkeiRenshuuTyou, Tokyo: 3A Corporation.
3. The Association For Overseas Technical Scholarships.(1998). *Minnna no Nihongo 1*,Tokyo: 3A Corporation.
4. The Association For Overseas Technical Schorlarships. (1997). *Shin Nihongo no Kiso 1* (Asian Edition).
5. Miyagi, S. & Mitsui, A.(1997). *Everyday Listening in 50 days*: Tokyo: Bonjinsha Corporation

UVW317/2
JAPANESE III

Students will be exposed to expanded vocabulary and higher level grammar, particles and sentence structure. Students will learn reading, writing and speaking longer sentences and dialogues. Throughout the course, students will also learn the elements of Japanese culture in the topics covered.

Prerequisite

Pass Japanese II with minimum Grade C.

References

1. Ku Mohd Nabil. (2010). *Modul Bahasa Jepun II*. Pusat Kemahiran Komunikasi dan Keusahawanan, Universiti Malaysia Perlis.
2. The Association For Overseas Technical Scholarships. (1998). *Minnna no Nihongo 1*,Tokyo: 3A Corporation.
3. The Association For Overseas Technical Schorlarships. (1997). *Shin Nihongo no Kiso 1* (Asian Edition).
4. Hirai, E. & Miwa, S. (2000). *Minna no Nihongo 1* Bunkei Renshuu Tyou, Tokyo: 3A Corporation.
5. Miyagi, S. & Mitsui, A. (1997). *Everyday Listening in 50 days*: Tokyo: Bonjinsha Corporation

UVW417/2
JAPANESE IV

At this level, students will use expanded vocabulary and focus on producing longer and grammatically correct sentences. They will also use the correct particles in both written and spoken Japanese. Students will be engaged in higher level communicative practice. Basic Chinese Characters (Kanji) will be introduced and students will learn more of Japanese culture elements through the topics covered.

Prerequisite

Pass Japanese III with minimum Grade C.

References

1. Ku Mohd Nabil. (2010). *Modul Bahasa Jepun II*. Pusat Kemahiran Komunikasi dan Keusahawanan, Universiti Malaysia Perlis.
2. The Association For Overseas Technical Scholarships. (1998). *Minnna no Nihongo 1*,Tokyo: 3A Corporation.
3. The Association For Overseas Technical Schorlarships. (1997). *Shin Nihongo no Kiso 1* (Asian Edition).
4. Hirai, E. & Miwa, S. (2000). *Minna no Nihongo 1*BunkeiRenshuuTyou, Tokyo: 3A Corporation.
5. Miyagi, S. & Mitsui, A.(1997). *Everyday Listening in 50 days*: Tokyo: Bonjinsha Corporation

UVW118/2
GERMAN I

Course synopsis

The objective of this course is to expose students to German language. Students will gain listening, speaking, reading and writing skills in standard spoken and written German language. Students will recognize the basic elements and structures of the language with an understanding of the culture in which the language is spoken. Students will be able to construct 4-5 word sentences for the purpose of communication. Students will also be able to read and comprehend short simple texts.

Prerequisite

Students who register **MUST NOT** have any formal qualifications in the language at PMR/SPM level; **and MUST NOT** have followed any education system which uses the language as the medium of instruction.

References

1. Gudrun Gotz, Eveline Schwarz. (2011), AussichtenA1 Deutsch als Fremdsprache für Erwachsene. Stuttgart, Ernst Klett GmbH.
2. Julia Guess.(2009), Deutsch Aktiv. Berlin und München Langenscheidt KG.
3. Dieter Maenner. (2006), Eurolingua Deutsch 1, Berlin, Cornelsen Verlag.

4. Ulrike Albrecht, Dorothea Dane. (2005), Passwort Deutsch 1 & 2, Stuttgart, Ernst Klett International GmbH.
5. Hanns-Josef Ortheil. (2010), Deutsch zum Ausprobieren, München, Sprachinstitut Treffpunkt.

UVW218/2
GERMAN II

Course Synopsis

The objective of this course is to extend students' knowledge of the German language which they started in German I. Students will continue and expand the basic elements, structures and constructions of the language as well as understand the culture of the people who speak the language. Students will be able to construct longer sentences in both written and spoken for the purpose of communication, express themselves using simple phrases and also to read and comprehend short simple texts.

Prerequisite

Students who register must pass German I with minimum grade C.

References

1. Gotz, G. Schwarz, E. (2011). AussichtenA1. Deutsch als Fremdsprache für Erwachsene. Stuttgart: Ernst Klett GmbH.
2. Guess, G. (2009) Deutsch Aktiv. Berlin und München: Langenscheidt KG.
3. Maenner, D. (2006) Eurolingua Deutsch 1 & 2. Stuttgart: Ernst Klett, International GmbH.
4. Dane, A.D. (2005). Passwort Deutsch 1 & 2. Stuttgart: Ernst Klett, International GmbH.
5. Ortheil, H.J. (2010). Deutsch zum Ausprobieren, München: Sprachinstitut Treffpunkt.

UVW318/2
GERMAN III

Course Synopsis

The objective of this course is the intorduction to, and use of vocabulary related to social contexts and its use in bussiness contexts. Students will be able to read longer dialogues and paragraphs related to social and simple bussiness contexts. Students will learn to construct longer sentences to produce dialogues related to topics learned.

Prerequisite

Students who register must pass German II with minimum grade C.

References

1. Gotz, G. Schwarz, E. (2011). AussichtenA1. Deutsch als Fremdsprache für Erwachsene. Stuttgart: Ernst Klett GmbH.
2. Guess, G. (2009) Deutsch Aktiv. Berlin und München: Langenscheidt KG.
3. Maenner, D. (2006) Eurolingua Deutsch 1 & 2. Stuttgart: Ernst Klett, International GmbH.
4. Ortheil, H.J. (2010). Deutsch zum Ausprobieren, München: Sprachinstitut Treffpunkt.

UVW418/2
GERMAN IV

Course Synopsis

The objective of this course is to expose and teach the students more complex grammatical forms and sentence structure as compared to level 1, 2 and 3. Classroom tasks demand a higher level of participation and allow students to express themselves using the language. Students are exposed to different authentic situations that they would encounter in their future workplace. Students will also learn how to write essays.

Prerequisite

Students who register must pass German III with minimum grade C.

References

1. Gotz, G. Schwarz, E.(2011). AussichtenA1. Deutsch als Fremdsprache für Erwachsene. Stuttgart: Ernst Klett GmbH
2. Guess, G. (2009.) Deutsch Aktiv. Berlin und München: Langenscheidt KG.
3. Maenner,D. (2006).Eurolingua Deutsch 1,Berlin: Cornelsen Verlag,
4. Dane,A.D.(2005). Passwort Deutsch 1 & 2, Stuttgart: Ernst Klett, International GmbH.
5. Ortheil, H.J .(2010). Deutsch zum Ausprobieren, München: Sprachinstitut Treffpunkt

UVW119/2
KOREAN I

Course Synopsis

This course is designed for beginners with no prior knowledge of Korean. It introduces students to the Korean language and covers reading and writing of the Hangul script as well as pronunciation. Starting with greetings, the course proceeds to develop communication through basic grammar, vocabulary and reading skills for simple sentences. Students will develop the four skills of listening, speaking, reading and writing in an interactive and integrated manner through theme-based activities that relate to daily life.

Prerequisite

Students who register **MUST NOT** have any formal qualifications in the language at PMR/SPM level; **and MUST NOT** have followed any education system which uses the language as the medium of instruction.

References

1. 47 Korean pronunciation for foreigners. (2009). Seoul University, Korea: Language Education Centre.
2. Easy to learn Korean. (2011). Korea, Seoul: Sungkyun Language Institute.
3. Kim, J. S., Bang, S. W., Lee, Y., Seo, H. J., & Ahn, M. (2004). *Exploring Korean workbook (Beginner's I).* Korea, Seoul: Kyung Hee University Press and the Institute of international Education.
4. Kim, D. G., Park, Y. H., Oh, S. A., Yu, J. Y., & Lee, H. W. (2005). *Korean grammar for foreigners.* Korea, Seoul: The National Institute of the Korean Language.
5. Lee, Z. C. (2007). *Queen' Korean.* (2007). Peking, China: Peking University Press.

UVW219/2
KOREAN II

Course Synopsis

In this course, students will become more familiar with the morphology of spoken and written Korean. Students will further develop their proficiency in the skills of listening, speaking, reading and writing. These skills will be taught in an interactive and integrated manner through theme-based activities related to everyday life. The course will also enable students to acquire more accurate pronunciation and articulation of Korean words and sentence patterns. By the end of the course, they will have a better understanding of Korean lifestyle and culture and they will be able to use Korean in a variety of social contexts.

Prerequisite

Pass Korean I with minimum grade C.

References

1. 47 Korean pronunciation for foreigners. (2009). Seoul University, Korea: Language Education Centre.
2. Easy to learn Korean. (2011). Korea, Seoul: Sungkyun Language Institute.
3. Kim, J. S., Bang, S. W., Lee, Y., Seo, H. J., & Ahn, M. (2004). *Exploring Korean workbook (Beginner's I).* Korea, Seoul: Kyung Hee University Press and the Institute of international Education.
4. Kim, D. G., Park, Y. H., Oh, S. A., Yu, J. Y., & Lee, H. W. (2005). *Korean grammar for foreigners.* Korea, Seoul: The National Institute of the Korean Language.
5. Lee, Z. C. (2007). *Queen' Korean.* (2007). Peking, China: Peking University Press.

UVW319/2
KOREAN III

Course Synopsis

This course aims to expand students' language skills by introducing more complex sentence structures, colloquial expressions in different cultural contexts. Classroom tasks in this course naturally demand a higher level of participation and hence incorporate learning through the use of audio-visual materials and class discussion. This course will introduce students to basic business Korean use and culture behavior in dealing business with people from Korea.

Prerequisite

Pass Korean II with minimum grade C.

References

1. 47 Korean pronunciation for foreigners. (2009). Seoul University, Korea: Language Education Centre.

2. Easy to learn Korean. (2011). Korea, Seoul: Sungkyun Language Institute.
3. Kim, J. S., Bang, S. W., Lee, Y., Seo, H. J., & Ahn, M. (2004). *Exploring Korean workbook (Beginner's I).* Korea, Seoul: Kyung Hee University Press and the Institute of International Education.
4. Kim, D. G., Park, Y. H., Oh, S. A., Yu, J. Y., & Lee, H. W. (2005). *Korean grammar for foreigners.* Korea, Seoul: The National Institute of the Korean Language.
5. Lee, Z. C. (2007). *Queen' Korean.* (2007). Peking, China: Peking University Press.

UVW419/2
KOREAN IV

Course Synopsis

Students are introduced to more complex grammatical forms and sentence structures as compared to level I, II and III. Classroom tasks in this course would demand a higher level of participation and allow students opportunities to express themselves using the language. Students are exposed to use the language in different authentic contexts that they would encounter in their future workplace.

Prerequisite

Pass Korean III with minimum grade C.

References

1. 47 Korean pronunciation for foreigners. (2009). Seoul University, Korea: Language Education Centre.
2. Easy to learn Korean. (2011). Korea, Seoul: Sungkyun Language Institute.
3. Kim, J. S., Bang, S. W., Lee, Y., Seo, H. J., & Ahn, M. (2004). Exploring Korean workbook (Beginner's I). Korea, Seoul: Kyung Hee University Press and the Institute of International Education
4. Kim, D. G., Park, Y. H., Oh, S. A., Yu, J. Y., & Lee, H. W. (2005). Korean grammar for foreigners. Korea, Seoul: The National Institute of the Korean Language.
5. Lee, Z. C. (2007). Queen' Korean. (2007). Peking, China: Peking University Press.

UVW120/2
RUSSIAN I

Course Synopsis

Russian Language I is a course designed for students who have no previous knowledge of the Russian language. At this level students will gain basic listening, reading, speaking and writing skills in standard spoken or written Russian. Students will learn and recognize Russian Alphabet (Cyrillic) and its sound system, as well as they will be introduced to simple grammar structures and also learn simple daily conversation in the Russian language. Throughout this course students will be introduced to Russian culture.

Prerequisite

Students who register **MUST NOT** have any formal qualifications in the language at PMR/SPM level; **and MUST NOT** have followed any education system which uses the language as the medium of instruction.

References

1. Rachel, F. (2002), Beginner's Russian, 2nd edition, Great Britain.
2. Karavanova, N.B. (2006), Survival Russian. A course in conversational Russian, 6th edition (stereotype), Moscow, Russian Language. Courses.
3. Kurlova, I.V. Nachinaem chitat po russki. (2008), Moscow. Russian Language. Courses.

UVW220/2
RUSSIAN II

Course Synopsis

A continuation from Russian I, students will gain secondary listening, speaking, reading and writing skills in Russian. Students will be able to understand spoken Russian, construct short sentences for communication, read and understand simple texts, as well as to be able to participate in discussion of the topics assigned. Moreover, based on the texts used in the course, students will also be introduced to Russian culture.

Prerequisite

Students who register must pass Russian I with minimum grade C.

References

1. Rachel, F. (2002), Beginner's Russian, 2nd Edition, Great Britain.
2. Karavanova, N.B. (2006). Survival Russian: A Course in Conversational Russian, 6th Edition (stereotype), Moscow, Russian Language Courses.
3. Kurlova, I.V. Nachinaem Chitat Po Russki. (2008), Moscow. Russian Language Courses.

Engineering Centre

Address

ENGINEERING CENTRE
University Malaysia Perlis
Level 1, Administration Building
Pauh Putra Main Campus
02600 Arau,Perlis
MALAYSIA

Tel.: +6(04) 988 5712 / 5719 / 5720
Fax: +6(04) 988 5739
www.unimap.edu.my

Engineering Centre

INTRODUCTION

The Engineering Centre is located within Main Campus of UniMAP. It was established to manage laboratories and workshops which are vitally needed for various engineering programs offered by UniMAP. The teaching learning approach practiced in UniMAP is essentially based on practical-oriented; hence the use of labs cannot be overemphasized.

OBJECTIVES

Besides managing laboratories and workshop, the Engineering Centre also supports research and development activities in UniMAP. It also aspires to be a centre for designing and creating innovative engineering products. The Engineering Centre offers facilities for courses which require training and technical skills, parallel to industry standard. It also offers ‘teaching factory’ that is based on industries advanced technology, facilities and conducive environment for research and development activities and training for students and members of staff.

COURSES OFFERED BY ENGINEERING CENTRE

There are two core courses offered by Engineering Centre for undergraduate’s level:

- Engineering Skills (ECT111)
- Engineering Skills (ECT112)
- Engineering Skills (PCT111)

And also a core course for diploma level:

- Basic Engineering Skill (DCT100)

ENGINEERING SKILLS (ECT111/ECT112)

- AutoCAD Software Module consist of drawing and editing, layer control and properties modification, hatching, and dimensioning, text and template drawing
- Technical Drawing consists of geometric construction, lettering, tolerance, sectional view and symbols
- MATLAB Software Module consists of M- Files, Projection format, Matrix, vector, scalar and plotting
- Mechanical workshop consists of basic measurement, machining, welding, fitting, sheet metal
- PCB Fabrication process
- PCB design by using OrCAD Software.
- Electrical domestic wiring.
- Mechanical workshop- machining
- PLC - Programmable Logic Control.

BASIC ENGINEERING SKILL (DCT 100)

- Basic knowledge of computer
- Construction and measurement of electronic circuit
- Basic knowledge of electrical wiring
- An exposure to measurement techniques, fitting and sheet metal process
- Experience to the welding techniques and handling of mechanical machine

LAB FACILITIES

PCB FABRICATION LAB

- Introduction to advance Printed Circuit Board process development including single sided and double sided PCB production. We also can produce multi layer PCB process up to 6 layers.

PLC LAB

- PLC application in automation

CAD/CAM LAB and COMPUTER LAB

- Introducing software of AUTOCAD, MATLAB and ORCAD.

ELECTRICAL WIRING WORKSHOP

- Domestic wiring, installation of surface wiring, PVC conduit and steel conduit wiring systems

MECHANICAL WORKSHOP

- Basic mechanical measurements, sheet metal process, fitting, welding, and machining

BASIC COMPUTER LAB

- Hardware assembly and software installation

TEACHING FACTORY

- Injection moulding, CNC turning, CNC milling, wave solder machine, Rapid Prototyping machine, Rotional machine, Vacum casting, powder metalogy, EDM wire cut

TECHNICAL DRAWING STUDIO

- Basic technical drawing equipment.

STAFF DIRECTORY

Dean
Assoc. Prof. Dr.
Che Mohd Ruzaidi Ghazali
e-mail: ruzaidi@unimap.edu.my

Deputy Dean
Mr. Sharulnizam Bin Mohd Mukhtar
e-mail: sharul@unimap.edu.my

Chairperson of Programme
Mr. Zulkapli Bin Abdullah
e-mail: zulkapli@unimap.edu.my

Assistant Registrar
Mrs. Alma Azizah Binti Abdul Rahim
e-mail: alma@unimap.edu.my

LECTURERS

Assoc. Prof. Dr.
Che Mohd Ruzaidi B. Ghazali
Ph.D (Material Engineering, Polymer), UniMAP
M.Sc. Tech. Polymer (USM)
B. Tech. Polymer (USM)
e-mail : ruzaidi@unimap.edu.my

Mr. Sharulnizam B. Mohd Mukhtar
M.Sc. (Electrical Sys. Eng.) (UniMAP)
B.Eng. (Hons) Electrical & Electronic (Power) (UPM)
e-mail : sharul@unimap.edu.my

SENIOR VOCATIONAL TRAINING OFFICER

Mr. Mahamad Akmal B. Hj. Saad
B.Sc. Mech. Eng (Hanyang University, Seoul Korea)
e-mail : mahakmal@unimap.edu.my

VOCATIONAL TRAINING OFFICER

Sabri B. Zakaria
Bac. Of Electric & Electronic Engineering, Akita University
e-mail : sabri@unimap.edu.my

Mohd. Nazri B. Abu Bakar
Bac. Of Mechatronic Engineering, Univ. Hochschule Aalen, German
e-mail : nazribakar@unimap.edu.my

Wan Mohd Faizal B. Wan Nik
Bac. Of Electrical Engineering (Instrumentation), UiTM
e-mail : mohdfaizal@unimap.edu.my

Shafie B. Omar
Bac. Of Mechanical Engineering, UiTM
e-mail : shafieomar@unimap.edu.my

Khairul Nizam B. Sultan Ali
Bac. Of Electrical Engineering (Mechatronic), KUITTHO
e-mail : khairulnizam@unimap.edu.my

Rokiah Bt. Abdullah
Bac. Of Electrical Engineering (Computer Engineering), KUITTHO
e-mail : rokiah@unimap.edu.my

Shahrul Fazly B. Sulaiman
Bac. Of Engineering (Hons) Electrical Electronic, Leeds Beckett University UK
e-mail : shahrulfazly@unimap.edu.my

Noor Shazliza Bt. Zakaria
Bac. Of Engineering (Hons) Computer Engineering (UniMAP)
e-mail : shazliza@unimap.edu.my

Zulkapli B. Abdullah
Bac. Of Engineering (Hons) Computer and Comunication Engineering (USM)
e-mail : zulkapli@unimap.edu.my

Mohd Wafiuddin B. Yahya
Bac. Engineering (Hons) Industrial Electronic (UniMAP)
e-mail : wafiuddin@unimap.edu.my

Mahzan B. Musa
Bac Of Engineering (Hons) Computer Engineering (UniMAP)
e-mail : mahzan@unimap.edu.my

Farah Nazlia Bt. Che Kassim
Bac. Of Engineering (Hons) Computer Engineering (UniMAP)
e-mail : nazlia@unimap.edu.my

ASSISTANT ENGINEER

Mr. Halim B. Harun
Cert. of Electronic Communication (Politeknik Ungku Omar)
e-mail : halim@unimap.edu.my

Mr. Rosiswardi B. Rusli
Cert. Of Mech. Eng (POLIMAS)
e-mail : rosis@unimap.edu.my

Mohd Irwan B. Ibrahim
Cert. Of Electric (Power), (POLIMAS)
e-mail : irwan@unimap.edu.my

Mohd Yusri B. Yahya
Cert. Of Mechanical Engineering (POLIMAS)
e-mail : mohdyusri@unimap.edu.my

Shahreeza B. Zainal Abidin
Cert. Of Electric (Power), (POLIMAS)
e-mail : shahreeza@unimap.edu.my

Mohd Zulmajdi B. Che Din
Cert. Of Electronic Comm. (POLIMAS)
e-mail : zulmajdi@unimap.edu.my

Roshidi B. Ali
Cert. Of Mechanical Engineering (POLIMAS)
e-mail : shidi@unimap.edu.my

Roslina Bt. Hamid@Ahmad
Cert. Of Manufacturing Technology (PSP)
e-mail : roslina@unimap.edu.my

Mohammad Farid B. Yusoff
Cert. Of Mechanical Engineering (PKU)
e-mail : mohdfarid@unimap.edu.my

Sufyian B. Abu Suhor
Cert. Of Mechanical Engineering (Politeknik Tuanku Syed Sirajuddin)
e-mail : sufyian@unimap.edu.my

Eirwan B. Rusli
Cert. Of Electrical & Electronic Engineering (Politeknik Tuanku Syed Sirajuddin)
e-mail : eirwanrusli@unimap.edu.my

HANDYMAN

Mr. Shaharizam B. Shafeei
Malaysian Skill Certificate - Level 2 in Milling and Lathe Operation (IKM Lumut)
e-mail : shaharizam@unimap.edu.my

ADMINISTRATION STAFFS

Mrs. Alma Azizah Bt. Abdul Rahim
Assistant Registrar
Tel. : +6(04) 988 5715
Fax : +6(04) 988 5739
e-mail : alma@unimap.edu.my

Mrs. Diliana Bt. Mohd Fauzi
Administrative Assistant (Clerical & Operations)
Tel. : +6(04) 988 5719
Fax : +6(04) 988 5739
e-mail : diliana@unimap.edu.my

Ms. Norhafizah Bt Ariffin
Administrative Assistant (Clerical & Operations)
Tel. : +6(04) 988 5720
Fax : +6(04) 988 5739
e-mail : nor_hafizah@unimap.edu.my

Mr. Hafizi B. Hassan Al- Kamal
General Office Assistant
e-mail : hafizi@unimap.edu.my

COURSE SYLLABUS

ECT111 /PCT111 ENGINEERING SKILLS

Synopsis

This subject is 100% practical coursework and carried out 3 units credit hours. This course contains six modules which are Basic Workshop, Machining, Wiring, PCB Design, PLC, AutoCAD and Technical Drawing that specifically planned for electronic based programs.

Course Outcomes

- Ability to apply and construct a basic skills and standard practiced of mechanical machines and equipments
- Ability to apply and construct the basic skills and standard practiced of domestic wiring.
- Ability to apply and construct a logic system using common controller tool (PLC).
- Ability to apply construct a standard practiced of manual technical drawing and able to design a product using common software (AutoCAD)
- Ability to apply and construct the basic skills and standard practiced of PCB layout design and fabrication process.

Syllabus

Technical Drawing
- DRAW, DISCUSS and APPLY the engineering practice to deliver an accurate technical drawing

Software: AutoCAD
- DEFINE, DISCUSS and USE the engineering software (AutoCAD) as a tool to create 2D and 3D product

Basic Workshop
- DEFINE and DEMOSTRATE the functions of metrology equipments. DESCRIBE and APPLY the techniques of fitting, sheet metal forming and metal joining (welding).

Machining
- DISCUSS and USE a standard mechanical engineering machines such as Milling, Lathe and Grinding Machine to produce general component.

Domestic Wiring
- DISCUSS, DEMOSTRATE and APPLY the techniques of domestic wiring such as surface and conduit (PVC and GI) techniques.

Programmable Logic Control
- DEFINE, DISCUSS and USE of common logic controller which involves with programming, PLC structure and application.

PCB Design & Fabrication
- DEFINE, DISCUSS and USE the engineering software (OrCAD) as a tool to design PCB layout. DISCUSS a process of PCB fabrication and USE common machines to produce PCB.

References

1. Timothy Sean Sykes. (2002). *AutoCAD 2002 One Step at A Time*. Prentice Hall.
2. Ralph Grabowski. (2002). *Using AutoCAD 2002*. Thompson Learning.
3. Mohd Ramzan Mainal, Badri Abdul Ghani, Yahya Samian. (2000). *Lukisan Kejuruteraan Asas*. UTM

ECT112 ENGINEERING SKILLS

Synopsis

This subject is 100% practical coursework and carried out 3 units credit hours. This course contains six modules which are Basic Workshop Machining, Wiring, Basic Electronics, Matlab, AutoCAD and Technical Drawing that specifically planned for non-electronic based programs.

Course Outcomes

- Ability to apply and construct a basic skills and standard practiced of mechanical machines and equipments
- Ability to apply and construct a basic skills and standard practiced of domestic wiring.
- Ability to apply and construct a mathematical analysis using Matlab software.
- Ability to apply and construct a basic skills and standard practiced of manual technical drawing and able to design a product using common software (AutoCAD)
- Ability to apply and construct a basic skill of electronics and its applications.

Syllabus

Technical Drawing
- DRAW, DISCUSS and APPLY the engineering practice to deliver an accurate technical drawing

Software: AutoCAD
- DEFINE, DISCUSS and USE the engineering software (AutoCAD) as a tool to create 1D and 3D product.

Basic Workshop

- DEFINE and DEMONSTRATE the function metrology equipments. DESCRIBE and APPLY the techniques of fitting, sheet metal forming and metal joining (welding).

Machining

- DISCUSS and USE a standard mechanical engineering machines such as Milling, Lathe and Grinding Machine to produce general component.

Domestic Wiring

- DISCUSS, DEMOSTRATE and APPLY the techniques of domestic wiring such as surface and conduit (PVC and GI) techniques.

Matlab

- DEFINE, DISCUSS and USE of common mathematical analysis software (MATLAB) to calculate matrix, differential, integration, graph, and other mathematical formulas.

Basic Electronics

- DEFINE, DISCUSS and USE of basic electronic devices, electronic components, soldering techniques, testing techniques, measurement techniques and its application.

References

1. Timothy Sean Sykes. (2002). *AutoCAD 2002 One Step at A Time*. Prentice Hall.
2. Ralph Grabowski. (2002). *Using AutoCAD 2002*. Thompson Learning.
3. William J. Palm III. (2001). *MATLAB for Engineering Students*. McGraw Hill.
4. Mohd Ramzan Mainal, Badri Abdul Ghani, Yahya Samian. (2000). *Lukisan Kejuruteraan Asas*. UTM

Institute of Engineering Mathematics

Address

INSTITUT MATEMATIK KEJURUTERAAN
Aras Bawah, Bangunan Pusat Kejuruteraan
Kampus Tetap Pauh Putra
02600 Arau, Perlis

Tel.: +6(04) 988 5702 / 5705
Fax: +6(04) 988 5703
http://imk.unimap.edu.my/

INTRODUCTION

The Institute of Engineering Mathematics is a centre for planning and monitoring the curriculum of Mathematics and Statistics to all engineering, engineering technology and business programmes in UniMAP. It undertakes exemplary teaching and research across a number of disciplines. Each discipline explores opportunities to support and enhance our subjects, providing exciting interdisciplinary research and innovative approaches to teaching. Our areas of expertise cover Mathematics, Statistics, Mathematical Physics, Simulation and Operational Research. Our scientists are active in internationally recognised research across the disciplines, advancing knowledge in the established fields, alongside novel developments in emerging areas such as fuzzy modeling, computational intelligence applications, computational fluid dynamics and multi-characteristics quality control.

MISSION

To provide excellent services in teaching and research related to Engineering Mathematics that consistent with the university's aspiration.

VISION

To become a competitive institution in teaching and research related to Engineering Mathematics.

STAFF DIRECTORY

Dean
Prof. Dr. Amran Ahmed
e-mail: amranahmed@unimap.edu.my

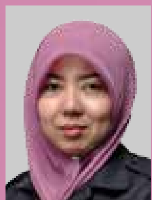
Deputy Dean
Dr. Muhammad Zaini Ahmad
e-mail: mzaini@unimap.edu.my

Chairperson of Postgraduate Programme
Dr. Ahmad Kadri Junoh
e-mail: kadri@unimap.edu.my

Chairperson of Degree Programme
Dr. Zainor Ridzuan Yahya
e-mail: zainoryahya@unimap.edu.my

Chairperson of Diploma Programme
Dr. Safwati Ibrahim
e-mail: safwati@unimap.edu.my

Assistant Registrar
Mrs. Azilah Abidin
e-mail: azilah@unimap.edu.my



ACADEMICS STAFF

PROFESSORS

Prof. Dr. Amran Ahmed
Ph.D (Medical Statistics), Hiroshima University, Japan
M.Sc (Statistics), Universiti Kebangsaan Malaysia
B.Sc (Mathematics), Universiti Sains Malaysia
e-mail : amranahmed@unimap.edu.my

Prof. Dr. Ismail Mohd
Ph.D (Global Optimization), University of St. Andrews
M.Sc (Optimization & Computing), Loughborough University of Technology, UK
Master (Mathematics), Institut Teknologi Bandung, Indonesia
B.Sc (Mathematics), Institut Teknologi Bandung, Indonesia
e-mail : ismailmohd@unimap.edu.my

ASSOCIATE PROFESSOR

Assoc. Prof. Dr. Abd Wahab Jusoh
Ph.D (Numerical Analysis), Loughborough University of Technology, UK
M.Sc (Optimization & Computing), Loughborough University of Technology, UK
Master (Statistics), Institut Teknologi Bandung, Indonesia
B.Sc (Mathematics), Institut Teknologi Bandung, Indonesia
e-mail : abdwahab@unimap.edu.my

SENIOR LECTURERS

Dr. Md. Moslemuddin Fakir
Ph.D (Aerospace Engineering), Universiti Putra Malaysia
M.Sc (Aerospace Engineering), Universiti Putra Malaysia
M.Sc (Applied Mathematics), University of Rajshahi, Bangladesh
B.Sc (Mathematics), University of Rajshahi, Bangladesh
e-mail : moslem@unimap.edu.my

Dr. Mohammad Fadzli Ramli
Ph.D (Mathematics), Universiti Teknologi Malaysia
M.Sc (IT-Manufacturing), Universiti Teknologi Malaysia
B.Sc (Computer), Universiti Teknologi Malaysia
Dip. (Computer Science), Universiti Teknologi Malaysia
e-mail : mfadzli@unimap.edu.my

Dr. Muhammad Zaini Ahmad
Ph.D (Industrial Computing), Universiti Kebangsaan Malaysia
M. Sc (Mathematics), Universiti Kebangsaan Malaysia
B.Sc (Mathematics), Universiti Putra Malaysia
e-mail : mzaini@unimap.edu.my

Dr. Zainor Ridzuan Yahya
Ph.D (Computer Aided Geometric Design), Universiti Sains Malaysia
M.Sc (Computer Aided Geometric Design), Universiti Sains Malaysia
B.App.Sc (Computer Modeling) Universiti Sains Malaysia
e-mail : zainoryahya@unimap.edu.my

Dr. Nursalasawati Rusli
PhD (Mathematics), Universiti Teknologi Malaysia
M.Sc (Mathematics), Universiti Kebangsaan Malaysia
B.Sc (Mathematics), Universiti Sains Malaysia
e-mail : nursalasawati@unimap.edu.my

Dr. Safwati Ibrahim
Ph.D (Applied Statistics), Universiti Malaya
M.Sc (Statistics), Universiti Malaya
B.Sc (Decision Science), Universiti Utara Malaysia
e-mail : safwati@unimap.edu.my

Dr. Ahmad Kadri Junoh
Ph.D Mechanical Engineering, Universiti Kebangsaan Malaysia
M.Sc (Mathematics), Universiti Kebangsaan Malaysia
B.Eng (Hons) Mechanical, Akita University, Japan
e-mail : kadri@unimap.edu.my

Dr. Mohamad Nazri Abdul Halif
Ph.D (Theoretical Physics), University of Nottingham, UK.
M.Sc (Theoretical Physics), Universiti Sains Malaysia
B.Sc (Applied Physics/Mathematics), Universiti Sains Malaysia
e-mail : m.nazri@unimap.edu.my

Mr. Mohd Syafarudy Abu
M.Sc (Mathematics), Universiti Kebangsaan Malaysia
B.Sc (Mathematics), Universiti Putra Malaysia
e-mail : syafarudy@unimap.edu.my

Mr. Lim Eng Aik
M.Sc (Mathematics), Universiti Sains Malaysia
B.Sc (Pure Mathematics), Universiti Sains Malaysia
e-mail : ealim@unimap.edu.my

Mdm. Maz Jamilah Masnan
M.Sc (Decision Science), Universiti Utara Malaysia
B.A (Statistics), Michigan State University
Dip. (Statistics), Universiti Teknologi Mara
e-mail : mazjamilah@unimap.edu.my

LECTURERS

Mr. Wan Mohd Khairy Adly Wan Zaimi
M.Sc (Mathematics), Universiti Teknologi Malaysia
B.Sc (Industrial Mathematics), Universiti Teknologi Malaysia
e-mail : khairy@unimap.edu.my

Mr. Wan Zuki Azman Wan Muhamad
M.Sc (Engineering Mathematics), Universiti Teknologi Malaysia
B.Sc (Industrial Mathematics), Universiti Teknologi Malaysia
e-mail: wanzuki@unimap.edu.my

Mr. Zabidi Abu Hasan
M.Sc (Mathematics), Universiti Sains Malaysia
B.Sc (Mathematics), Universiti Sains Malaysia
e-mail : zabidi@unimap.edu.my

Mr. Afifi Md Desa
M.Ed (Mathematics), Universiti Pendidikan Sultan Idris
B.Ed (Mathematics Education), Universiti Pendidikan Sultan Idris
e-mail : afifi@unimap.edu.my

Mr. Mohd Hafiz Zakaria
M.Sc (Statistics), Universiti Utara Malaysia
B.Sc (Decision Science), Universiti Utara Malaysia
e-mail : hafizzakaria@unimap.edu.my

Mrs. Aishah Mohd Noor
M.Sc (Statistics), Universiti Sains Malaysia
B.Sc (Statistics), Universiti Kebangsaan Malaysia
e-mail : aishah.mn@unimap.edu.my

Mdm. Wan Suhana Wan Daud
M.Sc. (Mathematics), Universiti Kebangsaan Malaysia
B.Sc (Mathematics), Universiti Teknologi Mara
Dip. (Computer Science), Universiti Teknologi Mara
e-mail : wsuhana@unimap.edu.my

Mdm. Nor Fashihah Mohd Noor
M.Sc (Statistics), Universiti Kebangsan Malaysia
B.Sc (Statistics), Universiti Kebangsaan Malaysia
e-mail : norfashihah@unimap.edu.my

Mdm. Elyana Sakib
M.Sc (Mathematics), Universiti Kebangsaan Malaysia
B.Sc with Edu (Statistics), Universiti Putra Malaysia
e-mail : elyana@unimap.edu.my

Mdm. Farah Adibah Adnan
M.Sc (Decision Science), Universiti Utara Malaysia
B.Sc (Decision Science), Universiti Utara Malaysia
e-mail : farahadiba@unimap.edu.my

Mdm. Siti Aisyah Zakaria
M.Ed (Mathematics), Universiti Pendidikan Sultan Idris
B.Sc (Decision Science), Universiti Utara Malaysia
e-mail : aisyahzakaria@unimap.edu.my

Mdm. Wan Nor Munirah Ariffin
M.Sc (Mathematics), Universiti Teknologi Malaysia
B.Sc (Industrial Mathematics), Universiti Teknologi Malaysia
e-mail : munirah@unimap.edu.my

Mrs. Sam Teek Ling
M.Sc (Mathematics), Universiti Sains Malaysia
B.Sc (Mathematics), Universiti Sains Malaysia
e-mail : tlsam@unimap.edu.my

Mrs. Alezar Mat Ya'acob
M. Ed (Mathematics), Universiti Teknologi Malaysia
B.Sc (Computer), Universiti Teknologi Malaysia
e-mail : alezar@unimap.edu.my

Mrs. Syafawati Md Saad
M.Sc (Decision Science), Universiti Utara Malaysia
B.Sc (Decision Science), Universiti Utara Malaysia
e-mail : syafawatisaad@unimap.edu.my

Mrs. Nor Hizamiyani Abdul Azziz
M.Sc (Mathematics), Universiti Sains Malaysia
B.Sc (Mathematics), Universiti Putra Malaysia
e-mail : hizamiyani@unimap.edu.my

Mdm. Wan Nurul Aiffah Ismail
M.Sc (Engineering Mathematics), Universiti Teknologi Malaysia
B.Eng (Electrical Telecommunication), Universiti Teknologi Malaysia
e-mail : aiffah@unimap.edu.my

Mrs. Nur 'Afifah Rusdi
M.Sc (Mathematics), Universiti Teknologi Malaysia
B.Sc (Industrial Mathematics), Universiti Teknologi Malaysia
e-mail : afifahrusdi@unimap.edu.my

Mrs. Nurshazneem Roslan
M.Sc (Mathematics), Universiti Sains Malaysia
B.Sc (Mathematics), Universiti Teknologi Mara
Dip. (Quantitative Sciences), Universiti Teknologi Mara
e-mail : nurshazneem@unimap.edu.my

Mdm. Nornadia Mohd Yazid
M.Sc (Decision Science), Universiti Utara Malaysia
B.Sc (Decision Science), Universiti Utara Malaysia
e-mail : nornadia@unimap.edu.my

TUTORS

Mdm. Haslina Zakaria
B.Sc (Decision Science), Universiti Utara Malaysia
e-mail : haslinazakaria@unimap.edu.my

Mdm. Siti Rohana Goh Abdullah
M.Sc (Decision Science), Universiti Utara Malaysia
B.Sc (Decision Science), Universiti Utara Malaysia
e-mail : sitirohana@unimap.edu.my

STUDY LEAVE

Mdm. Nor Azrita Mohd Amin
M.Sc (Mathematics), Universiti Teknologi Malaysia
B.Sc (Industrial Mathematics), Universiti Teknologi Malaysia
e-mail : norazrita@unimap.edu.my

Mdm. Nor Hazadura Hamzah
M.Sc (Mathematics),Universiti Teknologi Malaysia
B.Sc (Mathematics), Universiti Teknologi Malaysia
e-mail : hazadura@unimap.edu.my

Mrs. Shazalina Mat Zin
M.Phil (Applied Mathematics), Universiti Malaya
B.Sc (Industrial & Computational Mathematics), Universiti Malaya
e-mail : shazalina@unimap.edu.my

Mdm. Biliana Bidin
M.Sc (Mathematics), Universiti Kebangsaan Malaysia
B.Sc with Edu
Hons (Statistics), Universiti Putra Malaysia
e-mail : biliana@unimap.edu.my

Mr. Khairul Anwar Mohamad Khazali
M.Sc (Mathematics), Universiti Teknologi Malaysia
B.Sc (Industrial Mathematics), Universiti Teknologi Malaysia
e-mail : khairulanwar@unimap.edu.my

Mdm. Nooraihan Abdullah
M.Sc (Mathematics), Universiti Sains Malaysia
B.Sc (Mathematics), Universiti Putra Malaysia
e-mail : raihan@unimap.edu.my

Mrs. Wan Nurhadani Wan Jaafar
M.Sc Mathematics, Universiti Sains Malaysia
B.Sc (Mathematics), Universiti Sains Malaysia
e-mail : hadani@unimap.edu.my

Mrs. Siti Jasmida Jamil
M.Sc Mathematics, Universiti Sains Malaysia
B. Applied Sc. (Hons) Mathematical Modelling, Universiti Sains Malaysia
e-mail : jasmida@unimap.edu.my

Mrs. Nurhidayah Omar
M.Sc (Mathematics), Universiti Kebangsaan Malaysia
Bachelor of Science and Computer with Education (Mathematics), UTM
e-mail : hidayahomar@unimap.edu.my

Mrs. Shakila Saad
M.Sc (Mathematics), Universiti Teknologi Malaysia
B.Sc. (Mathematics), Universiti Teknologi Mara
Dip. (Computer Science), Universiti Teknologi Mara
e-mail : shakila@unimap.edu.my

Mdm. Najah Ghazali
M.Sc Mathematics, Universiti Kebangsaan Malaysia
B.Sc (Mathematics), Universiti Kebangsaan Malaysia
e-mail : najahghazali@unimap.edu.my

Mdm. Rohana Abdul Hamid
M.Sc (Mathematics), Universiti Putra Malaysia
B.Sc with Edu (Mathematics), Universiti Putra Malaysia
e-mail : rohanahamid@unimap.edu.my

Mdm. Nor Ashikin Abu Bakar
M.Sc (Mathematics), Universiti Kebangsaan Malaysia
B.Sc (Mathematics), Universiti Kebangsaan Malaysia
e-mail : ashikinbakar@unimap.edu.my

ADMINISTRATION STAFF

Mdm. Azilah Abidin
Assistant Registrar
Tel. : +6(04) 988 5705
e-mail : azilah@unimap.edu.my

Mdm. Rusmiza Abdullah
Office Secretary
Tel. : +6(04) 988 5702
e-mail : rusmiza@unimap.edu.my

Mrs. Afifah Mohamad Saad
Adminitrative Assistant (Clerical/Operational)
Tel. : +6(04) 988 5709
e-mail : afifahsaad@unimap.edu.my

Mr. Khairul Amir Hamid
Adminitrative Assistant (Clerical/Operational)
Tel. : +6(04) 988 5708
e-mail : kh.amir@unimap.edu.my

Mr. Mohd Ariff Yusoff
Technician
e-mail : ariffyusoff@unimap.edu.my

Mr. Muhammad Nasrudin Norsilan
General Office Assistant
e-mail : mnasrudin@unimap.edu.my

PROGRAMME OFFERED

Doctor of Philosophy by Research Mode
Master of Science by Research Mode
Master of Science (Engineering Mathematics) by Mixed Mode

COURSES OFFERED

DIPLOMA COURSES

DQT101/3 Mathematics I
DQT102/3 Mathematics II
DQT203/3 Mathematics III

DEGREE COURSES

i) Business Programme

BQT133/3 Business Mathematics
BQT173/3 Business Statistics

ii) Engineering Programme

EQT101/3 Engineeering Mathematics I
EQT102/3 Engineering Mathematics II
EQT203/3 Engineering Mathematics III
EQT221/3 Discrete Mathematics & Linear Algebra
EQT241/3 Intermediate Mathematics
EQT271/3 Engineering Statistics
EQT272/3 Probability and Statistics

iii) Engineering Technology Programme

PQT111/3 Mathematics for Engineering Technology I
PQT112/3 Mathematics for Engineering Technology II
PQT213/3 Mathematics for Engineering Technology III
PQT274/3 Statistics for Engineering Technology

COURSE SYLLABUS

EQT101/3
ENGINEERING MATHEMATICS I

Course Synopsis

This course will introduce the fundamental principles and concepts in linear algebra and calculus. The topics that will be discussed in this course are complex numbers, matrices, vectors, and differentiation & integration and partial differential equations also topic of Partial Derivatives.

Course Outcomes

1. Ability to relate relevant concepts and methods in algebra.
2. Ability to relate concepts and methods in calculus.
3. Ability to evaluate solutions of engineering problems using relevant concepts and methods.

References

1. Fundamental Mathematics McGraw Hill
2. James, G et.al.(2007): Modern Engineering Mathematics. Pearson Education, 4th edition.
3. Stroud, K.A. (2007): Engineering Mathematics. Industrial Press Inc, 6th edition.
4. Peter V. O'Niel (2006): *Advanced Engineering Mathematics*, 6th edition, CL Engineering.
5. Lawrence H.T. Chang and Radzuan Razali (2002): *Asas Metematik Kejuruteraan*, Prentice Hall.

EQT102/3
ENGINEERING MATHEMATICS II

Course Synopsis

This course will introduce to students to differential equations. Initially differential equations covered the methods to solve differential equations including first and second order differential equations and its applications. Next, the course will introduce to the separation of variables method to solve partial differential equations problem. Then, Laplace transform will be discussed as a method to solve differential equations. At the end of study, Fourier Series will be discussed to the students.

Cources Outcomes

1. Ability to solve differential equations which covered first and second order ordinary differential equations and partial differential equatio.
2. Ability to apply the Laplace transforms method to solve and analyze certain differential equations problems theoretically and physically.
3. Ability to apply the fundamental understanding of Fourier series and able to express Fourier series and Fourier series expansions to any given function.
4. Ability to relate the differential equations and analyze certain physical problems.

Prerequisite

EQT101
ENGINEERING MATHEMATICS I

References

1. Introduction To Ordinary Differential Equation (2010), Penerbit UniMAP
2. W. E. Boyce (2009): Elementary Differential Equations and Boundary Value Problems: International Student Version. John Wiley & Sons Inc,9th edition.
3. B.R. Hunt, L.J. Lardy ,R.L. Lipsman, J.E. Osborn, J.Rosenberg (2008): Differential Equations with Maple Wiley, 3rd edition.
4. R. K. Nagle, E. B. Saff and A.D. Snider (2008). Fundamentals of Differential Equations and Boundary Value Problems. Addison-Wesley,5th edition.
5. D. G. Zill and M.R. Cullen (2008): Differential Equations with Boundary-Value Problems. Brooks Cole,7th edition.
6. D.G. Zill (2008). A First Course in Differential Equations. Brooks Cole, 9th edition.

BQT133/3
BUSINESS MATHEMATICS

Course Synopsis

The purpose of the course is to provide the student with mathematical techniques to help them to make better decisions in the business problems. Topics include: Matrix Algebra, Financial Mathematics, Differential Calculus and Integral Calculus.

Cources Outcomes

1. Ability to identify and apply the knowledge of matrix algebra in business models.
2. Ability to apply the knowledge in mathematics to solve the financial problems
3. Ability to relate concepts and methods in calculus and select suitable methods to solve the business problems.

References

1. Marek Capiski and Tomasz Zastawniak (2010) *Mathematics for Finance An Introduction to Financial Engineering* (Second Edition), Springer.
2. Laurence D Hoffmann; Gerald L Bradley (2010) *Calculus for business, economics, and the social and life sciences*, McGraw-Hill.
3. Brechner, Robert (2008) *Contemporary Mathematics for Business and Consumers*, South-Western College Pub.
4. Raymond A. Barnett, Michael R. Ziegler, Karl E. Byleen (2008), *Finite mathematics for business, economics, life sciences, and social sciences,* Pearson/ Prentice Hall.
5. Zulkarnain Zakaria (2000), *Matematik Perniagaan*, UTM Press.

BQT173/3
BUSINESS STATISTICS

Course Synopsis

This course covers topics on data and statistics, descriptive statistics (tabular, graphical presentation and numerical measures), introduction to random variable, discrete and continuous probability distributions, sampling and sampling distributions, estimation, hypothesis tests, regression and correlation, and introduction to multiple regression.

Cources Outcomes

1. Ability to apply the basic concept of statistics for statistical analysis and summarizing data.
2. Ability to differentiate between discrete and continuous random variables and solve probability distribution.
3. Ability to identify and decide the suitable statistical inference and regression in decision making

References

1. Abdull Halim Abdul, Norazrita Amin, Biliana Bidin, Nor Fashihah Mohd Noor (2010) *Statistics*, Mc Graw Hill.
2. G C Beri (2010) *Business statistics*, McGraw-Hill.
3. Ronald M Weiers; J Brian Gray; Lawrence H Peters (2008) *Introduction to business statistics*, Thomson/South-Western.
4. Mark, L.B., Levine, D. M. & Krehbiel, T.C. (2008) *Basic Business Statistics*, 11 edition, Prentice Hall.
5. Bowerman, O. & Orris, P. (2008). *Essentials of Business Statistics*, 2nd edition, McGraw Hill/Irwin.
6. Weiers, R.M. (2007). *Introduction to Business Statistics*. Duxbury Press. An International Thompson Publishing Company.

EQT203/3
ENGINEERING MATHEMATICS III

Course Synopsis

This course introduces the definition and concepts in vector calculus, the fundamental theorems of vector calculus and numerical methods. The topics discuss the concept of differentiation and integration in vector calculus, the line, surface and volume integrals as well as the Green's, divergence and Stokes's theorems. In numerical methods topic, several numerical techniques will be introduced to solve nonlinear equations, interpolation, curve fitting, differentiation, intergration and also differential equations. The introduction of finite element method also will be exposed in this course.

Cources Outcomes

1. Ability to apply vector calculus concepts to solve single, double or triple integrals
2. Ability to apply the concept of differentiation and integration in vector calculus to solve classical theorems in vector calculus.
3. Ability to select appropriate numerical methods to solve the mathematical problems

References

1. Undergraduate Mathematics for Engineering Student. McGraw Hill
2. Erwin Kreyszig (2006): *Advanced Engineering Mathematics*, 9th edition, John Wiley & Sons, Inc.
3. Peter V. O'Niel (2006): *Advanced Engineering Mathematics*, 6th edition, CL Engineering.

4. Lawrence H.T. Chang and Radzuan Razali (2002): *Asas Metematik Kejuruteraan*, Prentice Hall.
5. K.A. Stroud (2001): *Engineering Mathematics*, 6th edition, Palgrave.
6. K.A. Stroud (2003): *Further Engineering Mathematics*, 3rd edition, Palgrave.
7. Harman, T.L., Dabney, J. and Richert, N. (1997): *Advance Engineering Mathematics using MATLAB V.4*, Boston: PWS Publishing Company.

EQT221/3
DISCRETE MATHEMATICS & LINEAR ALGEBRA

Course Synopsis

This course introduces the definition and concepts in discrete mathematics and linear algebra which is an essential tools in almost all subareas of computer science and communication systems. The topics discuss includes sets and functions, logic, theory number and cryptography, matrices and linear transformation, vector spaces and inner product spaces.

Cources Outcomes

1. Ability to identify and choose the suitable concepts of discrete mathematics in solving engineering problems.
2. Ability to apply the concept of linear algebra in solving engineering problems.
3. Ability to relate and solve engineering problems using discrete mathematics and linear algebra

References

1. Rosen, H. Kenneth. 2007. Discrete Mathematics and Its Application (6th Edition). McGraw-Hill, New York.
2. Ross, A. Kenneth & Wright, R. B. Charles. 1999. Discrete Mathematics (4th Edition). Prentice Hall, Inc, New Jersey
3. Kolman, Bernard & Hill, R. David. 2004. Elementery Linear Algebra (8th Edition). Pearson Education, Inc, New Jersey
4. Buchmann, J.A. 2004. Introduction to Cryptography (2nd Edition). Springer-Verlag, New York
5. Kolblizt, N. 1994. A course in Number Theory and Crytpgraphy (2nd Edition). Springer-Verlag, New York.
6. Ma Siu Lun, Victor Tan. 2006. Linear Algebra I. Pearson Prentice Hall, Inc, New Jersey.
7. Larson, R & Falvo, D. 2010. Elementary Linear Algebra, Brooks/Cole Cengage Learning.

EQT241/3
INTERMEDIATE MATHEMATICS

Course Synopsis

This course introduces the definition and concepts in vector calculus and numerical methods. Three important concepts related to scalar and vector fields. The topics discuss also includes numerical differentiation and numerical integration, numerical solution of differential equations and finite difference method.

Cources Outcomes

1. Ability to define the vector integrals and evaluate the line, volume and surface integral using Green, Guass and Stoke theorem.
2. Ability to find the numerical solution of the equation and use the suitable numerical methods to solve the problems.
3. Ability to relate the relevant concept of vector calculus and numerical methods to solve engineering problems.

References

1. Erwin Kreyszig (2006): *Advanced Engineering Mathematics*, 9th edition, John Wiley & Sons, Inc.
2. Undergraduate Mathematics for Engineering Student. McGraw Hill.
3. Peter V. O'Niel (2006): *Advanced Engineering Mathematics*, 6th edition, CL Engineering.
4. Lawrence H.T. Chang and Radzuan Razali (2002): *Asas Metematik Kejuruteraan*, Prentice Hall.
5. K.A. Stroud (2001): *Engineering Mathematics*, 6th edition, Palgrave.
6. K.A. Stroud (2003): *Further Engineering Mathematics*, 3rd edition, Palgrave.
7. Harman, T.L., Dabney, J. and Richert, N. (1997): *Advance Engineering Mathematics using MATLAB V.4*, Boston: PWS Publishing Company.

EQT271/3
ENGINEERING STATISTICS

Course Synopsis

This course introduces the fundamental concepts in statistics. The definition of statistics and basic concepts of statistics such as collection of data, data summary and presentation, probability distribution and sampling distribution will be introduced to the students in topic basic statistics. This course also teaches the students on how to make a statistical inference which are estimation and hypothesis testing. Apart from that, students will learn on how to run statistical test and analyze the results obtained. These skills will be taught in topic introductory linear regression (Simple linear regression, Least squares method, Test for linearity of regression and Pearson product moment correlation coefficient), analysis of variance (one-way and two-way ANOVA) and nonparametric statistics (The χ^2 test, Sign test, Mann-Whitney test, Kruskal Wallis test, Wilcoxon-signed rank test and Spearman rank correlation).

Cources Outcomes

1. Ability to understand, apply and explain the basic concepts of statistics.
2. Ability to solve problems using suitable statistical inference.
3. Ability to construct the model and analyze the result from ANOVA table and simple linear regression.
4. Ability to apply the basic methodology of nonparametric statistics to solve engineering problems.

References

1. Walpole, R., Myers, R., Myers, S. and Keying Ye (2006): *Probability & Statistics for Engineers & Scientist, 8th edition,* Pearson.
2. Ledolter, J. and Hogg, R. (2009): *Applied Statistics for engineers and Physical Scientists*, Pearson.
3. Mendenhall, W. and Sincich, T. (2006): *Statistics for engineering and the sciences, 5th edition,* Pearson.
4. McClave, J., Sincich, T. and Mendenhall, W. (2008): *Statistics, 11rd edition,* Pearson.
5. David, S.M., George, P.M. and Bruce, C. (2008): *Introduction to the Practise of Statistics, 6th edition, Palgrave.*
6. David, S.M. (2008): *The Basic Practise of Statistics, 5th edition,* Palgrave.

EQT272/3
PROBABILITY & STATISTICS

Course Synopsis

This course provides an elementary introduction to probability and statistics with applications. Topics include probability theorem, random variables, probability distribution, statistical inference which is including estimation and hypothesis testing and finally the regression concept.

Cources Outcomes

1. Ability to apply the theory of probability and solve discrete and continuous random variables.
2. Ability to understand and apply the concepts of probability distribution.
3. Ability to apply hypothesis testing and simple linear regression model to solve engineering problems.

References

1. Richard J. Larsen and Morris L. Marx, (2001): *An Introduction to Mathematical Statistics and Its Applications*, 3rd edition, Prentice Hall.
2. Peter V. O'Niel (2006): *Advanced Engineering Mathematics*, 6th edition, CL Engineering.
3. Lawrence H.T. Chang and Radzuan Razali (2002): *Asas Metematik Kejuruteraan*, Prentice Hall.
4. K.A. Stroud (2001): *Engineering Mathematics*, 6th edition, Palgrave.
5. K.A. Stroud (2003): *Further Engineering Mathematics*, 3rd edition, Palgrave.
6. Harman, T.L., Dabney, J. and Richert, N. (1997): *Advance Engineering Mathematics using MATLAB V.4*, Boston: PWS Publishing Company.

PQT111/3
MATHEMATICS FOR ENGINEERING TECHNOLOGY I

Course Synopsis

This course will introduce the fundamental principles and concepts in algebra, calculus and statistics. The topics that will be discussed in this course are complex numbers, matrices, vectors, differentiation & integration and statistics.

Cources Outcomes

1. Ability to solve mathematical problems using basic concepts of algebra (complex numbers, matrices and vectors).
2. Ability to solve mathematical problems using basic concepts of calculus (differentiation and integration).
3. Ability to solve statistical problems using data analysis.

References

1. Fundamental Mathematics, McGraw Hill
2. James, G et.al.(2007): Modern Engineering Mathematics. Pearson Education, 4th edition.
3. Stroud, K.A. (2007): Engineering Mathematics. Industrial Press Inc, 6th edition.
4. Mario F. Triola.(2009). Elementary Statistics Using Excel. Addison-Wesley. 4th Edition.
5. Beverly Dretzke. (2008). Statistics With Microsoft Excell. Prentice Hall. 4th Edition.
6. Devore, J.L. (2007): Probability and Statistics for Engineering and the Sciences. Duxbury Press,7th edition.
7. Montgomery, D.C. (2006): *Applied Statistics and Probability for Engineers*. Wiley, 4th edition.

PQT112/3
MATHEMATICS FOR ENGINEERING TECHNOLOGY II

Course Synopsis

This course will introduce the concepts of ordinary differential equations. The topics that will be discussed in this course are the methods in solving the differential equations including first and second order differential equations and its applications. Next, the course will introduce to the Laplace transform method to solve differentialequations and at the end of topic, Fourier Series expansion of a function will be discussed to the students.

Cources Outcomes

1. Able to solve differential equations involving the first and second order differential equation by selecting appropriate techniques and able to relate and analyze the certain physical problems to differential equations.
2. Ability to apply the Laplace transforms method to solve and analyze certain differential equations problems.
3. Ability to apply the fundamental understanding of Fourier series and able to express Fourier series and Fourier series expansions to any given function.

Prerequisite

PQT 111
MATHEMATICS FOR ENGINEERING TECHNOLOGY I

References

1. Introduction To Ordinary Differential Equation (2010), Penerbit UniMAP
2. W. E. Boyce (2009): Elementary Differential Equations and Boundary Value Problems: International Student Version. John Wiley & Sons Inc,9th edition.
3. B.R. Hunt, L.J. Lardy, R.L. Lipsman, J.E. Osborn, J.Rosenberg (2008): Differential Equations with Maple Wiley, 3rd edition.
4. R. K. Nagle, E. B. Saff and A.D. Snider (2008). Fundamentals of Differential Equations and Boundary Value Problems. Addison-Wesley, 5th edition.
5. D. G. Zill and M.R. Cullen (2008): Differential Equations with Boundary-Value Problems. Brooks Cole, 7th edition.
6. D.G. Zill (2008). A First Course in Differential Equations. Brooks Cole, 9th edition.

PQT213/3
MATHEMATICS FOR ENGINEERING TECHNOLOGY III

Course Synopsis

This course will introduce the definition and concepts of partial derivatives and vector calculus. An introduction to some theorems in vector calculus topic will be exposed for students. At the end of study, this course also discusses the topic of numerical methods that introduce several methods in solving mathematical problems.

Cources Outcomes

1. Ability to apply the concepts of partial derivatives and able to evaluate solutions of mathematical problems using suitable methods.
2. Ability to apply vector calculus concepts and able to differentiate and solve single, double or triple integrals
3. Ability to solve numerical problems by selecting suitable numerical methods.

References

1. Undergraduate Mathematics for Engineering Student. McGraw Hill
2. Erwin Kreyszig (2006): *Advanced Engineering Mathematics*, 9th edition, John Wiley & Sons, Inc.
3. Peter V. O'Niel (2006): *Advanced Engineering Mathematics*, 6th edition, CL Engineering.
4. Lawrence H.T. Chang and Radzuan Razali (2002): *Asas Metematik Kejuruteraan*, Prentice Hall.
5. K.A. Stroud (2001): *Engineering Mathematics*, 6th edition, Palgrave.
6. K.A. Stroud (2003): *Further Engineering Mathematics*, 3rd edition, Palgrave.

PQT 274/3
STATISTICS FOR ENGINEERING TECHNOLOGY

Course Synopsis

This course introduces the fundamental concepts in statistics. The definition of statistics and basic concepts of statistics such as collection of data, data summary and presentation, probability distribution and sampling distribution will be introduced to the students in topic basic statistics. This course also teaches the students on how to make a statistical inference which are estimation and hypothesis testing. Apart from that, students will learn on how to run statistical test and analyze the results obtained. These skills will be taught in topic introductory linear regression (Simple linear regression, Least squares method, Test for linearity of regression and Pearson product moment correlation coefficient), analysis of variance (one-way) and nonparametric statistics (The χ^2 test, Sign test, Mann-Whitney test and Spearman rank correlation).

Cources Outcomes

1. Ability to understand, apply and explain the basic concepts of statistics.
2. Ability to solve problems using suitable statistical inference
3. Students should be able to identify the coefficients and apply the methods to construct simple linear regression model.
4. Students should be able to construct the ANOVA table and analyze the result.
5. Students should be able to understand, select and apply the basic methodology of nonparametric statistics.

References

1. Walpole, R., Myers, R., Myers, S. and Keying Ye (2006): *Probability & Statistics for Engineers & Scientist, 8th edition,* Pearson.
2. Ledolter, J. and Hogg, R. (2009): *Applied Statistics for engineers and Physical Scientists*, Pearson.
3. Mendenhall, W. and Sincich, T. (2006): *Statistics for engineering and the sciences, 5th edition,* Pearson.
4. McClave, J., Sincich, T. and Mendenhall, W. (2008): *Statistics, 11rd edition,* Pearson.
5. David, S.M., George, P.M. and Bruce, C. (2008): *Introduction to the Practise of Statistics, 6th edition, Palgrave.*

Institute of Engineering Mathematics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ENGINEERING AND INDUSTRIAL APPLICATIONS
2014

Centre for Industrial & Governmental Collaboration (CIGC)

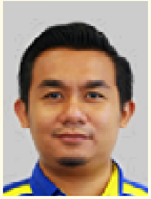
Address
CENTRE FOR INDUSTRIAL & GOVERNMENTAL COLLABORATION (CIGC)
Universiti Malaysia Perlis
Aras 2, Bangunan Pentadbiran Pusat Kejuruteraan dan Inovasi,
Kampus Tetap Unimap Pauh Putra,
02600 Arau, Perlis

Office: +6(04) 988 5722
Fax: +6(04) 988 5723
e-mail: dir_cic@unimap.edu.my

INTRODUCTION

The Centre for Industrial & Governmental Collaboration (CIGC) serves as the link between the university and industries in carrying out various R&D activities and academic programmes. The centre also represents the diversity of academic offerings and events based on participation and commitment from the industries. CIGC consists of several main units, namely Graduate Employability, Industrial Training, Industrial Networking, ICT & Publicity and Administration (Finance & Projects). Among the programmes conducted with the involvement from industries are Industrial Exposure (IndEx), Industrial Entrepreneur (IndEnt), Industrial Training (InTra), Forums, Seminars with Industries, Job Camps, Graduate Trainee Programs, MoU/MoA with Industries and Industry Centre of Excellence (ICoE).

STAFF DIRECTORY

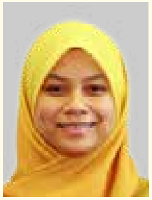


Director
Dr. Mukhzeer Bin Mohamad Shahimin
Tel: +6(04) 988 5721
e-mail: mukhzeer@unimap.edu.my

Deputy Director
(Graduate Employability & Industrial Community Network)
Dr. Vithyacharan A/L Retnasamy
Tel: +6(04) 988 5724
e-mail: rcharan@unimap.edu.my

Deputy Director
(Industrial Training & Administration)
Dr. Noorhafiza Binti Muhammad
Tel: +6(04) 988 5725
e-mail: noorhafiza@unimap.edu.my

Programme Chairman
(Industrial Training & Administration)
Mr. Mohd Rosli Bin Abdul Ghani
Tel: +6(04) 988 5726
e-mail: mohdrosli@unimap.edu.my



Programme Chairman
(Graduate Employability & Industrial Community Network)
Miss Ili Salwani Binti Mohamad
Tel: +6(04) 988 5728
e-mail: ilisalwani@unimap.edu.my

Assistant Registrar
(Industrial Training)
Mr. Khairul Usaidi Bin Harun
Tel: +6(04) 988 5727
e-mail: usaidi@unimap.edu.my

Assistant Registrar
(Industrial & Community Network)
Mr. Mohamad Firdaus Bin Abu Bakar
Tel: +6(04) 988 5730
e-mail: firdausbakar@unimap.edu.my

Assistant Registrar
(Graduate Employability)
Mrs. Siti Nur Idayu Binti Alias
Tel: +6(04) 988 5729
e-mail: nuridayualias@unimap.edu.my

Information Technology Officer
(ICT , Administration & Finance)
Mrs. Nurul Akhmar Binti Abdul Hamid
Tel: +6(04) 988 5731
e-mail: akhmarhamid@unimap.edu.my

LECTURERS

Dr. Mukhzeer Bin Mohamad Shahimin
MIET, MIEEE, MSPIE, MSET
Ph.D (Biophotonics)
(University of Southampton,UK)
B.Eng (Electronic engineering)
(University of Southampton,UK)
e-mail: mukhzeer@unimap.edu.my

Dr. Vithyacharan A/L Retnasamy
MIET, MIEEE & LMSPIE (UniMAP)
Ph.D (Microelectronic Engineering – Semiconductor Packaging)
(UniMAP)
M.Sc (Mechanical Engineering) (USM)
B. Eng (Mineral Resource Engineering) (USM)
e-mail: rcharan@unimap.edu.my

Dr. Noorhafiza Binti Muhammad
PhD (Mechanical Engineering)
University of Manchester, UK
MSc (Manufacturing Systems Engineering)
Coventry University, UK
BSc (Manufacturing Engineering With Management) (USM)
e-mail: noorhafiza@unimap.edu.my

Mr. Mohd Rosli Bin Abdul Ghani
MBA (UUM)
BBA (UIA)
e-mail: mohdrosli@unimap.edu.my

Miss Ili Salwani Binti Mohamad
MIEEE, MIEM
M.Sc Microelectronics
B.Eng (Hons) Microelectronic Engineering
e-mail: ilisalwani@unimap.edu.my

ADMINISTRATIVE OFFICER

Mrs. Siti Nur Idayu Binti Alias
e-mail: nuridayualias@unimap.edu.my

Mr. Mohamad Firdaus Bin Abu Bakar
e-mail: firdausbakar@unimap.edu.my

Mr. Khairul Usaidi Bin Harun
e-mail: usaidi@unimap.edu.my

Mrs. Nurul Akhmar Binti Abdul Hamid
e-mail: akhmarhamid@unimap.edu.my

ASSISTANT ADMINISTRATIVE OFFICER

Mr. Mohd Shahfi Bin Ismail
e-mail: shahfi@unimap.edu.my

Mrs. Janatul Naim Binti Zulkefli
e-mail: janatulnaim@unimap.edu.my

SECRETARY

Mrs. Nor Azlindamazlini Binti Mahamad
e-mail: dir_cic@unimap.edu.my

ADMINISTRATIVE ASSISTANT

Mrs. Nor Faezah Binti Mirdukhim
e-mail: faezahmustapa@unimap.edu.my

Mr. Azmi Bin Azit
e-mail: azmi@unimap.edu.my

GENERAL OFFICER

Mr. Abang Syamri Bin Ahmad
e-mail: syamri@unimap.edu.my

COURSE OFFERED

EIT 302/4 INDUSTRIAL TRAINING [DEGREE IN ENGINEERING PROGRAMME]

Syllabus

The course will expose students to the technical and application aspects as well as other organizational aspects such as company organization structure, company operation, department function, work procedure, safety procedure, management, communication, technical skills, project management and presentation. The students are also required to submit their logbook and report at the end of the Industrial Training. Overall, the course is a practical-based course.

Course Outcomes

CO1: Ability to display good work performance and adapt to the working environment during training period.
CO2: Ability to demonstrate good communication skills, leadership and work ethics during training period.
CO3: Ability to perform assigned task given by host company.

References

1. UniMAP Industrial Training Guideline
2. UniMAP Industrial Training Log Book

PIT 304/12 INDUSTRIAL TRAINING [DEGREE IN ENGINEERING TECHNOLOGY PROGRAMME]

Syllabus

This practical-based course exposes students to a company technical functions and organizational structure and operation such as departmental function, work procedure, safety procedure, communication, technical skills and project management.

Course Outcomes

CO1: Ability to analyze and adapt the working environment during training period.
CO2: Ability to demonstrate good work performance, good communication skills, leadership and work ethics during training period
CO3: Ability to operate assigned task given by host company.

References

1. UniMAP Industrial Training Log Book

BIT190/3 INDUSTRIAL TRAINING 1 BIT290/3 INDUSTRIAL TRAINING 2 [DEGREE IN BUSINESS (INTERNATIONAL BUSINESS) PROGRAMME]

Syllabus

The course will expose students to the technical and application aspects as well as other organizational aspects such as company organization structure, company operation, department function, work procedure, safety procedure, management, communication, technical skills, project management and presentation. The students are also required to submit their logbook and report at the end of the Industrial Training. Overall, the course is a practical-based course.

Course Outcomes

CO1: Ability to display good work performance and adapt to the working environment during training period.
CO2: Ability to demonstrate good communication skills, leadership and work ethics during training period.
CO3: Ability to perform assigned task given by host company.

Reference

1. UniMAP Industrial Training Log Book

BIT291/6
INCUBATOR PROGRAMME [DEGREE IN BUSINESS (ENGINEERING ENTREPRENEURSHIP) PROGRAMME]

Syllabus

This course gives students direct exposure to the real entrepreneurship and business world. Students will be stationed in business incubators, generally assigned to one of the startup companies. Students will go through the experience of starting up a company / business including being exposed to the company procedures, banking activities, development of new product, business networking, management of the company and so on. Students will also get exposure communicating in actual business world and this will develop their skills in fostering an entrepreneurial network.

Course Outcomes

CO1: Ability to display good work performance and adapt to the working environment during training period.
CO2: Ability to demonstrate good communication skills, leadership and work ethics during training period.
CO3: Ability to perform assigned task given by host company.

Reference

1. UniMAP Industrial Training Log Book

*STRUCTURED INTERNSHIP PROGRAMME (SIP)

A collaborative effort between TalentCorp Malaysia and Ministry of Education (MOE). The programme encourages a meaningful internship experience relevant to industries.

OBJECTIVES

- Introduce students to the working world as early as possible
- Provide practical experience and emphasise the development of specific knowledge or skills for student of higher educational institutions.
- Prepare graduates to become relevant to industries thus, generating more employable graduates to fill the current talent shortage in Malaysia
- Encourages companies/industries to make internship programmes more structured in terms of their competency development through the double tax deduction incentive.

BENEFIT FOR STUDENTS

- Chance to experience working life and put theories learnt from university into practice
- Familiarise themselves with working culture of preferred industry or company before embarking on their careers.
- A platform to demonstrate knowledge, skill and abilities to be considered as a future employee
- Develop skill sets required by the industry through a structured internship.

Co-Curriculum Centre

Address

CO-CURRICULUM CENTRE
Universiti Malaysia Perlis
Taman Utara Jejawi
Jalan Jejawi Sematang
02600 Jejawi, Arau, Perlis

Tel.: +6(04) 979 7908 / 7910 / 7911 / 7913 / 7914
Fax: +6(04) 979 7907

INTRODUCTION

The Department of Higher Education through a letter dated August 3rd, 2008 had instructed Co-curriculum Centres to be established at all Malaysian Public Institutions of Higher Education. The aim is to achieve the goal that had been outlined in the Country Higher Education Strategic Plan which is to strengthen the 'learning outcomes' through co-curriculum activities.

UniMAP Co-curriculum Unit was established in the year 2002 and was placed under the Centre for Communication Skills and Entrepreneurship. Then, on the 8th of June 2010 the Co-curriculum Centre had moved out from the Centre for Communication Skills and Entrepreneurship, and started operating at a new location at Taman Jejawi Utara. On the 29th of July 2010, the establishment of Co-curriculum Centre was officially launched by the Honourable Dato' Vice Chancellor of UniMAP.

The Co-curriculum Centre offers a lot of co-curriculum and uniformed bodies courses. All degree students are required to enroll at least 3 units of Co-Curriculum courses and student are compulsory to take uniformed body courses in their first year of study. Kindly refer to the table below:

OPTIONS	DETAILS COURSES	UNITS
1	Uniformed Bodies Co-curriculum	2 Unit 1 Unit
2	Uniformed Bodies	package

STAFF DIRECTORY

Director
Lt. Kol. Prof. Dr. Zaliman Sauli
e-mail: zaliman@unimap.edu.my

Deputy Director
Mr. Ahmad Nasir Che Rosli
e-mail: ahmadnasir@unimap.edu.my

Chairperson of PALAPES Programme
Lt. Lokman Hakim Ibrahim
e-mail: lokmanh@unimap.edu.my

Chairperson of SUKSIS Programme
ASP K/S Rohazita Bahari
e-mail: rohazita@unimap.edu.my

Assistant Registrar
Mrs. Isma Irini Shafie
e-mail: isma@unimap.edu.my

Co-Curriculum Centre

DIRECTOR

Professor Dr. Zaliman Sauli
PhD. (Microelectronic Engineering), (UniMAP)
MSc. (Advanced Semiconductor Materials and Devices), (Univ. of Surrey, UK)
BSc. (Physics)(Hons) (UTM)
Tel. : +6(04) 979 7913 / 7914
e-mail : zaliman@unimap.edu.my

DEPUTY DIRECTOR

Mr. Ahmad Nasir bin Che Rosli
M.Sc. (Computer Engineering), UniMAP (2008)
B.Comp.Sc. (Hons)(Artificial Intelligent), UM (2001)
Tel. : +6(04) 979 7912 / 7913
e-mail : ahmadnasir@unimap.edu.my

ADMINISTRATIVE STAFFS

Mrs. Isma Irini Shafie
Assistant registrar
Tel. : +6(04) 979 7911
e-mail : isma@unimap.edu.my

Mrs. Nur Nadiah Jalil
Assistant Administrative Officer
Tel. : +6(04) 979 7910
e-mail : nurnadiah@unimap.edu.my

Miss. Syarifah Syaimaa Binti Syed Hamzah
Office secretary
Tel. : +6(04) 979 7913
e-mail : syaimaa@unimap.edu.my

Mr. Zulkefly Wahab
Administrative Assistant (P/O)
Tel. : +6(04) 979 7908
e-mail : zulkefly@unimap.edu.my

Mrs. Nur Syafarina Che Ani
Administrative Assistant (P/O)
Tel. : +6(04) 979 7909
e-mail : syafarina@unimap.edu.my

Mr. Mohd Faiz Musa
Administrative Assistant (P/O)
Tel. : +6(04) 979 7908
e-mail : faizmusa@unimap.edu.my

Mrs. Roziana Binti Ahmad Tajuddin
Administrative Assistant (P/O)
Tel. : +6(04) 979 7908
e-mail : rozianatajuddin@unimap.edu.my

Miss. Nurul Ashikin Binti Mohd Josrie
Administrative Assistant (P/O)
Tel. : +6(04) 979 7908
e-mail : nurulashikin@unimap.edu.my

Mr. Amierul Athif Bin Asmadi
Office Assistant
Tel. : +6(04) 979 7908
e-mail : amierulathif@unimap.edu.my

CO-CURRICULUM COURSES OFFERED BY CO-CURRICULUM CENTRE

During their study, all the degree students must take 3 units from the courses that had been offered by the following divisions below:

BIL.	SENARAI KURSUS	KOD KURSUS	UNIT	TERAS	PRA- SYARAT
1	Golf *[Golf]*	UZW101	1	**Sukan *(Sport)***	**Ditawarkan Secara Tunggal** ***(Offered in Single)***
2	Besbal *[Baseball]*	UZW102	1		
3	Woodball *[Woodball]*	UZW103	1		
4	Bola Sepak *[Football]*	UZW104	1		
5	Bola Jaring *[Netball]*	UZW105	1		
6	Tenis *[Tennis]*	UZW106	1		
7	Ekuestrian *[Equestrian]*	UZW107	1		
8	Angkat Berat *[Weightlifting]*	UZW108	1		
9	Bola Tampar [Volleyball]	UZW109	1		
10	Lawan Pedang *[Fencing]*	UZW174	1		
11	Futsal [Futsal]	UZW175	1		
12	Boling Padang *[Lawn Bowl]*	UZW181	1		
13	Petanque *[Petanque]*	UZW182	1		
14	Kayak *[Canoe]*	UZW183	1		
15	Badminton *[Badminton]*	UZW184	1		
16	Hoki *[Hockey]*	UZW185	1		
17	Sepak Takraw [*Sepak Takraw]*	UZW186	1		
18	Ragbi *[Rugby]*	UZW187	1		
19	Memanah *[Archery]*	UZW188	1	**Sukan *(Sport)***	**Ditawarkan Secara Tunggal** ***(Offered in Single)***
20	Ping Pong *[Table Tennis]*	UZW189	1		
21	Seni Silat Cekak I *[Seni Silat Cekak I]*	UZW171	1	**Sukan *(Sport)***	**Kursus Berpakej - (Pelajar Harus Mengikuti Dari Peringkat 1 – 3 Untuk Memperolehi 3 Unit)** *** Tahun 1 - 2 (3 Semester)** ***Packaged Courses – (Students should Following From Stage 1 -3 To Acquire 3 Units)*** **** Years 1 - 2 (3 Semesters)***
	Seni Silat Cekak II *[Seni Silat Cekak II]*	UZW271	1		
	Seni Silat Cekak III *[Seni Silat Cekak III]*	UZW371	1		

BIL.	SENARAI KURSUS	KOD KURSUS	UNIT	TERAS	PRA- SYARAT
22	Taekwon-Do GTF I *[Taekwon-Do GTF I]*	UZW172	1	**Sukan** ***(Sport)***	**Kursus Berpakej - (Pelajar Harus Mengikuti Dari Peringkat 1 – 3 Untuk Memperolehi 3 Unit)** *** Tahun 1 - 2 (3 Semester)** ***Packaged Courses – (Students should Following From Stage 1 -3 To Acquire 3 Units)*** **** Years 1 - 2 (3 Semesters)***
	Taekwon-Do GTF II *[Taekwon-Do GTF II]*	UZW272	1		
	Taekwon-Do GTF III *[Taekwon-Do GTF III]*	UZW372	1		
23	Karate-Do *[Karate-Do]*	UZW173	1		
	Karate-Do II *[Karate-Do II]*	UZW273	1		
	Karate-Do III *[Karate-Do III]*	UZW373	1		
24	Taekwon-Do WTF I *[Taekwon-Do WTF I]*	UZW176	1		
	Taekwon-Do WTF II *[Taekwon-Do WTF II]*	UZW276	1		
	Taekwon-Do WTF III *[Taekwon-Do WTF III]*	UZW376	1		
25	Silat Olahraga I *[Sport Silat I]*	UZW177	1		
	Silat Olahraga II *[Sport Silat II]*	UZW178	1		
	Silat Olahraga III *[Sport Silat III]*	UZW277	1		
26	Renang I *[Swimming I]*	UZW180	1	**Sukan** ***(Sport)***	**Ditawarkan Secara Berperingkat** ***(Gradual Offered)***
	Renang II *[Swimming II]*	UZW280	1		
	Renang III *[Swimming III]*	UZW380	1		
27	*Penerbitan Video [Video Publishing]*	UZW132	1	**Kebudayaan** ***(Culture)***	**Ditawarkan Secara Tunggal** ***(Offered in Single)***
28	Seni Pergerakan Kreatif *[Arts of Creative Movement]*	UZW155	1		
29	Drama, Pementasan & Seni Lakon *[Drama, Playwright & Acting]*	UZW156	1		
30	Pancaragam I *[Brass Band I]*	UZW153	1	**Kebudayaan** ***(Culture)***	**Kursus Berpakej - (Pelajar Harus Mengikuti Dari Peringkat 1 – 3 Untuk Memperolehi 3 Unit)** *** Tahun 1 - 2 (3 Semester)** ***Packaged Courses – (Students should Following From Stage 1 -3 To Acquire 3 Units)*** **** Years 1 - 2 (3 Semesters)***
	Pancaragam II *[Brass Band II]*	UZW253	1		
	Pancaragam III *[Brass Band III]*	UZW353	1		
31	Asas Gamelan *[Foundations of Gamelan]*	UZW151	1	**Kebudayaan** ***(Culture)***	**Ditawarkan Secara Berperingkat** ***(Gradual Offered)***
	Gamelan II *[Gamelan II]*	UZW251	1		
	Gamelan III *[Gamelan III]*	UZW351	1		
31	Kumpulan Jazz I *[Jazz Band I]*	UZW152	1		
	Kumpulan Jazz II *[Jazz Band II]*	UZW25	1		
	Kumpulan Jazz III *[Jazz Band III]*	UZW352	1		
32	Angklung I *[Angklung I]*	UZW154	1	**Kebudayaan** ***(Culture)***	**Ditawarkan Secara Berperingkat** ***(Gradual Offered)***
	Angklung II *[Angklung II]*	UZW254	1		
	Angklung III *[Angklung III]*	UZW354	1		

BIL.	SENARAI KURSUS	KOD KURSUS	UNIT	TERAS	PRA- SYARAT
32	Khidmat Masyarakat *[Community Services]*	UZW191	1	**Kidmat Komuniti *(Community Services)***	**Ditawarkan Secara Tunggal *(Offered in Single)***
33	Tajwid *[Tajwid]*	UZW193	1	**Kepemimpinan *(Leadership)***	
34	Pidato *[Elocution]*	UZW194	1	**Pengucapan Awam *(Public Speaking)***	
35	Radio Kampus *[Campus Radio]*	UZW195	1		
36	Daya Usaha & Inovasi *[Initiative & Innovation]*	UZW192	1	**Daya Usaha & Inovasi *(Initiative & Innovation)***	
37	Student In-Free Enterprise (SIFE) *[Student In-Free Enterprise (SIFE)]*	UZW196	1	**Keusahawanan *(Entrepreneurship)***	
38	Kumpulan Latihan Kelanasiswa Malaysia I (Udara) / *[Malaysian University Rover Training Group I (Air)]*	UZW112	1	**Kesukarelawanan *(Volunteerism)***	**Kursus Berpakej – (Pelajar Harus Mengikuti Dari Peringkat 1 – 2 Untuk Memperolehi 2 Unit) * Tahun 1 (2 Semester) *Packaged Courses – (Students should Following From Stage 1 -2 To Acquire 2 Units) * Years 1 (2 Semesters)***
	Kumpulan Latihan Kelanasiswa Malaysia II (Udara) / *[Malaysian University Rover Training Group II (Air)]*	UZW113	1		
39	Briged Bomba I *[Fire And Rescue Briged I]*	UZW120	1		
	Briged Bomba II *[Fire And Rescue Briged II]*	UZW121	1		
40	Pandu Puteri Siswi I (PPS I) *[Girl Guide I (PPS I)]*	UZW122	1		
	Pandu Puteri Siswi II (PPS II) *[Girl Guide II (PPS II)]*	UZW123	1		
41	St. John Ambulans Malaysia I *[Malaysian St. John Ambulance I]*	UZW124	1		
	St. John Ambulans Malaysia II *[Malaysian St. John Ambulance II]*	UZW125	1		
42	Kumpulan Latihan Kelanasiswa Malaysia I *[Malaysian University Rover Training Group I]*	UZW126	1		
	Kumpulan Latihan Kelanasiswa Malaysia II *[Malaysian University Rover Training Group II]*	UZW127	1		
43	Kumpulan Latihan Kelanasiswa Malaysia (Laut) I *[Malaysian University Rover Training Group I(Sea)]*	UZW128	1		
	Kumpulan Latihan Kelanasiswa Malaysia II (Laut) *[Malaysian University Rover Training GrouP II (Sea)]*	UZW129	1		

BIL.	SENARAI KURSUS	KOD KURSUS	UNIT	TERAS	PRA- SYARAT
44	Kursus Persijilan Bulan Sabit Merah Malaysia I (BSMM I) *[The Malaysian Red Crescent Certification Course I]*	UZW164	1	**Kesukarelawanan *(Volunteerism)***	**Kursus Berpakej – (Pelajar Harus Mengikuti Dari Peringkat 1 – 3 Untuk Memperolehi 3 Unit) * Tahun 1 - 2 (3 Semester)** ***Packaged Courses – (Students should Following From Stage 1 -3 To Acquire 3 Units) * Years 1 - 2 (3 Semesters)***
	Kursus Persijilan Bulan Sabit Merah Malaysia II (BSMM II) *[The Malaysian Red Crescent Certification Course II]*	UZW165	1		
	Kursus Persijilan Bulan Sabit Merah Malaysia III (BSMM III) *[The Malaysian Red Crescent Certification Course III]*	UZW264	1		
45	Sukarelawan Siswa/Siswi Koreksional Jabatan Penjara Malaysia I (Kor SISKOR I) *[Students Voluntary Correctional Malaysian Prison Department I (Kor SISKOR I)]*	UZW110	1	**Kesukarelawanan *(Volunteerism)***	**Kursus Berpakej – (Pelajar Harus Mengikuti Dari Peringkat 1 – 4 Untuk Memperolehi 4 Unit) * Tahun 1 - 2 (4 Semester)** ***Packaged Courses – (Students should Following From Stage 1 -4 To Acquire 4 Units) * Years 1 - 2 (4 Semesters)***
	Sukarelawan Siswa/Siswi Koreksional Jabatan Penjara Malaysia II (Kor SISKOR II) *[Students Voluntary Correctional Malaysian Prison Department II (Kor SISKOR II)]*	UZW111	1		
	Sukarelawan Siswa/Siswi Koreksional Jabatan Penjara Malaysia III (Kor SISKOR III) *[Students Voluntary Correctional Malaysian Prison Department III (Kor SISKOR III)]*	UZW210	1		
	Sukarelawan Siswa/Siswi Koreksional Jabatan Penjara Malaysia IV (Kor SISKOR IV)] *[Students Voluntary Correctional Malaysian Prison Department IV (Kor SISKOR III)]*	UZW211	1		
46	Kor Siswa Siswi Pertahanan Awam I (Kor SISPA I) *[Malaysia Civil Defense Department I]*	UZW162	1	**Kesukarelawanan *(Volunteerism)***	**Kursus Berpakej – (Pelajar Harus Mengikuti Dari Peringkat 1 – 5 Untuk Memperolehi 5 Unit) * Tahun 1 – 3 (5 Semester)** ***Packaged Courses – (Students should Following From Stage 1 -5 To Acquire 5 Units) * Years 1 - 3 (5 Semesters)***
	Kor Siswa Siswi Pertahanan Awam II (Kor SISPA II) *[Malaysia Civil Defense Department II]*	UZW163	1		
	Kor Siswa Siswi Pertahanan Awam III (Kor SISPA III) *[Malaysia Civil Defense Department III]*	UZW262	1		
	Kor Siswa Siswi Pertahanan Awam IV (Kor SISPA IV) *[Malaysia Civil Defense Department IV]*	UZW263	1		
	Kor Siswa Siswi Pertahanan Awam V (Kor SISPA V) *[Malaysia Civil Defense Department V]*	UZW362	1		

BIL.	SENARAI KURSUS	KOD KURSUS	UNIT	TERAS	PRA- SYARAT
47	Palapes Darat I *[ROTU Army I]*	UZW160	1	**Kesukarelawanan** ***(Volunteerism)***	**Kursus Berpakej – (Pelajar Harus Mengikuti Dari Peringkat 1 – 6 Untuk Memperolehi 6 Unit)** *** Tahun 1 – 3 (6 Semester)** ***Packaged Courses – (Students should Following From Stage 1 -6 To Acquire 6 Units)*** **** Years 1 - 3 (6 Semesters)***
	Palapes Darat II *[ROTU Army II]*	UZW161	1		
	Palapes Darat III *[ROTU Army III]*	UZW260	1		
	Palapes Darat IV *[ROTU Army IV]*	UZW261	1		
	Palapes Darat V *[ROTU Army V]*	UZW360	1		
	Palapes Darat VI *[ROTU Army VI]*	UZW361	1		
48	SUKSIS-I @ Kor Sukarelawan Polis Siswa/Siswa *[SVPC- I @ Students Voluntary Police Corp]*	UZW166	1	**Kesukarelawanan** ***(Volunteerism)***	**Kursus Berpakej – (Pelajar Harus Mengikuti Dari Peringkat 1 – 6 Untuk Memperolehi 6 Unit)** *** Tahun 1 – 3 (6 Semester)** ***Packaged Courses – (Students should Following From Stage 1 -6 To Acquire 6 Units)*** **** Years 1 - 3 (6 Semesters)***
	SUKSIS-2 @ Kor Sukarelawan Polis Siswa/Siswa *[SVPC- 2 @ Students Voluntary Police Corp]*	UZW167	1		
	SUKSIS-3 @ Kor Sukarelawan Polis Siswa/Siswa *[SVPC- 3 @ Students Voluntary Police Corp]*	UZW266	1		
	SUKSIS-4 @ Kor Sukarelawan Polis Siswa/Siswa *[SVPC- 4 @ Students Voluntary Police Corp]*	UZW267	1		
	SUKSIS-5 @ Kor Sukarelawan Polis Siswa/Siswa *[SVPC- 5 @ Students Voluntary Police Corp]*	UZW366	1		
	SUKSIS-6 @ Kor Sukarelawan Polis Siswa/Siswa *[SVPC- 6 @ Students Voluntary Police Corp]*	UZW367	1		
49	Briged RELA Siswa Siswi (RELASIS) I *[Malaysian People's Volunteer corps I]*	UZW168	1	**Kesukarelawanan** ***(Volunteerism)***	**Kursus Berpakej – (Pelajar Harus Mengikuti Dari Peringkat 1 – 6 Untuk Memperolehi 6 Unit)** *** Tahun 1 – 3 (6 Semester)** ***Packaged Courses – (Students should Following From Stage 1 -6 To Acquire 6 Units)*** **** Years 1 - 3 (6 Semesters)***
	Briged RELA Siswa Siswi (RELASIS) II *[Malaysian People's Volunteer corps II]*	UZW169	1		
	Briged RELA Siswa Siswi (RELASIS) III *[Malaysian People's Volunteer corps III]*	UZW268	1		
	Briged RELA Siswa Siswi (RELASIS) IV *[Malaysian People's Volunteer corps IV]*	UZW269	1		
	Briged RELA Siswa Siswi (RELASIS) V *[Malaysian People's Volunteer corps V]*	UZW368	1		
	Briged RELA Siswa Siswi (RELASIS) VI *[Malaysian People's Volunteer corps VI]*	UZW369	1		

CO-CURRICULUM COURSES

UZW101
GOLF

Course Synopsis

The Golf Co-Curriculum course aims to expose the students to the science of the game of golf in both theoretical and technical skills. The theoretical aspect of the course covers the history, background, terminology, self-management and other related aspects of golf, while the technical portion focuses on the practical training i.e. skills in playing golf.

References

1. James, L. and Moore, T., 'Golf's Three Noble Truths: The Fine Art of Playing Awake', New World Library, 2010.
2. Lumb, N., 'A Beginner's Guide to Golf' Smithmark Publishers, 1989.
3. McCord, Gary., 'Golf For Dummies by', Wiley Publishing, 2006.
4. Parks, P., 'How to improve at Golf', Tunbridge Wells Ticktock, 2007.
5. Smith, A., 'Andrew's Essential Guide to Beginners Golf', Andrew's Book Company, 2009

UZW102
BASEBALL

Course Synopsis

The Baseball Co-Curriculum course aims to expose the students to both the theoretical and technical aspects of the baseball game. The theoretical aspect of the course covers the history, background, terminology, self-management and other related aspects of baseball, while the technical portion focuses on the practical training i.e. skills in playing baseball.

References

1. Eckart, E., 'I Can Play Baseball (Welcome Books)', Children's Press (CT), 2002.
2. Freeman, S. H., 'Basic Baseball Strategy: An Introduction for Coaches and Players', McGraw-Hill, 2006.
3. Morgan, J., 'Baseball for Dummies', For Dummies, 2005.
4. Wallace, J., 'Baseball: 365 Days', New York Abrams, 2008.
5. Wark, L., 'Baseball (Basics for Beginners)', Kids Can Press, 1994.

UZW103
WOODBALL

Course Synopsis

The Woodball Co-Curriculum course aims to expose the students to both the theoretical and technical aspects of the woodball game. The theoretical aspect of the course covers the history, background, terminology, self-management and other related aspects of woodball, while the technical portion focuses on the practical training i.e. skills in playing woodball.

References

1. Rules of Beach Woodball (International Woodball Federation), Revolution Publication, 1996.
2. http://www.iwbf-woodball.org/ Woodball Rules
3. http://www.woodball.org/

UZW104
FOOTBALL

Course Synopsis

The Soccer/Football Co-Curriculum course aims to expose the students to both the theoretical and technical aspects of the soccer/football game. The theoretical aspect of the course covers the history, background, terminology, self-management and other related aspects of soccer/football, while the technical portion focuses on the practical training i.e. skills in playing soccer.

References

1. Carr, D., and Metzler, M.W., 'Soccer: Mastering the Basics with the Personalized Sports Instruction System (A Workbook Approach)', Benjamin Cummings, 2000.
2. Drewett, J., 'How to improve at football', Tunbridge Well Ticktock Media, 2005.
3. Lewis, M. and Lalas, A., 'Soccer for Dummies', Inc. LASTUnited States Soccer Federation, 2000.
4. Negoesco, S., 'Soccer', McGraw-Hill, 1992.
5. Wark, L. and Ritchie, S., 'Soccer (Basics for Beginners)', Kids Can Press, 1994.

UZW105
NETBALL

Course Synopsis

The Netball Co-Curriculum course aims to expose the students to both the theoretical and technical aspects of the netball game. The theoretical aspect of the course covers the history, background, terminology, self-management and other related aspects of netball, while the technical portion focuses on the practical training i.e. skills in playing netball.

References

1. Galsworthy, B., 'Netball: The Skills of the Game', Crowood Press, 1996.
2. Mullan, N., Netball (Successful Sports)', Heinemann Library, 1997.
3. Navin, A., 'Netball: Skills Techniques Tactics (Crowood Sports Guides)', Crowood Press, 2008.
4. Shakespear, W., 'Netball: Steps to Success - 2nd Edition (Steps to Success Activity Series)', Human Kinetics, 2009.
5. Woodlands, J., 'The Netball Handbook', Human Kinetics, 2006.

UZW106
TENNIS

Course Synopsis

The Tennis Co-Curriculum course aims to expose the students to both the theoretical and technical aspects of the tennis game. The theoretical aspect of the course covers the history, background, terminology, self-management and other related aspects of tennis, while the technical portion focuses on the practical training i.e. skills in playing tennis.

References

1. Claxton, D., 'Tennis', McGraw-Hill, 1998.
2. Kumar, N., 'Complete Book of Lawn Tennis', New Delhi India Anmol Publication, 2006.
3. Metzler, M., 'Tennis: Mastering the Basics with the Personalized Sports Instruction System (A Workbook Approach)', Benjamin Cummings, 2000.
4. O'Meara, D.J., and Murray, T.J., 'Tennis Unlimited (The Basic Elements of Sports Series)', ICS Books, 1997.
5. Patrick McEnroe, P., 'Tennis for Dummies', For Dummies, 1998.

UZW107
EQUESTRIAN

Course Synopsis

This course aims to train the students in mastering the basic skills of horses handling and management. In addition, it exposes students to the knowledge on horses grooming, installation of equipment and riding techniques. Equestrian sports provide the opportunities for students to interact, foster the spirit of sportsmanship, cooperation, responsibility, and are able to develop positive personality among students.

References

1. Black, D., 'Horses and Owner's Guide', Greenwich Editions, 2001.
2. Draper, J., 'The Ultimate Book of the Horse and Rider' LB, 2000.
3. Foster, C., 'Basic Jumping (Crowood Equestrian Guides)', Crowood Press, 1991.
4. Foster, C., 'Basic Riding (Crowood Equestrian Guides)', Crowood Press, 1991.
5. Ripman, B., 'Basic Training (Crowood Equestrian Guides)', Crowood Press (UK), 1992.

UZW108
WEIGHTLIFTING

Course Synopsis

This course emphasizes on the identification, regulatory and basic refereeing system of weightlifting sports. Systematic planning in the weightlifting sport is able to develop students' performance to the optimum fitness level. Mastery of basic skills in bio-mechanics allows students to practice weightlifting skills safely. Economical energy coupled with high degree of self confidence in this sport lead to excellence in the weightlifting sport.

References

1. Buku kejurulatihan angkat berat pilot tahap 1 (P.A.B.M) & MSN
2. El-Hewie, M.F., 'Essentials of Weightlifting and Strength Training', Shaymaa Publishing Corporation, 2006.
3. Everett, G., 'Olympic Weightlifting: A Complete Guide for Athletes & Coaches', Catalyst Athletics, 2009.
4. Drechsler, A.J., 'The Weightlifting Encyclopedia: A Guide to World Class Performance', A is A Communications, 1998.
5. Kinetics, H. and Sandler, D., 'Weight Training Fundamentals (Sports Fundamentals Series)', Human Kinetics, 2003.

UZW109
VOLLEYBALL

Make curricular sports activities of Volleyball as an activity participated by all students through the activities planned in order to master the basic skills of volleyball, the organization of the game, and the rules of the game.
In addition to member interaction opportunities, fun and occupy their free time with useful things as well as fostering a sense of sportsmanship and cooperation, responsible and contribute to the university.

References

1. Lee E. Brown, Vance A. Ferrigno, 2005, Training for speed, agility and Quickness, Second Edition, human kinetic.

2. Kinda S.Lenberg, 2004 Coaching Volleyball Defensive Fundamentals and Tecnhniques, Second Edition, Coaches Choice.

UZW171
SENI SILAT CEKAK I

Course Synopsis

Martial Arts Fight Co-Curriculum course aims to expose students to the knowledge of martial arts self defence fight in terms of theoretical skills and technical. In terms of theory, this course is more focused on the history, background back, terminology, self-management and other related to Martial arts. While technically, this course focused on practical training (practical) skills in terms of hands and feet that are being practice from time to time.

References

1. Malay, 'Silat Cekak Hanafi - Peneraju Warisan Mutlak', 2005.
2. Pengenalan kepada Persatuan Seni Silat Cekak Malaysia, Persatuan Seni Silat Cekak Perlis, Perlis.
3. Talib, A., 'Silat: A perspective on the Malay Martial Arts', Amiruddin Dato Seri Paduka Haji Talib Talib, 2009.
4. www.silatcekak.org.my, 2010.
5. www.silatcekakhanafi.org, 2010.

UZW271
SENI SILAT CEKAK II

Course Synopsis

Martial Arts Fight II Co-Curriculum course aims to expose the students the knowledge of martial arts self defence fight in terms of theoretical skills and technical. In terms of theory, this course is more focused on the history, background back, terminology, self-management and other related to Martial arts. While technically, this course focused on practical training (practical) skills in terms of hands and feet that are being practice from time to time.

References

1. Malay, 'Silat Cekak Hanafi - Peneraju Warisan Mutlak', 2005.
2. Pengenalan kepada Persatuan Seni Silat Cekak Malaysia, Persatuan Seni Silat Cekak Perlis, Perlis.
3. Talib, A., 'Silat: A perspective on the Malay Martial Arts', Amiruddin Dato Seri Paduka Haji Talib Talib, 2009.
4. www.silatcekak.org.my, 2010.
5. www.silatcekakhanafi.org, 2010.

UZW371
SENI SILAT CEKAK III

Course Synopsis

Martial Arts Fight III Co-Curriculum course aims to expose the students the knowledge of martial arts self defense fight in terms of theoretical skills and technical. In terms of theory, this course is more focused on the history, background back, terminology, self-management and other related to Martial arts. While technically, this course focused on practical training (practical) skills in terms of hands and feet that are being practice from time to time.

References

1. Malay, 'Silat Cekak Hanafi - Peneraju Warisan Mutlak', 2005.
2. Pengenalan kepada Persatuan Seni Silat Cekak Malaysia, Persatuan Seni Silat Cekak Perlis, Perlis.
3. Talib, A., 'Silat: A perspective on the Malay Martial Arts', Amiruddin Dato Seri Paduka Haji Talib Talib, 2009.
4. www.silatcekak.org.my, 2010.
5. www.silatcekakhanafi.org, 2010.

UZW172
TAEKWON – DO GTF I

Course Synopsis

Taekwon-Do I (GTF) Co-Curriculum course aims to expose the students to the knowledge of martial arts that is Taekwon-Do (GTF) in terms of theoretical and technical skills. In terms of theory, this course is focused on historical background, terminology, self-management and other related with Taekwon-Do. While technical, this course is more focused on practical training (practical) skills in terms of hands and feet that are being practice from time to time.

References

1. Hi, C., 'Encyclopedia of Taekwon-Do', 1972.
2. Huraisen Masri, A.R., 'Modul Ko-Kurikulum Taekwon-Do (GTF)', UniMAP, 2003.
3. Legacy, 'Taekwon-Do VCD, The Complete Pattern Black Belt Series', 2000.
4. Wai Meng, L., 'Taekwon-Do, The Complete Syllabus & Grading Manual', 1992.
5. Whang S.C., Whang, J.C., Lee, D.S., and Saltz, B., 'Taekwondo: The State of the Art', Broadway, 1999.

UZW272
TAEKWON – DO GTF II

Course Synopsis

Course Co-Curriculum II Taekwon-Do (GTF) is an extension of Taekwon-Do I (GTF). Through this course, emphasis is given to the technical aspects related to each stage of belts. Among the aspects to be covered include the philosophy, theory, and etc. In addition, the students are exposed to the theory of how to manage a tournament or competition.

References

1. Hi, C., 'Encyclopedia of Taekwon-Do', 1972.
2. Huraisen Masri, A.R., 'Modul Ko-Kurikulum Taekwon-Do (GTF)', UniMAP, 2003.
3. Legacy, 'Taekwon-Do VCD, The Complete Pattern Black Belt Series', 2000.
4. Wai Meng, L., 'Taekwon-Do, The Complete Syllabus & Grading Manual', 1992.
5. Whang S.C., Whang, J.C., Lee, D.S., and Saltz, B., 'Taekwondo: The State of the Art', Broadway, 1999.

UZW372
TAEKWON – DO GTF III

Course Synopsis

Course Co-Curriculum Taekwon-Do III (GTF) is an extension of Taekwon-Do II (GTF). This course is the last course in a series of courses Taekwon-Do (GTF). Theoretical and technical knowledge learned in previous courses will be practiced through discussion, presentation, practice, practices by students and by increasing the test belts. In addition, the students will be exposed to theory and practice of the method of Taekwon-Do class management and coaching.

References

1. Hi, C., 'Encyclopedia of Taekwon-Do', 1972.
2. Huraisen Masri, A.R., 'Modul Ko-Kurikulum Taekwon-Do (GTF)', UniMAP, 2003.
3. Legacy, 'Taekwon-Do VCD, The Complete Pattern Black Belt Series', 2000.
4. Wai Meng, L., 'Taekwon-Do, The Complete Syllabus & Grading Manual', 1992.
5. Whang S.C., Whang, J.C., Lee, D.S., and Saltz, B., 'Taekwondo: The State of the Art', Broadway, 1999.

UZW173
KARATE-DO

Course Synopsis

The karate-do co-curriculum course exposes the students to the knowledge of martial arts karate-do in terms of theoretical and technical skills. In terms of theory, this course is more focused on the history, background, terminology, management of oneself and other associated with the art of karate-do. While technically, this course is focused on practical training (practical) skills in the art of karate-do.

References

1. Frost, B., 'Koei-Kan Karate-Do: Practice and Precept', Frog Books, 1998.
2. Funakoshi, G., 'Karate-Do Kyohan: The Master Text', Kodansha International, 1973.
3. Funakoshi, G., 'Karate-Do Nyumon: The Master Introductory Text', Kodansha International, 1994.
4. Funakoshi, G., 'The Twenty Guiding Principles of Karate: The Spiritual Legacy of the Master', Kodansha International, 2003.
5. Healy, K., 'Karate A Step By Step Guide to Shotokan Karate', New Delhi Health Harmony, 2002

UZW273
KARATE-DO II

Course Synopsis

The karate-do co-curriculum course exposes the students to the knowledge of martial arts karate-do in terms of theoretical and technical skills. In terms of theory, this course is more focused on the history, background, terminology, management of oneself and other associated with the art of karate-do. While technically, this course is focused on practical training (practical) skills in the art of karate-do.

References

1. Karate A Step By Step Guide to Shotokan Karate (KevinHealy) New Delhi Health Harmony, 2002.

UZW373
KARATE-DO III

Course Synopsis

The karate-do co-curriculum course exposes the students to the knowledge of martial arts karate-do in terms of theoretical and technical skills. In terms of theory, this course is more focused on the history, background, terminology, management of oneself and other associated with the art of karate-do. While technically, this course is focused on practical training (practical) skills in the art of karate-do.

References

1. Karate A Step By Step Guide to Shotokan Karate (KevinHealy) New Delhi Health Harmony, 2002.

UZW176
TAEKWON-DO WTF I

Course Synopsis

Taekwon-Do I (GTF) Co-Curriculum course aims to expose the students to the knowledge of martial arts that is Taekwon-Do (GTF) in terms of theoretical and technical skills. In terms of theory, this course is focused on historical background, terminology, self-management and other related with Taekwon-Do. While technical, this course is more focused on practical training (practical) skills in terms of hands and feet that are being practice from time to time.

References

1. Hi, C., ‘Encyclopedia of Taekwon-Do’, 1972.
2. Huraisen Masri, A.R., ‘Modul Ko-Kurikulum Taekwon-Do (GTF)’, UniMAP, 2003.
3. Legacy, ‘Taekwon-Do VCD, The Complete Pattern Black Belt Series’, 2000.
4. Wai Meng, L., ‘Taekwon-Do, The Complete Syllabus & Grading Manual’, 1992.
5. Whang S.C., Whang, J.C., Lee, D.S., and Saltz, B., ‘Taekwondo: The State of the Art’, Broadway, 1999.

UZW276
TAEKWON-DO WTF II

Course Synopsis

Taekwon-Do I (GTF) Co-Curriculum course aims to expose the students to the knowledge of martial arts that is Taekwon-Do (GTF) in terms of theoretical and technical skills. In terms of theory, this course is focused on historical background, terminology, self-management and other related with Taekwon-Do. While technical, this course is more focused on practical training (practical) skills in terms of hands and feet that are being practice from time to time.

References

1. Hi, C., ‘Encyclopedia of Taekwon-Do’, 1972.
2. Huraisen Masri, A.R., ‘Modul Ko-Kurikulum Taekwon-Do (GTF)’, UniMAP, 2003.
3. Legacy, ‘Taekwon-Do VCD, The Complete Pattern Black Belt Series’, 2000.
4. Wai Meng, L., ‘Taekwon-Do, The Complete Syllabus & Grading Manual’, 1992.
5. Whang S.C., Whang, J.C., Lee, D.S., and Saltz, B., ‘Taekwondo: The State of the Art’, Broadway, 1999.

UZW376
TAEKWON-DO WTF III

Course Synopsis

Taekwon-Do I (GTF) Co-Curriculum course aims to expose the students to the knowledge of martial arts that is Taekwon-Do (GTF) in terms of theoretical and technical skills. In terms of theory, this course is focused on historical background, terminology, self-management and other related with Taekwon-Do. While technical, this course is more focused on practical training (practical) skills in terms of hands and feet that are being practice from time to time.

References

1. Hi, C., ‘Encyclopedia of Taekwon-Do’, 1972.
2. Huraisen Masri, A.R., ‘Modul Ko-Kurikulum Taekwon-Do (GTF)’, UniMAP, 2003.
3. Legacy, ‘Taekwon-Do VCD, The Complete Pattern Black Belt Series’, 2000.
4. Wai Meng, L., ‘Taekwon-Do, The Complete Syllabus & Grading Manual’, 1992.
5. Whang S.C., Whang, J.C., Lee, D.S., and Saltz, B., ‘Taekwondo: The State of the Art’, Broadway, 1999.

UZW174
FENCING

Course Synopsis

The fencing co-curriculum course aims to expose the students to the science of fencing sports theory and technical skills. In terms of theory, this course is more focused on the history, background, terminology, the skills of defence of oneself and other related aspects of fencing sports. While technically, this course is more focused on skills in practical training (practical).

References

1. Cheris, E., ‘Fencing: Step to Success’, Champaign IL Human Kinetics, 2002.
2. Evangelista, N., ‘The Art and Science of Fencing’, McGraw-Hill; 1st Edition, 1999.
3. Evangelista, N., ‘The Inner Game of Fencing: Excellence in Form, Technique, Strategy and Spirit’, McGraw-Hill; 1st Edition, 2000.
4. Pitman, B., ‘Fencing: Techniques of Foil, Epee and Sabre’, Crowood Press, 1988.
5. Price, R. G., ‘The Ultimate Guide to Weight Training for Fencing (Ultimate Guide to Weight Training…)’, Sportsworkout.com; 2nd Edition, 2009

UZW175
FUTSAL

Make curricular sports activities of Futsal as an activity participated by all students through the activities planned in order to master the basic skills of futsal, organization of games and game laws. In addition to the opportunity of interaction, fun and occupy their free time with useful things as well as fostering a sense of difficulty and collaborative, responsible and contribute to the the university.

References

1. V.Hermans & R. Engler, 2011, Futsal: Technique, Tactics, Training, Midenhead Mayer & Mayer Sport (UK) Ltd.
2. T. Burn, 2004, Holistic Futsal, Lulu Enterprises Incorporated.

UZW180
SWIMMING I

Course Synopsis

The swimming co-curriculum course aims to expose the students to the science of swim in the theoretical and technical skills. In terms of theory, this course is more focused on the history, background, terminology and other related aspects of swimming activities. While technical, this course is more focused on the practical training in terms of swimming skills.

References

1. Brems, M., 'The Fit Swimmer: 120 Workouts & Training Tips', Mc-Graw Hill; 1st Edition, 1984.
2. Keegan, N., 'Swimming (Vintage Contemporaries)', Vintage, 2010.
3. Kumar, N., 'Complete Book of Swimming', New Delhi: India Anmall Publication, 2006.
4. Mason, P., 'How to Improve at Swimming', Tumbrigde Wells Ticktock Media, 2005.
5. Thomas, D., 'Swimming: Steps to Success – 3rd Edition (Steps to Success Sports Series)', Human Kinetics; 3rd Edition, 2005.

UZW280
SWIMMING II

Course Synopsis

The swimming II co-curriculum course aims to enhance the students' knowledge and skills on the techniques of swimming. In terms of theory, this course is more focused on the history, background, terminology and other related aspects of swimming activities. While technical, this course is more focused on the practical training (practical) in terms of swimming skills.

References

1. Brems, M., 'The Fit Swimmer: 120 Workouts & Training Tips', Mc-Graw Hill; 1st Edition, 1984.
2. Keegan, N., 'Swimming (Vintage Contemporaries)', Vintage, 2010.
3. Kumar, N., 'Complete Book of Swimming', New Delhi: India Anmall Publication, 2006.
4. Mason, P., 'How to Improve at Swimming', Tumbrigde Wells Ticktock Media, 2005.
5. Thomas, D., 'Swimming: Steps to Success – 3rd Edition (Steps to Success Sports Series)', Human Kinetics; 3rd Edition, 2005.

UZW380
SWIMMING III

Course Synopsis

The swimming III co-curriculum course aims to enhance and sustain the students' knowledge and skills on the techniques of swimming. In terms of theory, this course is more focused on the history, background, terminology and other related aspects of swimming activities. While technical, this course is more focused on the practical training (practical) in terms of swimming skills.

References

1. Brems, M., 'The Fit Swimmer: 120 Workouts & Training Tips', Mc-Graw Hill; 1st Edition, 1984.
2. Keegan, N., 'Swimming (Vintage Contemporaries)', Vintage, 2010.
3. Kumar, N., 'Complete Book of Swimming', New Delhi: India Anmall Publication, 2006.
4. Mason, P., 'How to Improve at Swimming', Tumbrigde Wells Ticktock Media, 2005.
5. Thomas, D., 'Swimming: Steps to Success – 3rd Edition (Steps to Success Sports Series)', Human Kinetics; 3rd Edition, 2005.

UZW181
LAWN BOWL

Course Synopsis

The lawn bowl co-curriculum courses aims to expose the students to the knowledge of lawn sports in the theory and technical skills. In terms of theory, this course is more focused on the history, background, terminology, management of oneself and other related aspects of lawn sports. While technically, this course is more focused on the practical training (practical) skills in lawn bowls.

References

1. Bell, J., 'Bowls: Skills, Techniques, Tactics (Crowood Sports Guides)', Crowood Press; illustrated Edition, 2007.
2. Dobbie, J., 'Successful Lawn Bowls', John Wiley & Sons Australia Ltd; Revised Edition, 1987.
3. Marshall, B. L. G., ' Lawn Bowls Champions Secrets', Lulu.com, 2008.
4. Newton, A., 'Fundamental of Lawn Bowls', Angus & Robertson; 2nd Edition, 1993.

5. Taylor, T. & Esch, H. L., ‘Lawn Bowling Handbook’, Harold L. Esach, 1948.

UZW182
PETANQUE

Course Synopsis

The petanque co-curriculum courses aims to expose the students to the knowledge of petanque sports in theory and technical skills. In terms of theory, this course is more focused on the history, background, terminology, management of oneself and other aspects associated with petanque sports. While technically, this course is more focused on practical training (practical) skills in petanque.

References

1. Durbin, M. ‘From Gutterballs to Strikes’, McGraw-Hill; 1st Edition, 1998.
2. Fieux, P., ‘La Petanque de Competition’, Les Presses du Midi, 2002.
3. Fieux, P., ‘Dictionary de la Petanque’, Presses du Midi, 2003.
4. Freeman, G., ‘Petanque: The French Game of Boules’, Hyperion Books, 1987.
5. Philpott, P., ‘The Art of Wrist-Spin Bowling’, Crowood Press, 1997.

UZW183
CANOE

Course Synopsis

The canoeing co-curriculum course aims to expose the students to the sports science of canoeing theory and technical skills. In terms of theory, this course is more focused on the history, background, terminology, management of oneself and other related aspects associated with canoeing. While technically, this course is more focused on the practical training (practical) skills in canoeing.

References

1. Evans, J and Mattos, B., ‘The Ilustrated Handbook of Kayaking, Canoeing and Sailing’, 2007.
2. Harrison, D., ‘Whitewater Kayaking (Canoe & Kayak Techniques)’, Stackpole Books; 1st Edition, 1998.
3. Harrison, D. & Morser, B., ‘Canoeing: Canoe & Kayak Techniques’, Stackpole Books; 1st Edition, 1998.
4. Johson, S., ‘The Complete Sea Kayaker’s Handbook’, International Marine/Ragged Mountain Press; 1st Edition, 2001.
5. Mattos, B. & Evans, J., ‘The Ilustrated Handbook of Kayaking’, Canoeing and Sailing, 2007.

UZW184
BADMINTON

Course Synopsis

The badminton co-curriculum course aims to expose the students to the knowledge of badminton in terms of theoretical and technical skills. In terms of theory, this course is more focused on the history, background, terminology, management of oneself and other related aspects associated with badminton. While technically, this course is more focused on the practical training (practical) skills in playing badminton.

References

1. Chen, G. & Chen, Carol, ‘Coaching Badminton 101’, Coaches Choice, 2009.
2. Davis, P. ‘Badminton (Play the Game)’, Ward Lock Limited; 3rd Edition, 1998.
3. Golds, M., ‘Badminton: Skills of the Game’, Crowood Press, 2002.
4. Grice, T., ‘Badminton: Steps to Success – 2nd Edition (Steps to Success Activity Series)’, Human Kinetics; 2nd Edition, 2007.
5. Metzlar, M., ‘Badminton: Mastering the Basic with the Personalized Sports Instructions System’, Boston Allyn & Bacon, 2001.

UZW185
HOCKEY

Course Synopsis

The hockey ho-curriculum course aims to expose the students to the sport science of hockey in terms of theoretical and technical skills. In terms of theory, this course is more focused on the history, background, terminology, management of oneself and other related aspects associated with hockey. While technically, this course is more focused on the practical training (practical) in terms of skills in playing hockey.

References

1. Andershttp://www.amazon.com/Field-Hockey-Steps-Success-Sports/dp /0736068376/ref=pd_cp_b_2, E., ‘Field Hockey: Steps to Success’, Human Kinetics; 2nd edition, 2008.
2. Barth, K. and Nordmann, L., ‘Learning Field Hockey’, Meyer & Meyer, 2007.
3. Complete Book of Hockey (Anupam Sharma) New Delhi India: Anmol Publication 2006.
4. French, L., http://www.amazon.com/How-Play-Hockey-Step---Step/dp/0711704902/ref=sr_1_5?s=books&ie=UTF8&qid=1279557235&sr=1-5‘How to Play Hockey: A Step-By-Step Guide’, Jarrold Sports, Jarrold Publishing, 1993.

5. Mitchell-Taverner, C., http://www.amazon.com/Hockey-Techniques-Tactics-Claire-Mitchell-Taverner /dp /0736054375 /ref=sr_1_2?s=books &ie=UTF8&qid=1279557235&sr=1-2'Field Hockey Techniques & Tactics', Human Kinetics; 2nd edition, 2004) **Claire Mitchell-Taverner** (Author)
6. **›** Visit Amazon's Claire Mitchell-Taverner Page
7. Find all the books, read about the author, and more.
8. See search results for this author
9. Are you an author? Learn about Author Central
10. .

UZW186
SEPAK TAKRAW

Course Synopsis

The sepak takraw co-curriculum course aims to expose the students to the science of sepak takraw sports, theoretically and technically. In terms of theory, this course is more focused on the history, background, terminology, management of oneself and other related aspects associated with sepak takraw. While technically, this course is more focused on the practical training (practical) in terms of skills in playing sepak takraw.

References

1. Books LLC, 'Sport in Southeast Asia: Sepak Takraw', Books LLC, 2010.
2. Dunsmore, S., 'Sepak Raga (Takraw) The South East Asian Ball Game', Sarawak Museum, 1983.
3. Lorna Fe P. Lopez, 'Physical education, health and music (sepak takraw)', Rex Book Store.Inc, Philippine Copyright, 2000.

UZW187
RUGBY

Course Synopsis

The rugby co-curriculum course aims to expose the students to the knowledge of rugby in terms of theory and technical skills. In terms of theory, this course is more focused on the history, background, terminology, management of oneself and other aspects associated with rugby. While technically, this course is more focused on the practical training (practical) skills in playing rugby.

References

1. Biscombe, T. and Drewett, P., 'Rugby: Steps to Success', Human Kinetics; 2nd edition, 2009.
2. Brown, M., Guthrie, P. and Growden, G., 'Rugby For Dummies', For Dummies; 2nd edition, 2007.
3. Richards http://www.amazon.com/Game-Hooligans-History-Rugby-Union/dp/1845962559 / ref=sr_1_2?s=books&ie=UTF8&-qid=1279559168&sr=1-2, H., 'A Game for Hooligans: The History of Rugby Union', Mainstream Publishing, 2007.
4. Williams, T. and Bunce, F., 'Rugby Skills, Tactics and Rules', Firefly Books; Revised edition, 2008.
5. http://www.irlfunds.org/new zealand/news.html

UZW188
ARCHERY

Course Synopsis

The archery co-curriculum course aims to expose the students to archery, shooting sports science in terms of theoretical and technical skills. In terms of theory, this course is more focused on the history, background, terminology, management of oneself and other related aspects concerning shooting. While technically, this course is more focused on the practical training (practical) skills in archery.

References

1. Axford, R., 'Archery Anatomy: An Introduction to Techniques for Improved Performance', Souvenir Press, 1996.
2. Engh, D., 'Archery Fundamentals (Sports Fundamentals Series)', Human Kinetics; 1st edition, 2004.
3. Haywood, M. and Lewis, C., 'Archery: Step to Success', Champaign IL Kinetics, 2006.
4. Ruis, S. and Stevenson, C., 'Precision Archery', Human Kinetics; 1st edition, 2003.
5. Sorrells, B., 'Beginner's Guide to Traditional Archery', Stackpole Books; 1st edition, 2004.

UZW189
TABLE TENNIS

Course Synopsis

The table tennis co-curriculum course aims to expose the students to the knowledge of ping pong sports in terms of theoretical and technical skills. In terms of theory, this course is more focused on the history, background, terminology, management of oneself and other related aspects associated with ping-pong. While technically, this course is more focused on the practical training (practical) skills in playing ping-pong.

References

1. Heaton, J., 'Table Tennis: Skills, Techniques, Tactics (Crowood Sports Guides)', Crowood Press, 2009.

2. Hodges, L., ‘Table Tennis: Step to Success’, Champaign IL Human Kinetic, 1993.
3. McAfee, R., ‘Table Tennis: Steps to Success (Steps to Success Activity Series)’, Human Kinetics; 1st edition, 2009.
4. Roetert, P. and Ellenbecker, T., ‘Complete Conditioning for Tennis (Complete Conditioning for Sports Series)’, Human Kinetics; 2007.
5. Seemiller, D. and Holowchak, M., “Winning Table Tennis: Skills, Drills, and Strategies’, Human Kinetics,1996.

UZW132
VIDEO PUBLISHING

Course Synopsis

Kursus ini berkisar tentang proses Penerbitan Video. Kursus akan bermula Fasa Pra-Produksi yang mana menyentuh tentang kerja-kerja pengurusan sebelum menjalani proses pengambaran atau Fasa Produksi. Proses pembelajaran akan berjalan hingga ke Fasa akhir iaitu Post-Produksi bagi menyiapkan kerja-kerja penyuntingan .Selain itu kursus ini juga mengetengahkan kemahiran pengendalian kamera dan pencahayaan bagi menyokong penerbitan video pendek di akhir kursus ini.

References

1. Deborah S.Patz. (2010). Film Production Management 101 second edition. Michael Wiese Productions (ISBN:978—932907-77-3)
2. Brordwell & Thomsan. (2008). Film Art An Introduction Eight Edition. N.York: The McGraw-Hill Companieslc. (ISBN:-13:978-0071101592)
3. Legal Reseach Board. (2008). Film Cencorship Act 2002 (ACT 620) & Perbadanan KEmajuan Filem Nasional Malaysia ACT 1981 (ACT 244).Intrnasional Law Book Services. Selangor, Malaysia. (ISBN 967-891468-9)
4. Tom Ang. (2006). Digital Video An Introduction. Star Standard, Singapore. (ISBN-13: 978-1-40531-254-7)
5. Gloman, Chuck B.(2003).303 Digital lFilmmaking Solution: Solve Ang Video Shoot or edit problem in 10 minutes or less. McGraw-Hill (ISBN: 0-07-141651-X)
6. Beacham, Frank (1994). American Cinematographer video manual second Edition. Sinclair Printing Company, United States. (ISBN: 0-935578-1-9)

UZW151
FOUNDATIONS OF GAMELAN

Course Synopsis

The Basic Gamelan Co-Curriculum course aims to expose the students to both the theoretical and technical aspects of the traditional art of gamelan. The theoretical aspect of the course covers the history, background, terminology, self-management and other related aspects of traditional art of gamelan, while the technical portion focuses on the practical training i.e. the skills in playing gamelan.

References

1. Ahmad, A., ‘Lagu- lagu Gamelan: Buku 1‘, UM, 1997.
2. Nasarudin, M.G., ‘Buku Muzik Tradisional Malaysia Edisi Baharu’, DBP, 2003.
3. Pickvance, R., ‘A Gamelan Manual: A player’s guide to the central Javanese gamelan’, Jaman Mas Books, 2006.
4. Sutton,R. A., ‘Traditions of Gamelan Music in Java: Musical Pluralism and Regional Identity (Cambridge Studies in Ethnomusicology)’, Cambridge University Press, 2008.
5. Tenzer, M., ‘Balinese Music’, Periplus Editions, 1998.

UZW251
GAMELAN II

Course Synopsis

The Gamelan II Co-Curriculum course aims to expose the students to both the theoretical and technical aspects of the traditional art of gamelan. The theoretical aspect of the course covers the history, background, terminology, self-management and other related aspects of traditional art of gamelan, while the technical portion focuses on the practical training i.e. theskills in playing gamelan.

References

1. Ahmad, A., ‘Lagu- lagu Gamelan: Buku 1‘, UM, 1997.
2. Nasarudin, M.G., ‘Buku Muzik Tradisional Malaysia Edisi Baharu’, DBP, 2003.
3. Pickvance, R., ‘A Gamelan Manual: A player’s guide to the central Javanese gamelan’, Jaman Mas Books, 2006.
4. Sutton,R. A., ‘Traditions of Gamelan Music in Java: Musical Pluralism and Regional Identity (Cambridge Studies in Ethnomusicology)’, Cambridge University Press, 2008.
5. Tenzer, M., ‘Balinese Music’, Periplus Editions, 1998.

UZW351
GAMELAN III

Course Synopsis

The Gamelan III Co-Curriculum course aims to expose the students to both the theoretical and technical aspects of the traditional art of gamelan. The theoretical aspect of the course covers the history, background, terminology, self-management and other related aspects of traditional art of gamelan, while the technical portion focuses on the practical training i.e. skills in playing the gamelan.

References

1. Ahmad, A., 'Lagu- lagu Gamelan: Buku 1', UM, 1997.
2. Nasarudin, M.G., 'Buku Muzik Tradisional Malaysia Edisi Baharu', DBP, 2003.
3. Pickvance, R., 'A Gamelan Manual: A player's guide to the central Javanese gamelan', Jaman Mas Books, 2006.
4. Sutton,R. A., 'Traditions of Gamelan Music in Java: Musical Pluralism and Regional Identity (Cambridge Studies in Ethnomusicology)', Cambridge University Press, 2008.
5. Tenzer, M., 'Balinese Music', Periplus Editions, 1998.

UZW152
JAZZ BAND I

Course Synopsis

The Jazz Group Co-Curriculum course aims to expose the students to both the theoretical and technical aspects of the jazz music. The theoretical aspect of the course covers the history, background, terminology, self-management and other related aspects of jazz music, while the technical portion focuses on the practical training i.e. skills in playing the jazz music.

References

1. Mause, A.D., 'How to Play Jazz Guitar: For Group or Individual Instruction (Acorn Basic Lessons, 120360)', Acorn Music Press, 1978.
2. Meeder, C., 'Jazz: the Basics', Routledge, 2007.
3. Mike, C., 'The Sound of Improvisation: A Basic Method for Individuals, Small Groups, Jazz Band - Book One', Alfred Publishing Co., 1976.
4. Sutro, D., 'Jazz for Dummies', NJ Wiley Pub, 2006.
5. Szwed, J.F., 'Jazz 101: A Complete Guide to Learning and Loving Jazz', Hyperion, 2000.

UZW252
JAZZ BAND II

Course Synopsis

The Jazz Group II Co-Curriculum course aims to expose the students to both the theoretical and technical aspects of the jazz music. The theoretical aspect of the course covers the history, background, terminology, self-management and other related aspects of jazz music, while the technical portion focuses on the practical training i.e. skills in playing the jazz music.

References

1. Mause, A.D., 'How to Play Jazz Guitar: For Group or Individual Instruction (Acorn Basic Lessons, 120360)', Acorn Music Press, 1978.
2. Meeder, C., 'Jazz: the Basics', Routledge, 2007.
3. Mike, C., 'The Sound of Improvisation: A Basic Method for Individuals, Small Groups, Jazz Band - Book One', Alfred Publishing Co., 1976.
4. Sutro, D., 'Jazz for Dummies', NJ Wiley Pub, 2006.
5. Szwed, J.F., 'Jazz 101: A Complete Guide to Learning and Loving Jazz', Hyperion, 2000

UZW352
JAZZ BAND III

Course Synopsis

The Jazz Group II Co-Curriculum course aims to expose the students to both the theoretical and technical aspects of the jazz music. The theoretical aspect of the course covers the history, background, terminology, self-management and other related features of jazz music, while the technical portion focuses on the practical training i.e. skills in playing the jazz music.

References

1. Mause, A.D., 'How to Play Jazz Guitar: For Group or Individual Instruction (Acorn Basic Lessons, 120360)', Acorn Music Press, 1978.
2. Meeder, C., 'Jazz: the Basics', Routledge, 2007.
3. Mike, C., 'The Sound of Improvisation: A Basic Method for Individuals, Small Groups, Jazz Band - Book One', Alfred Publishing Co., 1976.
4. Sutro, D., 'Jazz for Dummies', NJ Wiley Pub, 2006.
5. Szwed, J.F., 'Jazz 101: A Complete Guide to Learning and Loving Jazz', Hyperion, 2000.

UZW153
BRASS BAND I

Course Synopsis

The Brass Band Co-Curriculum course aims to expose the students to both the theoretical and technical aspects of brass musical instruments. The theoretical aspect of the course covers the history, background, terminology, self-management and other related features of brass band, while the technical portion focuses on practical training of playing the brass musical instruments in group.

References

1. Bailey, W. and Caneva, T., ‘The Complete Marching Band Resource Manual: Techniques and Materials for Teaching, Drill Design, and Music Arranging (Plastic Comb)’, University of Pennsylvania Press, 2003.
2. Brand, V. and Brand, G., ‘Brass Bands in the Twentieth Century’, Egon Publishers Ltd, 1979.
3. Burns, M., ‘Keeping the Beat on the Street: The New Orleans Brass Band Renaissance’, Louisiana State University Press, 2008.
4. Cameron, A., ‘A Whole Brass Band’, Harbour, 1992.
5. Newsome, R., ‘The Modern Brass Band: From The 1930s To The New Millennium’, Ashgate Publishing, 2006.

UZW253
BRASS BAND II

Course Synopsis

Brass Band II Co-Curriculum course aims to expose the students to both the theoretical and technical aspects of brass musical instruments. The theoretical aspect of the course covers the history, background, terminology, self-management and other related features of brass band, while the technical portion focuses on practical training of playing the brass musical instruments in group.

References

1. Bailey, W. and Caneva, T., ‘The Complete Marching Band Resource Manual: Techniques and Materials for Teaching, Drill Design, and Music Arranging (Plastic Comb)’, University of Pennsylvania Press, 2003.
2. Brand, V. and Brand, G., ‘Brass Bands in the Twentieth Century’, Egon Publishers Ltd, 1979.
3. Burns, M., ‘Keeping the Beat on the Street: The New Orleans Brass Band Renaissance’, Louisiana State University Press, 2008.
4. Cameron, A., ‘A Whole Brass Band’, Harbour, 1992.
5. Newsome, R., ‘The Modern Brass Band: From The 1930s To The New Millennium’, Ashgate Publishing, 2006.

UZW353
BRASS BAND III

Course Synopsis

Brass Band III Co-Curriculum course aims to expose the students to both the theoretical and technical aspects of brass musical instruments. The theoretical aspect of the course covers the history, background, terminology, self-management and other related features of brass band, while the technical portion focuses on practical training of playing the brass musical instruments in group.

References

1. Bailey, W. and Caneva, T., ‘The Complete Marching Band Resource Manual: Techniques and Materials for Teaching, Drill Design, and Music Arranging (Plastic Comb)’, University of Pennsylvania Press, 2003.
2. Brand, V. and Brand, G., ‘Brass Bands in the Twentieth Century’, Egon Publishers Ltd, 1979.
3. Burns, M., ‘Keeping the Beat on the Street: The New Orleans Brass Band Renaissance’, Louisiana State University Press, 2008.
4. Cameron, A., ‘A Whole Brass Band’, Harbour, 1992.
5. Newsome, R., ‘The Modern Brass Band: From The 1930s To The New Millennium’, Ashgate Publishing, 2006.

UZW154
ANGKLUNG

Course Synopsis

Angklung Co-Curriculum course seeks to expose the students to both the theoretical and traditional aspects of the traditional art of angklung music. The theoretical aspect of the course covers on the history, background, terminology, self-management and other related to angklung, while the technical portion focuses on practical training (practical) of skills in playing the angklung musical instruments.

References

1. Benary, B., Angklung Sampler Book‘,Self Published, 1993.
2. LLC, B., ‘Indonesian Music: Gamelan, Music of Indonesia, Indonesian Popular Music Recordings, Gamelan Gong Kebyar, Kecak, Angklung, I La Galigo‘, Books LLC, 2010.

3. Nasarudin, M.G., ‘Buku Muzik Tradisional Malaysia Edisi Baharu’, DBP, 2003.
4. Tenzer, M., ‘Balinese Music’, Periplus Editions, 1998.
5. Winitasasmita, M.H., ‘Angklung: Petunjuk praktis‘, Balai Pustaka, 1978.

UZW254
ANGKLUNG II

Course Synopsis

Angklung II Co-Curriculum course seeks to expose the students to both the theoretical and traditional aspects of the traditional art of angklung music. The theoretical aspect of the course covers on the history, background, terminology, self-management and other related to angklung, while the technical portion focuses on practical training (practical) of skills in playing the angklung musical instruments.

References

1. Benary, B., ‚Angklung Sampler Book‘,Self Published, 1993.
2. LLC, B., ‘Indonesian Music: Gamelan, Music of Indonesia, Indonesian Popular Music Recordings, Gamelan Gong Kebyar, Kecak, Angklung, I La Galigo‘, Books LLC, 2010.
3. Nasarudin, M.G., ‘Buku Muzik Tradisional Malaysia Edisi Baharu’, DBP, 2003.
4. Tenzer, M., ‘Balinese Music’, Periplus Editions, 1998.
5. Winitasasmita, M.H., ‘Angklung: Petunjuk praktis‘, Balai Pustaka, 1978.

UZW354
ANGKLUNG III

Course Synopsis

Angklung III Co-Curriculum course seeks to expose the students to both the theoretical and traditional aspects of the traditional art of angklung music. The theoretical aspect of the course covers on the history, background, terminology, self-management and other related to angklung, while the technical portion focuses on practical training (practical) of skills in playing the angklung musical instruments.

References

1. Benary, B., ‚Angklung Sampler Book‘,Self Published, 1993.
2. LLC, B., ‘Indonesian Music: Gamelan, Music of Indonesia, Indonesian Popular Music Recordings, Gamelan Gong Kebyar, Kecak, Angklung, I La Galigo‘, Books LLC, 2010.
3. Nasarudin, M.G., ‘Buku Muzik Tradisional Malaysia Edisi Baharu’, DBP, 2003.
4. Tenzer, M., ‘Balinese Music’, Periplus Editions, 1998.
5. Winitasasmita, M.H., ‘Angklung: Petunjuk praktis‘, Balai Pustaka, 1978.

UZW155
ART OF CREATIVE MOVEMENT

Course Synopsis

Creative movement Co-Curriculum course aims to expose the students to the knowledge of arts creative movement in terms of theoretical skills and technical. In terms of theory, this course is more focused on the history, background, terminology, self-management and other related arts creative movement, while technically, this course is more focused practical training (practical) of skills in the art of creative movement.

References

1. Bossler, C., ‘15 minutes Dance Workout’, London Dorling Kindersley, 2009.
2. Kaufmann, K.A., ‘Inclusive Creative Movement and Dance’, Human Kinetics, 2005.
3. Dora, M.B., ‘See what I can do!: A book of creative movement’, Prentice-Hall, 1973.
4. H’Doubler, M.N. and Mary Alice Brennan, M.A., ‘Dance: A Creative Art Experience’, University of Wisconsin Press, 1959.
5. Whitehouse, M.S., ‘Authentic Movement (v. 1)’, Jessica Kingsley Publishers, 1999.

UZW156
DRAMA, PLAYWRIGHT AND ACTING

Course Synopsis

The drama, playwright and acting co-curriculum course aims to expose the students to the knowledge of drama, theatre in terms of theoretical and technical skills. In terms of theory, this course is more focused on the history, background, terminology, self-management and other related aspects of drama, theatre and arts. The technical terms, this course is more focused on the practical training (practical) skills in drama, theatre and playwright. .

References

1. Adler, S., ‘The Art of Acting’, Applause Books, 2000.
2. Bernard, I., ‘Film and Television Acting, Second Edition: From stage to screen’, Focal Press; 2nd edition, 1997.

3. Comey, J., ‘The Art of Film Acting: A Guide For Actors and Directors’, http://www.amazon.com/Art-Film-Acting-Actors-Directors/dp/0240805070/ref=pd_sim_b_4Focal Press; 1st edition, 2002.
4. Marsh, M., ‘Screen Acting’, Nabu Press, 2010.
5. Tucker, P., ‘Secret of Screen Acting’, New York Routledge, 2003.

UZW191
COMMUNITY SERVICE

Course Synopsis

The community service co-curriculum course fosters community spirit of volunteerism among the students. In addition, the course will also help the process of forming communication network and self-stimulate the intellectual of the community.

References

1. Carole B., ‘Community Care for an Aging Society: Issues, Policies, and Services (Springer Series on Lifestyles and Issues in Aging)’, Springer Publishing Company; 1st edition, 2004.
2. Faizulaswad, ‘Modul perlaksana kursus & seminar Motovasi’, 2003.
3. Faizulaswad, ‘Modul teknik-teknik belajar yang berkesan’, 2003.
4. Kamaruddin Hussin, ‘Modul konsep kumpulan Dinamika & Peranan Fasilitator dalam mengendalikan latihan kumpulan secara berkesan’, 1999.
5. Marlene, G. and Lesser, G., ‘Clinical Social Work Practice: An Integrated Approach’, Allyn & Bacon; 3rd edition, 2007.

UZW192
INITIATIVE & INNOVATION

Course Synopsis

This course intends to train the students to master the basic skill of design and engineering. Additionally, it gives an exposure to students to know ways of using recycling materials, mechanisms that can be used and techniques of designing. This course gives the opportunity to students to spill out ideas that are constructive and apply it in a form of a product, high level of cooperativeness, be responsible and ability to develop student personality that is excellent.

References

1. Ocvirk, Otto G. et al. (1998). Art Fundamentals: Theory and Practice. Boston, Mesachusetts.
2. *Acoustic*.

UZW193
TAJWID

Course Synopsis

This course covers an introduction to the basics of Tajweed knowledge, basic knowledge of the laws of the holy Qur’an is right, and so Talaqqi and practice reading the Quran in mujawwad. Students learn the basic rules and laws fluently, held talks in a feedback session, complete Quran recitation, Tajweed and subsequently apply the knowledge Talaqqi Musyafahah and undergo testing for evaluation.

References

1. Theory and Practice of Tajwid,” Encyclopedia of Arabic Language and Linguistics, IV, Leiden, Brill, 2007
2. Surul Shahbudin bin Hassan (2007). Ilmu Tajwid Hafs ‘An ‘Asim. Kuala Lumpur: Prospecta Printers Sdn. Bhd.
3. Ustaz Mahadi bin Dahlan & Ustaz Azharuddin Sahil (2005). Al-Quran Rasm Uthmani – Bertajwid dan Disertai Makna. Kuala Lumpur: Pustaka Haji Abdul Majid.
4. Haji Abdul Ghani Arifin (2005). Panduan Tajwid & Taranum. Kuala Lumpur: Sarjana Media.
5. Theory and Practice of Tajwid,” Encyclopedia of Arabic Language and Linguistics, IV, Leiden, Brill, 2009

UZW194
ELOCUTION

Course Synopsis

Speech curriculum courses expose students to the purposes, techniques and types of speech. Speech emphasizes interpersonal communication skills, self-confidence, motivation, enthusiasm and accurate information**.**

References

1. Abdullah Hassan & Ainon Muhammad (1994). Bahasa Melayu untuk maktab Perguruan. Kuala Lumpur: Fajar Bakti.
2. Abdullah Hassan (1994) Tatabahasa Dinamika. Kualala Lumpur: Utusan Publication & Distributors.
3. Abdul Halim A. Karim (1992) Pengucapan Awam. Sungai Petani: Intan.
4. Amat Johari Moain (1989) Sistem Panggilan Dalam Bahasa Melayu: Kuala Lumpur: Dewan Bahasa dan Pustaka. 3
5. Ahmad Kamal Mohamad (1992) Kejayaan Berkomunikasi. Kuala Lumpur: Nurin Enterprise.

6. Awang Sariyan (1980) Kesalahan Umum Penggunaan Bahasa Malaysia. Kuala Lumpur: Dewan Bahasa dan Pustaka.

UZW195
CAMPUS RADIO

Course Synopsis

Radio is one of the most effective medium or disseminator of information, and also more extensive compared to TV. Campus Radio curriculum will expose students to the ethics of broadcasting, editing management, recording, and live events. Campus Radio will help students to communicate better and have better ethical in delivering information to the public.

References

1. Multimedia dan Teknologi Komunikasi Edisi Kedua (2005)

UZW196
STUDENT IN-FREE ENTERPRISE (SIFE)

Course Synopsis

SIFE co-curriculum course is to inculcate entrepreneurial culture and foster a sense of community among students. In addition, this course also has 3 elements that are taken to contribute to the entrepreneurial community, education and the environment. It is implemented so that the students can help the community to improve the standard of living for those in need.

References

1. Kuratko, Donald F (2009). *Introduction to Entrepreneurship*, 8th edn, Canada: South Western.
2. Scarborough, Norman M. & Zimmerer, Thomas W (2004). *Esssentials of Entrepreneurship and Small Business Management*, 4th edn, New Jersey: Pearson Education.
3. AB Aziz Yusof (2003). *Prinsip Keusahawanan*, Prentice Hall-Pearson Malaysia Education.
4. AB Aziz Yusof (2000). *Usahawan dan Pengukuhan Jaringan Rakan Niaga, Kedah, Malaysia*: Penerbit UUM.
5. Barringer, Bruce R & Ireland, R. Duane (2008). *Entrepreneurship: Succesfully Launching New Ventures*, 2nd edn, New Jersey: Prentice Hall.

UZW160
ROTU ARMY I

Course Synopsis

Candidates must fulfil the conditions that have been set by ATM Selection Board. Training will start after the candidates have succeeded in the selection test by PALAPES Base and Reserve Team Section. Level I and II aims are to expose students to Basic Military Training (Theory and Practical) and life in camp.

References

1. Modul Latihan dari Kolej Tentera Darat ATM
2. Buku Panduan Senjata-senjata Kompeni, Kementerian Pertahanan Malaysia, 2004
3. Buku Panduan Askar Wataniah, Kementerian Pertahanan Malaysia, 1995

UZW161
ROTU ARMY II

Course Synopsis

Candidates must fulfil the conditions that have been set by ATM Selection Board. Training will start after the candidates have succeeded in the selection test by PALAPES Base and Reserve Team Section. Level I and II aim are to expose students to the Basic Military Training (Theory and Practical) and life in camp.

References

1. Modul Latihan dari Kolej Tentera Darat ATM
2. Buku Panduan Senjata-senjata Kompeni, Kementerian Pertahanan Malaysia, 2004
3. Buku Panduan Askar Wataniah, Kementerian Pertahanan Malaysia, 1995

UZW260
ROTU ARMY III

Course Synopsis

This training is the addition from Level I, II and III. Emphasis made towards the administration leadership principle, planning and grouped training.

References

1. Modul Latihan dari Kolej Tentera Darat ATM
2. Buku Panduan Senjata-senjata Kompeni, Kementerian Pertahanan Malaysia, 2004
3. Buku Panduan Askar Wataniah, Kementerian Pertahanan Malaysia, 1995

UZW261
ROTU ARMY IV

Course Synopsis

This training is the addition from Level I, II and III. Emphasis made towards the administration leadership principle, planning and grouped training.

References

1. Modul Latihan dari Kolej Tentera Darat ATM
2. Buku Panduan Senjata-senjata Kompeni, Kementerian Pertahanan Malaysia, 2004
3. Buku Panduan Askar Wataniah, Kementerian Pertahanan Malaysia, 1995

UZW360
ROTU ARMY V

Course Synopsis

This course is the continuity from Level III and IV. In this level, student is trained to become a head, lead the team in all related to training, administration and social. Student will be evaluated and given the support to be accredited in the Commissioning Ceremony and Certificate Awarding by DYMM SPB Yang Dipertuan Agong.

References

1. Modul Latihan dari Kolej Tentera Darat ATM
2. Buku Panduan Senjata-senjata Kompeni, Kementerian Pertahanan Malaysia, 2004
3. Buku Panduan Askar Wataniah, Kementerian Pertahanan Malaysia, 1995

UZW361
ROTU ARMY VI

Course Synopsis

This course is the continuity from Level III, IV and V. In this level, student is trained to become a head, lead the team in all related to training, administration and social. Student will be evaluated and given the support to be accredited in the Commissioning Ceremony and Certificate Awarding by DYMM SPB Yang Dipertuan Agong.

References

1. Modul Latihan dari Kolej Tentera Darat ATM
2. Buku Panduan Senjata-senjata Kompeni, Kementerian Pertahanan Malaysia, 2004
3. Buku Panduan Askar Wataniah, Kementerian Pertahanan Malaysia, 1995

UZW162
MALAYSIA CIVIL DEFENSE DEPARTMENT I (Kor SISPA I)

Course Synopsis

This course offers basic knowledge and skills of marching, first aid essentials, human blood circulation, fire burns treatment, treatment for bone injuries, joint and muscle pain, treatment of insect bites and poisonous animals, Cardiopulmonary resuscitation, and extrication techniques. The students will learn the theoretical and practical rescue, and also first aid during accidents to enhance the understanding, mentally and physically ready to face any emergency issues.

References

1. Buku Panduan Pengurusan Kor Siswa Siswi Pertahanan Awam (Kor SISPA). (2011) Universiti Teknologi MARA, Shah Alam, Selangor.
2. Pertolongan Cemas: Manual Pelajar. (1999) Federal Publication, Selangor.
3. Ali Nafiah. (2011) Panduan Menyelamatkan Nyawa. Pertolongan Cemas. Shuth Network Sdn. Bhd

UZW163
MALAYSIA CIVIL DEFENSE DEPARTMENT II (Kor SISPA II)

Course Synopsis

This course offers basic knowledge and skills of marching, extrication techniques, rope knots, chainsaw safety operation manual, fire science and firefighting equipment, map and compass reading techniques, first aid management and also security during natural disasters. The students will learn the theoretical and practical rescue and first aid during an accident to enhance the understanding and the mental and physical readiness to face any emergency issues.

References

1. Buku Panduan Pengurusan Kor Siswa Siswi Pertahanan Awam (Kor SISPA). (2011) Universiti Teknologi MARA, Shah Alam, Selangor.
2. Pertolongan Cemas: Manual Pelajar. (1999) Federal Publication Selangor.
3. Ali Nafiah. (2011) Panduan Menyelamatkan Nyawa. Pertolongan Cemas. Shuth Network Sdn. Bhd.

UZW262
MALAYSIA CIVIL DEFENSE DEPARTMENT III (Kor SISPA III)

Course Synopsis

This course offers basic knowledge and skills of marching, National Integrity Plan (NIP), the use of power cutter and hydraulic equipment, tools and techniques of ascending and descending, rescue techniques from high places, the introduction of basic fire-fighting equipment, tools & Basic Trauma Life Support (BTLS) and the introduction of ambulance equipment. The students will learn the theoretical and practical rescue and first aid during an accident to enhance the understanding and the mental and physical readiness to face any emergency issues.

References

1. Buku Panduan Pengurusan Kor Siswa Siswi Pertahanan Awam (Kor SISPA). (2011) Universiti Teknologi MARA, Shah Alam, Selangor.
2. Pertolongan Cemas: Manual Pelajar. (1999) Federal Publication Selangor.
3. Ali NAfiah. (2011) Panduan Menyelamatkan Nyawa. Pertolongan Cemas. Shuth Network Sdn. Bhd

UZW263
MALAYSIA CIVIL DEFENSE DEPARTMENT IV (Kor SISPA IV)

Course Synopsis

This course offers basic knowledge and skills of marching, 999 Emergency services, disaster and crisis management, training management, team management, leadership courses in the organization (PTB), and etiquette and protocol courses. Students will learn the theory and practice of rescue operations and administration of the Civil Defense Department (JPA) to enhance students' understanding of the organizational structure of JPA.

References

1. Buku Panduan Pengurusan Kor Siswa Siswi Pertahanan Awam (Kor SISPA). (2011) Universiti Teknologi MARA, Shah Alam, Selangor.
2. Pertolongan Cemas: Manual Pelajar. (1999) Federal Publication Selangor.
3. Ali NAfiah. (2011) Panduan Menyelamatkan Nyawa. Pertolongan Cemas. Shuth Network Sdn. Bhd

UZW362
MALAYSIA CIVIL DEFENSE DEPARTMENT V (Kor SISPA V)

Course Synopsis

This course offers basic knowledge and skills of marching, management of meetings, characteristics, ethics, leadership, etiquette and protocol, endurance training coaching-skills courses and courses to be officers. The students will learn in theory and practice regarding the management and administration of the Malaysian Civil Defence Department (JPA) team to further enhance the preparedness of the students with the possibility in the future.

References

1. Buku Panduan Pengurusan Kor Siswa Siswi Pertahanan Awam (Kor SISPA). (2011) Universiti Teknologi MARA, Shah Alam, Selangor.
2. Pertolongan Cemas: Manual Pelajar. (1999) Federal Publication Selangor.
3. Ali NAfiah. (2011) Panduan Menyelamatkan Nyawa. Pertolongan Cemas. Shuth Network Sdn. Bhd

UZW164
THE MALAYSIAN RED CRESCENT SOCIETIES CERTIFICATION COURSE I

Course Synopsis

Certified Red Crescent Co-Curriculum course aims to expose the students to both the theoretical and traditional aspects of Certified Red Crescent. The theoretical aspect of the course covers on historical background, terminology, self-management and other related features of Certification by the Red Crescent, while the technical aspects focuses on practical training in terms of skills for the Certification of the Red Crescent.

References

1. Akta Persatuan Palang Merah Malaysia (PERBADANAN), 1965.
2. DK Publishing, 'ACEP First Aid Manual, 3rd Edition', by, DK Adult, 2010.
3. Handal, K.A., 'The American Red Cross First Aid and Safety Handbook', Little, Brown and Company, 1992.
4. Mu'in, H.U., 'Gerakan Palang Merah dan Bulan Sabit Merah Internasional & Perhimpunan Palang Merah Indonesia', Gramedia Pustaka Utama, 1999.
5. Perlembagaan dan Undang-undang Persatuan Palang Merah Malaysia.

UZW165
THE MALAYSIAN RED CRESCENT SOCIETIES CERTIFICATION COURSE II

Course Synopsis

Certification of Red Crescent II Co-Curriculum course aims to expose students in terms of sport science in Certification by the Red Crescent theoretical and technical skills. In terms of theory, this course is focused on historical background, terminology, self-management and other related Certification by the Red Crescent. While technically, this course is focus on practical training (practical) in terms of skills Certification of the Red Crescent.

References

1. Akta Persatuan Palang Merah Malaysia (PERBADANAN),1965.
2. DK Publishing, 'ACEP First Aid Manual, 3rd Edition', by, DK Adult, 2010.
3. Handal, K.A., 'The American Red Cross First Aid and Safety Handbook', Little, Brown and Company, 1992.
4. Mu'in, H.U., 'Gerakan Palang Merah dan Bulan Sabit Merah Internasional & Perhimpunan Palang Merah Indonesia', Gramedia Pustaka Utama, 1999.
5. Perlembagaan dan Undang-undang Persatuan Palang Merah Malaysia.

UZW264
THE MALAYSIAN RED CRESCENT SOCIETIES CERTIFICATION COURSE III

Course Synopsis

Certification of Red Crescent III Co-Curriculum course aims to expose students in terms of sport science in Certification by the Red Crescent theoretical and technical skills. In terms of theory, this course is focused on historical background, terminology, self-management and other related Certification by the Red Crescent. While technically, this course is focus on practical training (practical) in terms of skills Certification of the Red Crescent.

References

1. Akta Persatuan Palang Merah Malaysia (PERBADANAN), 1965.
2. DK Publishing, 'ACEP First Aid Manual, 3rd Edition', by, DK Adult, 2010.
3. Handal, K.A., 'The American Red Cross First Aid and Safety Handbook', Little, Brown and Company, 1992.
4. Mu'in, H.U., 'Gerakan Palang Merah dan Bulan Sabit Merah Internasional & Perhimpunan Palang Merah Indonesia', Gramedia Pustaka Utama, 1999.
5. Perlembagaan dan Undang-undang Persatuan Palang Merah Malaysia.

UZW166
SVPC-1 @STUDENTS VOLUNTARY POLICE CORP

Course Synopsis

The Co-Curriculum course is to form personality and student development that is knowledgeable, disciplined and patriotic, and also possesses good level of police knowledge. The training programme and SVPC Corp activities are by following the training programme and activity that was provided and approved by PDRM. A total of 672 hours needed to comply with the training needs and SVPC Corp activity for commission purposes. Thus, a total of 112 hours of training are needed to fulfil the training requirement in the aspect of Administration/ Management, outdoor activity and academic. The reason the SVPC Corp was established are:

a. To produce a SVPC Corp Police officer that is knowledgeable in relation to law, has the attitude and suitable (police) discipline Able to play a role and responsible efficiently and effective as a SVPC Crop Police Officer.
b. To create civic consciousness and good police relationship with society.
c. Nurture physical resilience, mental and strong personality to face challenge.

References

1. Akta Polis 1967 (Akta 344)
2. Kanun Keseksaan (Akta 574) atau Penal Code (Act 574)
3. Modul Latihan dari PDRM
4. Akta Dadah Merbahaya 1952 (Akta 234)
5. Modul Undang-undang PDRM
6. Akta Penagih Dadah (Rawatan dan Pemulihan) (Akta 283)
7. Buku Panduan Senjata
8. Akta Pencegahan Jenayah 1959
9. Manual Pertolongan Cemas PBSMM
10. Manual Senjata Kecil PDRM

UZW 167
SVPC-2 @STUDENTS VOLUNTARY POLICE CORP

Course Synopsis

This is the addition from the programme that has been implemented in semester one that intends to shape student personality and development that is knowledgeable, discipline and patriotic, and also possess good police knowledge level. The training programme and SVPC Corp activity is followed by the training programme and activity that has been provided and approved by PDRM. Thus, a total of 112 hours of training are needed to fulfil the training requirement in the aspect of Administration/ Management, outdoor activity and academic.

References

1. Akta Polis 1967 (Akta 344)
2. Kanun Keseksaan (Akta 574) atau Penal Code (Act 574)
3. Modul Latihan dari PDRM
4. Akta Dadah Merbahaya 1952 (Akta 234)
5. Modul Undang-undang PDRM
6. Akta Penagih Dadah (Rawatan dan Pemulihan) (Akta 283)
7. Buku Panduan Senjata
8. Akta Pencegahan Jenayah 1959
9. Manual Pertolongan Cemas PBSMM
10. Manual Senjata Kecil PDRM

UZW 266
SVPC-3 @STUDENTS VOLUNTARY POLICE CORP

Course Synopsis

This is the addition from the programme that has been implemented in semester two that intends to shape student personality and development that is knowledgeable, discipline and patriotic, and also possess good police knowledge level. The training programme and SVPC Corp activity is followed by the training programme and activity that has been provided and approved by PDRM. Thus, a total of 112 hours of training are needed to fulfil the training requirement in the aspect of Administration/ Management, outdoor activity and academic.

References

1. Akta Polis 1967 (Akta 344)
2. Kanun Keseksaan (Akta 574) atau Penal Code (Act 574)
3. Modul Latihan dari PDRM
4. Akta Dadah Merbahaya 1952 (Akta 234)
5. Modul Undang-undang PDRM
6. Akta Penagih Dadah (Rawatan dan Pemulihan) (Akta 283)
7. Buku Panduan Senjata
8. Akta Pencegahan Jenayah 1959
9. Manual Pertolongan Cemas PBSMM
10. Manual Senjata Kecil PDRM

UZW267
SVPC-4 @STUDENTS VOLUNTARY POLICE CORP

Course Synopsis

This is the addition from the programme that has been implemented in semester three that intends to shape student personality and development that is knowledgeable, discipline and patriotic, and also possess good police knowledge level. The training programme and SVPC Corp activity is followed by the training programme and activity that has been provided and approved by PDRM. Thus, a total of 112 hours of training are needed to fulfil the training requirement in the aspect of Administration/ Management, outdoor activity and academic.

References

1. Akta Polis 1967 (Akta 344)
2. Kanun Keseksaan (Akta 574) atau Penal Code (Act 574)
3. Modul Latihan dari PDRM
4. Akta Dadah Merbahaya 1952 (Akta 234)
5. Modul Undang-undang PDRM
6. Akta Penagih Dadah (Rawatan dan Pemulihan) (Akta 283)
7. Buku Panduan Senjata
8. Akta Pencegahan Jenayah 1959
9. Manual Pertolongan Cemas PBSMM
10. Manual Senjata Kecil PDRM

UZW366
SVPC-5 @STUDENTS VOLUNTARY POLICE CORP

Course Synopsis

This is the addition from the programme that has been implemented in semester four that intends to shape student personality and development that is knowledgeable, discipline and patriotic, and also possess good police knowledge level. The training programme and SVPC Corp activity is followed by the training programme and activity that has been provided and approved by PDRM. Thus, a total of 112 hours of training are needed to fulfil the training requirement in the aspect of Administration/ Management, outdoor activity and academic.

References

1. Akta Polis 1967 (Akta 344)
2. Kanun Keseksaan (Akta 574) atau Penal Code (Act 574)
3. Modul Latihan dari PDRM
4. Akta Dadah Merbahaya 1952 (Akta 234)
5. Modul Undang-undang PDRM
6. Akta Penagih Dadah (Rawatan dan Pemulihan) (Akta 283)
7. Buku Panduan Senjata
8. Akta Pencegahan Jenayah 1959
9. Manual Pertolongan Cemas PBSMM
10. Manual Senjata Kecil PDRM

UZW367
SVPC-6 @STUDENTS VOLUNTARY POLICE CORP

Course Synopsis

This is the addition from the programme that has been implemented in semester five that intends to shape student personality and development that is knowledgeable, discipline and patriotic, and also possess good police knowledge level. The training programme and SVPC Corp activity is followed by the training programme and activity that has been provided and approved by PDRM. Thus, a total of 112 hours of training are needed to fulfil the training requirement in the aspect of Administration/ Management, outdoor activity and academic.

References

1. Akta Polis 1967 (Akta 344)
2. Kanun Keseksaan (Akta 574) atau Penal Code (Act 574)
3. Modul Latihan dari PDRM
4. Akta Dadah Merbahaya 1952 (Akta 234)
5. Modul Undang-undang PDRM
6. Akta Penagih Dadah (Rawatan dan Pemulihan) (Akta 283)
7. Buku Panduan Senjata
8. Akta Pencegahan Jenayah 1959
9. Manual Pertolongan Cemas PBSMM
10. Manual Senjata Kecil PDRM

UZW168
MALAYSIAN PEOPLE 'S VOLUNTEER CORP I

Course Synopsis

This course exposes students to the introduction of the People's Volunteer Corps (RELA), REAL legislation, union people, the concept of voluntary, external training and marching.

References

1. Abdullah Sanusi Ahmad (1982) "Kerajaan & Pentadbiran Malaysia. "Dewan Bahasa Dan Pustaka, Kuala Lumpur.
2. Abu Saman Abd Kader (1997). "Khidmat Masyarakat (PKJ)". Muzakah FKJ, Institut Teknologi Maklumat, Segamat ,Johor.
3. Jamaludin Badusah et al. (2009). "Pembangunan Pelajar: Memperkasakan Kokurikulum Institut Pengajian Tinggi". Jabatan Pengajian Tinggi dan Penerbit Universiti Putra Malaysia.

UZW169
MALAYSIAN PEOPLE 'S VOLUNTEER CORP II

Course Synopsis

This course exposes students to the introduction of the People's Volunteer Corps (RELA), REAL legislation, union people, the concept of voluntary, external training and marching.

References

1. Abdullah Sanusi Ahmad (1982) "Kerajaan & Pentadbiran Malaysia. "Dewan Bahasa Dan Pustaka, Kuala Lumpur.
2. Abu Saman Abd Kader (1997). "Khidmat Masyarakat (PKJ)". Muzakah FKJ, Institut Teknologi Maklumat, Segamat ,Johor.
3. Jamaludin Badusah et al. (2009). "Pembangunan Pelajar: Memperkasakan Kokurikulum Institut Pengajian Tinggi". Jabatan Pengajian Tinggi dan Penerbit Universiti Putra Malaysia.

UZW268
MALAYSIAN PEOPLE 'S VOLUNTEER CORP III

Course Synopsis

This course exposes students to the introduction of the People's Volunteer Corps (RELA), REAL legislation, union people, the concept of voluntary, external training and marching.
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References

1. Abdullah Sanusi Ahmad (1982) "Kerajaan & Pentadbiran Malaysia. "Dewan Bahasa Dan Pustaka, Kuala Lumpur.
2. Abu Saman Abd Kader (1997). "Khidmat Masyarakat (PKJ)". Muzakah FKJ, Institut Teknologi Maklumat, Segamat ,Johor.
3. Jamaludin Badusah et al. (2009). "Pembangunan Pelajar: Memperkasakan Kokurikulum Institut Pengajian Tinggi". Jabatan Pengajian Tinggi dan Penerbit Universiti Putra Malaysia.

UZW269
MALAYSIAN PEOPLE 'S VOLUNTEER CORP IV

Course Synopsis

This course exposes students to the introduction of the People's Volunteer Corps (RELA), REAL legislation, union people, the concept of voluntary, external training and marching.

References

1. Abdullah Sanusi Ahmad (1982) "Kerajaan & Pentadbiran Malaysia. "Dewan Bahasa Dan Pustaka, Kuala Lumpur.
2. Abu Saman Abd Kader (1997). "Khidmat Masyarakat (PKJ)". Muzakah FKJ, Institut Teknologi Maklumat, Segamat ,Johor.
3. Jamaludin Badusah et al. (2009). "Pembangunan Pelajar: Memperkasakan Kokurikulum Institut Pengajian Tinggi". Jabatan Pengajian Tinggi dan Penerbit Universiti Putra Malaysia.

UZW368
MALAYSIAN PEOPLE 'S VOLUNTEER CORP V

Course Synopsis

This course exposes students to the introduction of the People's Volunteer Corps (RELA), REAL legislation, union people, the concept of voluntary, external training and marching.

References

1. Abdullah Sanusi Ahmad (1982) "Kerajaan & Pentadbiran Malaysia. "Dewan Bahasa Dan Pustaka, Kuala Lumpur.
2. Abu Saman Abd Kader (1997). "Khidmat Masyarakat (PKJ)". Muzakah FKJ, Institut Teknologi Maklumat, Segamat ,Johor.
3. Jamaludin Badusah et al. (2009). "Pembangunan Pelajar: Memperkasakan Kokurikulum Institut Pengajian Tinggi". Jabatan Pengajian Tinggi dan Penerbit Universiti Putra Malaysia.

UZW369
MALAYSIAN PEOPLE 'S VOLUNTEER CORP VI

Course Synopsis

This course exposes students to the introduction of the People's Volunteer Corps (RELA), REAL legislation, union people, the concept of voluntary, external training and marching.

References

1. Abdullah Sanusi Ahmad (1982) "Kerajaan & Pentadbiran Malaysia. "Dewan Bahasa Dan Pustaka, Kuala Lumpur.
2. Abu Saman Abd Kader (1997). "Khidmat Masyarakat (PKJ)". Muzakah FKJ, Institut Teknologi Maklumat, Segamat ,Johor.
3. Jamaludin Badusah et al. (2009). "Pembangunan Pelajar: Memperkasakan Kokurikulum Institut Pengajian Tinggi". Jabatan Pengajian Tinggi dan Penerbit Universiti Putra Malaysia.

UZW120
FIRE AND RESCUE BRIGED I

Course Synopsis

The main purpose of this course is expected to

i. Foster the spirit of loyalty to the organization (UniMAP & Fire Brigade) and the National, independent mark, discipline and willing to provide volunteer services at any time and from any where in need.
ii. Foster and enhance the "soft skills" among students UniMAP
iii. Fire is a threat that there is no war, then this course hopes to promote and provide greater awareness to students and staff about the dangers of fire UniMAP.
iv. Provide knowledge, training, skills to students UniMAP as a precaution and prevention.
v. Enhance the spirit of community among the students served the UniMAP especially when there is a fire threat

References

1. Manual Pertolongan Cemas (BRCS, SJAA, SAA)
2. Manual Bomba dan Penyelamat Malaysia

UZW121
FIRE AND RESCUE BRIGED II

Course Synopsis

The main purpose of this course is expected to

i. Foster the spirit of loyalty to the organization (UniMAP & Fire Brigade) and the National, independent mark, discipline and willing to provide volunteer services at any time and from any where in need.
ii. Foster and enhance the "soft skills" among students UniMAP
iii. Fire is a threat that there is no war, then this course hopes to promote and provide greater awareness to students and staff about the dangers of fire UniMAP.
iv. Provide knowledge, training, skills to students UniMAP as a precaution and prevention.
v. Enhance the spirit of community among the students served the UniMAP especially when there is a fire threat

References

1. Manual Pertolongan Cemas (BRCS, SJAA, SAA)
2. Manual Bomba dan Penyelamat Malaysia

UZW122
GIRL GUIDE I (PPS I)

Course Synopsis

Course curriculum uniformed bodies 1 Girl Guides Association was implemented in two semesters (semester 1 and 2) aims to produce graduates with soft skills through Girl Guides Association program especially in terms of basic knowledge and skills Guides Princess based on teamwork that can be applied in your career or life.

References

1. Ab. Alim Abdul Rahim. (2004). Pengurusan Gerak Kerja Kokurikulum. Kuala Lumpur. Fajar Bakti Sdn. Bhd.
2. Ab. Alim Abdul Rahim. (2004). Panduan Perkhemahan, Simpulan dan Pioneering. Kuala Lumpur. Fajar Bakti Sdn. Bhd.
3. Dasar Pertubuhan dan Undang-undang – Am – Siswi – Pemimpin. (2011). Persatuan Pandu Puteri Malaysia.
4. Persatuan Pandu Puteri Malaysia. (2011). Perlembagaan Persatuan Pandu Puteri Malaysia. Kuala Lumpur.
5. Dasar Pertubuhan dan Undang-undang Perkhemahan Persatuan Pandu Puteri Malaysia (2011).
6. Risalah Upacara dan Istiadat Pandu Puteri. (2011). Persatuan Pandu Puteri Malaysia.
7. Baden - Powell, R. (2005). Ilmu Pengakap Bagi Budak-Budak. (Terjemahan). Batu Caves: Edusystem Sdn. Bhd.
8. Khairul Azman Arshad (2006). Asas Perkhemahan Dan Ikhtiar Hidup. Shah Alam: Fajar Bakti Sdn. Bhd.

UZW123
GIRL GUIDE I (PPS II)

Course Synopsis

Course curriculum uniformed bodies 1 Girl Guides Association was implemented in two semesters (semester 1 and 2) aims to produce graduates with soft skills through Girl Guides Association program especially in terms of basic knowledge and skills Guides Princess based on teamwork that can be applied in your career or life.

References

1. Ab. Alim Abdul Rahim. (2004). Pengurusan Gerak Kerja Kokurikulum. Kuala Lumpur. Fajar Bakti Sdn. Bhd.
2. Ab. Alim Abdul Rahim. (2004). Panduan Perkhemahan, Simpulan dan Pioneering. Kuala Lumpur. Fajar Bakti Sdn. Bhd.
3. Dasar Pertubuhan dan Undang-undang – Am – Siswi – Pemimpin. (2011). Persatuan Pandu Puteri Malaysia.
4. Persatuan Pandu Puteri Malaysia. (2011). Perlembagaan Persatuan Pandu Puteri Malaysia. Kuala Lumpur.
5. Dasar Pertubuhan dan Undang-undang Perkhemahan Persatuan Pandu Puteri Malaysia (2011).
6. Risalah Upacara dan Istiadat Pandu Puteri. (2011). Persatuan Pandu Puteri Malaysia.
7. Baden - Powell, R. (2005). Ilmu Pengakap Bagi Budak-Budak. (Terjemahan). Batu Caves: Edusystem Sdn. Bhd.
8. Khairul Azman Arshad (2006). Asas Perkhemahan Dan Ikhtiar Hidup. Shah Alam: Fajar Bakti Sdn. Bhd.

UZW124
MALAYSIAN ST. JOHN AMBULANCE I

Course Synopsis

This course introduces the basic principles and goals of first aid. Students will explore how to provide assistance in an emergency. They will learn methods of wrapping and pembebatan, as well as how to handle external bleeding and shock conditions. Students will recognize bone fracture, sprain, dislocation, and how to provide emergency treatment for such cases.

References

1. First Aid Manual, 8th edition (2002). Authorised manual of the UK's leading First Aid providers. Great Britain: Dorling Kindersley.
2. Harvey D. Grant, Robert H. Murray, Jr., J. David Bergeron. Emergency Care, 5th Edition. U.S.A.: Prentice-Hall International.
3. Basic Life Support, Guidelines 2005, Handbook for Healthcare Providers, 4th Edition

UZW125
MALAYSIAN ST. JOHN AMBULANCE II

Course Synopsis

This course introduces the basic principles and goals of first aid. Students will explore how to provide assistance in an emergency. They will learn methods of wrapping and pembebatan, as well as how to handle external bleeding and shock conditions. Students will recognize bone fracture, sprain, dislocation, and how to provide emergency treatment for such cases.
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References

1. First Aid Manual, 8th edition (2002). Authorised manual of the UK's leading First Aid providers. Great Britain: Dorling Kindersley.
2. Harvey D. Grant, Robert H. Murray, Jr., J. David Bergeron. Emergency Care, 5th Edition. U.S.A.: Prentice-Hall International.
3. Basic Life Support, Guidelines 2005, Handbook for Healthcare Providers, 4th Edition

UZW126
MALAYSIA UNIVERSITY ROVER TRAINING GROUP I

Course Synopsis

KLKM is an international characteristic uniformed body that teaches about the science of life and survival skills. The students will be exposed to the ethical life settings, cooperation, respect, love fellow human beings and the environment through the appreciation of the Treaty and Scout Law.

References

1. Aktiviti Pengakap muda Malaysia (1990),Ab. Alim dan Balkis, Dewan Bahasa dan Pustaka
2. Panduan kelana siswa (2010), Persekutuan pengakap Malaysia
3. Panduan Pengakap Raja (2008), Ab. Alim, Persekutuan pengakap Malaysia

UZW127
MALAYSIA UNIVERSITY ROVER TRAINING GROUP II

Course Synopsis

KLKM is an international characteristic uniformed body that teaches about the science of life and survival skills. The students will be exposed to the ethical life settings, cooperation, respect, love fellow human beings and the environment through the appreciation of the Treaty and Scout Law

References

1. Aktiviti Pengakap muda Malaysia (1990), Ab. Alim dan Balkis, Dewan Bahasa dan Pustaka
2. Panduan kelana siswa (2010), Persekutuan pengakap Malaysia
3. Panduan Pengakap Raja (2008), Ab. Alim, Persekutuan pengakap Malaysia

UZW128
MALAYSIA UNIVERSITY ROVER TRAINING GROUP I (SEA)

Course Synopsis

This course is also known by other names as Sea Rover Scouts Unit, which is part of the 4th of training in the Organization of Scouting Movement Sea Rover. It is a part of Scout Adults make space for youth in enriching their knowledge. Sea Rover Scouts devoted to follow Rover Wood Badge Leadership Course aims to produce Sea Rover Scout Leaders who are skilled, knowledgeable and qualified in the move The Sea Rover Scouts. This section consists of teens aged 17 to 25 years, offering a variety of activities and skills training in developing human capital individuals directly or indirectly. Convergence is also given to the development of self-awareness which emphasizes self-responsibility, obedience to leaders, organizations, communities and the country as well as providing volunteer services to the community, in accordance with Sea Rover Scout motto of “SERVICE”

References

1. Panduan Pengurusan Kumpulan Latihan Kelanasiswa Laut Malaysia.
2. Panduan Skim Latihan Pengakap Kelana Laut.
3. Panduan Skim Lencana Pengakap Malaysia

UZW129
MALAYSIA UNIVERSITY ROVER TRAINING GROUP II (SEA)

Course Synopsis

This course is also known by other names as Sea Rover Scouts Unit, which is part of the 4th of training in the Organization of Scouting Movement Sea Rover. It is a part of Scout Adults make space for youth in enriching their knowledge. Sea Rover Scouts devoted to follow Rover Wood Badge Leadership Course aims to produce Sea Rover Scout Leaders who are skilled, knowledgeable and qualified in the move The Sea Rover Scouts. This section consists of teens aged 17 to 25 years, offering a variety of activities and skills training in developing human capital individuals directly or indirectly. Convergence is also given to the development of self-awareness which emphasizes self-responsibility, obedience to leaders, organizations, communities and the country as well as providing volunteer services to the community, in accordance with Sea Rover Scout motto of “SERVICE”

References

1. Panduan Pengurusan Kumpulan Latihan Kelanasiswa Laut Malaysia.
2. Panduan Skim Latihan Pengakap Kelana Laut.
3. Panduan Skim Lencana Pengakap Malaysia

UZW177
SPORT SILAT I

Course Synopsis

Sports Silat course introduces and exposes the students with the martial art in terms of theory and practice. Students will learn the background, concepts, equipment and regulations in martial arts and martial arts sports. Students will also be emphasized in terms of self-discipline. In addition, students will learn the basics of martial arts movement, combination of technical and fundamental movements in martial arts.

References

1. Persatuan Silat Kebangsaan Malaysia (PESAKA) (Syarat dan Peraturan Pertandingan Silat Olahraga)
2. Persatuan Silat Kebangsaan Negeri Perlis (PESAKA Perlis)

UZW178
SPORT SILAT II

Course Synopsis

Silat course of this exercise is continued from the course exercise Silat I. This course will explore Silat sport again in theory, ternikal and practical. Students will learn about the art of tying headdress, art sampin bond and basic movement and sports games silat martial art. Students will also be emphasized in terms of self-discipline. In addition, students will learn the basics of coaching workshops sports and martial arts martial arts.

References

1. Persatuan Silat Kebangsaan Malaysia (PESAKA) (Syarat dan Peraturan Pertandingan Silat Olahraga)
2. Persatuan Silat Kebangsaan Negeri Perlis (PESAKA Perlis)

UZW277
SPORT SILAT III

Course Synopsis

Silat course of this exercise is a continuation of the course Silat sport II. This course will explore Silat sport again in theory, ternikal and practical. Students will learn about the art of tying headdress, art sampin bond and basic movement and sports games silat martial art. Students will also be emphasized in terms of self-discipline. In addition, students will learn the basics of coaching workshops sports and martial arts martial arts.

References

1. Persatuan Silat Kebangsaan Malaysia (PESAKA) (Syarat dan Peraturan Pertandingan Silat Olahraga)
2. Persatuan Silat Kebangsaan Negeri Perlis (PESAKA Perlis

UZW112
MALAYSIAN UNIVERSITY ROVER TRAINING GROUP I (AIR)

Course Synopsis

Co-curricular courses uniformed bodies Kelana Student Training Group I with another name Air Scout Unit, which is a newly established unit within the Group Kelana Students in Malaysia. This university is a pioneer in the establishment of the Air Scout. Malaysia is the only university that has the Air Scout. Air Scout Training Scheme will be exposed to the new Air Scout and Leadership courses scouter. Air Scout is comprised of adolescents aged from 17 years up to 25 years old offering a range of activities and skills training in developing human capital of individuals directly or indirectly. Concentration is also given to the development of self-awareness that emphasizes self-responsibility, obedience to the leader, organization, community and volunteerism State and providing services to the public, in line with the Scout motto of "Serving"

References

1. Panduan Pergurusan Pengakap Kumpulan Latihan Kelana Siswa Malaysia
2. Skim Latihan Pengakap Kelana Udara

UZW113
MALAYSIAN UNIVERSITY ROVER TRAINING GROUP II (AIR)

Course Synopsis

Co-curricular courses uniformed bodies Kelana Student Training Group II with another name Air Scout Unit, which is a newly established unit within the Group Kelana Students in Malaysia. This university is a pioneer in the establishment of the Air Scout. Malaysia is the only university that has the Air Scout. Air Scout Training Scheme will be exposed to the new Air Scout and Leadership courses scouter. Air Scout is comprised of adolescents aged from 17 years up to 25 years old offering a range of activities and skills training in developing human capital of individuals directly or indirectly. Concentration is also given to the development of self-awareness that emphasizes self-responsibility, obedience to the leader, organization, community and volunteerism State and providing services to the public, in line with the Scout motto of "Serving"

References

1. Panduan Pergurusan Pengakap Kumpulan Latihan Kelana Siswa Malaysia
2. Skim Latihan Pengakap Kelana Udara

UZW110
STUDENTS VOLUNTARY CORRECTIONAL MALAYSIAN PRISON DEPARTMENT I
(KOR SISKOR I)

Course Synopsis

This course is a preliminary course in the series Prison Teachers Training courses. Through this course, students will be introduced to the prison organization, its history and its importance in the development of the State. At the initial stage, the students will be exposed to activities, training and education syllabus assignment of the role of the Prison Department of Malaysia, as well as providing the relevant disclosure as volunteer basis, the Prison Act 1995 as amended in 2008, REGULATIONS Prison In 2000, United Nations Standard Minimum Rules (UNSMR) and marching exercises.

References

1. Akta Penjara Malaysia. (1995; Pindaan 2008). Undang – undangMalaysia. Kuala Lumpur: Jabatan Penjara Malaysia.
2. Jabatan Penjara Malaysia. (1985). Buku bimbingan penjara. Kuala Lumpur. Unit Perancangan dan Penyelidikan
3. Laporan Tahunan Jabatan Penjara 2010
4. Laporan Tahunan Jabatan Penjara 2011
5. Laporan Tahunan Jabatan Penjara 2012
6. Jamaludin Badusah *et al*. (2009). Pembangunan Pelajar: Memperkasakan Kokurikulum Institut Pengajian Tinggi. Jabatan Pengajian Tinggi & Penerbit Universiti Putra Malaysia
7. Price, D. (1998). Security categorization in prisons. Institute Criminology: Cambridge University
8. United Nations (1957). Standard minimum rules of the treatment of prisoners. New York. United States.

UZW111
STUDENTS VOLUNTARY CORRECTIONAL MALAYSIAN PRISON DEPARTMENT II
(KOR SISKOR II)

Course Synopsis

Undergraduate students Correctional II (SISKOR II) is an extension of SISKOR II where he emphasized the safety of the placement, the placement of detention, the placement service and the placement of recovery (PPI) at the Prisons Department. This Course also emphasizes interpersonal skills and character building of students. Students will be exposed to skills training drills, snap and handling of firearms. In addition, students are given an overview of the compulsory attendance (FGM), involving the community program.

References

1. Akta Penjara Malaysia. (1995; Pindaan 2008). Undang – undangMalaysia. Kuala Lumpur: Jabatan Penjara Malaysia.
2. Jabatan Penjara Malaysia. (1985). Buku bimbingan penjara. Kuala Lumpur. Unit Perancangan dan Penyelidikan
3. Laporan Tahunan Jabatan Penjara 2010
4. Laporan Tahunan Jabatan Penjara 2011
5. Laporan Tahunan Jabatan Penjara 2012
6. Jamaludin Badusah *et al*. (2009). Pembangunan Pelajar: Memperkasakan Kokurikulum Institut Pengajian Tinggi. Jabatan Pengajian Tinggi & Penerbit Universiti Putra Malaysia
7. Price, D. (1998). Security categorization in prisons. Institute Criminology: Cambridge University
8. United Nations (1957). Standard minimum rules of the treatment of prisoners. New York. United States.

UZW210
STUDENTS VOLUNTARY CORRECTIONAL MALAYSIAN PRISON DEPARTMENT III
(KOR SISKOR III)

Course Synopsis

Undergraduate students Correctional III (SISKOR III) is an advanced course SISKOR III which emphasizes the understanding of the Prison Policy, Promoting Prisons Rehabilitation and Housing Intermediate (RP). School Students are also given skills training and marching outside.

References

1. Akta Penjara Malaysia. (1995; Pindaan 2008). Undang – undangMalaysia. Kuala Lumpur: Jabatan Penjara Malaysia.
2. Jabatan Penjara Malaysia. (1985). Buku bimbingan penjara. Kuala Lumpur. Unit Perancangan dan Penyelidikan
3. Laporan Tahunan Jabatan Penjara 2010
4. Laporan Tahunan Jabatan Penjara 2011

5. Laporan Tahunan Jabatan Penjara 2012
6. Jamaludin Badusah *et al*. (2009). Pembangunan Pelajar: Memperkasakan Kokurikulum Institut Pengajian Tinggi. Jabatan Pengajian Tinggi & Penerbit Universiti Putra Malaysia
7. Price, D. (1998). Security categorization in prisons. Institute Criminology: Cambridge University
8. United Nations (1957). Standard minimum rules of the treatment of prisoners. New York. United States..

UZW211
STUDENTS VOLUNTARY CORRECTIONAL MALAYSIAN PRISON DEPARTMENT IV
(KOR SISKOR IV)

Course Synopsis

Undergraduate students Correctional IV (SISKOR IV) is an advanced course SISKOR III which emphasizes the Teachers Training Program Occupational Safety and Parole and Community Services in Prison Institutions that become core bussines in correctional services. Students will be exposed to the knowledge base prison rehabilitation program, theoretical training and practical firearms, Rehabilitation Program, and Internal Security Unit. In addition, students are required to undertake university and community ties.

References

1. Akta Penjara Malaysia. (1995; Pindaan 2008). Undang – undangMalaysia. Kuala Lumpur: Jabatan Penjara Malaysia.
2. Jabatan Penjara Malaysia. (1985). Buku bimbingan penjara. Kuala Lumpur. Unit Perancangan dan Penyelidikan
3. Laporan Tahunan Jabatan Penjara 2010
4. Laporan Tahunan Jabatan Penjara 2011
5. Laporan Tahunan Jabatan Penjara 2012
6. Jamaludin Badusah *et al*. (2009). Pembangunan Pelajar: Memperkasakan Kokurikulum Institut Pengajian Tinggi. Jabatan Pengajian Tinggi & Penerbit Universiti Putra Malaysia
7. Price, D. (1998). Security categorization in prisons. Institute Criminology: Cambridge University
8. United Nations (1957). Standard minimum rules of the treatment of prisoners. New York. United States.

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