UniMAP

Academic GuideBook for Bachelor Degree Programmes

ACADEMIC SESSION 2011-2012

UNIVERSITI MALAYSIA PERLIS

Knowledge Sincerity Excellence

Academic GuideBook for
Bachelor Degree Programmes
ACADEMIC SESSION 2011-2012

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and

Dean of Engineering Schools, Dean of School of Business Innovation & Technopreneurship (PPIPT), Dean of Centre for Communication Technology and Human Development (PTKPI), Dean of Engineering Centre, Dean of Institute of Engineering Mathematics (IMK), Dean of Centre of International Affairs (PHEA), Director of Centre for Industrial Collaboration (CIC), Director of Diploma Programme Unit, Director of Co-curriculum Centre

and

All the staff at Academic Management Division, Deputy Vice-Chancellor (Academic & International) Office, Universiti Malaysia Perlis.

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**From time to time, the university may do some changes on certain aspects of curriculum and academic system in order to fulfil the current needs and requirements. If there are any changes, all students will be informed. All students are subject to the change*

Introduction

The Guidebook for Bachelor Degree Programme (Academic Session 2011/2012) is prepared to assist UniMAP new students in understanding the process and procedure that are related to their study in UniMAP. Students should utilize this book as their major guidance in planning and deciding on courses to be taken from their first until final year of their studies. This guidebook also gives some basic information on the study plan structures, academic systems, list of courses offered together with the synopsis, source of 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.

Currently, UniMAP has 9 schools that offer 24 Degree Programmes and 6 Diploma Programmes. Below are the list of schools and Degree Programmes offered at UniMAP:

List of Schools at UniMAP:

1. School of Microelectronic Engineering
2. School of Computer & Communication Engineering
3. School of Mechatronic Engineering
4. School of Electrical Systems Engineering
5. School of Manufacturing Engineering
6. School of Material Engineering
7. School of Bioprocess Engineering
8. School of Environmental Engineering
9. Centre of Business Innovation and Techno Entrepreneur (PPIPT)

List of Academic Programmes (Degree)

1. Bachelor of Engineering (Microelectronic Engineering)
2. Bachelor of Engineering (Electronic Engineering)
3. Bachelor of Engineering (Computer Engineering)
4. Bachelor of Engineering (Communication Engineering)
5. Bachelor of Engineering (Mechatronic Engineering)
6. Bachelor of Engineering (Mechanical Engineering)
7. Bachelor of Engineering (Electrical System Engineering)
8. Bachelor of Engineering (Industrial Electronic Engineering)
9. Bachelor of Engineering (Manufacturing Engineering)
10. Bachelor of Engineering (Product Design Engineering)
11. Bachelor of Engineering (Material Engineering)
12. Bachelor of Engineering (Metallurgy Engineering)
13. Bachelor of Engineering (Biomedical Electronic Engineering)
14. Bachelor of Engineering (Bioprocess Engineering)
15. Bachelor of Engineering (Environmental Engineering)
16. Bachelor of Engineering (Polymer Engineering)
17. Bachelor of Engineering (Photonic Engineering)
18. Bachelor of Engineering (Bio System Engineering)
19. Bachelor of Engineering (Building Engineering)
20. Bachelor of Engineering (Computer Network Engineering)
21. Bachelor of Engineering (Electrical Power System)
22. Bachelor of Business (Entrepreneurial Engineering)
23. Bachelor of Business (International Business)
24. Bachelor of Chemical Engineering Technology (Biotechnology Industry)

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

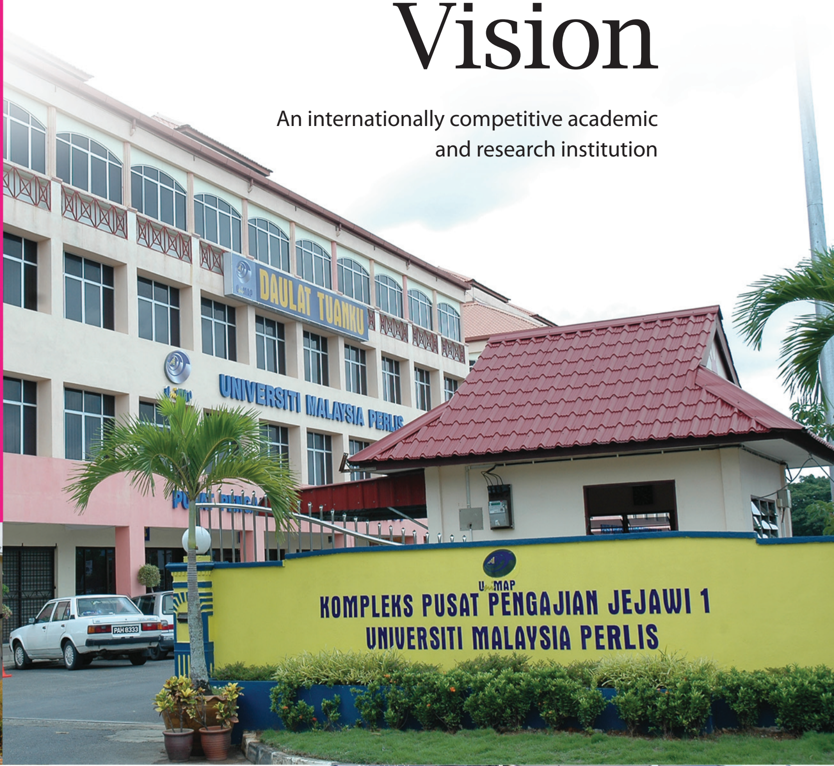
Universiti Malaysia Perlis
Alam Kejuruteraan
Ilmu Keikhlasan Kecemerlangan
Wawasan Jiwa Kita

Mission

To produce a holistic human capital that contributes to the nation's development and industrial competitiveness agenda

Vision

An internationally competitive academic and research institution



UniMAP'S CHANCELLOR

D.Y.T.M. TUANKU SYED FAIZUDDIN PUTRA IBNI TUANKU SYED SIRAJUDDIN PUTRA JAMALULLAIL D.K., S.P.M.P.

CROWN PRINCE OF PERLIS
CHANCELLOR OF UNIVERSITI MALAYSIA PERLIS

UniMAP'S PRO CHANCELLOR

D.Y.T.M TUANKU HAJAH LAILATUL SHAHREEN
AKASHAH KHALIL

PRO CHANCELLOR OF UNIVERSITI MALAYSIA
PERLIS

UniMAP'S PRO CHANCELLOR

Vice Chancellor's Message

Brig. Gen. Dato' Prof. Dr. Kamarudin Hussin
Universiti Malaysia Perlis

> " As a result, graduates of UniMAP are not only capable academically but also equipped with various value added skills and knowledge. "

Bismillah Hirrahman Nirrahim

Assalamualaikum Warahmatullahi Taala Wabarakatuh and a very warm welcome.

First of all I would like to congratulate all of you for being selected to enroll at Universiti Malaysia Perlis. As the Vice-Chancellor of this university I am very pleased to welcome the new intake of students into the family of UniMAP. This university places a great emphasis in inculcating the culture of knowledge, sincerity and excellence. These are the values that we would like to pass on to our dear students and we are comitted to this cause.

As part of ensuring a conducive learning environment and quality in education, we try to cater to every needs of the students. In fact we have gone the extra miles to provide the best using the resources available to us and you can witness swift progress we have made within the span of only nine years of existence. In addition, the university's staff is made up of a wonderful mix of the young and enthusiastic with the more experienced ones, both fuelled with dedication and passion to education.

Regardless of the circumstances and challenges of being a distributed campus, we are proud to see the graduates of this university are well accepted in the industry even some have become successful in their ventures and enterprise. One of the reasons for this success is due to the integration of Soft Skills in teaching and learning and students development activities which include co-curricular programs that are based on the foundation of the 7i-Pillars. Every students of UniMAP are required to complete the seven activities that have been planned in order for them to graduate.

The significance of students' involvement in co-curricular activities and university programs lies in the believe that it will enhance generic skills among the students. This in turn will complete the cycle of education which involves intellectual domain in the build up to the physical, social and emotional development. Aside from that, other elements such as discipline, entrepreneurship, creativity, innovation and appreciation for mother nature are hoped to be sowed into the students through involvements in these activities. As a result, graduates of UniMAP are not only capable academically but also equipped with various value added skills and knowledge.

My dear students, I strongly hope all of you would embrace UniMAP as your home for the next few years and immerse yourself in its educational values. Once again, welcome to UniMAP and **'Carpe Diem!'**

EXCO COMMITTEE

UniMAP EXCO COMMITTEE (PRINCIPAL OFFICERS)

Brig. Jen. Dato' Prof. Dr. Kamarudin Hussin
(Vice Chancellor)

Prof. Dr. Zul Azhar Zahid Jamal
Deputy Vice Chancellor (Academic & International)

Prof. Dr. Ismail Daut
Deputy Vice Chancellor (Research & Innovation)

NOT YET APPOINTED

Registrar

Mrs Saodah Hassan
Bursar

NOT YET APPOINTED

Chief Librarian

UniMAP at a GLANCE

UniMAP was formerly known as Kolej Universiti Kejuruteraan Utara Malaysia (KUKUM). On February 1st, 2007, it underwent a rebranding exercise, whereby its name was changed to Universiti Malaysia Perlis.

This change of name was done due to a number of reasons, the main one being that there is a need to promote a brand new image in terms of academic and research excellence since the University has shown enormous potential in the last five years or so of its establishment. UniMAP has roughly 5715 students and a workforce of approximately 1,723 people comprising academic and non-academic staff. There are 24 Degree programmes, 6 Diploma programmes and 24 Postgraduate programmes leading to the MSc and PhD, all offered through 9 schools.

UniMAP aims to produce highly-skilled engineers who are capable of planning, designing, building, testing, and maintaining devices, systems, and processes, as well as being capable of solving engineering problems in an innovative and creative manner. These qualities, among others, are in line with the characteristics of the 'Global Engineer', as implied in the various engineering education curricular that conform to the internationally accepted Washington Accord. Graduates of UniMAP are expected to not only exhibit excellence in knowledge and skills directly related to their academic fields of study, but are also expected to be proficient in communication and ICT skills, as well as possessing unsurpassed traits of professionalism and patriotism. In addition, they should also be confident enough to explore entrepreneurial possibilities.

Looking at the importance of Engineering Technology, University Malaysia Perlis (UniMAP) taking proactive steps by introducing Engineering Technology which aims to educate and train highly skilled manpower to contribute to achieve high income advanced industrial countries (world class industrial nation). It is also expected to offset the vacancies required by the industry for a professional team called the Engineering Technologists.

The Bachelor of Chemical Engineering Technology (Hons.) (Biotechnology Industry) is a program under the School of Bioprocess Engineering. This programme is the first Engineering Technology offered at UniMAP this academic session.

ACADEMIC CALENDAR 2011/2012 SESSION (DEGREE PROGRAMME)

SEMESTER 1 (12 September 2011 – 22 January 2012) - 19 Weeks			
Registration New Intake	4 September 2011	-	1 Day
Orientation	5 September 2011	11 September 2011	1 Weeks
Lecture	12 September 2011	4 November 2011	8 Weeks
Mid Semester Break	5 November 2011	13 November 2011	1 Weeks
Lecture	14 November 2011	23 December 2011	6 Weeks
Revision Week	24 December 2011	1 January 2012	1 Week
Examination Week	2 January 2012	22 January 2012	3 Weeks
Semester Break	23 January 2012	19 February 2012	4 Weeks

SEMESTER 2 (20 February 2012 – 22 Jun 2012) - 18 Weeks			
Lecture	20 February 2012	6 April 2012	7 Weeks
Mid Semester Break	7 April 2012	15 April 2012	1 Week
Lecture	16 April 2012	1 Jun 2012	7 Weeks
Revision Week	2 Jun 2012	10 Jun 2012	1 Week
Examination	11 Jun 2012	12 Jun 2012	2 Weeks
Semester Break	23 Jun 2012	2 September 2012	10 Weeks

Update: April, 2011
Source: Senate Unit

ADDMISSION REQUIREMENTS

ADMISSION REQUIREMENTS FOR UNDERGRADUATE DEGREE PROGRAM ACADEMIC SESSION OF 2011/2012

MATRICULATION

No.	**(i) Programme** **(ii) Code** **(iii) Programme Duration**	**KPM Matriculation/ UM Foundation Studies in Science/ UiTM Foundation Studies Minimum Requirement**
		University General Requirement Passed the Malaysian Certificate of Education/Sijil Pelajaran Malaysia (SPM)/equivalent with credit in Bahasa Melayu / Bahasa Malaysia or credit in Bahasa Melayu / Bahasa Malaysia July paper; **and** Passed **KPM Matriculation/ UM Foundation Studies in Science/ UiTM Foundation Studies with minimum CGPA 2.00;** **and** Passed with at least Band 1 in Malaysian University English Test (MUET).
1.	Kejuruteraan Mikroelektronik (Microelectronics Engineering) **RK05** (8 Semesters)	**Passed the University General Requirement and Programme Requirement** Passed with minimum **C Grade (2.00)** in Matriculation/Foundation Studies from any of these subjects:- • Physics / Engineering Physics / Chemistry / Engineering Chemistry; **and** • Mathematics / Engineering Mathematics Candidates who do not passed with C Grade in Matriculation/ Foundation Studies for Physics Subject, must at least passed with credit in SPM Physics. **and** Candidates must not be blind or must not have any disability that can harm the labs processes. **(This is also to be offered to the Technical Sciences Matriculation students).**
2.	Kejuruteraan Mekanikal (Mechanical Engineering) **RK08** (8 Semesters)	
3.	Kejuruteraan Pembuatan (Manufacturing Engineering) **RK13** (8 Semesters)	
4.	Kejuruteraan Komputer (Computer Engineering) **RK20** (8 Semesters)	
5.	Kejuruteraan Sistem Elektrik (Electrical System Engineering) **RK23** (8 Semesters)	

6.	Kejuruteraan Mekatronik (Mechatronics Engineering) **RK24** (8 Semesters)	
7.	Kejuruteraan Elektronik Industri (Industrial Electronics Engineering) **RK45** (8 Semesters)	
8.	Kejuruteraan Perhubungan (Communication Engineering) **RK53** (8 Semester)	**Passed the University General Requirement and Programme Requirement** Passed with minimum **C Grade (2.00)** in Matriculation/Foundation Studies from any of these subjects:- • Physics / Engineering Physics / Chemistry / Engineering Chemistry; **and** • Mathematics / Engineering Mathematics Candidates who do not passed with C Grade in Matriculation/ Foundation Studies for Physics Subject, must at least passed with credit in SPM Physics. **and** Candidates must not be blind or must not have any disability that can harm the labs processes. **(This is also to be offered to the Technical Sciences Matriculation students).**
9.	Kejuruteraan Metalurgi (Metallurgical Engineering) **RK56** (8 Semesters)	
10.	Kejuruteraan Bangunan (Building Engineering) **RK82** (8 Semesters)	
11.	Kejuruteraan Rekabentuk Produk (Product Design Engineering) **RK84** (8 Semesters)	
12.	Kejuruteraan Elektronik (Electronics Engineering) **RK86** (8 Semesters)	
13.	Kejuruteraan Fotonik (Fotonic Engineering) **RK89** (8 Semesters)	
14.	Kejuruteraan Rangkaian Komputer (Computer Network Engineering) **RK93** (8 Semesters)	
15.	Kejuruteraan Elektrik Sistem Tenaga (Electrical Energy System Engineering) **RK96** (8 Semesters)	

16.	Kejuruteraan Alam Sekitar (Environmental Engineering) **RK07** (8 Semesters)	**Passed the General University Requirement and Programme Requirement** Passed with minimum **C Grade (2.00)** in Matriculation/Foundation Studies from any of these subjects:- • Physics / Engineering Physics / Chemistry / Engineering Chemistry; **and** • Mathematics / Engineering Mathematics Candidates who do not passed with C Grade in Matriculation /Foundation Studies for Physics Subject, must at least passed with credit in SPM Physics. **and** Candidates must not be blind or must not have any disability that can harm the labs processes. **(This is also to be offered to the Technical Sciences Matriculation students).**
17.	Kejuruteraan Bahan (Material Engineering) **RK12** (8 Semesters)	
18.	Kejuruteraan Bioproses (Bioprocess Engineering) **RK28** (8 Semester)	
19.	Kejuruteraan Polimer (Polymer Engineering) **RK32** (8 Semesters)	
20.	Kejuruteraan Elektronik Bioperubatan (Electronic Biomedical Engineering) **RK85** (8 Semesters)	
21.	Kejuruteraan Biosistem (Biosystem Engineering) **RK90** (8 Semesters)	
22.	Keusahawanan Kejuruteraan (Engineering Entrepreneurship) **RP52** (6 Semesters)	**Passed the University General Requirement and Programme Requirement** Passed with minimum **C Grade (2.00)** in Matriculation/Foundation Studies from any of this subjects:- Passed **KPM Matriculation/ UM Foundation Studies in Science/ UiTM Foundation Studies** /equivalent (**science/arts/technical or accounting stream)** with: **Minimum** C (2.00) **in any of these two** (2) subjects: Science Stream/Technical Stream: **Mathematics / Engineering Mathematics / Physics / Engineering Physics / Chemistry / Engineering Chemistry/ Biology / Computer Science / Civil Engineering Studies/ Electrical & Electronics Engineering Studies/ Mechanical Engineering Studies**

		or Arts/Accounting Stream: Mathematics / Economics / Business Management/ Accounting/ Computer Science And Passed with at least C credit in SPM in these subjects: i) English and **ii) Any one (1) of these subjects:** Fizik/ Kimia/ Biologi/ Matematik/ Matematik Tambahan
23.	Perniagaan Antarabangsa (International Business) **RE09** (6 Semesters)	**Passed the University General Requirement and Programme Requirement** Passed with minimum **C Grade (2.00)** in Matriculation/Asasi from any of this subjects:- Passed **KPM Matriculation/ UM Foundation Studies in Science/ UiTM Foundation Studies** (science/arts/technical or accounting stream) **with:** **Minimum** C (2.00) **in any of these two** (2) subjects: Science Stream/Technical Stream: **Mathematics / Engineering Mathematics / Physics / Engineering Physics / Chemistry / Engineering Chemistry / Biology / Computer Science / Civil Engineering Studies/ Electrical & Electronics Engineering Studies/ Mechanical Engineering Studies** Or Arts/Accounting Stream: Mathematics / Economics / Business Management/Accounting/ Computer Science And Passed with at least C credit in SPM in these subjects: i) English and ii) **Any one (1) of these subjects:** Matematik / Matematik Tambahan / Prinsip Perakaunan / Ekonomi Asas / Perdagangan / Pengajian Keusahawanan

ADDMISSION REQUIREMENTS

ADMISSION REQUIREMENTS FOR UNDERGRADUATE DEGREE PROGRAM ACADEMIC SESSION OF 2011/2012

STPM

No.	**(i) Programme** **(ii) Code** **(iii) Programme Duration**	**STPM Minimum Requirement**
		University General Requirement Passed the Malaysian Certificate of Education/Sijil Pelajaran Malaysia (SPM)/equivalent with credit in Bahasa Melayu / Bahasa Malaysia or credit in Bahasa Melayu / Bahasa Malaysia July paper; **and** Passed Malaysian Higher Certificate of Education/Sijil Tinggi Persekolahan Malaysia (STPM)/equivalent with minimum **CGPA 2.00;** • C Grade (NGMP 2.00) in General Studies; and • C Grade (NGMP 2.00) in other two (2) subjects. and Passed with at least Band 1 in Malaysian University English Test (MUET).
1. 2. 3.	Kejuruteraan Mikroelektronik (Microelectronics Engineering) **RK05** (8 Semesters) Kejuruteraan Mekanikal (Mechanical Engineering) **RK08** (8 Semester) Kejuruteraan Pembuatan (Manufacturing Engineering) **RK13** (8 Semesters)	**Passed the University General Requirement and Programme Requirement** Passed with minimum **C Grade (2.00)** in STPM/equivalent from any of these subjects: • **Physics / Chemistry;** **and** • **Mathematics T / Further Mathematics T**

3.	Kejuruteraan Pembuatan (Manufacturing Engineering) **RK13** (8 Semesters)	Candidates who do not passed with C Grade in STPM Physics, must at least passed with credit in SPM Physics. **and** Candidates must not be blind or must not have any disability that can harm the labs process. **(This is also to be offered to the Technical Sciences Matriculation students).**
4.	Kejuruteraan Komputer (Computer Engineering) **RK20** (8 Semesters)	
5.	Kejuruteraan Sistem Elektrik (Electrical System Engineering) **RK23** (8 Semester)	
6.	Kejuruteraan Mekatronik (Mechatronics Engineering) **RK24** (8 Semesters)	
7.	Kejuruteraan Perhubungan (Communication Engineering) **RK53** (8 Semesters)	**Passed the University General Requirement and Programme Requirement** Passed with minimum **C Grade (2.00)** in STPM/equivalent from any of these subjects: • **Physics / Chemistry;** **and** • **Mathematics T / Further Mathematics T** Candidates who do not passed with C Grade in STPM Physics, must at least passed with credit in SPM Physics. **and** Candidates must not be blind or must not have any disability that can harm the labs process. **(This is also to be offered to the Technical Sciences Matriculation students).**
8.	Kejuruteraan Metalurgi (Metallurgical Engineering) **RK56** (8 Semester)	
9.	Kejuruteraan Bangunan (Building Engineering) **RK82** (8 Semesters)	
10.	Kejuruteraan Rekabentuk Produk (Product Design Engineering) **RK84** (8 Semesters)	
11.	Kejuruteraan Rekabentuk Produk (Product Design Engineering) **RK84** (8 Semesters)	
12.	Kejuruteraan Elektronik (Electronics Engineering) **RK86** (8 Semesters)	
13.	Kejuruteraan Fotonik (Fotonic Engineering) **RK89** (8 Semesters)	

14.	Kejuruteraan Rangkaian Komputer (Computer Network Engineering) **RK93** (8 Semesters)	
15.	Kejuruteraan Elektrik Sistem Tenaga (Electrical Energy System Engineering) **RK96** (8 Semesters)	
16.	Kejuruteraan Alam Sekitar (Environmental Engineering) **RK07** (8 Semesters)	**Passed the University General Requirement and Programme Requirement** Passed with minimum **C Grade (2.00)** in STPM/equivalent from any of these subjects: • **Physics / Chemistry;** **and** • **Mathematics T / Further Mathematics T** Candidates who do not passed with C Grade in STPM Physics, must at least passed with credit in SPM Physics. **and** Candidates must not be blind or must not have any disability that can harm the labs process. **(This is also to be offered to the Technical Sciences Matriculation students).**
17.	Kejuruteraan Bahan (Material Engineering) **RK12** (8 Semesters)	
18.	Kejuruteraan Bioproses (Bioprocess Engineering) **RK28** (8 Semesters)	
19.	Kejuruteraan Polimer (Polymer Engineering) **RK32** (8 Semesters)	
20.	Kejuruteraan Elektronik Bioperubatan (Electronic Biomedical Engineering) **RK85** (8 Semesters)	
21.	Kejuruteraan Biosistem (Biosystem Engineering) **RK90** (8 Semesters)	
22.	Keusahawanan Kejuruteraan (Engineering Entrepreneurship) **RP52** (6 Semesters)	**Passed the University General Requirement and Programme Requirement** Passed with minimum **C Grade (2.00)** in STPM/equivalent from any of these subjects: **Passed STPM/equivalent with at least C (2.00) in any of these two** (2) subjects: Mathematics T / Further Mathematics T / Mathematics S / Physics / Chemistry / Biology / Pengajian Perniagaan / Ekonomi / Perakaunan / Computing

		And **Passed with at least C credit in SPM in these subjects:** i) English and ii) **Any one (1) of these subjects:** Physics/Chemistry Biology / Mathematics / Additional Mathematics.
23.	Perniagaan Antarabangsa (International Business) **RE09** (6 Semesters)	**Passed the University General Requirement and Programme Requirement** Passed with minimum **C Grade(2.00)** in STPM/equivalent from any of these subjects: **Passed STPM/equivalent with at least C** (2.00) **in any of these two** (2) subjects: Mathematics S / Mathematics T / Further Mathematics T / Business Study / Accountings / Economics / Physics / Chemistry / Biology / Computing And **Passed with at least C credit in SPM in these subjects:** i) English and ii) **Any one (1) of these subjects:** Mathematics / Additional Mathematics. / Prinsip Perakaunan / Econoics / Trades/ Business Study / Business Accounting

ADDMISSION REQUIREMENTS

ADMISSION REQUIREMENTS FOR UNDERGRADUATE DEGREE PROGRAM ACADEMIC SESSION OF 2011/2012

DIPLOMA/EQUIVALENT

No.	**(i) Programme** **(ii) Code** **(iii) Programme Duration**	**Diploma/Equivalent Minimum Requirement**
		Passed the Malaysian Certificate of Education/Sijil Pelajaran Malaysia (SPM)/equivalent with credit in Bahasa Melayu / Bahasa Malaysia or credit in Bahasa Melayu / Bahasa Malaysia July paper; **and** Passed Diploma/equivalent that recognised by Malaysian Government and the University Senate; **or** Passed Malaysian Higher Certificate of Education/**STPM for the year 2009 or previous with at least CGPA 2.00** and obtained: • C Grade (NGMP 2.00) Pengajian Am; and • C Grade (NGMP 2.00) in two (2) other subjects: or **Passed Matriculation/Foundation Studies for the year 2009 or previous with at least CGPA 2.00;** and Passed with at least Band 1 in Malaysian University English Test (MUET).
1.	Kejuruteraan Mikroelektronik (Microelectronics Engineering) **RK05** (8 Semesters)	**Passed the University General Requirement and Programme Requirement** **Diploma** Obtained a **Diploma** from any Public Universities/Institusi Pengajian Tinggi Awam (IPTA) or other institutions that is recognised in field that related to the programme applied;
2.	Kejuruteraan Mekanikal (Mechanical Engineering) **RK08** (8 Semesters)	

3.	Kejuruteraan Pembuatan (Manufacturing Engineering) **RK13** (8 Semesters)	Posses at least **CGPA 2.50** at Diploma level. Exemption from subjects that equivalent will be given based on the grades from the diploma level. (Candidates must send their full diploma academic transcripts to UniMAP during application). **or** **STPM/Matrikulasi KPM/PASUM/Asasi UiTM (Year 2009 or previous)** Passed with minimum **C Grade (2.00)** in **STPM/ Matrikulasi KPM/ PASUM/Asasi UiTM/equivalent** from any of these two (2) subjects: • **Physics / Chemistry / Engineering Physics / Engineering Chemistry** **and** • **Mathematics T / Further Mathematics T / Mathematics** Candidates who do not passed with C Brade in STPM Physics, must at least passed with credit in SPM Physics. and Candidates must not be blind or must not have any disability that can harm the labs process.
4.	Kejuruteraan Komputer (Computer Engineering) **RK20** (8 Semester)	
5.	Kejuruteraan Sistem Elektrik (Electrical System Engineering) **RK23** (8 Semesters)	
6.	Kejuruteraan Mekatronik (Mechatronics Engineering) **RK24** (8 Semester)	
7.	Kejuruteraan Elektronik Industri (Industrial Electronics Engineering) **RK45** (8 Semesters)	
8.	Kejuruteraan Perhubungan (Communication Engineering) **RK53** (8 Semesters)	
9.	Kejuruteraan Metalurgi (Metallurgical Engineering) **RK56** (8 Semesters)	
10.	Kejuruteraan Bangunan (Building Engineering) **RK82** (8 Semesters)	
11.	Kejuruteraan Rekabentuk Produk (Product Design Engineering) **RK84** (8 Semesters)	
12.	Kejuruteraan Elektronik (Electronics Engineering) **RK86** (8 Semesters)	
13.	Kejuruteraan Fotonik (Fotonic Engineering) **RK89** (8 Semesters)	

14.	Kejuruteraan Rangkaian Komputer (Computer Network Engineering) **RK93** (8 Semester)	
15.	Kejuruteraan Elektrik Sistem Tenaga (Electrical Energy System Engineering) **RK96** (8 Semester)	
16.	Kejuruteraan Alam Sekitar (Environmental Engineering) **RK07** (8 Semester)	**Passed the University General Requirement and Programme Requirement** **Diploma** Obtained a **Diploma** from any Public Universities/Institutusi Pengajian Tinggi Awam (IPTA) or other institutions that is recognised in field that related to the programme applied; Posses at least **CGPA 2.50** at Diploma level. Exemption from subjects that equivalent will be given based on the grades from the diploma level. (Candidates must send their full diploma academic transcripts to UniMAP during application). or **STPM/ KPM Matriculation/ PASUM/UiTM Foundation Studies (Year 2009 or previous)** Passed with minimum **Gred C (2.00)** in **STPM/ KPM Matriculation/ PASUM/UiTM Foundation Studies /equivalent** from any of these two (2) subjects: • **Physics / Chemistry/ Engineering Physics / Engineering Chemistry / Biology;** **and** • **Mathematics T/ Further Mathematics T / Mathematics** Candidates who do not passed with Gred C Grade in STPM Physics, must at least passed with credit in SPM Physics. and Candidates must not be blind or must not have any disability that can harm the labs process.
17.	Kejuruteraan Bahan (Material Engineering) **RK12** (8 Semesters)	
18.	Kejuruteraan Bioproses (Bioprocess Engineering) **RK28** (8 Semesters)	
19.	Kejuruteraan Polimer (Polymer Engineering) **RK32** (8 Semesters)	
20.	Kejuruteraan Elektronik Bioperubatan (Electronic Biomedical Engineering) **RK85** (8 Semesters)	
21.	Kejuruteraan Biosistem (Biosystem Engineering) **RK90** (8 Semesters)	

22.	Keusahawanan Kejuruteraan (Engineering Entrepreneurship) **RP52** (6 Semesters)	**Passed the University General Requirement and Programme Requirement** **<u>Diploma</u>** Obtained a **Diploma** from any Public Universities/Institusi Pengajian Tinggi Awam (IPTA) or other institutions that is recognised in field that related to the programme applied; Posses at least **CGPA 2.50** at Diploma level. Exemption from subjects that equivalent will be given based on the grades from the diploma level. (Candidates must send their full diploma academic transcripts to UniMAP during application). **or** **<u>STPM/Matrikulasi KPM/PASUM/Asasi UiTM (Year 2009 or previous)</u>** (Science/arts/technical or accounting stream): **Minimum C** (2.00) **in any of these two** (2) subjects: Science Stream/Technical Stream: **Mathematics / Engineering Mathematics / Physics / Engineering Physics / Chemistry / Engineering Chemistry / Biology / Computer Science / Civil Engineering Studies/ Electrical & Electronics Engineering Studies/ Mechanical Engineering Studies** or Arts/Accounting Stream: **Mathematics / Economics / Business Management/ Accounting/ Computer Science**

23.	Perniagaan Antarabangsa (International Business) **RE09** (6 Semesters)	**Passed the University General Requirement and Programme Requirement** **<u>Diploma</u>** Obtained a **Diploma** from any Public Universities/Institusi Pengajian Tinggi Awam (IPTA) or other institutions that is recognised in field that related to the programme applied; Posses at least **CGPA 2.50** at Diploma level. Exemption from subjects that equivalent will be given based on the grades from the diploma level. (Candidates must send their full diploma academic transcripts to UniMAP during application). or **<u>STPM/Matrikulasi KPM/PASUM/Asasi UiTM (Year 2009 or previous)</u>** (Science/arts/technical or accounting stream): **Minimum C** (2.00) **in any of these two** (2) subjects: Science Stream/Technical Stream: **Mathematics / Engineering Mathematics / Physics / Engineering Physics / Chemistry / Engineering Chemistry / Biology / Computer Science / Civil Engineering Studies/ Electrical & Electronics Engineering Studies/ Mechanical Engineering Studies** or Arts/Accounting Stream: **Mathematics / Economics / Business Management/ Accounting/ Computer Science**

ADMISSION REQUIREMENTS FOR UNDERGRADUATE DEGREE PROGRAM ACADEMIC SESSION OF 2011/2012

INTERNATIONAL STUDENTS

Country	General Requirements	Specific Requirements	
China	• Completed 12 years of education in 3 levels of schools (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 equivalent qualification as 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 University Senate.	Bachelor of Engineering	*(Electronic-Based)* • English : 60% • Mathematics : 60% • Physics/Chemistry : 60% *(Bio-Based)* • English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%
Indonesia	• Completed 12 years of education in 3 levels of schools (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 in Senior Secondary @ *Sekolah Menengah Atas* examination.	Bachelor of Engineering	*(Electronic-Based)* • English : 60% • Mathematics : 60% • Physics/Chemistry : 60% *(Bio-Based)* • English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%

Country	General Requirements	Specific Requirements	
	• Obtain TOEFL 525 / IELTS 5.5 / Equivalent *(Candidates who do not possess equivalent qualification as 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 University Senate.	Bachelor of Business	• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%
Saudi Arabia	• Completed 12 years of education in 3 levels of schools (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 equivalent qualification as 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 University Senate.	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%

Country	**General Requirements**	**Specific Requirements**	
Iraq	• Completed 11 or 12 years of education in 3 levels of schools (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 equivalent qualification as 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 University Senate.	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%
Nigeria	• Completed 12 years of education in 2 or 3 levels of schools (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 equivalent qualification as 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 University Senate.	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%

Country	General Requirements	Specific Requirements	
Thailand	• Completed 12 years of education in 3 levels of schools (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 equivalent qualification as 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 University Senate.	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%
Uzbekistan	• Completed 11 or 12 years of education in 2 levels of schools (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 equivalent qualification as 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 University Senate.	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%

Country	General Requirements	Specific Requirements	
Yemen	• Completed 12 years of education in 2 levels of schools (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 equivalent qualification as 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 University Senate.	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%
Somalia	• Completed 12 years of education in 2 levels of schools (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 equivalent qualification as TOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP).*	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%

Country	General Requirements	Specific Requirements	
	- Other requirements that have been endorsed by University Senate.		or Business/ Economics/ Commerce/Accounting : 60%
Mauritius	- Completed 12 years of education in 3 levels of schools (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 equivalent qualification as 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 University Senate.	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%
Sudan	- Completed 11 years of education in 2 levels of schools (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 equivalent qualification as TOEFL 525 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP).*	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%

Country	General Requirements	Specific Requirements	
	• Other requirements that have been endorsed by University Senate.	Bachelor of Business	• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%
Syria	• Completed 12 years of education in 3 levels of schools (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.	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
	• Obtain TOEFL 525 / IELTS 5.5 / Equivalent *(Candidates who do not possess equivalent qualification as 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 University Senate.	Bachelor of Business	• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%
Jordan	• Completed 12 years of education in 2 levels of schools (Basic School and Secondary School / Vocational Secondary School) • Pass and obtain at least 60% in *Al-Tawjihi* @ General Secondary Education Certificate / Vocational Certificate.	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%

Country	General Requirements	Specific Requirements	
	• Obtain TOEFL 525 / IELTS 5.5 / Equivalent *(Candidates who do not possess equivalent qualification as 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 University Senate.		*(Bio-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%
Pakistan	• Completed 12 years of education in 2 levels of schools (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 equivalent qualification as 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 University Senate.	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%

Country	General Requirements	Specific Requirements	
Libya	• Completed 12 years of education in 2 levels of schools (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 equivalent qualification as TOEFL 550 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP).* • Other requirements that have been endorsed by University Senate.	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%
Ethiopia	• Completed 12 or 13 years of education in 3 levels of schools (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 equivalent qualification as 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 University Senate.	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%

Country	General Requirements	Specific Requirements	
Iran	- Completed 12 years of education in 3 levels of schools (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 equivalent qualification as 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 University	Bachelor of Engineering	*(Electronic-Based)*
			- English : 60% - Mathematics : 60% - Physics/Chemistry : 60%
			(Bio-Based)
			- English : 60% - Mathematics : 60% - Physics/Chemistry/Biology : 60%
		Bachelor of Business	- English : 60% - Mathematics : 60% - Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%
Palestine	- Completed 12 years of education in 2 levels of schools (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 equivalent qualification as 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 University	Bachelor of Engineering	*(Electronic-Based)*
			- English : 60% - Mathematics : 60% - Physics/Chemistry : 60%
			(Bio-Based)
			- English : 60% - Mathematics : 60% - Physics/Chemistry/Biology : 60%
		Bachelor of Business	- English : 60% - Mathematics : 60% - Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%

Country	General Requirements	Specific Requirements	
Chad	• Completed 13 years of education in 2 levels of schools (Primary School and Secondary School) • Pass and obtain at least 60% in *Baccalaureat.* • Obtain TOEFL 550 / IELTS 5.5 / Equivalent *(Candidates who do not possess equivalent qualification as TOEFL 550 / IELTS 5.5 are required to undergo Intensive English Course for six (6) months in UniMAP).* • Other requirements that have been endorsed by University	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%
Algeria	• Completed 13 years of education in 2 levels of schools (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 equivalent qualification as 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 University	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%

Country	General Requirements	Specific Requirements	
Bangladesh	• Completed 12 years of education in 2 levels of schools (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 equivalent qualification as 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 University	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics/Physics/ : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%
United Arab Emirates (UAE)	• Completed 12 years of education in 3 levels of schools (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 equivalent qualification as 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 University Senate.	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics/Physics/ : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%

Country	General Requirements	Specific Requirements	
Lebanon	• Completed 12 years of education in 3 levels of schools (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 equivalent qualification as 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 University Senate.	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%
Myanmar	• Completed 11 years of education in 3 levels of schools (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 equivalent qualification as 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 University Senate.	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%

Country	General Requirements	Specific Requirements	
Tunisia	• Completed 13 years of education in 2 levels of schools (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 equivalent qualification as 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 University Senate.	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics/Physics/ : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%
Cameroon	• Completed 14 years of education in 2 levels of schools (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 equivalent qualification as 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 University Senate.	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics/Physics/ : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%

Country	General Requirements	Specific Requirements	
Egypt	• Completed 11 or 13 years of education in 3 levels of schools (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 equivalent qualification as 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 University Senate.	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%
Cambodia	• Completed 12 years of education in 3 levels of schools (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 equivalent qualification as 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 University Senate.	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%

Country	General Requirements	Specific Requirements	
Vietnam	• Completed 12 years of education in 3 levels of schools (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 equivalent qualification as 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 University Senate.	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics/Physics/ : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%
Turkey	• Completed 12 years of education in 2 levels of schools (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 equivalent qualification as 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 University Senate.	Bachelor of Engineering	*(Electronic-Based)*
			• English : 60% • Mathematics : 60% • Physics/Chemistry : 60%
			(Bio-Based)
			• English : 60% • Mathematics : 60% • Physics/Chemistry/Biology : 60%
		Bachelor of Business	• English : 60% • Mathematics/Physics/ : 60% • Physics/Chemistry/Biology : 60% or Business/ Economics/ Commerce/Accounting : 60%

ACADEMIC SYSTEM

The Bachelor of Engineering curriculum is designed to be completed in four years while the Bachelor in Business is to be completed in three 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 that are offered in Bachelor in Engineering programme are divided into four levels which are level 100,200,300, and 400 that are equivalent to Year 1, 2, 3 and 4.

For the purposes of graduation, Bachelor of Engineering students must undergo for 120 units Core Courses while Bachelor of Business students must undergo for 72 or 74 units of Core Courses (taken according to specialization) and 30 units of Elective Courses. Students also need to take University's core courses of 15 units for Bachelor of Engineering and 18 units for Bachelor of Business.

Students are also required to submit a copy of Malaysian University English Test (MUET) result as a requirement to graduate. Students also need to obtain at least a C grade for the University's Core Course (W) and at least a grade D for Core Courses (T) and a minimum of 2.00 CGPA before they are eligible to be considered for the award of a degree.

PROGRAMME STRUCTURE

Bachelor of Engineering and Bachelor of Business programme structures are clustered as shown in the following table. Students are required to undergo 135 units (Bachelor of Engineering) and 120 or 122 units (Bachelor of Business) in order to graduate as shown in **Figure 1.**

Figure 1 – Programme Structure

BACHELOR OF ENGINEERING	
COURSES	**UNIT (S)**
ENGINEERING CORE COURSES	**120**
UNIVERSITY CORE COURSES	**15**
a. Engineering Entrepreneurship	2
b. Thinking Skills	2
c. University Malay Language	2
d. University English Language	2
e. Islam and Asian Civilization	2
f. Ethnic Relations	2
g. Co- Curriculum	1
h. Optional Course	2
TOTAL	**135**

BACHELOR OF BUSINESS (ENGINEERING ENTREPRENUERSHIP)	
COURSES	**UNIT (S)**
BUSINESS CORE COURSES	**72**
UNIVERSITY CORE COURSES	**18**
a. Engineering Entrepreneurship	2
b. Thinking Skills	2
c. University Malay Language	2
d. University English Language	2
e. Islam and Asian Civilization	2
f . Ethnic Relations	2
g. Skills and Technology in	2
Communication	3
h. Business Communication	
i. Co- Curriculum	1
ELECTIVES	**30**
TOTAL	**120**

BACHELOR OF BUSINESS (INTERNATIONAL BUSINESS)	
COURSES	**UNIT (S)**
BUSINESS CORE COURSES	**74**
UNIVERSITY CORE COURSES	**18**
a. Engineering Entrepreneurship	2
b. Thinking Skills	2
c. University Malay Language	2
d. University English Language	2
e. Islam and Asian Civilization	2
f . Ethnic Relations	2
g. Skills and Technology in Communication	2
h. Business Communication	3
i. Co- Curriculum	1
ELECTIVES	**30**
TOTAL	**122**

TYPES OF COURSES

I. Core Courses (Bachelor of Engineering)
Core Courses consist of engineering courses that are compulsory to be taken by students according to their major. These courses are part of the requirements for graduation. Students who fail the Core Courses must repeat them before they can graduate.

II. Core Courses (Bachelor of Business)
Bachelor of Business Core Courses is divided into two groups which are (i) Business Core Courses and (ii) Programme Core Courses.

Business Core Courses consist of contemporary courses in business field which are compulsory to be taken by business students while Programme Core Courses are offered according to the student's major.

These courses are part of the graduation criteria. Students who fail any of the core courses must repeat them before they can graduate.

III. Elective Courses (Bachelor of Business)
Students can choose elective courses according to the fields that they are interested in.

IV. University Courses
University Courses are courses outside of the student's major. These courses are offered by the Centre for Communication Skills and Entrepreneurship. Some of these courses are compulsory while others are optional.

V. Optional Courses
Optional Courses are any courses which are offered by the Centre for Communication Skills and Entrepreneurship other than the 13 compulsory units from University Courses as listed in Figure 1 (Bachelor of Engineering). Students need to complete two units of Optional Courses.

Optional Courses calculations are as follows: students who took two units of Foundation English (EUW112) before taking University English Language (EUW212) are considered to have fulfilled a unit of Optional Courses or, students who took 3 units of Co-Curriculum – (only one unit are compulsory) are considered to have fulfilled the Optional Courses.

DEFINITION AND VALUE 'CREDIT 'AND 'UNIT '

In UniMAP, credit' and 'unit' are used as if they carry the same meaning. 'Unit' changes to 'credit' after students have passed a subject.

Core Courses that are offered consist of theory and practical. The contact hours are as follows:

I. Theory Component
One unit of theory component is equivalent to 1 hour of lecture/ tutorial/ reading per week or 14 hours per semester.

II. Practical Component
One unit of practical component is equivalent to 2 contact hours in a week or 28 hours in a semester.

TEACHING AND LEARNING APPROACHES AT UniMAP

Bachelor of Engineering

UniMAP places great emphasis on teaching and learning approaches, be they theoretical or practical, which are in tandem with industrial development. Students' understanding of a theoretical component is enhanced through practical learning session apart from product design, problem solving, team-work, preparation and presentation of reports.

Generally, a four unit core course comprises three units of theory component and one unit of practical component. One unit of the theory component normally comprises one-hour of lecture while the one unit of practical component usually comprises two hours of lab work. Due to logistical restrictions, these courses are arranged in a such a way that for the four-unit course, students will undergo a two-hour lecture followed by two hours of lab work followed by another hour of lecture in a week. Some of the courses offered are 100% lab oriented courses.

For most of the core courses, students are required to complete a mini project and sit for an exam or viva at the end of the semester.

The practical components consist of the following teaching and learning models:

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

- **Teaching Factory Learning** – a group of students consisting of five to six students will carry out a process run using actual scale equipment used in the industry.

- **E- Learning** – Learning approach that is reinforced using ICT that is equipped with the latest conventional learning apparatus. Students learn the course or selected topics using moduls that can be accessed directly from the UniMAP website. These modules consist of lecture notes in multimedia format using audio, video, graphic, animation, simulation, games and numerous interaction–oriented activites.

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

Industrial Training

Industrial Training is a 6 unit course. 3rd year Engineering students are required to undergo 12 weeks of industrial training in order to get 6 credits for this course. An average of 8 contact hours per day for 5 days in a week, which is 8 hours per day X 5 days = 40 hours per week, is regarded as contact hours evaluation (working hours for designated organization/corporation)

The main objectives of the Industrial Training are to:

- Instill professionalism among the students
- Give awareness to students on the importance and connection between the industrial training, laboratory work and engineering theories.
- Provide early exposure on the industrial environment and practices to the students. 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 Collaboration (CIC) is also coordinating the following programmes that require industries' involvement:

1. **Industrial Exposure (IndEx)**
   - Short term exposure programme – 1 day
   - Experts, managers and engineers from the industry are invited to give talks, briefings, demonstrations and dialogues according to the dates given.
   - Involves visits to the industry
   - This exposure is only for students who have completed their first academic session.

2. **Industrial Entrepreneurship Exposure (IndEnt)**
   - Short term exposure programme – 1 day
   - Involvement of small sector industries, R&D firms and government bodies such as the

Ministry of Entrepreneur Development.
- Includes demonstrations, dialogues and briefings
- Involves only second year students.

BACHELOR OF BUSINESS (ENGINEERING ENTREPRENEURSHIP)

This programme is based on a three-year coursework that is equivalent to six semesters on a full-time basis. The teaching and learning approaches for this programme not only cover lectures and tutorials but also practical training via the Business Incubator Programme. After the fourth semester, the students will participate in the Business Incubator Programme for twelve (12) weeks. They will earn 6 credit hours.

Students are mentored by companies in business incubators. This will give them the opportunity to be part of the team involved in product development which may even lead to commercialisation. They should 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 Business Incubator Programme, students are required to prepare a report on their experience throughout the Business Incubator Programme that they have undergone 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). Among its members include Technology Park Malaysia, Malaysian Technology Development Corporation, Sirim and Kulim Technology Park Corporation. UniMAP works closely with these organisations to warrant the success of the programme.

BACHELOR OF BUSINESS (INTERNATIONAL BUSINESS)

This programme is based on a three year coursework that is equivalent to six semesters on a full time basis. The teaching and learning methods comprise lectures, tutorials and practical (via industrial training and *International Business Field Trips)*.

During the second and fourth semester, students will undergo industrial training. Students have two options to choose which is Option 2+2 or 3+1. For the 2+2 option, students will undergo two phases (2 months +2 months) of industrial training in selected multinational companies in Malaysia. Moderation will be conducted with collaboration from the UniMAP Centre for Industrial Collaboration. In the second option which is the Option 3+1, students will undergo industrial training in the selected multinational companies in Malaysia for the first three months and go for an educational trip overseas during the last month. Students are given the freedom to choose any of the two options given for their industrial training according to their interest and financial abilities. Apart from industrial training, students also have to prepare their final year project in their third year of study (semester 5 and 6). The Final Year Project consists of 6 credit hours.

UNIVERSITY CORE COURSES

I. **Engineering Entrepreneurship (2 units)**
Students are required to take two units of Engineering Entrepreneurship course. Students are advised to take other courses in ‘entrepreneurship’ category, whereby the units that are collected will be counted as Optional Courses. Students need to pass with at least a C.

II. **Ethnic Relations (2 units)**
Two units of Ethnic Relation course is compulsory for all students. Students need to pass with at least a C.

III. **Islam and Asian Civilization (2 units)**
Islam and Asian Civilization is compulsory for all students. Students need to pass with at least a C.

IV. **University Malay Language (2 units)**
Two units of University Malay Language course is compulsory and is a requirement for graduation. Students need to pass with at least a C.

V. **University English Language (2 units)**
Two units of University English Language course is compulsory and is a requirement for graduation. However, students who acquired band 1,2 and 3 in MUET need to take Foundation English before enrolling for University English. The two extra units from Foundation English are counted as Optional Courses. Students need to pass with at least a C for University English Language.

VI. Thinking Skills (2 units)
It is compulsory for students to take 2 units of Thinking Skills course. Students need to pass with at least a C.

VII. Skills and Technology in Communication (2 units)
It is compulsory for students to take 2 units of skills and technology in communication course. Student need to pass with at least C.

VIII. Business Communication (3 units)
Students from Bachelor of Business need to take this course and pass with at least a C.

IX. Co- Curriculum Programme
Students need to undergo at least one unit of co-curriculum throughout their study in UniMAP. Only 3 units are required for graduation. One unit is compulsory while the other 2 units are considered as Optional Courses.

COURSE CODE

Each course has its own code. The first letter in the code is 'E' which stands for Bachelor. The second letter shows the faculty while the third letter shows whether the courses are Core Courses or University Core Courses.

Figure 2 shows the letters that are used for each faculty.

Figure 2– Course Code and Faculty.

Second letter 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
U	Centre for Communication Skills and Entrepreneurship
C	Engineering Centre
Q	Institute of Engineering Mathematics
I	Centre for Industrial Collaboration
F	Centre of Business Innovation and Techno Entrepreneur (PPIPT)
U	Centre for Communication Technology and Human Development (PTKPI)
Z	Co-Curriculum Centre
T	School of Engineering Technology

The three last course codes represent the following – the first number is the level of course. The second and third numbers are the course number. The codes are simplified in Figure 3 :-

Figure 3– Course Code and Faculty.

A	B	C	1	2	3	2	COURSE NUMBER	
↓	↓	↓	↓	↓	↓	↓		
↓	↓	↓	↓	↓	↓	↓	**LEVEL**	**COURSE**
↓	↓	↓	↓	↓	↓	→	4 =	Level 400
↓	↓	↓	↓	↓	└	→	3 =	Level 300
↓	↓	↓	↓	└	→	→	2 =	Level 200
│	│	│	└	→	→	→	1 =	Level 100
↓	↓	└	→	→	→	→	**TYPES**	**COURSE**
↓	↓						T =	Core
↓	↓						W =	University Core
↓	└	→	→	→	→	→	**FACULTY**	(refer Figure 2)
└	→	→	→	→	→	→	**E**	Bachelor of Engineering
							B	Bachelor of Business

COURSE REGISTRATION

All students are required to register for the course offered at a date specified by the University. Course registration is done online by all UniMAP students. Senior students will register according to the students' preceding semester results [after the results have been announced]. Subjects taken for the subsequent semester shall be registered before the end of the compulsory registration period [2 weeks] / fourteen days (14th) of the current semester.

All the active students are allowed to registered not more than twenty two [22] units and not less than ten [10] units except for those whose involve in Industrial Training and the final year students. For the students who wish to registered more than twenty two [22] units, they have to get the approval from the Academic Advisor with the confirmation by the Dean. Students must also fill the HEA-09a form [Borang Pendaftaran Kursus].

New students will register online on the specified date during the orientation week according to their School. Students will be briefed about the courses in the orientation week with the School. Students who are extending must register in the next semester.

Students who failed to register subjects within the specific period of time are subject to a penalty RM50. Late registration shall not exceed the third week [3rd] of the compulsory registration period. The students must fill the HEA-09 [Borang Pendaftaran Kursus Lewat] and must have the approval from the Dean.

It is a compulsory for the student to meet with their Academic Advisor after registration together with the printed registration slip. The Academic Advisor will validate / not validate the subject registered by the students. If the Academic Advisor approves of the course registered by the students, then validation will be made in the system. Upon the approval of a student's subject registration by the Academic Advisor, the student can print out the corrected subject registration slip. If the Academic Advisor disagrees with the courses registered by the students, then the students should re-register. Only with the Academic Advisor's consent will the student registration be valid.

It is the responsibility of the students to check and ensure that all particulars stated in the Subject Registration Slip are correct.

PROBATION STUDENT REGISTRATION [P]

Student with the probation status are not allowed to register online by them self. The students must meet up with their Academic Advisor get the confirmation from the Dean and filling the HEA-09b form [Borang Pendaftaran Kursus-Percubaan (P)] before handling it to the School or Registrar Office to register the subjects. Only the Assistant Registrar of School / Registrar Office were given the right to register the subjects. Probation students are only allowed to take the maximum of 12 units and minimum of 10 units.

ADD/DROP/WITHDRAWAL COURSE

It is compulsory for students to log in into the registration system at the beginning of the semester to check their registration status. Students are allowed to do add / drop course by online for 2 weeks. Students may add / or drop subjects up to the second (2) week of the Semester. After the add / drop online week ended, the student must fill the HEA-11 form [Borang Tambah Kursus] before handing it to the School or Registrar Office to register the subjects.

After add / drop session ended, the students are allowed to drop a course starting from the 2nd week until the sixth week by using the HEA-10 form [Borang Gugur Kursus]. Students must have the Dean's approval for the form before handing it to the Registrar to be recorded. The form can be obtained from the Registrar, School or portal.

After the drop session ended, the students are allowed to withdraw from the course after the sixth week (not exceeding the 14th week or before the examination week) by filling the HEA-19 form [Borang Tarik Diri] and will be penalized RM50 for each course. Students must have the Dean's approval for the form before handing it to the Registrar to be recorded. The form can be obtained from the Registrar, School or portal. Students must take note that even though they have withdrawn from the course, the registration of the course [withdrawn course] will be appeared in the student transcript. However, the grade will not be included in the calculation of GPA and CGPA.

CHANGE OF PROGRAMME

Change of programme is not encouraged because 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 as follows:

- Application can only be done by students who have completed at least the first semester. Students must fill in completely *Borang Permohonan Pertukaran Program Pengajian / Change of Programme Application Form (HEA-12)*. The form can be obtained at the Registry Department or at Schools. However, for special cases, application to change the programme in the first semester can be done, subjected to approval by the Vice Chancellor or Deputy Vice Chancellor (Academic & International).

- Application must be presented within the first two weeks of the semester.
- Concrete reasons need to be given in written form and must be attached together with recommendation letter from both the Dean and RPS of current and applied schools.
- Every application that has been recommended by the Dean of current and applied schools must be verified by the Dean of Academic Affairs, followed by an approval by Vice Chancellor / Deputy Vice Chancellor (Academic & International) before it is officially recorded by the Registry Department (Students Admission & Records Unit).
- For students who obtain schorlarships or PTPTN or other types of sponsorships, they must get approval from their respective sponsors. Students need to deal directly with their sponsors or seek advice from Student Affairs and Alumni Department.

POSTPONEMENT OF STUDY

Application to postpone a study is permitted for students who have health problem and are verified of being ill by government hospitals or University's panel doctors only. Application made because of other reasons can be given consideration if it is reasonable, and is recommended by RPS, Dean of School, Dean of Academic Affairs, and last but not least, approved by the Vice Chancellor / Deputy Vice Chancellor (Academic and International).

Students can apply for postponement of study by filling in Borang Penangguhan Pengajian / Postponement of Study Application Form (HEA/HEP-13) which can be obtained from Registry Department or at their respective schools. Application should be submitted to the Dean of the School. The Dean has the right to request the student to consult a counsellor (if necessary) before making a decision.

Application for postponement of study should be submitted before the seventh week of an academic session, except those with written approval. Application made after that period will only be allowed for medical reasons and is verified by government hospitals or University's panel doctors. Students are not allowed to postpone their studies more than two semesters consecutively.

Application for postponement of study from international students must be accompanied by letter of recommendation from their sponsors (for sponsored students only).

For students who postpone their studies due to health problem, the applied semester will not be counted for graduation (without penalty). Students who postpone their studies due to other problems apart from health problem, the semester will be counted for graduation (with penalty) unless permitted otherwise. Students who suffer from a long term health problem which may hinder their studies, can be considered to be terminated from continuing their studies upon recommendation from government hospitals or University's panel doctors.

A warning letter will be issued to students who do not register for present semester without submitting any application to postpone their studies. Students who fail to sumbit postponement application for a certain period of time will be terminated from the university. Their names will be dropped from List of Registered Students and verified of being quitted.

STUDENT STATUS

A student's status cannot be directly determined according to the year of study. It is determined based on the accumulated credit units. The details are listed in **Table 4 (a)** and **Table 4 (b):**

Table 4 (a) Determinant of Student Status (Bachelor of Engineering)

Year 1	Year 2	Year 3	Year 4
0 – 36 unit	37 – 73 unit	74 – 106 unit	107 – 135 unit

Table 4 (b) Determinant of Student Status (Bachelor of Business)

Year 1	Year 2	Year 3
0 – 40 unit	41 – 80 unit	81 – 122 unit

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 those students who are allowed to take the Curative Course (course offered during long semester break), their curative course 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 not good, it maintained the standard of Semester II.

A student with GPA less 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 less than 2.00 for two consecutive semesters. If the GPA of students still get a GPA of less than 2.00 for the following semester, the student will not be allowed to continue with their studies, except if the CGPA of students exceeding 2.00, and the University approval. The University authorities have the right to terminate any students who do not perform and fulfil the academic requirements stated by the university.

STUDENT'S MINIMUM AND MAXIMUM PERIOD OF STUDY

Bachelor of Engineering Students have to complete their period of study within the duration given that is within the minimum 8 semesters (4 years) or the maximum 14 semesters (7 years). However, for students who are given unit exemptions, the maximum duration given to complete their periods of study cannot be less than 6 semesters (3 years) and not more than 12 semesters (6 years).

CURATIVE COURSES

Curative Courses are held after the second semester. Registration for curative courses are very limited and depends on the particular course is offered from the School and the Senate. Students must fill in the HEA-09c [Borang Pendaftaran Kursus Kuratif]. Students are only allowed to take a maximum of 10 units at one time. The learning and teaching of these curative courses are in the form of tutorials. The curative course normally comprises 2 weeks of tutorial and 1 week of examination.

EXEMPTION OF UNITS

The provision of Credit Exemption according to the Academic Regulations of a semester system is for the purpose of giving recognition to a student's prior learning. A Credit Exemption is the total credit exempted for the conferment of a Diploma / that is given based on the academic qualification of Diploma as approved by the University. Credit Exemption is given to a student who has obtained the minimum grade of C+ in a subject according to the University grade system and subject to terms and conditions determined by the University.

A student who has attended a similar or equivalent subject with 1/3 similar learning content and passed with a minimum of C+ according to the grading system of the University may be given Credit Exemption. The application for the relevant courses can be merged [2 courses or more] for one course in UniMAP to be exempted. Exemptions for Bahasa Melayu, Bahasa Inggeris dan co-curriculum are not allowed.

Exemptions for Tamadun Islam and Tamadun Asia only can be done for students who have taken TITAS as long as it is the same name with the same unit or more. SPM results cannot be taken into consideration for exemption. Students will not be allowed to apply the exemption for Industrial Training.

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 others before being eligible to sit for an exam. The duration for exams is as follows:

Figure 5 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 consists of 100% if the entire course is lab structured. Coursework consists of assignments, lab reports and test. Students' achievement evaluation is based on letter grades and points as follows:

Figure 6– 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	**CONDITIONAL PASS**
D+	1.50	
D	1.00	**FAIL**
D-	0.75	
F	0.00	

APPEAL TO RE- CHECK EXAMINATION RESULTS

On certain occasions, students might want to apply for a re-check on their examination result. Students are only allowed to appeal for a re-check 15 days after examination results are released officially by the Registrar. Application after this duration will not be entertained.

If the student is still unsatisfied with his/her grades, he/she can apply for an "appeal to re-check the course" so that his/her examination answer script will be re-marked.

Figure 7 – Calculation of GPA and CGPA:

Courses	Units	Vale Grade [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				

$$\text{CGPA} = \frac{\text{Total Accumulated Grade Value}}{\text{Total Accumulated Unit}}$$

$$= \frac{62.00 + 59.75}{20 + 18}$$

$$= 3.20$$

Students can obtain the forms needed for this process from their Faculty. This will need to be filled in two copies.

Students will be charged RM50 per course for their appeal. Payment in cash or postal orders is to be directed to the Bursary. Students will have to keep one copy of the forms.

ENGLISH LANGUAGE USAGE

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

ACADEMIC ADVISOR AND BUDDY SYSTEM

Academic Advisor and Buddy System or RPS connects students and lecturers to discuss and decide on students' study plan. Even though the registration is done online, students are advised to meet with their Buddy or Academic Advisor during the registration exercise.

RPS is a system where academic staff supervise small group of students for the whole duration of the students' stay in UniMAP. 'Supervision' here entails frequent meetings under informal settings, where students can relax with their staff ("buddies") and discuss academic and social issues that concern them. Students who do not hold satisfactory academic performance look to their buddies as 'mentors', in which case the student becomes the 'mentee' of the buddy, who helps the student out every step of the way.

ACADEMIC SUPPORT CENTRES

These centres are established to support UniMAP in terms of achieving academic excellence.

I. Centre for Communication Skills and Entrepreneurship

Beginning Semester 1, Academic Session 2009/2010, this Centre will be offering the Bachelor of Business degree programmes while at the same time it will still offer the University Core Courses.

II. Engineering Centre

The Engineering Centre was established to manage labs and common workshops that are needed for courses that are offered in UniMAP.

Engineering Centre also supports research and design in UniMAP. A few courses are offered here such as Basic Engineering Skills that is compulsory for all students from PPK Electric, PPK Microelectronic and PPK Computer & Relations.

III. Institute of Engineering Mathematics

The Institute of Engineering Mathematics is a centre for planning and handling engineering mathematics curriculum in UniMAP. It also serves as as a reference centre in providing expertise in mathematical research method, simulation and statistical method. IEM also serves as a training center for in-campus and out-campus personnels in fields related to mathematics.

IV. Centre of Industrial Cooperation

Centre of Industrial Cooperation liaises with industrial sectors in a lot of aspects, especially in programmes directly related towards student's 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.

V. Information Technology and Communication Centre

Information Communication and Technology Centre is established to implement ICT while assisting with academic and university's administration. ICT Centre also develops and facilitates computerized information system in the university. It also provides consultants in ICT and helps to promote the usage of technology in University.

VI. Library

The University's Library is established to provide facilities and quality services to support the teaching/learning and research in this University.

VII. Teaching and Learning Unit

This unit helps towards coordinating services that uplift the university's academic staff's professionalism. This unit also plans courses, workshops and counselling for students.

ACADEMIC MANAGEMENT DIVISION, DEPARTMENT OF REGISTRY

The Academic Management Division is responsible for handling matters related to student enrolment, data processing and student records, examinations, Senate and students' graduation. The units in the Academic Management Division are:

1. Students Admission and Records Unit
2. Exam Unit
3. The Senate and Graduation Unit

Address:

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The Department of Registry,
Universiti Malaysia Perlis,
Ground Floor, No. 34 & 35,
Hong Leong Bank Building,
Off Jalan Bukit Lagi,
01000 Kangar,
PERLIS.

1. Admission and Student Records Unit

Students Admission and Records Unit is responsible for handling matters related to the admission of students, student records and data processing. Among the duties and responsibilities undertaken are:

1. Controlling the whole process of recruitment and registration of students in the country in the first degree and diploma.
2. Controlling the recruitment and registration of international students in the first degree.
3. Managing and controlling the data processing aspects of the Student Information System.
4. Managing students' personal records and student status, including leave with permission, postponement of study and change of student programs.
5. Managing students' online course registration for each semester.
6. Managing the process of students' unit exemption and credit transfer.

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2. Examination Unit

Examination Unit is responsible in managing and monitoring the processes of final examination related matter. Among the tasks undertaken by the unit are as follows:

1. To issue Examination Circular to School/Centre/Institute.
2. To issue Examination Schedule for diploma and bachelor degree programmes.
3. To manage the Final Semester Examination within the stipulated time frame.
4. To be a Secretariat for the University Board of Examination.
5. To manage examination data processing using Students Information System.
6. To announce examination result for the Final Semester Examination.
7. To manage requestt from student about appeal for rechecking examination result.
8. To issue Academic Transcript upon Convocation.

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3. The Senate and Graduation Unit

Provide secretariat services to the Senate meetings and also to the committee established under Senate like the Education Committee, the Ad-Hoc Committee, the Honorary Award Committee and Standing Committee on Nomination for Honorary Degree. This unit also responsible for the preparation date of the semester, managing the course offering list and deal with the Ministry of Education Malaysia(MOE) and the Public Service Department (PSD) of the new program offerings and recognition of degrees.

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Programmes Offered :

- Engineering Diploma (Microelectronic Engineering)
- Engineering Degree (Hons) (Microelectronic Engineering)
- Engineering Degree (Hons) (Electronic Engineering)
- Engineering Degree (Hons) (Photonic Engineering)
- Masters of Science (Microelectronic Engineering)
- Philosophy of Doctor

1.

SCHOOL OF MICROELECTRONIC ENGINEERING

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Introduction

The School of Microelectronic Engineering was the first school that was established in UniMAP on 30th April 2002. The philosophy of the school's establishment is to emphasize on the importance of the integrity of knowledge and technical practice. Based on that philosophy, the programs that are being offered by the School of Microelectronic Enginnering have been formed:

- To fulfill industries' needs
- To fulfill the requirements of profesional bodies such as Institution of Engineers Malaysia (IEM) and Boards of Engineers Malaysia (BEM)
- To ensure the balance between knowledge theory and engineering practice
- To ensure the programs' contents are always updated as per current technological advance

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PROGRAMME OBJECTIVES FOR PPK MIKROELEKTRONIK

Programme Objectives 1
Graduates who are leaders in the field of electronic engineering or chosen field as demonstrated through career advancement

Programme Objectives 2
Graduates who are members of and contribute to professional society

Programme Objectives 3
Graduates who engaged in life-long learning or continuous education opportunities

Programme Objectives 4
Graduates who contribute towards research and development

Programme Objectives 5
Graduates who are entrepreneurial engineers

PROGRAMME OUTCOMES (PO)

NO	HEADING	AREA	PROPOSED PROGRAMME OUTCOMES (PO)
1	Engineering Knowledge	C	Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in electronic engineering discipline.
2	Problem Analysis	C and/or CTPS	Ability to identify, formulate and solve engineering problems.
3	Design and Development of Solutions	C and/or CTPS	Ability to design a system, component or process to meet desired needs.
4	Investigation	P	Ability to design and conduct experiments, as well as to analyze and interpret data.
5	Modern Tool Usage	P	Ability to use techniques, skills and modern engineering tools necessary for engineering practices
6	The Engineer and Society	EM	Ability to understand the social, cultural, global and environment responsibilities of a professional engineer.
7	Environment and Sustainability	ES	Ability to understanding entrepreneurship, the process of innovation and the need for sustainable development of the environment.

NO	HEADING	AREA	PROPOSED PROGRAMME OUTCOMES (PO)
8	Ethics	EM	Ability to understand the professional and ethical responsibilities and commitment to the community.
9	Individual and Team-work	TS and LS	Ability to function on multi-disciplinary teams.
10	Communication	CS	Ability to communicate effectively.
11	Lifelong Learning	LL	Ability to understand the need for, and to engage in life-long learning.
12	Project Management and Finance	ES	Ability to demonstrate understanding of project management and finance principles

CURICULUM STRUCTURE 2011/2012
BACHELOR OF ENGINEERING (HONS) (MICROELECTRONIC ENGINEERING)
SCHOOL OF MICROELECTRONIC ENGINEERING

YEAR	**FISRT**		**SECOND**		**THIRD**			**FOURTH**	
Semester	I	II	III	IV	V	VI		VII	VIII
ENGINEERING CORE	EMT110/3 Engineering Material	EMT124/3 Fundamental of Electrical Engineering	EMT230/3 Thermo dynamic in Electronics	EMT243/3 Introduction to IC Design	EMT353/3 Digital Integrated Circuit Design	EMT360/3 Control Engineering	EIT 302/4 Industrial Training & Engineering Innovation	EMT 445/2 Final year Project	EMT 446/4 Final Year Project
	ECT111/3 Engineering Skills	EMT125/3 Digital Electronic Principles I	EMT235/3 Digital Electronic Principles II	EMT245/3 Introduction to Micro processor Design	EMT 357/3 Fundamental of Micro electronic Fabrication	EMT 366/2 Engineering Writing 2		EMT470/3 Semi conductor Packaging	EMT474/3 Opto-electronics System
	EMT114/3 Introduction To Electric Circuit	EMT126/2 Engineering Writing 1	EMT237/3 Electronic Devices	EMT248/3 Signal Analysis	EMT358/3 Communica-tion Engineering	EMT367/3 Micro electronic Fabrication		EMT475/3 Computer Organization and Architecture	**EMTXXX/3 Elective course
	EMT115/3 Programming Language	EMT127/3 Semi-conductor Fundamental	EMT238/3 Electro magnetic Theory	EMT249/3 Analogue Electronics I	EMT359/3 Analogue Electronics II	EMT369/3 Power Electronics		EMT478/3 Instrumenta-tion	EMT480/3 Reliability & Failure Analysis
	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT203/3 Engineering Mathematics III	EQT271/3 Engineering Mathematics IV				EMT490/3 Micro-Electro-Mechanical-Systems	
NON ENGINEER-ING		EUT122/2 Skills & Technology in Communica-tion				EUT 440/3 Engineers in Society		EUT443/2 Engineering Management	
REQUIRED UNIVERSITY (15)	EUWXXX/1 Co-Curiculum	*EUWXXX/2 Opsyen	EUW212/2 University English	EUW224/2 Engineering Entre-preneurship	EUW235/2 Ethnic Relations	EUW233/2 Islamic & Asia Civilization			
	EUW410/2 University Malay Language				EUW322/2 Thinking Skills				
	18	18	17	17	16	16	14	16	13

***EUWXXX/2 if MUET Band 3 and below is compulsory to take EUW112/2 Basic English.**

**EMT483/3 System on Chip or EMT488/3 Digital Signal Processing

PROGRAMME OBJECTIVES FOR PPK MIKROELEKTRONIK

Programme Objectives 1
Graduates who are leaders in the field of electronic engineering or chosen field as demonstrated through career advancement

Programme Objectives 2
Graduates who are members of and contribute to professional society

Programme Objectives 3
Graduates who engaged in life-long learning or continuous education opportunities

Programme Objectives 4
Graduates who contribute towards research and development

Programme Objectives 5
Graduates who are entrepreneurial engineers

PROGRAMME OUTCOMES (PO)

NO	HEADING	AREA	PROPOSED PROGRAMME OUTCOMES (PO)
1	Engineering Knowledge	C	Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in electronic engineering discipline.
2	Problem Analysis	C and/or CTPS	Ability to identify, formulate and solve engineering problems.
3	Design and Development of Solutions	C and/or CTPS	Ability to design a system, component or process to meet desired needs.
4	Investigation	P	Ability to design and conduct experiments, as well as to analyze and interpret data.
5	Modern Tool Usage	P	Ability to use techniques, skills and modern engineering tools necessary for engineering practices
6	The Engineer and Society	EM	Ability to understand the social, cultural, global and environment responsibilities of a professional engineer.
7	Environment and Sustainability	ES	Ability to understanding entrepreneurship, the process of innovation and the need for sustainable development of the environment.

NO	HEADING	AREA	PROPOSED PROGRAMME OUTCOMES (PO)
8	Ethics	EM	Ability to understand the professional and ethical responsibilities and commitment to the community.
9	Individual and Team-work	TS and LS	Ability to function on multi-disciplinary teams.
10	Communication	CS	Ability to communicate effectively.
11	Lifelong Learning	LL	Ability to understand the need for, and to engage in life-long learning.
12	Project Management and Finance	ES	Ability to demonstrate understanding of project management and finance principles

CURICULUM STRUCTURE 2011/2012
BACHELOR OF ENGINEERING (HONS) (ELECTRONIC ENGINEERING)
SCHOOL OF MICROELECTRONIC ENGINEERING

YEAR	**FISRT**		**SECOND**		**THIRD**		EIT 302/4 Industrial Training & Engineering Innovation	**FOURTH**	
Semester	**I**	**II**	**III**	**IV**	**V**	**VI**		**VII**	**VIII**
ENGINEERING CORE	EMT110/3 Engineering Material	EMT124/3 Fundamental of Electrical Engineering	EMT230/3 Thermo dynamic in Electronics	EMT243/3 Introduction to IC Design	EMT353/3 Digital Integrated Circuit Design	EMT360/3 Control Engineering		EMT 445/2 Final year Project	EMT 446/4 Final Year Project
	ECT111/3 Engineering Skills	EMT125/3 Digital Electronic Principles I	EMT235/3 Digital Electronic Principles II	EMT245/3 Introduction to Micro processor Design	EMT 355/3 Micro controller	EMT363/3 VLSI Design		EMT473/3 MEMS Design and Fabrication	EMT483/3 Systems on Chip
	EMT114/3 Introduction To Electric Circuit	EMT126/2 Engineering Writing 1	EMT237/3 Electronic Devices	EMT248/3 Signal Analysis	EMT358/3 Communication Engineering	EMT366/2 Engineering Writing 2		EMT475/3 Computer Organization and Architecture	**EMTXXX/3 Elective course
	EMT115/3 Programming Language	EMT127/3 Semiconductor Fundamental	EMT238/3 Electro magnetic Theory	EMT249/3 Analogue Electronics I	EMT359/3 Analogue Electronics II	EMT369/3 Power Electronics		EMT478/3 Instrumentation	EMT488/3 Digital Signal Processing
	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT203/3 Engineering Mathematics III	EQT271/3 Engineering Mathematics IV				EMT479/3 Analog Integrated Circuit Design	
NON ENGINEER-ING		EUT122/2 Skills & Technology in Communication				EUT 440/3 Engineers in Society		EUT443/2 Engineering Management	
REQUIRED UNIVERSITY (15)	EUWXXX/1 Co-Curiculum	*EUWXXX/2 Opsyen	EUW212/2 University English	EUW224/2 Engineering Entrepreneurship	EUW235/2 Ethnic Relations	EUW233/2 Islamic & Asia Civilization			
	EUW410/2 University Malay Language				EUW322/2 Thinking Skills				
	18	18	17	17	16	16	14	16	13

***EUWXXX/2 if MUET Band 3 and below is compulsory to take EUW112/2 Basic English.**

**EMT483/3 System on Chip or EMT488/3 Digital Signal Processing

PROGRAMME OBJECTIVES FOR PPK MIKROELEKTRONIK

Programme Objectives 1
Graduates who are leaders in the field of electronic engineering or chosen field as demonstrated through career advancement

Programme Objectives 2
Graduates who are members of and contribute to professional society

Programme Objectives 3
Graduates who engaged in life-long learning or continuous education opportunities

Programme Objectives 4
Graduates who contribute towards research and development

Programme Objectives 5
Graduates who are entrepreneurial engineers

PROGRAMME OUTCOMES (PO)

NO	HEADING	AREA	PROPOSED PROGRAMME OUTCOMES (PO)
1	Engineering Knowledge	C	Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in electronic engineering discipline.
2	Problem Analysis	C and/or CTPS	Ability to identify, formulate and solve engineering problems.
3	Design and Development of Solutions	C and/or CTPS	Ability to design a system, component or process to meet desired needs.
4	Investigation	P	Ability to design and conduct experiments, as well as to analyze and interpret data.
5	Modern Tool Usage	P	Ability to use techniques, skills and modern engineering tools necessary for engineering practices
6	The Engineer and Society	EM	Ability to understand the social, cultural, global and environment responsibilities of a professional engineer.
7	Environment and Sustainability	ES	Ability to understanding entrepreneurship, the process of innovation and the need for sustainable development of the environment.

NO	HEADING	AREA	PROPOSED PROGRAMME OUTCOMES (PO)
8	Ethics	EM	Ability to understand the professional and ethical responsibilities and commitment to the community.
9	Individual and Team-work	TS and LS	Ability to function on multi-disciplinary teams.
10	Communication	CS	Ability to communicate effectively.
11	Lifelong Learning	LL	Ability to understand the need for, and to engage in life-long learning.
12	Project Management and Finance	ES	Ability to demonstrate understanding of project management and finance principles

CURICULUM STRUCTURE 2011/2012
BACHELOR OF ENGINEERING (HONS) (PHOTONIC ENGINEERING)
SCHOOL OF MICROELECTRONIC ENGINEERING

YEAR	FISRT		SECOND		THIRD			FOURTH	
Semester	I	II	III	IV	V	VI		VII	VIII
ENGINEERING CORE	EMT110/3 Engineering Material	EMT124/3 Fundamental of Electrical Engineering	EMT230/3 Thermo dynamic in Electronics	EMT243/3 Introduction to IC Design	EMT 358/3 Communication Engineering	EMT360/3 Control Engineering	EIT 302/4 Industrial Training & Engineering Innovation	EMT 445/2 Final year Project	EMT 446/4 Final Year Project
	ECT111/3 Engineering Skills	EMT125/3 Digital Electronic Principles I	EMT235/3 Digital Electronic Principles II	EMT245/3 Introduction to Micro processor Design	EMT 359/3 Analogue Electronics II	EMT 354/3 Photonic Devices		EMT 475/3 Computer Organization and Architecture	EMT 474/3 Optoelectronic Systems
	EMT114/3 Introduction To Electric Circuit	EMT126/2 Engineering Writing 1	EMT237/3 Electronic Devices	EMT248/3 Signal Analysis	EMT 353/3 Digital Integrated Circuit Design	EMT369/3 Power Electronics		EMT 491/3 Optical Design	**EMTXXX/3 Elective course
	EMT115/3 Programming Language	EMT127/3 Semi-conductor Fundamental	EMT238/3 Electro magnetic Theory	EMT249/3 Analogue Electronics I	EMT 391/3 Photonics Engineering	EMT366/2 Engineering Writing 2		EMT 473/3 MEMS Design & Fabrication	EMT 492/3 Quantum Electronics
	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT203/3 Engineering Mathematics III	EQT271/3 Engineering Mathematics IV				EMT478/3 Instrumentation	
NON ENGINEERING		EUT122/2 Skills & Technology in Communication				EUT 440/3 Engineers in Society		EUT443/2 Engineering Management	
REQUIRED UNIVERSITY (15)	EUWXXX/1 Co-Curiculum	*EUWXXX/2 Opsyen	EUW212/2 University English	EUW224/2 Engineering Entre-preneurship	EUW235/2 Ethnic Relations	EUW233/2 Islamic & Asia Civilization			
	EUW410/2 University Malay Language				EUW322/2 Thinking Skills				
	18	18	17	17	16	16	14	16	13

***EUWXXX/2 if MUET Band 3 and below is compulsory to take EUW112/2 Basic English.**

** EMT 488/3 Digital signal processing or EMT483/3 Systems on Chip

COURSE SYLLABUS

EMT110/3 ENGINEERING MATERIALS

Course Synopsis

The course is tailored to give students a broad introduction to material properties and limitations. The subject will cover class of material properties, measurement of the properties, and fundamental 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 process as well as performance.

Course Outcomes

CO 1 :
Ability to **describe** types of material families, material properties, and strategy for designing material.

CO 2 :
Ability to **analyze, calculate,** and **compare** various material characteristic by measuring material's mechanical properties on strain, stress, and density, fracture, and friction.

CO 3 :
Ability to **analyze** and **compare** the structure and mechanical behavior of metal, polymer, ceramic and composite.

CO 4 :
Ability to **analyze** and **explain** specific material properties that related to the field of electric, magnetic, and optical.

CO 5 :
Ability to **describe** and **explain** material life cycle, oxidation and corrosion mechanism of material

References

1. Ashby, M., Shercliff, H. and Cebon, D., A., (2007). Materials: engineering, science, processing, and design, Elsevier.
2. Ashby, M. and Jones, D.R.H.(2005). Engineering Materials I: An Introduction to Properties, Applications, and Design, 3rd Edition, Elsevier, Butterworth Heinemann.
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). Enginjeering material properties and applications of metal and alloys, Prentice Hall, New Delhi.
5. Rajput, R.K. (2000). Engineering Materials. S.Chand & Companu, New Delhi.

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.

Course Outcomes

CO 1 :
Ability to **describe** types of material families, material properties, and strategy for designing material.

CO 2 :
Ability to **analyze, calculate,** and **compare** various material characteristic by measuring material's mechanical properties on strain, stress, and density, fracture, and friction.

CO 3 :
Ability to **analyze** and **compare** the structure and mechanical behavior of metal, polymer, ceramic and composite.

CO 4 :
Ability to **analyze** and **explain** specific material properties that related to the field of electric, magnetic, and optical.

CO 5 :
Ability to **describe** and **explain** material life cycle, oxidation and corrosion mechanism of material

References

1. Alexander, C.K, Sadiku, M.N.O, (2009) *Fundamental of Electric Circuit*, 3rd Editions, Mc Graw-Hill,
2. Nilsson, J.W. Riedel, S.A, (2001), *Electric Circuit*, 6th Edition, Prentice Hall.
3. Irwin, J.D, Nelms, R.M, *Basic Engineering Circuit Analysis*, 8th

Edition, John Wiley, 2005

4. Robbins, A.H, Miller, W.C, (2003),*Circuit Analysis: Theory and Practice*, 3rd Edition, Thomson/ Delmar Learning,.
5. Hyat, W.H, Durbin, S.M, Kimmerly, J.E, (2002), *Engineering Circuit Analysis, 6th Edition*, Mc Graw Hill

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 is designed to teach students how to solve engineering and science problem using the C programming language. Students will be exposed to the basic structures of computer, and the coding techniques used in C programming.

Course Outcomes

CO1:
Ability to **apply** programming concepts and principles to solve engineering and science problems

CO2:
Ability to **apply** programming techniques and tools to design computer programming.

CO 3:
Ability to **demonstrate** coding, executing and debugging the computer programs.

CO4:
Ability to **solve** engineering related problem using computer programming techniques.

References

1. Harry H. Cheng, (2010) “C for Engineers and Scientists, An Interpretive Approach”, McGraw Hill International Edition.
2. Deitel and Deitel, Sudin, S., Ahmad, R.B. and Yacob, Y., (2006) “C How To Program”, Pearson-Prentice Hall.
3. Jeri R. Hanly & Elliot B. Koffman “C Program Design for Engineers”,Addison-Wesley, 2001
4. Tan & D Orazio “C Programming for Engineering & Computer Science” , Mc Graw Hill , 1999
5. Forouzan, B. A. & Gilberg R. F., “Computer Science: A Structured Programming Approach Using C”, Brooks/Cole, 2001
6. Al Kelley, Ira Pohl, “C by Dissection: The Essentials of C Programming” 4th ed., Addison-Wesley, 2000

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.

Course Outcomes

CO1:
Ability to define, solve and analyze problems on transformers, dc machines and ac machines with respect to their efficiency, equivalent circuits and losses

CO2:
Ability to define, solve and analyze problems on the basic operations of dc and ac meters, dc and ac bridges.

CO 3:
Ability to define, solve and analyze problems on 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

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.

Course Outcomes

CO1:
Ability to **define, convert** and **demonstrate** arithmetic in various number systems

CO2:
Ability to **illustrate, apply** and **analyze** Boolean Algebra to minimize the design of a logic circuit

CO 3:
Ability to **describe, illustrate** and **demonstrate** combinational logic circuits design

CO 4:
Ability to **identify, illustrate** and **analyze** synchronous and asynchronous sequential circuits 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.

EMT 126/2
ENGINEERING WRITING I

Course Synopsis

To expose the students to the common requirements and expectations of writing as an engineer; as well as to the format and techniques of writing various types of engineering documents.

Course Outcomes

CO1:
Ability to **produce** engineering documents in consideration of ethics, spelling, grammar and avoidance of typing errors while at the same time considering the flow and continuity of ideas.

CO2:
Ability to **write** letters, memos and emails and to **produce** definitions and descriptions

CO 3:
Ability to **write** common engineering documents and to **utilize** sources of engineering information

References

1. Leo Finkelstein Jr (2008). Pocket Book of Technical Writing for Engineers and Scientist, 3rd Ed. (New York: McGraw Hill International Edition)
2. Beer, D. (2009). A Guide to Writing as an Engineer, 3rd Ed. (John Wiley, USA)
3. Pfeiffer, W. S., Adkins, K. E. (2010). Technical Communication – A Practical Approach, 7th Ed. (Pearson, USA)
4. Lannon, J. M, Gurak, L. J. (2011) Technical Communication, 12th Ed. (Longman).
5. Riordan, D. G., Pauley, S. E. (2005) Technical Report Writing Today 9th Ed. (Houghton Mifflin).

EMT 127/3
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.

Course Outcomes

CO1:
Ability to describe, explain and distinguish the theory and physics of semiconductor and devices

CO2:
Ability to analyze different semiconductor processes and devices in terms of its problems and performances

CO 3:
Ability to apply knowledge in item 1 and 2 to explain and investigate behaviors in semiconductor devices.

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 230/3
THERMODYNAMIC IN ELECTRONICS

Course Synopsis

The course is tailored to give students the basic knowledge or insight on the principles of the engineering thermodynamics. In overall, this subject will cover measured thermodynamic properties, the concept of energy transformation, working fluids, theory and application of zero, first and second laws of thermodynamics. This course is also deals with the development and application of thermal analysis and design techniques to the electronic devices and systems.

Course Outcomes

CO1:
Ability to analyze concept of internal energy change and Thermodynamics cycle.

CO2:
ability to calculate and analyze various Thermodynamics properties using various forms of working fluids properties tables.

CO3:
Ability to analyze thermodynamic first law to solve and to design the thermal systems which involving cyclic processes.

CO4:
Ability to analyze the thermodynamic second law to solve calculation on a thermodynamics system.

CO5:
Ability to analyze thermal transfer in the electronic devices and system.

References

1. Yunus, A.C, Michael, A.B. (2010) Thermodynamics: An Engineering Approach, 7th Edition, McGraw Hill.
2. 1. Sonntag, R. E. & Borgnakke, C. (2005) Introduction to Engineering Thermodynamics, 2nd Edition, Wiley.
3. 2. David D. (2001). Fundamental Engineering Thermodynamics, Longman.
4. 3. Ab. Karim Yaacob (2004). Termodinamik. McGraw Hill: Kuala Lumpur.
5. 4. Srivastava, R.C., Subit, K.S., and Abhay, K.J. (2007). Thermodynamics: A Core Course. Prentice-Hall, India.

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.

Course Outcomes

CO1:
Ability to Define, Explain and Illustrate digital design concepts.

CO2:
Ability to Define, Construct, and Compare various types of counters; to interpret state tables, state diagrams(Finite State Machines, FSM): Mealy & Moore, and Algorithmic State Machines (ASM) charts; and to construct sequential circuit designs.

CO3:
Ability to Define the basic concepts of memory used in digital circuits; to Explain the principles of Datapaths, Arithmetic Logic Unit (ALU), Shifter and Control Word; and to Construct a simple ALU.

References

1. M. M. Mano, Floyd - Digital Electronics Design Compiled by Norina Idris, Rafikha Aliana A. Raof, Phak Len Eh Kan, Mohammad Nazri Md. Noor, Prentice Hall. 2007.
2. Digital Principles and Design, Donald D. Givone, McGraw-Hill, 2002.
3. Digital Design 4th Ed., M. M. Mano and M. D. Ciletti, Prentice Hall, 2008.
4. Logic and Computer Design Fundamentals, M. Morris Mano and Charles R. Kime, Prentice Hall, 4th Ed., 2008.
5. Fundamentals of Digital Logic with Verilog/VHDL Design, Stephen Brown and Zvonko Vranesic, McGraw Hill 2009.
6. Digital Design – Principles and Practices 4th Ed., John F. Wakerley, Prentice Hall, 2007.

EMT 237/3
ELECTRONIC DEVICES

Course Synopsis

This course will expose students to the basic electronic devices. The topic covered including introduction to semiconductor: Atomic Structures, Semiconductors, Conductors, and Insulators,CovalentBonds,Conduction in Semiconductor, N-Type and P-Type Semiconductor, The Diode Biasing a Diode, Diode I-V characteristic, Diode Models, Testing a Diode.

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, Voltage Multipliers, The Diode Datasheet and Troubleshooting., Special Purpose Diodes: Zener Diode, Zener Diode characteristics and application as a voltage regulator, Varactor Diode, Optical Diodes, Other Types of Diodes and Troubleshooting.

Bipolar Junction Transistors (BJTs) and various types of Field Effect Transistors (FETs) are also covered in this course. The topics including BJT structure, BJT basic operation, BJT Characteristics and Parameters, BJT as an Amplifier, BJT as a switch, The BJT Datasheet, Troubleshooting. The DC Operating Points, Voltage Divider Bias and Other Bias Methods, Troubleshooting. The JFET structure, JFET Characteristics and Parameters, JFET Biasing, The Ohmic Region, The MOSFET structure, MOSFET Characteristics and Parameters, MOSFET Biasing and Troubleshooting.

Course Outcomes

CO1:
Ability to describe and illustrate the fundamental concept of electronic devices.

CO2:
Ability to explain the basic operation of Diode and construct and analyze the basic biasing circuits using data sheet.

CO3:
Ability to explain the basic operation of BJT transistors and construct and analyze the basic biasing circuits using data sheet.

CO4:
Ability to explain the basic operation of JFET transistors and construct and analyze the basic biasing circuits using data sheet.

References

1. Thomas L. Floyd, “Electronic Devices”, 8th Edition, Pearson, 2008.
2. Floyd,T.,”Electronic Devices”, 7th Edition, Prentice Hall, 2002.
3. Boylestad, R.L, Nashelsky, L., ” Electronic Devices and Circuit Theory”, 8th Edition, Prentice Hall, 2002.
4. Thomas L. Floyd , Electronic Devices (Conventional Current Version), 8/E, Prentice Hall, 2007.
5. Ahmad Radzi Mat Isa, Yaacob Mat Daud, Roslinda Zainal, ” Elektronik Asas Peranti Semikonduktor”, ISBN 983-52-0419-5, 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.

Course Outcomes

CO1:
Ability to apply, derive, and analyze the basic concepts of vectors.

CO2:
Ability to apply, derive, and analyze electrostatics and magnetostatics.

CO3:
Ability to apply, derive, and analyze Maxwells Equation.

CO4:
Ability to apply, derive, and analyze electromagnetic waves.

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

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.

Course Outcomes

CO1:
Students will be able to construct and experiment (simulate) logic circuits at transistor level using schematic entry as well as netlists format.

CO2:
Students will be able to produce the layout design of a circuit based on the design rules specified and understand the principles of fabrication related.

CO3:
Students will be able to analyze CMOS transistor characteristics and to express the performance estimation of a circuit.

References

1. Wolf, Rabeay, Jan M. Weste, Neil H.E. - CMOS VLSI; A Design Perspective, Compiled by Norina Idris, Norhawati Ahmad, Rizalafande Che Ismail, Muammar Mohamad Isa, Siti Zarina Md Naziri, Muhammad Imran Ahmad. Pearson, 2008.
2. Weste, Neil H.E. and Harris, D., CMOS VLSI Design- A Circuits and Systems Perspective, Prentice Hall, 2005.
3. Rabaey, J.M., et al., Digital Integrated Circuits – A Design Perspective, 2nd Ed., Prentice-Hall, 2003.
4. Wolf, W., Modern VLSI Design – System on Chip, Prentice Hall, 2002.
5. Wayne Wolf, Modern VLSI Design: IP-Based Design, 2009.
6. Vai, M. M., VLSI Design, CRC Press, 2001.
7. Uyemura, John P., Chip Design for Submicron VLSI: CMOS Layout and Simulation, SGS Thomson, 2006.

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.

Course Outcomes

CO1:
Ability to define, summarize, illustrate and classify the concept and requirement of basic architecture for microprocessor.

CO2:
Ability to define, summarize, illustrate, classify and write a structured programmed using assembly language.

CO3:
Ability to define, summarize, illustrate, classify the interfacing of microprocessor to the I/O devices.

CO4:
Ability to define, summarize, illustrate, classify and design and develop a simple application on a microprocessor based system.

References

1. R.S. Gaonkar, Microprocessor Architecture, Programming, and Applications with the 8085, 5th Edition, Prentice Hall, 2002.
2. W. Kleitz, Microprocessor and Microcontroller Fundamentals: The 8085 and 8051 Hardware and Software, Prentice Hall, 1998.
3. B.B. Brey, The 8085A Microprocessor: Software, Programming and Architecture, 2nd Edition, Prentice Hall, 1996.

EMT 248/3
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.

Course Outcomes

CO1:
Ability to reproduce, analyze and solve signal waveform types and characteristics

CO2:
Ability to identify, analyze and solve signals and systems via Fourier Transform

CO3:
Ability to identify, analyze and solve signals and systems via Laplace Transform

CO4:
Ability to identify, analyze and solve signals and systems via Z Transform

References

1. Simon Haykin, Barry Van Veen "Signals and Systems", 2nd. Ed., Wiley, 1999
2. Fred J. Taylor, "Principles of Signals and Systems", McGraw Hill International Ed. 1994
3. Charles L. Philips, John M. Parr, Eve A. Riskin, "Signals, Systems and Transforms", 3rd Ed., Prentice Hall International Edition, 2003

EMT 249/3
ANALOGUE ELECTRONICS I

Course Synopsis

This course exposes the students to the basic knowledge in analog 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 analog electronics skills covering theories and practicals.

Course Outcomes

CO1:
Students will be able to describe, explain, apply and analyze various types of amplifier circuits using Bipolar Junction Transistors (BJTs)

CO2:
Students will be able to define, explain, apply and analyze various types of amplifier circuits using Field Effect Transistors (FETs)

CO3:
Student will be able to define the concept, explain, apply and analyze various classes and several circuit configurations of cascade and power amplifiers

CO4:
Students will be able to define and explain and analyze the operations and applications of thyristors and other devices.

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 353/3
DIGITAL INTEGRATED CIRCUIT DESIGN

Course Synopsis

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

Course Outcomes

CO1:
Ability to **explain, apply** and **analyze** the hardware and software principles of digital design using Verilog HDL

CO2:
Ability to **construct** and **design** a complete digital system consisting of control and Data path unit by design and simulation using Verilog HDL

CO3:
Ability to **explain** and **analyze** the working principles and design issues related to field programmable gate array (FPGA) device

References

1. Ciletti, D. Micheal. (1999). Modeling, Synthesis and Rapid Prototyping with the Verilog HDL. Prentice Hall.
2. Palnitkar, S. (2003). Verilog HDL, A Guide To Digital Design And Synthesis. Prentice Hall.
3. Brown, S., and Vranesic, Z. (2004). Fundamentals Of Digital Logic with Verilog Design. Mc Graw Hill.
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 354/3 PHOTONIC DEVICES

Course Synopsis

To educate students on the concepts, principles and operation of various major photonics devices. The course assumes basic knowledge of optics, semiconductor and electromagnetic waves. Devices covered in this course are: waveguide and couplers, nonlinear photonics, lasers and semiconductor optoelectronics.

Course Outcomes

CO1:
Ability to **explain** and **evaluate** the concept, principles and operation of waveguide and couplers.

CO2:
Ability to **explain** and **evaluate** the concept, principles and operation of nonlinear photonics and laser.

CO3:
Ability to **explain** and **evaluate** the concept, principles and operation of semiconductor optoelectronics.

References

1. Liu, Jia Ming, "Photonic Devices", Cambridge, 2005.
2. B.E.A. Saleh, M.C. Teich, "Photonics", Wiley Interscience, 2 ed. 2007.
3. Kwok. K. Ng, "Complete Guide to Semiconductor Devices, 2nd ed., Wiley Interscience, 2002.
4. M. Born, E. Wolf, "Principles of optics", Cambridge University Press, 7 ed. 2001.
5. Chai Yeh, "Applied Photonics", Academic Press, 1994.
6. J. Chrostowski, "Applications of Photonic Technology", Springer, 1995.
7. Bishnu P. Pal, "Guided Wave Optical Components and Devices: Basics, Technology, and Applications (Optics and Photonics)," Academic Press, 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.

Course Outcomes

CO1:
Ability to define, summarize, illustrate classify and synthesis the concept and requirement of embedded system

CO2:
Ability to define, summarize, illustrate, synthesis, classify and write a structured programmed in assembly language and C for the system application

CO3:
Ability to define, summarize, synthesis, illustrate, classify and design embedded system based in a single chip microcontroller

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.

Course Outcomes

CO1:
Ability to name, define and explain the essiential aspects of the semiconductor fabrication technology which include materials, processes, facilities and standard parctises.

CO2:
Ability to state, define, explain, demonstrate and determine important parameters of wafer cleaning, etching and thermal processes.

CO3:
Ability to state, define, explain, demonstrate and determine important parameters of photolithography process, chemical vapour deposition and physical vapour deposition.

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. Mc Graw 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 Modeling, 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 analog 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.

Course Outcomes

CO1:
Ability to define basic principles of analog and digital communication, and the essential of communication system in real world.

CO2:
Ability to define and explain the analog modulation, solve the problems related to the types of analog modulation.

CO3:
Ability to define and explain the digital modulation, solve the problems related to the types of digital modulation.

CO4:
Ability to define and explain the digital transmission, solve the problems related to the types of digital modulation.

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 Analog Communication Systems", 4th Ed. Oxford Univ Press, 2009.
6. A.B.Calson, P. Crilly, " Communication Systems", 5th Ed. McGraw Hill, 2009.

EMT 359/3
ANALOGUE 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.

Course Outcomes

CO1:
Students will be able to **define, explain, apply** and **analyze** the fundamental, application and feedback concepts of op-amp

CO2:
Students will be able to **describe, explain** and **construct** an amplifiers, oscillators and filters

CO3:
Students will be able to **define, explain** and **analyze** the basic concept, principle and applications of voltage regulators

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 360/3
CONTROL ENGINEERING

Course Synopsis

This is an introduction course to control systems engineering. Students will be exposed to the mathematical modeling 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.

Course Outcomes

CO1:
Ability to obtain the mathematical model for electrical/electronic and mechanical systems.

CO2:
Ability to perform system's time-domain analysis with response to test inputs. Analysis includes the determination of the system stability.

CO3:
Ability to perform system's frequency-domain analysis with response to test inputs. Analysis includes the determination of the system stability.

CO4:
The ability to design P, PI, PD, PID, lead, lag controllers based on the analysis of the system's response in time and frequency domain.

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.

Course Outcomes

CO1:
Student will be able to analyze CMOS transistor characteristics.

CO2:
Student will be able to design an experiment to analyse and report the results in terms of circuit's performance.

CO3:
Students will be able to analyze CMOS Analog circuits and/or systems.

CO4:
Student will be able to apply the theoretical aspects of analog circuits to solve the project given.

References

1. Philips E.Allen, Douglas R.Holberg, "CMOS Analog Circuit Design", Oxford University Press, February 2002 (text book).
2. Behzad Razavi, "Design of Analog CMOS Integrated Circuits", McGraw-Hill, August 2000.
3. Paul R. Gray," Analysis and Design of Analog Integrated Circuit", Willey, 4th Ed, 2001.
4. David Johns, Kenneth W.Martin," Analog Integrated Circuit Design", Willey, November 1996.

EMT 366/2
ENGINEERING WRITING II

Course Synopsis

To educate students on the concepts of technical writing for engineers. The topics covered in this course varies from grammar and punctuation in research reports, to technical how to in writing documentations and up to presentation and business communications.

Course Outcomes

CO1:
Ability to **explain** and **distinguish** the concept and principles of proper English grammar and punctuation.

CO2:
Ability to **explain, discuss** and **solve** any research report task in English

CO3:
Ability to **explain, solve** and **analyse** group work involving presentations, reports and communication task

References

1. Leo Finkelstein Jr (2008). Pocket Book of Technical Writing for Engineers and Scientist. (New York: McGraw Hill International Edition)
2. Ballard, B. and Clanchy J. (1991). Essay writing for students: a practical guide. (Melbourne: Longman Cheshire.)
3. Taylor, G. (1989). The student's writing guide for the arts and social sciences. (Cambridge: Cambridge University Press.)
4. Alley, M., The Craft of Scientific Writing, 3rd ed. (New York: Springer-Verlag New York, Inc., 1996).
5. Alley, M., The Craft of Editing: A Guide for Managers, Scientists, and Engineers (New York: Springer-Verlag New York, Inc., 2000).
6. Alley, M., The Craft of Scientific Presentations (New York: Springer-Verlag New York, Inc., 2003).

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.

Course Outcomes

CO1:
Ability to **explain** and **construct** the essential aspects of the advanced CMOS based process technology, its requirements and issues.

CO2:
Ability to **discuss** and **design** the major CMOS process modules such as isolation technology, well technology, gate oxide technology and so on. Able to **demonstrate** and **calculate** CMOS process parameters which based on the CMOS device requirements.

CO3:
Ability to **analyse** and **predict** the major CMOS process and device issues. Able to **design**, fabricate, **analyse** and **evaluate** basic integrated circuits components.

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 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.

Course Outcomes

CO1:
Ability to explain power electronic systems operation, applications area and need for efficiency design.

CO2:
Ability to describe different types of power semiconductor device; power diode, SCR, BJT, IGBT, GTO and MOSFET.

CO3:
Ability to analyze and design 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 391/3
PHOTONIC ENGINEERING

Course Synopsis

The subject consists of fundamental principles of optics in particular properties of light propagation and its interaction in various media. This subject is divided into the following areas: light propagation characteristics, Geometrical Optics, Ray Optics, Wave Optics and Beam Optics.

Course Outcomes

CO1:
Ability to construct and analyze the principles of light propagation and geometrical optics.

CO2:
Ability to construct and analyze the ray optics, wave optics and beam optics.

CO3:
Ability to construct and analyze the concepts and principles of Electromagnetic Optics

CO4:
Ability to construct and analyze the optics of media and the applications.

References

1. Francis A.Jenkins & Harvey E.White. Fundamental of Optics 4th Edition, 2006
2. Hecht, Eugene, "Optics", Addison-Wesley, 2002.
3. Introduction to optics Third Edition, Frank L. Pedrotti, S.J, Pearson, 2007.
4. Bahaa E. A. Saleh & Malvin Carl Teich, "Fundamentals of Photonics", John Wiley & Sons, 2007.
5. Naess, Robert O., "Optics for technology students", Prentice Hall, 2001.

EMT 445/2
FINAL YEAR PROJECT

Course Synopsis

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

Course Outcomes

CO1:
Ability to apply theory into practice

CO2:
Ability to possess enhancement in problem solving skill

CO3:
Ability to strengthen capability in working independently

CO4:
Ability to undertake project planning, design, implementation and management

References

Based on project title

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 modelings in packaging are also introduced.

Course Outcomes

CO1:
Ability to understand and explain the semiconductor packaging process flow.

CO2:
Ability to identify the critical parameters in semiconductor packaging process.

CO3:
Ability to discuss the technology trend in semiconductor packaging.

CO4:
ability to identify, analyze and tackle the common problems that occur in semiconductor packaging industry.

CO5:
Ability to identify the materials, process and technology needed to package the semiconductor product.

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.

EM 473/3
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.

Course Outcomes

CO1:
Ability to explain the overview of MEMS, MEMS materials and micromachining technologies.

CO2:
Ability to analyze MEMS structures in automotive, photonic, life sciences and RF applications.

CO3:
Ability to solve scaling law problems in miniaturization.

CO4:
Ability to solve, explain and differentiate MEMS packaging and reliability issues.

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 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.

Course Outcomes

CO1:
Ability to define, summarize, illustrate and classify the theory of computer system components and the interactions between the components

CO2:
Ability to define, summarize, illustrate and classify the architecture of a central processing unit

CO3:
Ability to define, summarize, illustrate and classify the theory of a control unit

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.

Course Outcomes

CO1:
Ability to apply the fundamental concept of Electronic instrumentation.

CO2:
Ability to evaluate an instrument comprising of sensors, data acquisition and embedded system.

CO3:
Ability to demonstrate and use stand-alone and computer -based instrument.

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.

Course Outcomes

CO1:
Ability to analyse the mos transistor operation and design the basic building block for analog circuit.

CO2:
Ability to analyse and design single stage amplifier.

CO3:
Ability to analyse and design differential amplifier.

CO4:
ability to analyse and design operational amplifier and its application to solve the project given.

References

1. Behzad Razavi, Design of Analog CMOS Integrated Circuit, McGraw-Hill, 2000.
2. Phillip E. Allen, Douglas R. Holberg, CMOS Analog Circuit Design, Oxford University Press, 2002.
3. Paul R. Gray, Analysis and Desgn of Analog 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 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.

Course Outcomes

CO1:
Ability to relate, apply design and synthesis the basics of imaging and optical system design

CO2:
Ability to relate, apply ,design and synthesis geometrical aberration and material selection

CO3:
Ability to relate, apply, design, synthesis illumination systems

CO4:
ability to relate, apply and design, synthesis tolerancing, evaluation and manufacturing.

References

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

EMT 446/4
FINAL YEAR PROJECT

Course Synopsis

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

Course Outcomes

CO1:
Ability to apply theory into practice

CO2:
Ability to possess enhancement in problem solving skill

CO3:
Ability to strengthen capability in working independently

CO4:
Ability to undertake project planning, design, implementation and management

References

Based on project title

EMT 480/3
RELIABILITY & FAILURE ANALYSIS

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.

Course Outcomes

CO1:
Ability to define, illustrate, explain and solve Reliability-based problems

CO2:
Ability to define and explain the failure analysis process flow and the related terms

CO3:
Ability to identify, compare, explain and illustrate (where applicable) the different tools and techniques available in FA, its importance and the details operation principle

CO4:
Ability to conduct various experiment, investigate, analyze, make a hypothesis and develop solution based on a failure given.

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.

Course Outcomes

CO1:
Ability to define, summarize, illustrate classify, design the system-on-chip architecture

CO2:
Ability to define, summarize, illustrate classify, produce results in terms of circuit performance for clock and flip-flop

CO3:
Ability to define, summarize, illustrate classify, develop DSM interconnection and power distribution system.

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 474/3
OPTOELECTRONIC SYSTEM

Course Synopsis

The students studying this course will develop a basic understanding of the principles and practices of modern optoelectronic device includes fiber 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 fiber systems and measurement will also be acquired.

Course Outcomes

CO1:
Ability to define, describe and analyze light properties, principle in optical fiber fundamental and optical component and passive device.

CO2:
Ability to explain, solve and evaluate the concept, principles and operation of LEDS principles and operation of lasers concept,

CO3:
Ability to define and analyze laser Diode and Photodetectors

CO4:
Ability to analyze electro optics, construct non linear optics activity, acoustic optics and systems and applications for display

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
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5. John M. Senior, Optical Fiber Communications; Principles and Practice, 2nd Edition, Prentice-Hall, 1992.

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.

Course Outcomes

CO1:
Ability to define, explain & solve basic principles, analog interface in real time.

CO2:
Ability to define & explain the discrete time signal in both time and frequency domain solve and analyze related problems

CO3:
Ability to define, discuss, solve, analyze & design the problem related to digital IIR filters.

CO4:
Ability to define, discuss, solve, analyze & design the problem related to digital FIR filters.

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.

Course Outcomes

CO1:
Ability to explain and apply the fundamental concept of MEMS and its technology.

CO2:
Ability to analyze and derive the concept and formula of electrical and mechanical aspects of MEMS Micromachined sensor.

CO3:
Ability to design and analyze MEMS sensors and actuators.

CO4:
Ability to explain and design MEMS packaging and reliability issues.

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 492/3
QUANTUM ELECTRONICS

Course Synopsis

To educate students on the concepts of modern physics, quantization and postulates of quantum phenomena. The elements of this subject cover Quantum Mechanics, Boundaries and oscillators and Time-Independent Schrodinger Equation. Theories, principles and practical are stressed in this course.

Course Outcomes

CO1:
ability to explain and distinguish the concept and principles of modern physics, quantisation and postulates of quantum phenomena and elements of quantum mechanics

CO2:
Ability to explain, discuss and solve quantum potential structure and photon interactions.

CO3:
Ability to explain, solve and analyse the time-independent Schrodinger equation.

References

1. A. Yariv, P. Yeh, “Photonics”, Oxford University Press; 6 ed. 2006.
2. A. Ghatak, “Optics”, McGraw-Hill, 1 ed. 2009.
3. B.E.A. Saleh, M.C. Teich, “Photonics”, Wiley Interscience, 2 ed. 2007.
4. M. Born, E. Wolf, “Principles of optics”, Cambridge University Press, 7 ed. 2001.
5. Eugene Hecht, “Optics: International 4th Edition”, Addison Wesley, 2002
6. Pedrotti, “Introduction to Optics 3rd Edition”. Addison Wesley, 2007

CAREER OPPORTUNITIES

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

Among the electronic, microelectronic & photonic specialities & skills that the graduates can undertake as a career are as follows:

- Semiconductor/Microelectronic fabrication
- Full IC Design for digital, analog, mixed signals & RF-IC
- IC Layout Design, System On Chip for digital, analog, 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

Programmes Offered :

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

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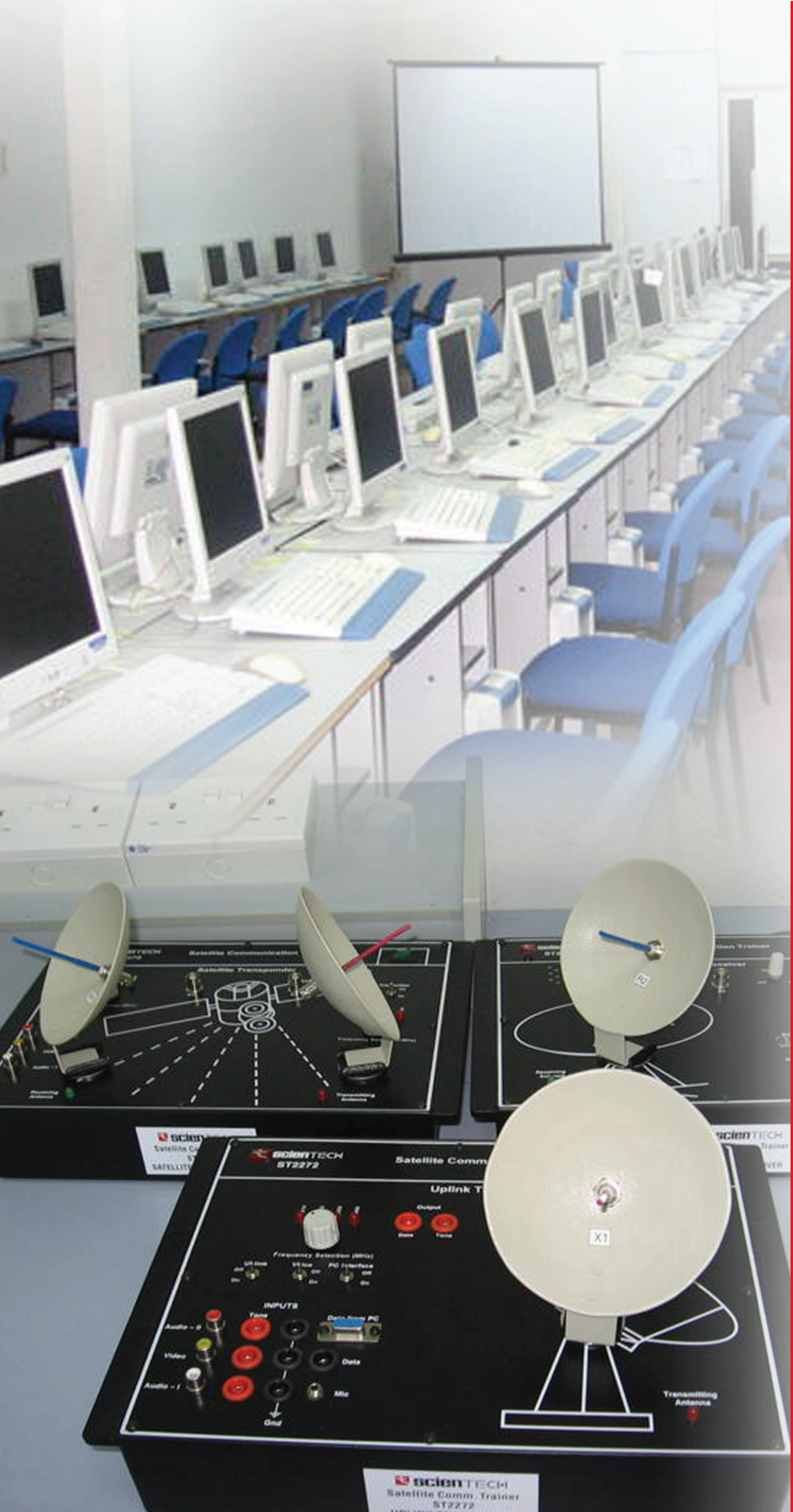

Introduction

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.

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COMPUTER ENGINEERING PROGRAMME OBJECTIVES (PEO)

Programme Objective 1
Graduates who are leaders in the field of computer engineering or chosen field as demonstrated through career advancement

Programme Objective 2
Graduates who are members and contribute to professional society

Programme Objective 3
Graduates pursue continuing education opportunities

Programme Objective 4
Graduates make contributions through research and development

Programme Objective 5
Graduates who are entrepreneur

PROGRAM OUTCOMES-PO

NO	HEADING	PROPOSED PROGRAMME OUTCOMES (PO) FOR UniMAP
1	Engineering Knowledge	Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in electronic engineering discipline.
2	Problem Analysis	Ability to identify, formulate and solve engineering problems.
3	Design and Development of Solutions	Ability to design a system, component or process to meet desired needs.
4	Investigation	Ability to design and conduct experiments, as well as to analyze and interpret data.
5	Modern Tool Usage	Ability to use techniques, skills and modern engineering tools necessary for engineering practices
6	The Engineer and Society	Ability to understand the social, cultural, global and environment responsibilities of a professional engineer.
7	Environment and Sustainability	Ability to understanding entrepreneurship, the process of innovation and the need for sustainable development of the environment.
8	Ethics	Ability to have professional personality, ethical responsibilities and commitment to the community.

NO	HEADING	PROPOSED PROGRAMME OUTCOMES (PO) FOR UniMAP
9	Individual and Team-work	Ability to function on multi-disciplinary teams.
10	Communication	Ability to communicate effectively.
11	Lifelong Learning	Recognition of the need for, and an ability to engage in life-long learning.
12	Project Management and Finance	Ability to acquire of project management and finance principles

CURRICULUM STRUCTURE FOR BACHELOR OF ENGINEERING (HONOURS) (COMPUTER ENGINEERING)

YEAR	FISRT		SECOND		THIRD			FOURTH	
Semester	I	II	III	IV	V	VI		VII	VIII
ENGINEERING CORE (97)	EKT101/4 Electric Circuit Theory	EKT 103/3 Electrical Engineering	EKT221/4 Digital Electronics II	EKT222/4 Microprocessor Systems	EKT303/4 Principles of Computer Architecture	EKT322/4 Embedded Systems Design	EIT 302/4 Industrial Training & Engineering Innovation	EKT445/2 Final Year Project I	EKT446/4 Final Year Project II
	EKT120/4 Computer Programming	EKT124/3 Digital Electronics I	EKT204/4 Analog Electronic Circuits	EKT232/3 Signals and Systems	EKT343/4 Principles of Communication Engineering	EKT308/3 Modern Control Systems		EKT424/4 Real-Time Systems	EKT421/3 Software Engineering
	EKT102/3 Basic Electronic Engineering	EKT112/4 Principles of Measurement and Instrumention		EKT242/3 Electromagnetic Theory	EKT333/3 Modern Operating Systems	EKT336/3 Computer Networks		Program Elective I /3	Open Elective / 3
		ECT111/3 Engineering Skills		EKT214/4 Analog Electronic Circuits II	EKT334/4 Algorithm and Data Structures	EKT314/4 Electronic Instrumentation		Program Elective II /3	
NON ENGINEERING (19)	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT272/3 Probability and Statistic			EUT440/3 Engineers in Society		EUT443/2 Engineering Management	
	EUT122/2 Skills and Technology in Communication		EQT221/3 Discrete Mathematics and Linear Algebra						
REQUIRED UNIVERSITY (15)	EUWXXX/1 Co-curriculum	EUW410/2 University Malay Language	EUW212/2 University English	EUW224/2 Engineering Entrepreneurship	EUW235/2 Ethnic Relation				
			EUW322/2 Thinking Skills	EUW233/2 Islam & Asia Civilisation (TITAS)					EUWXXX/2 Option Subjects
135	17	18	18	18	17	17	4	14	12
Total Units for Graduation 131 + 4 (Industrial Training) = 135									

Open Elective : Any 4th Year subjects offered by the school or other schools.
Elective I & II : EKT 353 Principle of Digital Signal Processing, EKT466 Artificial Intelligence, EKT 422 Parallel Computing, EKT 426 Database Management System,
and Open : EKT 345 Microwave Engineering, EKT 460 Image Processing, EKT428 Mobile Computing, EKT465 Optical Communication Systems, EKT 450
Elective : Network Security, EKT454 Wireless Network & Communication

COMMUNICATION ENGINEERING PROGRAMME OBJECTIVES (PEO)

Programme Objective 1
Graduates are leaders in the field of communication engineering or chosen field as demonstrated through career advancement

Programme Objective 2
Graduates who are members and contribute to professional society

Programme Objective 3
Graduates pursue continuing education opportunities

Programme Objective 4
Graduates make contributions through research and development

Programme Objective 5
Graduates who are entrepreneur

PROGRAM OUTCOMES-PO

NO	HEADING	PROPOSED PROGRAMME OUTCOMES (PO) FOR UniMAP
1	Engineering Knowledge	Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in electronic engineering discipline.
2	Problem Analysis	Ability to identify, formulate and solve engineering problems.
3	Design and Development of Solutions	Ability to design a system, component or process to meet desired needs.
4	Investigation	Ability to design and conduct experiments, as well as to analyze and interpret data.
5	Modern Tool Usage	Ability to use techniques, skills and modern engineering tools necessary for engineering practices
6	The Engineer and Society	Ability to understand the social, cultural, global and environment responsibilities of a professional engineer.
7	Environment and Sustainability	Ability to understanding entrepreneurship, the process of innovation and the need for sustainable development of the environment.
8	Ethics	Ability to have professional personality, ethical responsibilities and commitment to the community.

NO	HEADING	PROPOSED PROGRAMME OUTCOMES (PO) FOR UniMAP
9	Individual and Team-work	Ability to function on multi-disciplinary teams.
10	Communication	Ability to communicate effectively.
11	Lifelong Learning	Recognition of the need for, and an ability to engage in life-long learning.
12	Project Management and Finance	Ability to acquire of project management and finance principles

CURRICULUM STRUCTURE FOR BACHELOR OF ENGINEERING (HONOURS) (COMMUNICATION ENGINEERING)

YEAR	FISRT		SECOND		THIRD			FOURTH	
Semester	I	II	III	IV	V	VI		VII	VIII
ENGINEERING CORE (97)	EKT101/4 Electric Circuit Theory	EKT 103/3 Electrical Engineering	EKT221/4 Digital Electronics II	EKT222/4 Microprocessor Systems	EKT303/4 Principles of Computer Architecture	EKT357/3 Digital Communication Engineering	EIT 302/4 Industrial Training & Engineering Innovation	EKT445/2 Final Year Project I	EKT446/4 Final Year Project II
	EKT120/4 Computer Programming	EKT124/3 Digital Electronics I	EKT204/4 Analog Electronic Circuits	EKT232/3 Signals and Systems	EKT343/4 Principles of Communication Engineering	EKT308/3 Modern Control Systems		EKT440/4 Telecommunication Switching & Network	EKT441/3 Mobile Communication Systems
	EKT102/3 Basic Electronic Engineering	EKT112/4 Principles of Measurement and Instrumention		EKT242/3 Electromagnetic Theory	EKT341/4 Antenna and Propagation	EKT 345/4 Microwave Engineering		Program Elective I /3	Open Elective / 3
		ECT111/3 Engineering Skills		EKT214/4 Analog Electronic Circuits II	KT353/3 Principles of Digital Signal Processing	EKT314/4 Electronic Instrumentation		Program Elective II /3	
NON ENGINEERING (19)	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT272/3 Probability and Statistic			EUT440/3 Engineers in Society		EUT443/2 Engineering Management	
	EUT122/2 Skills and Technology in Communication		EQT221/3 Discrete Mathematics and Linear Algebra						
REQUIRED UNIVERSITY (15)	EUWXXX/1 Co-curriculum	EUW410/2 University Malay Language	EUW212/2 University English	EUW224/2 Engineering Entrepreneurship	EUW235/2 Ethnic Relation				
			EUW322/2 Thinking Skills	EUW233/2 Islam & Asia Civilisation (TITAS)					EUWXXX/2 Option Subjects
135	17	18	18	18	17	17	4	14	12
Total Units for Graduation 131 + 4 (Industrial Training) = 135									

Open Elective : Any 4th year subjects offered by the school or other schools.
Elective I & II and Open Elective : EKT 445 Radar Engineering, EKT446 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

COMPUTER NETWORK ENGINEERING
PROGRAMME OBJECTIVES (PEO)

Programme Objective 1
Graduates are leaders in the field of computer network engineering or chosen field as demonstrated through career advancement

Programme Objective 2
Graduates who are members and contribute to professional society

Programme Objective 3
Graduates pursue continuing education opportunities

Programme Objective 4
Graduates make contributions through research and development

Programme Objective 5
Graduates who are entrepreneur

PROGRAM OUTCOMES-PO

NO	HEADING	PROPOSED PROGRAMME OUTCOMES (PO) FOR UniMAP
1	Engineering Knowledge	Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in electronic engineering discipline.
2	Problem Analysis	Ability to identify, formulate and solve engineering problems.
3	Design and Development of Solutions	Ability to design a system, component or process to meet desired needs.
4	Investigation	Ability to design and conduct experiments, as well as to analyze and interpret data.
5	Modern Tool Usage	Ability to use techniques, skills and modern engineering tools necessary for engineering practices
6	The Engineer and Society	Ability to understand the social, cultural, global and environment responsibilities of a professional engineer.
7	Environment and Sustainability	Ability to understanding entrepreneurship, the process of innovation and the need for sustainable development of the environment.
8	Ethics	Ability to have professional personality, ethical responsibilities and commitment to the community.

NO	HEADING	PROPOSED PROGRAMME OUTCOMES (PO) FOR UniMAP
9	Individual and Team-work	Ability to function on multi-disciplinary teams.
10	Communication	Ability to communicate effectively.
11	Lifelong Learning	Recognition of the need for, and an ability to engage in life-long learning.
12	Project Management and Finance	Ability to acquire of project management and finance principles

CURRICULUM STRUCTURE FOR BACHELOR OF ENGINEERING (HONOURS) (COMPUTER NETWORK ENGINEERING)

YEAR	FISRT		SECOND		THIRD			FOURTH	
Semester	I	II	III	IV	V	VI		VII	VIII
ENGINEERING CORE (97)	EKT101/4 Electric Circuit Theory	EKT 103/3 Electrical Engineering	EKT221/4 Digital Electronics II	EKT222/4 Microprocessor Systems	EKT303/4 Principles of Computer Architecture	EKT355/4 Advanced Computer Network	EIT 302/4 Industrial Training & Engineering Innovation	EKT445/2 Final Year Project I	EKT446/4 Final Year Project II
	EKT120/4 Computer Programming	EKT124/3 Digital Electronics I	EKT204/4 Analog Electronic Circuits	EKT232/3 Signals and Systems	EKT343/4 Principles of Communication Engineering	EKT308/3 Modern Control Systems		EKT433/4 Network Modeling	EKT434/3 Network Programming
	EKT102/3 Basic Electronic Engineering	EKT112/4 Principles of Measurement and Instrumention		EKT242/3 Electromagnetic Theory	EKT335/3 Principles of Computer Network	EKT333/3 Modern Operating Systems		Program Elective I /3	Open Elective / 3
		ECT111/3 Engineering Skills		EKT214/4 Analog Electronic Circuits II	EKT334/4 Algorithm and Data Structures	EKT314/4 Electronic Instrumentation		Program Elective II /3	
NON ENGINEERING (19)	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT272/3 Probability and Statistic			EUT440/3 Engineers in Society		EUT443/2 Engineering Management	
	EUT122/2 Skills and Technology in Communication		EQT221/3 Discrete Mathematics and Linear Algebra						
REQUIRED UNIVERSITY (15)	EUWXXX/1 Co-curriculum	EUW410/2 University Malay Language	EUW212/2 University English	EUW224/2 Engineering Entrepreneurship	EUW235/2 Ethnic Relation				
			EUW322/2 Thinking Skills	EUW233/2 Islam & Asia Civilisation (TITAS)					EUWXXX/2 Option Subjects
135	17	18	18	18	17	17	4	14	12
Total Units for Graduation 131 + 4 (Industrial Training) = 135									

Open Elective : Any 4th Year subjects offered by the school or other schools.
Elective I & II : EKT 353 Principles of Digital Signal Processing, EKT466 Artificial Intelligence, EKT 422 Parallel Computing, EKT 426 Database Management System,
And Open : EKT 345 Microwave Engineering, EKT 460 Image Processing, EKT428 Mobile Computing, EKT465 Optical Communication Systems,
Elective : EKT 450 Network Security, EKT454 Wireless Network & Communication

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 112/4 PRINCIPLES OF 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 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 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 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 analysed in the time and frequency domain.

References

1. Simon Haykin, Barry Van Veen. (2003). Signals and Systems. 2nd ed. John Wiley & Sons, Inc.
2. MJ 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 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 334/4
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 335/3
PRINCIPLES OF COMPUTER NETWORK

Course Synopsis

This course exposes students to the principle and the knowledge of computer networks. Computer network cover so the aspects of local area network and wide area network and it is expanding rigourously. Thus, in this course, it is focused on the fundamental concept and theories, applications and advantages of computer networks. Related technologies such as Local Area Network, Wide Area Network and techniques used 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 345/4
MICROWAVE ENGINEERING

Course Synopsis

This course aims to expose students with basic concept of parameters that are being used in microwave communication network. Analysis the device characteristics for microwave. To explain the importance and applications of microwave communication system. Additionally, the students are introduced how to design microwave's filters and amplifiers.

References

1. David M. Pozar. (2004). Microwave Engineering. Wiley Ed.
2. Max W. Medley Jr. (1993). Microwave and RF Circuits Analysis, Synthesis and Design. Artech House Inc.
3. Randall W.Rhea (2005). HF Filter Design and Computer Simulation. McGraw Hill Inc.
4. Om P.Gandhi, "Microwave Engineering And Applications", Maxwell Macmillan Int. Edition, 1989.
5. Collin, R.E., "Foundations For Microwave Engineering", Mc-Graw Hill, 1992.

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.

EKT308/3
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, 3 Sub edition 1996.

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

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 rigourously. 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 353/3
PRINCIPLES 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 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 SYSTEMS

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.

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.

References

1. UniMAP Industrial Training Guideline Rev A (July 2008)
2. UniMAP Industrial Training Log Book

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.

References

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.

References

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. [2004], " Core Web Programming: The Sun Microsystems Press JAVA Series" 2nd Edition, Prentice Hall.
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 to discuss the technology applied in communication network, emphasized on application of concept architecture and layer, signal transmission technique, switching system and switching circuit network. It also discussed on multiplexing as well as to give an exposure of network application and basic network programming.

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.

EKT441/3
MOBILE COMMUNICATION

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

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.

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 Entrepreneurs

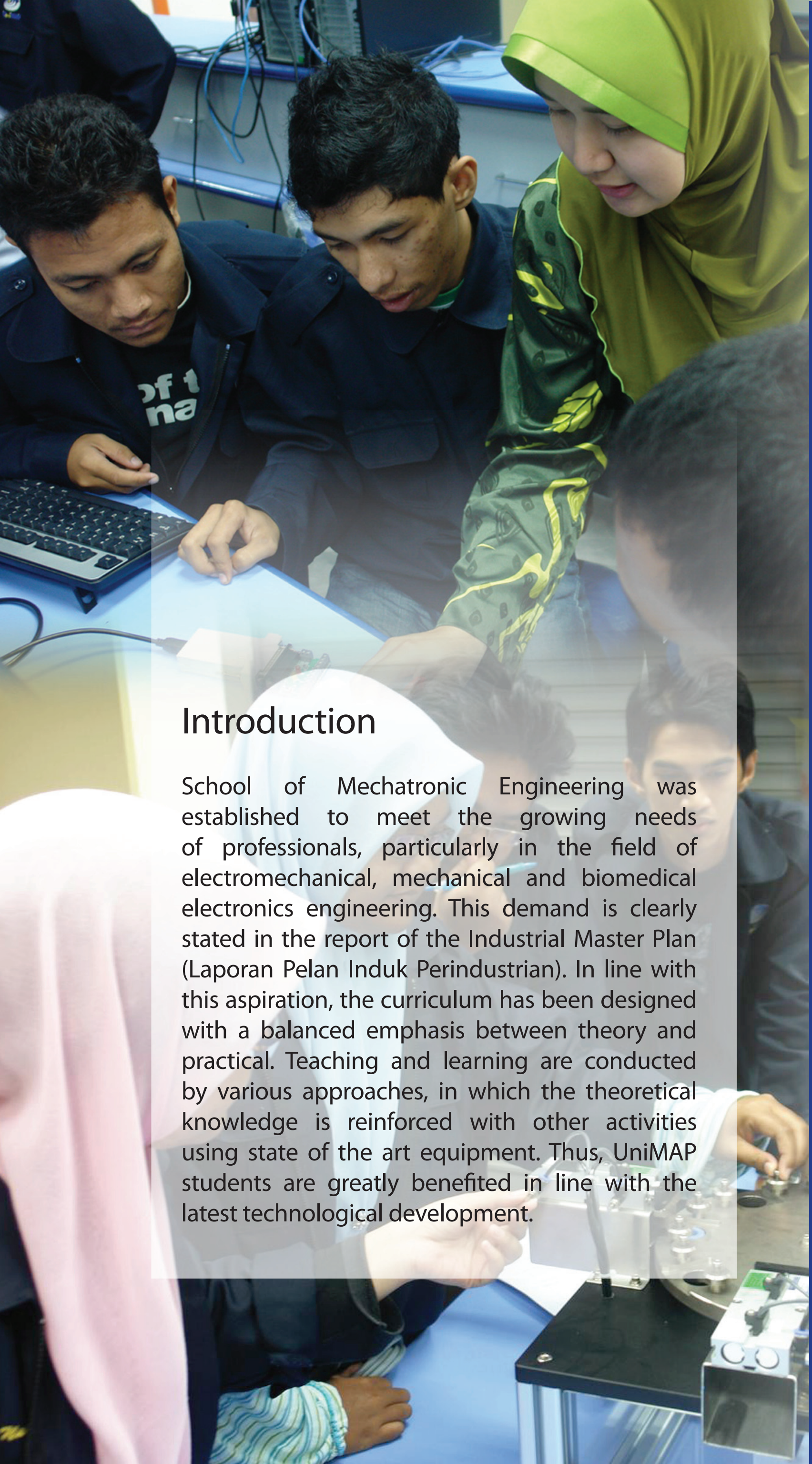
Programmes Offered :

- Diploma in Engineering (Mechatronic)
- Bachelor of Engineering (Hons) (Mechatronic Engineering)
- Bachelor of Engineering (Hons) (Mechanical Engineering)
- Bachelor of Engineering (Hons) (Biomedical Electronic Engineering)
- Master of Science (Mechatronic Engineering)
- Master of Science (Mechanical Engineering)
- Master of Science (Biomedical Electronic Engineering)
- Doctor of Philosophy (Ph.D)

3. SCHOOL OF MECHATRONIC ENGINEERING

SCHOOL OF MECHATRONIC ENGINEERING
Universiti Malaysia Perlis (UniMAP),
Ulu Pauh Campus,
02600 Arau, Perlis.

Tel : 04-988-5166
Fax : 04-988-5167



Introduction

School of Mechatronic Engineering was established to meet the growing needs of professionals, particularly in the field of electromechanical, mechanical and biomedical electronics engineering. This demand is clearly stated in the report of the Industrial Master Plan (Laporan Pelan Induk Perindustrian). In line with this aspiration, the curriculum has been designed with a balanced emphasis between theory and practical. Teaching and learning are conducted by various approaches, in which the theoretical knowledge is reinforced with other activities using state of the art equipment. Thus, UniMAP students are greatly benefited in line with the latest technological development.

School of Mechatronic Engineering offers three exciting and challenging study programmes using the up-to-date equipments and teaching and learning approaches. The curriculum of each programme offered at School of Mechatronic Engineering are designed to produce graduate professionals who have the analytical skills and are able to work in all fields of engineering and related industries. Learning environment will be more enjoyable and competitive with the mix of local and international students.

Mechatronic Engineering Programme

The programme is a multi disciplinary field that is synergistic of electrical, mechanical, electronics, control and computer engineering disciplines which enables its graduates having good analytical and design knowledge of integrated mechatronic systems to cater for the needs in the automation industry.

Mechanical Engineering Programme

The programme emphasizes 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

The programme combines knowledge of electrical, electronic and mechanical engineering, as well as medical science such as anatomy, physiology and radiology. Combination of the knowledge in these areas enables engineers to cater for the needs in the biomedical industry.

STAFF DIRECTORY

DEAN
ASSOCIATE PROFESSOR DR. ABDUL HAMID BIN ADOM
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PROGRAMME OBJECTIVES (PEO) (MECHATRONIC ENGINEERING)

Programme Objectives 1
Graduates who effectively demonstrate engineering knowledge and entrepreneurial skills by providing practical solutions.

Programme Objectives 2
Graduates who effectively demonstrate professionalism in multi-disciplinary engineering environment, leadership quality and teamwork.

Programme Objectives 3
Graduates who make contributions to knowledge and establish best engineering practice through research and development.

Programme Objectives 4
Graduates who demonstrate an ethical commitment to the community and the profession through involvement with professional organizations and society.

Programme Objectives 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 an in-depth technical competence in Mechatronic Engineering discipline.
PO 02 Ability to identify, formulate and solve engineering problems.
PO 03 Ability to design a system, component or process to meet desired needs.
PO 04 Ability to design and conduct experiments, 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 In-depth understanding of entrepreneurship, the process of innovation and the need for sustainable development.
PO 08 Understanding of professional and ethical responsibilities and commitment to the community.
PO 09 Ability to function on multi-disciplinary teams.
PO 10 Ability to communicate effectively.
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	FISRT		SECOND		THIRD			FOURTH	
Semester	I	II	III	IV	V	VI		VII	VIII
ENGINEERING CORE (98)	ENT 161/4 Electrical Circuits	ENT 162/4 Analogue Electronics	ENT 281/3 Signals & Systems	ENT 256/4 Machine Design	ENT 385/3 Control Engineering	ENT 372/4 Robotics	EIT 302/4 Industrial Training & Engineering Innovation	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 Principles of Electromagnetics	ENT 374/3 Power Electrical Systems	ENT 363/4 Machine Vision Systems		ENT 473/4 Mechatronic Systems Design	ENT XXX/3 Elective 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	ENT XXX/3 Elective III
			ENT 289/3 Drives and Powe Electronics		ENT 373/4 Embedded System Design and Applications	ENT 331/3 Management Production & Control of Quality		ENT XXX/3 Elective I	
NON ENGINEERING (22)	ENT189/3 Computer Programming	EQT 102/3 Engineering Mathematics II	EQT241/3 Numerical Methods & Vector Calculus	EQT271/3 Engineering Statistics				EUT440/3 Engineers in Society	EUT443/2 Engineering Management
	EQT 101/3 Engineering Mathematics I								
	EUT122/2 Skills and Technology in Communication								
REQUIRED UNIVERSITY (15)		EUW 410/2 University Malay Language	EUW 233/2 Islamic & Asian Civilisations	EUW 322/2 Thinking Skills	EUW XXX/2 Option	EUW 235/2 Ethnic Relations			
		EUW XXX/1 Co-Curriculum		EUW 212/2 University English	EUW 224/2 Engineering Entrepreneurship				
	18	17	18	17	17	16	4	16	12
Total Units for Graduation 135									

Electives :
Elective I : ENT491/3 Robotic Control / ENT493/3 Advanced Control Systems
Elective II :ENT478/3 Mobile Robotics / ENT497/3 Artificial Intelligence in Engineering
Elective III :ENT474/3 Intelligent Mechatronic Systems / ENT499/3 Digital Signal Processing & Applications

PROGRAMME OBJECTIVES (PEO)(MECHANICAL ENGINERING)

Programme Objectives 1
Graduates who effectively demonstrate engineering knowledge and entrepreneurial skills by providing practical solutions.

Programme Objectives 2
Graduates who effectively demonstrate professionalism in multi-disciplinary engineering environment, leadership quality and teamwork.

Programme Objectives 3
Graduates who make contributions to knowledge and establish best engineering practice through research and development.

Programme Objectives 4
Graduates who demonstrate an ethical commitment to the community and the profession through involvement with professional organizations and society.

Programme Objectives 5
Graduates who engage in life-long learning as demonstrated through career advancement.

PROGRAM OUTCOMES-PO

PO 01 Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in Mechanical Engineering discipline.
PO 02 Ability to identify, formulate and solve engineering problems.
PO 03 Ability to design a system, component or process to meet desired needs.
PO 04 Ability to design and conduct experiments, 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 In-depth understanding of entrepreneurship, the process of innovation and the need for sustainable development.
PO 08 Understanding of professional and ethical responsibilities and commitment to the community.
PO 09 Ability to function on multi-disciplinary teams.
PO 10 Ability to communicate effectively.
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	FISRT		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	ENT 348/4 Mechanical System Design	EIT 302/4 Industrial Training & Engineering Innovation	ENT445/2 Final Year Project I	ENT446/4 Final Year Project II
	ENT150/3 Engineering Graphic & Computer Aided Drafting	ENT143/3 Thermo dynamics 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 III
	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		ENTXXX/3 Elective II	ENTXXX/3 Elective IV
		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	
NON ENGINEERING (22)						ENT381/2 Microprocessors			
	EQT 101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT241/3 Numerical Methods & Vector Calculus	EQT271/3 Engineering Statistics				EUT440/3 Engineers in Society	EUT443/2 Engineering Management
	EUT122/2 Skills & Technology in Communication								
REQUIRED UNIVERSITY (15)	ENT189/3 Computer Programming								
		EUW410/2 University Malay Language	EUW224/2 Engineering Entrepreneurship	EUW322/2 Thinking Skills	EUW233/2 Islamic & Asian Civilisations	EUW235/2 Ethnic Relations			
	EUWXXX/1 Co-curriculum	EUW212/2 University English			EUWXXX/2 Option				
	18	18	17	18	17	17	4	14	12
Total Units for Graduation 135									

Elective:

Elective I : ENT461/3 Renewable Energy / ENT463/3 Elasticity / ENT465/3 Rapid Engineering
Elective II : ENT462/3 Turbomachinery / ENT464/3 Fracture Mechanics / ENT466/3 Design Optimization
Elective III :ENT431/3 Refrigeration & Air Conditioning / ENT433/3 Plasticity / ENT435/3 Robotics
Elective IV :ENT432/3 Energy Conversion / ENT434/3 Impact Mechanics / ENT436/3 Computer Aided Manufacturing

PROGRAMME OBJECTIVES (PEO)(BIOMEDICAL ELECTRONIC ENGINEERING)

Programme Objectives 1
Graduates who effectively demonstrate engineering knowledge and entrepreneurial skills by providing practical solutions.

Programme Objectives 2
Graduates who effectively demonstrate professionalism in multi-disciplinary engineering environment, leadership quality and teamwork.

Programme Objectives 3
Graduates who make contributions to knowledge and establish best engineering practice through research and development.

Programme Objectives 4
Graduates who demonstrate an ethical commitment to the community and the profession through involvement with professional organizations and society.

Programme Objectives 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 an in-depth technical competence in Biomedical Engineering discipline.
PO 02 Ability to identify, formulate and solve engineering problems.
PO 03 Ability to design a system, component or process to meet desired needs.
PO 04 Ability to design and conduct experiments, 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 In-depth understanding of entrepreneurship, the process of innovation and the need for sustainable development.
PO 08 Understanding of professional and ethical responsibilities and commitment to the community.
PO 09 Ability to function on multi-disciplinary teams.
PO 10 Ability to communicate effectively.
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) (BIOMEDICAL ELECTRONIC ENGINEERING)

YEAR	FISRT		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 & Engineering Innovation	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 Machine & Electrical Drives		ENTXXX/4 Elective I	ENTXXX/4 Elective II
			ENT217/3 Principles of Signal & System	ENT265/4 Microcontroller & Interfaces	ENT315/4 Medical Signal Processing	ENT317/4 Medical Electronics & Bioinstrumentation		ENT412/4 Bioelectrical Instrumentation Design	ENTXXX/4 Elective III
					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				EUT440/3 Engineers in Society	EUT443/2 Engineering Management
	EKT120/4 Computer Programming	ENT111/4 Anatomy & Physiology	ERT106/3 Biochemistry						
	EUT122/2 Skills & Technology in Communication								
REQUIRED UNIVERSITY (15)	EUW 233/2 Islamic & Asian Civilizations	EUW410/2 University Malay Language	EUW224/2 Engineering Entrepreneurship	EUW322/2 Thinking Skills					
	EUWXXX/1 Co-Curriculum	EUW235/2 Ethnic Relations		EUW212/2 University English		EUWXXX/2 Option			
	18	17	17	17	17	18	4	16	14
Total Units for Graduation 135									

Elective I (Medical Computing): ENT420/4 Biological System Modeling, ENT421/4 Medical Image Processing, ENT422/4 E-Health & Telemedicine, ENT423/4 Artificial Intelligent Systems, ENT424/4 Forces, Fields & Flows in Biomedical Engineering

Elective II (Medical Instrumentation): ENT425/4 Advanced Bioinstrumentation, ENT426/4 Computed Tomography & Applications, ENT427/4 Clinical Engineering, ENT428/4 Medical Robotics & Automation, ENT429/4 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, urinary system and also the reproductive system. At the end of the course, the students are expected to master the anatomical and physiological aspects of the human body and able to apply basic engineering principles in solving health problems.

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

An introductory course to electrical circuit analysis, the students will be exposed to fundamentals of electrical elements, basic laws, circuit theorems, sinusoidal steady-state analysis and ac circuit analysis. Throughout the course, the students will undergo a combination of laboratory and tutorial sessions that will assist them in understanding the theories used. At the end of the course, the students are expected to understand the concepts which will allow them to solve various circuit problems in the engineering discipline.

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-Hil.
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). Analog 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). Analog 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. Russel Johnston & William E.C (2007)., "Vector Mechanics for Engineers: Statics.", 8th ed., Mc Graw Hill.
4. Ferdinand P. Beer, E. Russel 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

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 analyze problems related to production, forming of metals, light alloys corrosion and magnetic materials.

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). Fundanmental 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

The study includes electrical elements and basic laws, circuit theorems, sinusoidal steady state analysis and ac circuit analysis. This course also will expose students to the practical work of the study that are included in 4 modules of laboratory session. At the end of this course, students should understand and be able to solve circuit analysis.

Course Outcomes

CO1:
Ability to define and explain basic concepts of Electric elements and Basic laws

CO2:
Ability to choose, apply, and analyze electrical circuits to solve engineering problems.

CO3:
Ability to explain, apply, and analyze AC circuits.

References

1. Electric Circuits, Eighth edition, James W. Nilson and Susan A. Riedel. 2008. Addison Wesley.
2. Fundamental of Electric Circuits, Second Edition, Charles K. Alexander & Matthew N.O. Sadiku. 2005. McGrawHill.
3. Electric Circuit Fundamental, Sixth Edition, Thomas L. Floyd. 2006. Prentice Hall.
4. Introduction to Electric Circuits. 7th Edition, Richard C. Dorf and James A. Svoboda. 2006. John Wiley & Sons.

5. Alexander, C. K. & Sadiku, M. N. O. (2007). Fundamentals of Electric Circuits, 4th ed: McGraw Hill.

ENT 162/4 ANALOGUE ELECTRONICS

Course Synopsis

This course is designed to introduce the basic concepts of semiconductor electronics and its applications. This course also helps the students to apply the theory to design, developing and test electronic circuits.

Course Outcomes

CO1:
Ability to define and analyze the components and characteristics of semiconductor devices.

CO2:
Ability to discuss and analyze basic application of semiconductor devices.

CO3:
Ability to discuss and analyze application of power and operational amplifiers.

CO4:
Ability to analyze and design basic electronic systems.

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. Boylestead R. L. and Nashelsky L. 2002. Electronic Devices and Circuit Theory. 8th ed. Upper Saddle River, New Jersey, Prentice Hall.

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. 2ndEdition, Wiley.

ENT 189/3 COMPUTER PROGRAMMING

Course Synopsis

This module focuses on problem solving strategies and the use of algorithmic language to describe such problem solving. It introduces 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. Various problems are considered to be solved using C-like procedural programming language.

Course Outcomes

CO1:
Ability to define the basic technique of programming.

CO2:
Ability to apply suitable programming technique to solve a given problem.

CO3:
Ability to develop solution to particular problem and translate into programming code.

CO4:
Ability to develop perpetually seeks and acquires contemporary in advance programming technique and scale.

References

1. Deitel & Deitel, Suhizaz Sudin, R. Badlishah and Yasmin Yacob (2006). C How To Program. 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., AddisonWesley.
6. Sprankle and Maureen (2006). Problem Solving and Programming Concepts. 7th Edition. Prentice Hall.

ENT 216/3
ANALOGUE ELECTRONICS II

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). Analog Circuits: World Class Designs. Elsevier.

ENT 217/3
PRINCIPLES OF SIGNAL & SYSTEM

Course Synopsis

This course introduces the different types of signals and networks present in a communication system. Emphasis mainly will be on continuous signal. Signal representation in both the time (Fourier series) and frequency domain (Fourier and Laplace transform) are discussed. The concept of transfer function is introduced and other applications of the Laplace transform such as for the solution of differential equations, and circuit analysis is presented. The use of Bode plot in filter design is introduced.

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

Course Synopsis

This is an introductory course to 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 basic knowledge of biomaterials and to provide understanding of interactions between physiological components and biomaterials. Ranges of materials currently being utilized for various biomedical applications and their biocompatibility with references to the biological responses and environments available 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 SYSTEM

Course Synopsis

This course will introduce students to control system techniques for analysis and design; includes mathematical modeling of 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 aims to introduce 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 focuses on the safety issues in the healthcare institution which particularly emphasized on medical devices and their interrelation with the hospital's environment.

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. On completion of this course, students should have a firm grasp of basic electromagnetic and identify their effects on the biological system which covers bioelectric, bio-electromagnetic, and bio-magnetic phenomena.

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
MACHINE & ELECTRICAL DRIVES

Course Synopsis

This course provides the student 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 Outcomes

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.
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 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 Outcomes

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 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.
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 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 Outcomes

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

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 Outcomes

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 Outcomes

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 Outcomes

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 Outcomes

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

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 Outcomes

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. 5rd 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

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 265/4
MICROCONTROLLER & INTERFACES

Course Synopsis

This course is designed to introduce the Microchip PIC18 microcontroller architecture and help the students to explore the embedded system application. This includes the knowledge of PIC18 hardware system, assembly language programming, I/O interfacing, arithmetic operations, data transfer, timers, serial port programming, interrupts, LCD and keyboard interfacing and data converters. The course also helps student 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 microcontroller.

CO2:
Ability to describe and write assembly language and illustrate the PIC18 microcontroller built-in functions.

CO3:
Ability to analyze and apply the microcontroller with I/O devices.

CO4:
Ability to evaluate and develop a simple microcontroller-based application.

References

1. Mazidi, M.A., Mckinlay, R.D., and Causey, D. (2008). PIC Microcontroller and Embedded Systems: Using Assembly and C for PIC18. Pearson Prentice Hall.

2. Brey, B.B. (2008). Applying PIC18 Microcontrollers: Architecture, Programming, and Interfacing using C and Assembly. Prentice Hall.
3. Huang H.W. (2005). PIC Microcontroller: An Introduction to Software and Hardware Interfacing. Thomson & Delmar Learning.
4. Peatman, J.B. (1998). Design with PIC Microcontrollers. Prentice Hall.
5. Bates, M. (2006). Interfacing PIC Microcontrollers: Embedded Design by Interactive Simulation. Newnes.

ENT 268/3 ELECTROMAGNETICS THEORY

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 obtain basic theory of electrical and magnetic fields.

CO2:
Ability to perform basic postulates of electrostatic and magnetostatic field.

CO3:
Ability to apply the fundamental mathematics of vector analysis and Maxwell's equations to in electromagnetic problems.

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 Electomagnetics", 2nd Ed., McGraw Hill International Ed. 1995.

ENT 281/3 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 relates 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.

Course Outcomes

CO1:
Ability to identify type and waveform of the signals and its characteristics in engineering system.

CO2:
Ability to analyze signals and determine the process of the systems.

CO3:
Ability to identify the system response using variable methods.

CO4:
Ability to analyze signals using related software.

References

1. William H. Hayt and John A. Buck, "Engineering Electromagnetics", 7th edition, McGraw- Hill, 2006.
2. John G. Proakis and Masoud Salehi, "Fundamentals of Communication Systems", Prentice-Hall, 2005.
3. Roy Blake, "Electronic Communication Systems", 2nd edition, Delmar Thomson Learning, 2002.
4. Gordon E. Carlson, "Signal and Linear System Analysis", 2nd edition, John Wiley & Sons, 1998.
5. Signals & Systems. Alan V. Oppenheim, Alan S. Willsky with S. Hamid Nawab. Prentice-Hall International, Inc. Second Edition. 1997

ENT 286/3 INSTRUMENTATIONS AND MEASUREMENTS

Course Synopsis

An introduction to measurement systems; basic measurement circuits; resistance-based transducers; magnetic-based transducers; capacitance-based transducers; self-generating transducers; electrochemical transducers; semiconductor transducers; mechanical transducers in flow measurement, pressure, force and weight; interfacing with computer and data input.

Course Outcomes

CO1:
Ability to explain basic concepts of transducers, sensors and measurement techniques.

CO2:
Ability to apply interfacing concept between transducers and computer and data collection from measurement techniques.

CO3:
Ability to apply suitable measurement concepts in specific engineering problem.

CO4:
Ability to design measurement system using suitable sensors and transducers.

References

1. Bentley, J.P. (2005). Principles of Measurement Systems. 4th Edition, Prentice Hall.
2. Johnson, C. (2006). Process Control Instrumentation Technology. 8th Edition, Prentice Hall.
3. Doebelin, E.O. (2004). Measurement System: Application and Design. Mc Graw Hill.
4. Sinclair, I. (2001). Sensors and Transducers. 3rd Edition, Newnes.
5. Holman, J.P. (2001). Experimental Methods for Engineers. 7th Edition, Mc Graw Hill.
6. Usher, M.J. (1996). Sensors and Transducers. MacMillan.
7. Bell D. A. (1994). Electronic Instrumentation and Measurements.2nd Edition, Prentice Hall.

ENT 288/3
MICROPROCESSORS

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.

Course Outcomes

CO1:
Understand the theory and basic architecture of microprocessor.

CO2:
Able to program a microprocessor system using assembly language.

CO3:
Understand and capable of interfacing the microprocessor to the I/O devices.

CO4:
Able to develop a simple application on a microprocessor-based system.

References

1. Ramesh S. Goankar. Microprocessor Architecture, Programming and Applications with 8085. 5th Edition, Prentice Hall.
2. Barry B. Brey (2008). Applying PIC18 Microcontrollers: Architecture, Programming, and Interfacing using C and Assembly. Pearson Prentice Hall.
3. Huang Han-Way (2005). PIC Microcontroller: An Introduction to Software and Hardware Interfacing. Thomson & Delmar Learning.
4. John B. Peatman (1998). Design with PIC Microcontrollers. Prentice Hall.
5. Martin Bates (2006). Interfacing PIC Microcontrollers: Embedded Design by Interactive Simulation. Newnes.
6. Barry B. Brey (2008). INTEL Microprocessors. 7th Edition, Prentice-Hall Inc., U.S.A.

ENT 289/3
DRIVES AND POWER ELECTRONICS

Course Synopsis

The aim of this course is to introduce students about power semiconductor devices, commutation, power converters and control, adjustable speed dc and ac motor drives, applications of microprocessor and digital signal processor in power electronics.

Course Outcomes

CO1:
Ability to describe basic concept of various drive system (AC motor, DC motor. stepper motor).

CO2:
Ability to describe basic concept of Power Electronics

CO3:
Ability to design a system using suitable combination of controller and drive

CO4:
Ability to design mechatronic devices using controller and drive like a robot

References

1. Theodore Wildi. Electrical Machines, Drives, and Power Systems. Sixth Edition, 2006 (Text)
2. Anthony Esposito. Fluid Power with applications. Sixth Edition, 2003 (Text)
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

Course Synopsis

This course is an introduction to DSP concepts and implementation. It starts by explaining the need for digital signal processing and DSP systems. A complete model of a DSP system is examined from the input transducer, through all the stages including: signal conditioning, anti-aliasing filter, analog-to-digital and digital-to-analog conversion, output smoothing filter, and output transducers. Sampling theory, sample resolution and anti-aliasing filters are explored with real examples to illustrate this important area of DSP. DSP tools are demonstrated to illustrate the tools available needed to apply DSP techniques. C compiler 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 is designed to introduce the students to medical instruments used at hospitals and in medical industries. 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 application.

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 is a course on artificial organs that is used for the heart, kidney, lung, pancreas and ear. This course focuses on the implementation of artificial organs by understanding the anatomical, physiological and biological transport aspects of the respective organs. At the end of the course, the students are expected to have the ability to apply the concepts and fundamental principles of the artificial organs and perform simple modeling and simulation task.

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 Zero-th law, the first law and the 2nd law. In heat transfer, different modes through conduction, convection and radiation will 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", Mc Graw 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 Outcomes

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 Outcomes

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 Outcomes

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 Outcomes

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 Outcomes

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 program to solve beam and frame problems by using finite element analysis.

CO4:
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 Outcomes

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 organize components of machine vision systems and pre-processing concepts.

CO2:
Ability to organize imaging concepts on binary images and image segmentation.

CO3:
Ability to organize imaging concepts on edge and feature extraction.

CO4:
Ability to organize imaging concepts to design 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.

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 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 (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 Modeling. 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

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 explain the concepts and requirements of embedded system

CO2:
Ability to write a structured program in C language for embedded system application.

CO3:
Ability to design embedded system applications based on a single chip microcontroller.

CO4:
Ability to 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

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 program 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 Communiation 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 modeling 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 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 Outcomes

CO1:
The ability to obtain the mathematical model for electrical and mechanical systems.

CO2:
The ability to perform system's time-domain analysis with response to test inputs. Analysis includes the determination of the system stability.

CO3:
The ability to perform system's frequency-domain analysis with response to test inputs. Analysis includes the determination of the system stability.

CO4:
The ability to design P,PI, PD, PID, lead, lag controllers based on the analysis of the system's response in time and frequency domain.

References

1. Norman S.Nise (2009). Control Systems Engineering. 5th Edition, John Wiley & Sons.
2. Kuo B.C. (1995). Automatic Control System. 8th Edition, Prentice Hall.
3. Ogata K. (1999). Modern Control Engineering. Prentice Hall.
4. Franklin G.F., Powell J.D. and Emani-Naeni A. (1994). Feedback Control Systems. Addison-Wesley.

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 analog and digital devices. This course helps the student to apply the theory to develop and test electronic equipments.

Course Outcomes

CO1:
Ability to describe and analyze analog 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 412/4 BIOELECTRICAL INSTRUMENTATION DESIGN

Course Synopsis

An advanced course to medical instrumentation, 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 application. Their theoretical knowledge will be tested in a mini-project, specifically developed to give an integrated input in designing a complete bioelectrical instrumentation system.

Course Outcomes

CO1:
Ability to design an instrumentation system to acquire bioelectrical signals.

CO2:
Ability to design a microcontroller-based medical device and integrate with personal computer.

CO3:
Ability to function as a team in executing and evaluate design projects.

CO4:
Ability to present and defend the outcomes of a project and write technical report of acceptable quality.

References

1. Plonsey, R (2007). Bioelectricity: A Quantitative Approach, 3rd Edition, Springer.
2. Marieb, E.N. (2006). Human Anatomy and Physiology. 7th Ed. Benjamin Cummings.
3. Webster, J.G (2010). Medical Instrumentation: Application and Design, 4th Ed., Wiley.
4. Wilmhurst, T. (2007). Designing Embedded Systems with PIC Microcontrollers: Principles and Applications. 1st Ed. Newnes.
5. Nise, N.S. (2004). Control Systems Engineering. 4th Ed., Wiley.

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 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 Outcomes

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.

References

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 Outcomes

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.

References

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 Outcomes

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

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 analyze the automation technology principles and its relationship with assembly process and material handling system.

CO2:
Ability to analyze automation components such as sensor, actuator and drive/motion system.

CO3:
Ability to design automation controller system using PLC and analyze the PLC applications in field bus and computer aided automated system

CO4 :
Ability to perform in group/teams to design and assemble simple automation system using PLC and demonstrate the PLC applications in automation system.

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,
4. Glencoe/McGraw-Hill
5. Ridley, J.E (1999), "Introduction to Programmable Logic Controller"

ENT 473/4
MECHATRONIC SYSTEMS DESIGN

Course Synopsis

This course aims to deliver the basic knowledge of mechatronics. The course topics include sensors and transducers, signal conditioning, pneumatic, hydraulic, mechanical and electrical actuators, input and output interfacing, communication systems, programmable logic controllers, microprocessors and fault finding analysis.

Course Outcomes

CO1:
Ability to design and develop measurement systems using sensors/ transducers and relevant conditioning circuits.

CO2:
Ability to design and develop actuation systems using pneumatic, hydraulic, mechanical and electrical circuit elements.

CO3:
Ability to analyze, design and develop analogue or digital controllers using closed-loop techniques.

CO4:
Ability to interface, communicate and program input/output systems using microprocessors and microcontrollers.

References

1. Bolton, W., Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, 3rd edition, Addison Wesley Longman: Essex England, 2003.
2. D. Shetty and R. A. Kolk, Mechatronics System Design, PWS Publishing Co., Boston, MA, 1997
3. R. Isermann, Mechatronic Systems: Fundamentals, Springer-Verlag: Great Britain, 2003
4. Tim Wilmshurst, Designing Embedded Systems with PIC Microcontrollers: Principles and Applications, Newnes 2007.
5. Martin Bates, Interfacing PIC Microcontrollers: Embedded Design by Interactive, Simulation, Newnes 2006.

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 423/4
ARTIFICIAL INTELLIGENT SYSTEMS

Course Synopsis

This course is intended to explore the ideas and developments in Artificial Intelligence (AI). It starts with an introduction to AI, followed by specific topics include fuzzy systems, artificial neural networks and evolutionary computation. Three case studies of AI for medical applications will be presented and discussed. At the end of this course students should know a few major techniques in AI and has experience how to apply the techniques to solve medical problems.

Course Outcomes

CO1:
Ability to explain, choose and categorize the right AI techniques for simple application.

CO2:
Ability to apply, display and design a Fuzzy logic system.

CO3:
Ability to design a neural network system and evaluate simple optimization problem using genetic algorithm.

References

1. Negnevitsky, M. (2004). Artificial Intelligence: A Guide to Intelligent System. 2nd Ed., Addison Wesley.
2. Begg, R. (2007). Computational Intelligence in Biomedical Engineering. CRC Press.
3. Russel, S.J. (2003). Artificial Intelligence: A Modern Approach. Prentice-Hall.
4. Rajasekaran, S. (2007). Neural Networks, Fuzzy Logic and Genetic Algorithms. 7th Ed., Prentice Hall.
5. Mukaidono M., Kikuchi H.(2001), "Fuzzy Logic for Beginners", World Scientific.

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 Mc Graw 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. Mc Graw 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, inter-granular 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 proto typing 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

ENT478/3
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

This Course is designed to introduce the dynamic modelling of robot, the trajectory planning and robot control methods; the robot control methods encompass techniques such as linear state feedback, non-linear control and fuzzy logic control with applications in robotic automation systems.

Course Outcomes

CO1:
Ability to use Robot simulation software package such as WORKSPACE to design a robot of required structure and control, and organize a robot work cell.

CO2:
Ability to evaluate the fuzzy logic control for critical decision making in robot applications.

CO3:
Ability to explain various non-linearities in robot functioning and to analyze methods for successful control.

CO4:
Ability to choose an advanced control package (among state feedback, digital control etc) to construct relatively complex trajectory tracking.

References

1. Saeed B Niku: "Introduction to Robotics" Prentice Hall, 2001
2. Mittel R. K and Nagarath I J, " Robotics and Control", Tata McGraw Hill, New Delhi, 2003
3. Man Zhihong, ' Robotics", Pearson Prentice Hall, Singapore, 2005
4. Low K. H, "Robotics: Principles and System Modeling", Prentice Hall, 2006 .
5. Robert J. Shilling, Fundamentals of Robotics: Analysis and Control", Prentice Hall, 1990

ENT 493/3
ADVANCED CONTROL SYSTEMS

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 (AI) 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 choose the right AI techniques for simple applications.

CO2:
Ability to design a Fuzzy logic system.

CO3:
Ability to design a neural network system

CO4:
Ability to solve simple optimization problem using genetic algorithm.

References

1. Negnevitsky M., "Artificial Intelligence: A guide to Intelligent System", 2nd Edition, Addison Wesley, 2004.
2. Sivanandam S N., Paulraj M., "Introduction to Artificial Neural Networks", Second Edition, 2005, Vikas Publications.
3. Russell S.J., Norvig P., Canny J.F., "Artificial Intelligence: A Modern Approach", Prentice Hall, 2003
4. Rajasekaran. S., Pai G.A.V., "Neural Networks, Fuzzy Logic and Genetic Algorithms", 7th Edition, Prentice Hall India, 2007.
5. Mukaidono M., Kikuchi H., "Fuzzy Logic for Beginners", World Scientific, 2001

ENT499/3
DIGITAL SIGNAL PROCESSING & APPLICATIONS

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 apply concepts of digital signals in time domain

CO2:
Ability to analyze concepts of digital signals in frequency domain using fourier and z-transforms.

CO3:
Ability to analyze digital processing of continuous signals and design digital filters.

CO4:
Ability to evaluate simple digital signal processing applications.

References

1. E.C. Ifeachor and B.W. Jervis , ' Digital Signal Processing: A Practical Approach' Prentice Hall, Second Edition 2002
2. Richard G. Lyons, 'Understanding Digital Signal Processing', Prentice Hall, Second Edition, 2004
3. J. G. Proakis and D. G. Manolakis, 'Digital Signal Processing: Principles, Algorithms, and Applications', 1989 Stephen W. Smith, 'The Scientist and Engineer's Guide to Digital Signal Processing', California Technical Publishing, 2nd Edition, 2003.
4. B. A. Shenoi, Introduction to Digital Signal Processing and Filter Design. New Jersey: Wiley, 2006.
5. S. M. Kuo and W. S. Gan, Digital Signal Processors: Architectures, Implementations, and Applications. Upper Saddle River, NJ: Prentice-Hall, 2005.

CAREER
OPPORTUNITIES

Graduates in this area will have the ability to engage in the design, research and development, consultancy, education, manufacturing, construction, maintenance, sales and management in industries such as manufacturing, processing, automotive, aviation and shipping, mining and services, communications and building services and medical industries.

Among of the firms that offer employment opportunities to graduates of this course 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
- Support industry of other health care

Programmes Offered :

- Diploma in Electrical Engineering
- Bachelor of Engineering (Hons) (Electrical System Engineering)
- Bachelor of Engineering (Hons) (Industrial Electronic Engineering)
- Bachelor of Engineering (Hons) (Electrical in Energy Systems Engineering)
- Master of Science (Electrical System Engineering)
- Doctor of Philosophy (PhD)

4.

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School of Electrical System Engineering offers three programmes, 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 Lab, Digital Electronic Lab, Computer Programming Lab, Electrical Technology Lab, Instrumentation Lab, Power System Lab, Electrical Machine Lab, Power Electronic Lab and Electromagnetic and Machine Design Lab.

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. The programme provides emphasis on the major fields of power engineering, which includes electrical machines, power systems and high voltage engineering. These are offered as compulsory course so as 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 System 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 System) is a new programme offered under the responsibility of the School of Electrical System Engineering. This 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.

The 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 a broad scope, particularly in the sectors of power generation and energy renewal.

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ELECTRICAL SYSTEM ENGINEERING PROGRAMME OBJECTIVES (PEO)

Programme Objectives 1
Graduates who are leaders in the field of electrical engineering as demonstrated via career advancement.

Programme Objectives 2
Graduates who are members of and contribute to professional society.

Programme Objectives 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.

PROGRAM OUTCOMES-PO

PO1 Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in electrical engineering discipline.
PO2 Ability to identify, formulate and solve electrical engineering problems.
PO3 Ability to design a system, component or process to meet desired needs.
PO4 Ability to design and conduct experiments, as well as to analyze and interpret data.
PO5 Ability to use techniques, skills and modern engineering tools necessary for engineering practices
PO6 Ability to demonstrate/understand the social, cultural, global and environmental responsibilities of a professional engineer.
PO7 Ability to demonstrate/understand entrepreneurship, the process of innovation and the need for sustainable development of the environment.
PO8 Understanding of professional and ethical responsibilities and commitment to the society.
PO9 Ability to function on multi-disciplinary teams.
PO10 Ability to communicate effectively.
PO11 Understanding 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) (ELECTRICAL SYSTEM ENGINEERING)

YEAR	FISRT		SECOND		THIRD			FOURTH	
Semester	I	II	III	IV	V	VI		VII	VIII
ENGINEERING CORE (98)	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	EIT 302/4 Industrial Training & Engineering Innovation	EET445/2 Final Year Project I	EET446/4 Final Year Project II
	EET101/3 Electric Circuit I	EET107/3 Digital Electronics I	EET202/3 Digital Electronics II	EET203/4 Microprocessor Systems and Application	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
NON ENGINEERING (22)	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT203/3 Engineering Mathematics III	EQT271/3 Engineering Statistics					
		EUT122/2 Skills And Technology in Communication			EUT440/3 Engineers in Society	EETxxx/2 Engineering Economics			EUT443/2 Engineering Management
		ECT111/3 Engineering Skills							
REQUIRED UNIVERSITY (15)	EUW233/2 Islamic Civilization and Asia Civilization			EUW212/2 University English Language		EUW322/2 Thinking Skills		EUWXXX/2 Option	
	EUW410/2 University Malay Language		EUWXXX/1 Co-curriculum	EUW224/2 Engineering Entrepreneurship					
	EUW235/2 Ethnic Relation								
135	15	17	17	17	17	17	4	16	15
Total Units for Graduation 135									

Elective I: EET427/3 Industrial Electronic Control or EET426/3 Power Electronics II or EET431/3 Electrical Energy System
Elective II: EET418/3 Power Quality or EEET433/3 Renewable Energy System

INDUSTRIAL ELECTRONIC ENGINEERING PROGRAMME OBJECTIVES (PEO)

Programme Objectives 1
Graduates who are leaders in the field of electrical engineering 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.

PROGRAM OUTCOMES-PO

PO 01 Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in electrical engineering discipline.
PO2 Ability to identify, formulate and solve electrical engineering problems.
PO3 Ability to design a system, component or process to meet desired needs.
PO4 Ability to design and conduct experiments, as well as to analyze and interpret data.
PO5 Ability to use techniques, skills and modern engineering tools necessary for engineering practices
PO6 Ability to demonstrate/understand the social, cultural, global and environmental responsibilities of a professional engineer.
PO7 Ability to demonstrate/understand entrepreneurship, the process of innovation and the need for sustainable development of the environment.
PO8 Understanding of professional and ethical responsibilities and commitment to the society.
PO9 Ability to function on multi-disciplinary teams.
PO10 Ability to communicate effectively.
PO11 Understanding 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) (INDUSTRIAL ELECTRONIC ENGINEERING)

YEAR	FISRT		SECOND		THIRD			FOURTH	
Semester	I	II	III	IV	V	VI		VII	VIII
ENGINEERING CORE (98)	EET106/3 Engineering Science	EET110/3 Computer Programming	EET206/3 Electric Circuit II	EET208/3 Electrical Power Technology	EET301/4 Power System Engineering	EET308/3 Power System Analysis	EIT 302/4 Industrial Training & Engineering Innovation	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 Microprocessor Systems and Application	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
NON ENGINEERING (22)	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT203/3 Engineering Mathematics III	EQT271/3 Engineering Statistics					
		EUT122/2 Skills And Technology in Communication			EUT440/3 Engineers in Society	EETxxx/2 Engineering Economics			EUT443/2 Engineering Management
		ECT111/3 Engineering Skills							
REQUIRED UNIVERSITY (15)	EUW233/2 Islamic Civilization and Asia Civilization			EUW212/2 University English Language		EUW322/2 Thinking Skills		EUWXXX/2 Option	
	EUW410/2 University Malay Language		EUWXXX/1 Co-curriculum	EUW224/2 Engineering Entrepreneurship					
	EUW235/2 Ethnic Relation								
135	16	17	17	17	17	17	4	16	15
Total Units for Graduation 135									

Elective:
EET412/3 Electrical Machine Design or EET414/3 Substation Design or EET432/3 Electrical Energy Utilization

ELECTRICAL ENERGY SYSTEMS ENGINEERING PROGRAMME OBJECTIVES (PEO)

Programme Objectives 1
Graduates who are leaders in the field of electrical engineering 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)

PO 01 Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in electrical engineering discipline.
PO2 Ability to identify, formulate and solve electrical engineering problems.
PO3 Ability to design a system, component or process to meet desired needs.
PO4 Ability to design and conduct experiments, as well as to analyze and interpret data.
PO5 Ability to use techniques, skills and modern engineering tools necessary for engineering practices
PO6 Ability to demonstrate/understand the social, cultural, global and environmental responsibilities of a professional engineer.
PO7 Ability to demonstrate/understand entrepreneurship, the process of innovation and the need for sustainable development of the environment.
PO8 Understanding of professional and ethical responsibilities and commitment to the society.
PO9 Ability to function on multi-disciplinary teams.
PO10 Ability to communicate effectively.
PO11 Understanding 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) (ELECTRICAL ENERGY SYSTEMS ENGINEERING)

YEAR	FISRT		SECOND		THIRD			FOURTH	
Semester	I	II	III	IV	V	VI		VII	VIII
ENGINEERING CORE (98)	EET106/3 Engineering Science	EET110/3 Computer Programming	EET206/3 Electric Circuit II	EET208/3 Electrical Power Technology	EET301/4 Power System Engineering	EET308/3 Power System Analysis	EIT 302/4 Industrial Training & Engineering Innovation	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 Microprocessor Systems and Application	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	
								EETXXX/3 Elective I	EETXXX/3 Elective II
NON ENGINEERING (22)	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT203/3 Engineering Mathematics III	EQT271/3 Engineering Statistics					
		EUT122/2 Skills And Technology in Communication			EUT440/3 Engineers in Society	EETxxx/2 Engineering Economics			EUT443/2 Engineering Management
		ECT111/3 Engineering Skills							
REQUIRED UNIVERSITY (15)	EUW233/2 Islamic Civilization and Asia Civilization			EUW212/2 University English Language		EUW322/2 Thinking Skills		EUWXXX/2 Option	
	EUW410/2 University Malay Language		EUWXXX/1 Co-curriculum	EUW224/2 Engineering Entrepreneurship					
	EUW235/2 Ethnic Relation								
135	15	17	17	17	17	17	4	16	15
Total Units for Graduation 135									

Elective:
EET427/4 Industrial Electronic Control or EET426/4 Power Electronics II or EET411/3 Power System Operation and Control

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 para meters of three phase AC system for Wye and Delta connection.

CO3:
Ability to explain and apply the basic concept of magnetism and electro-magnetism 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. Fowler. (2008). Electricity Principles and Applications. 7th Edition. Mc Graw Hill.
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. Y.A.Cengal and M.A. Boles. (2008). Thermodynamics: An Introduction Approach', 6th Ed., McGraw-Hill.
2. William D. Callister, Jr. (2007). Materials Science and Engineering: An Introduction. 7th ed.
3. Robert L. Mott. (2006). Applied Fluid Mechanics. 6th ed. Pearson.
4. Yunus A. Cengel, Robert H. Turner. (2005). Fundamentals of Thermal-Fluid Sciences. Int ed. McGraw-Hill.
5. Lim Poh Seng, Tay Seng How, Koh Kok Pin. (2003). Strength of Materials for Polytechnic. Revised ed. Prentice Hall.

EET107/3
DIGITAL ELECTRONICS I

Course Synopsis

To introduce and discuss the fundamental of digital circuit analysis and digital circuit design. The lecture and laboratory exercises cover the following topics:, Numbering System, Boolean Algebra, Basic Logic Gates, Combinational Logic Design, and Sequential Logic Design.

Course Outcomes

CO1:
Ability to explain and use the basic principles of numbering system and basic theory of binary system in digital electronics.

CO2:
Ability to design and optimizes logic circuit using Boolean functions and Karnaugh maps.

CO3:
Ability to design digital system applications using combinational and sequential logic design techniques.

References

1. Floyd. TL. (2009). Digital Fundamentals. 10th ed. Prentice Hall.
2. Ronald J. Tocci. (2007). Digital Systems – Principles and Application. 10th ed. Prentice Hall.
3. Godse, Atul P. Godse, Deepali A. Godse, Gurpreet Singh Ghai. (2007). Digital Electronics. Technical Publications Pune.
4. Rafikha Aliana A Raof, Norina Idris, Phaklen Eh Kan Mohamad Nazri Md Noor. (2006). Digital Electronics Design. 1st ed. Prentice Hall.
5. Nigel P.C. (1999). A First Course in Digital Electronics. 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 to solve problems in DC circuits.

CO2:
Ability to analyze the first and second order circuits containing passive elements, DC sources and switches using differential equations.

CO3:
Ability to calculate circuits parameters containing sinusoidal steady-state sources using complex impedances and phasor representations.

References

1. Alexander, C.K. & Sadiku, M.N.O. (2009). Fundamentals of Electric Circuits. 4th ed. McGraw-Hill.
2. Nilsson, J.W., Riedel, S.A. (2008). Electric Circuits. 8th ed. Prentice Hall.
3. Irwin, J.D., Nelms, R.M. (2008). Basic Engineering Circuit Analysis. 9th ed. John Wiley.
4. Hyat W.H., Durbin, S.M., Kimmerly, J.E. (2007). Engineering Circuit Analysis. 7th ed. McGraw Hill.
5. Robbins, A.H, Miller, W.C. (2003). Circuit Analysis: Theory and Practice. 3rd ed. Thomson/Delmar Learning.

EET109/3
ELECTRONIC DEVICES

Course Synopsis

EET 109 will expose to students the basic electronic devices. It provides in depth study on 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 and other types of diodes that are signed for specific application including zener, Shockley diode, SCR and its application, SCS, Diac, and Triac. Bipolar Junction Transistors (BJTs) and various types of Field-Effect Transistor (FET) which are Junction Field-Effect Transistor (JFET) and the Metal Oxide Semiconductor Field-Effect Transistor MOSFET will be introduced in this course. Basic theories, principles and practical are stressed in this course.

Course Outcomes

CO1:
Ability to explain and describe the fundamental concepts of electronic Devices.

CO2:
Ability to explain and calculate the basic operations of electronic devices such as diode, BJT and various types of FET.

CO3:
Ability to calculate and analyze the basic biasing circuits using datasheet.

References

1. Neamen Donald A. (2010). Microelectronics Circuit Analysis and Design. 4th ed. McGraw Hill.
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. Puspa Inayat Khalid, Rubita Sudir man, Siti Hawa Ruslan. (2001). Modul Pengajaran Elektronik. Edisi ke 3.

EET202/3
DIGITAL ELECTRONICS II

Course Synopsis

This course expose the students to the Combinational Logic System Design, Shift Register, Register & Register Transfer, Sequencing and Control and Computer design basic as well as Computer Organisation.

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. Rafikha Aliana, Norina Idris, Phak Len Eh Kan, Mohammad Nazri. (2007). Digital Electronics Design. 1st ed. Prentice Hall
2. Floyd. TL. (2009). Digital Fundamentals. 10th 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
MICROPROCESSOR SYSTEMS AND APPLICATION

Course Synopsis

The aim of this course is to study the Intel 8085 microprocessor architecture and related 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.

Course Outcomes

CO1:
Ability to explain the basic microcontroller architecture.

CO2:
Ability to analyze and write a microcontroller programming language in assembly and C program.

CO3:
Ability to interface the input and output devices with microcontroller.

CO4:
Ability to design a simple microcontroller based system and present in group.

References

1. William Routt. (2006). Microprocessor Architecture, Programming, and Systems Featuring The 8085. 1st ed. Delmar Cengage Learning.
2. John Uffenbeck. (1999). Microcomputers and Microprocessors: The 8080, 8085, and Z-80 Programming, Interfacing, and Troubleshooting. Prentice Hall.
3. R.S. Gaonkar. (2002). Microprocessor Architecture, Programming and Applications with the 8085. 5th ed. Prentice Hall.
4. W.Kleitz. (1998). Microprocessor and Microcontroller Fundamentals: The 8085 and 8051 Hardware and Software. Prentice Hall.
5. B.B. Brey. (1996). The 8085A Microprocessor: Software, Programming and Architecture. Prentice Hall.

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. Rajendra Prasad.(2004). Electrical Measurement and Measuring Instrument. Khanna Publishers, India.
2. H.S Kalsi.(2003). Electronics Instrumentation. Tata Mc Graw Hill.
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 Edition, Great Britain, Elsevier.

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 explain the 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. Floyd, T. (2008). Electronic Devices. 8th Ed. Pearson Education, Inc.
2. Boylestad, R.L. (2009). Nashelsky, L., 'Electronic Devices and Circuit Theory. 10th Ed. Prentice Hall.
3. Donald A. Neamen. (2007). Microelectronics Circuit Analysis and Design. 3rd Ed. Mc Graw-Hill.
4. Bogart, T.F. (2004). Electronic Devices and Circuits. 6th Ed. Prentice Hall.
5. Adel S. Sedra, Kenneth C. Smith. (2009). Microelectronic Circuits. 6th Ed. Oxford University Press.

EET206/3
ELECTRIC CIRCUIT II

Course Synopsis

This course exposes the students to the circuit analysis using Laplace and Fourier Transform. Student also would able to explain the concept of mutual inductance, frequency response of AC circuit and two port network.

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 explain the concepts of frequency response for AC circuits and derive and analyze Bode plot for various types of transfer function.

CO4:
Ability to work in team and communicate effectively.

References

1. Sadiku, M. N. O, Alexander, C. K. (2009). Fundamentals of Electric Circuits. Singapore, 4th ed. McGraw-Hill.
2. Nilsson, J. W. and Riedel, S.A. (2008). Electric Circuits. 8th ed. Prentice Hall, New Jersey.
3. Dorf, R.C., Svodoba, J.A. (2008). Introduction to electric circuits. 8th ed. John Wiley.
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 characteristic in engineering systems.

CO2:
Ability to analyze signals and determine the process of the systems.

CO3:
Ability to explain and calculate the system response using variable methods.

CO4:
Ability to prepare a report in relevant topics using various resources.

References

1. Charles L. Philips, John M. Parr, Eve A. Riskin. (2008). Signals, Systems and Transforms. 4th ed. Prentice Hall International Edition.
2. P Rao. (2008). Signals and Systems. Tata Mc Graw Hill.
3. Simon Haykin, Barry Van Veen. (2005). Signals and Systems. 2nd ed. Wiley.
4. Ashok Ambardar. (1999). Analog and Digital Signal Processing. 2nd ed.
5. Fred J. Taylor. (1994). Principles of Signals and Systems. McGraw Hill International.

EET208/3
ELECTRICAL POWER TECHNOLOGY

Course Synopsis

Basically, this course reviews the electrical fundamentals and introduces the students to the concept and theory of magnetism, electromagnetism and magnetic circuit. The students also will be exposed to the operating principle and analysis of transformer. Course content include the three-phase system which consist of balanced and unbalanced load.

Course Outcomes

CO1:
Ability to EXPLAIN, DEMONSTRATE and CALCULATE parameters of balanced three phase AC systems for wye and delta connections.

CO2:
Ability to EXPLAIN, CALCULATE and ANALYZE electromagnetic and its application in transformer.

CO3:
Ability to EXPLAIN, DETERMINE and ANALYZE the parameters and equivalent circuit of transformer.

CO4:
Ability to EXPLAIN, CALCULATE and ANALYZE three-phase system with balance and unbalanced load.

References

1. Edward Hughes, Ian McKenzie Smith, John Hiley, Keith Brown. (2008). Electrical and Electronic Technology. 10th ed. Prentice Hall.
2. Rizzoni, Giorgio. (2007). Principles and Applications of Electrical Engineering. 5th ed. New York: McGraw Hill.
3. Theraja B.L. (2007). A Text Book of Electrical Technology. Volume I (Basic Electrical Engineering): S.Chand & Company Ltd.
4. Chapman, Stephen J. (2005). Electric Machinery Fundamentals. 4th ed. New York: McGraw-Hill.
5. Muthusubramanian.R, Salivahanan.S and Muraledharan. K. A. (2000). Basic Electrical, Electronics and Computer Engineering. 2nd ed., New Delhi: Tata McGraw-Hill.

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 explain types and operation of power system generations in groups.

CO2:
Ability to solve single-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 analyze fault and protection system in power system.

References

1. DP Kothari, I. J. Nagarath. (2008). Power System Engineering. 2nd ed. Tata McGraw-Hill Publishing Company Limited.
2. Mohamed E. El-Hawary. (2008). Introduction to Electrical Power Systems. New Jersey: John Wiley & Sons, Inc.
3. Turan Gonen. (2008). Electric Power Distribution System Engineering. 2nd ed. CRC Press.
4. Theodore R. Bosela. (2003). Electrical Systems Design. Pearson Education, Inc, New Jersey.
5. Chapman, Stephen J. (2002). Electric Machinery and Power System Fundamental. Boston: McGraw Hill.

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 apply the concept of electromagnetic in transmission line analysis.

References

1. Matthew N.O. Sadiku. (2008). Element of Electromagnetics. 3rd ed. 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. 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. 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 motors.

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. Bhattacharya S.K. (2008). Electrical Machines. 3rd ed. Tata McGraw-Hill.
2. Theraja B.L. (2007). A Text Book of Electrical Technology. Volume II (AC & DC Machines), S.Chand & Company Ltd.
3. Charles A. Gross. (2007). Electric Machine. CRS Press.
4. Wildi. T. (2006). Electrical Machine, Drives and Power System. 6th ed. Prentice-Hall.
5. Stephen J. Chapman. (2005). Electric Machinery Fundamentals. 4th ed. McGraw-Hill.

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 explain 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 design 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. 1st ed. McGraw Hill.
2. Robert Perret. (2009). Power Electronics: Semiconductor Devices. NJ: Wiley
3. Muhammad H. Rashid. (2004). Power Electronics: Circuits, Devices & Applications. 3rd ed. Pearson, Prentice Hall.
4. Mohan, Underland, Robbins. (2003). Power Electronics: Converters, Applications & Design. 3rd ed. John Wiley.
5. Cyril W. Lander. (1993). Power Electronics. 3rd ed. McGraw Hill.

EET308/3
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,and ANALYZE 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. Saadat, H. (2004). Power System Analysis. 2nd ed. McGraw-Hill.
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. Mgraw-Hill

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.

The laboratory sessions will be conducted to enable the students to strengthen the theory. This also includes a mini project/assignment for the system analysis and controller design.

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 analyze control system problems by utilizing control system graphical tools such as root locus or bode plot.

CO4:
Ability to design appropriate controller/s through system compensation in performing control system analysis.

References

1. Norman S. Nise. (2010). Control System Engineering. 6th ed. John Wiley & Sons.
2. Kuo B. C. (2010). Automatic Control System. 9th ed. John Wiley & Sons.
3. Ogata K. (2009). Modern Control Engineering. 5th ed. Prentice Hall.
4. Franklin G. F., Powell J. D. and Emani-Naeni A. (2009). Feedback Control of Dynamic Systems System. 9th ed. Prentice Hall.
5. Richard C. Dorf and Robert H. Bishop. (2008). Modern Control Systems. 11th edition. Prentice Hall.

EET411/3
POWER SYSTEM OPERATION & CONTROL

Course Synopsis

This course aims to provide further understanding of the fundamentals of power system operations. 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 with Lambda method, power system control and optimal power flow, unit commitment (UC), interconnected power systems and communication in power system. To further strengthen the theoretical background, students are exposed to simulation of power system operations and control in the laboratory using MiPower software.

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 Load Shedding 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, Supervisory Control and Data Acquisition (SCADA) system in power System

CO5:
Ability to CALCULATE and ANALYZE , security studies, sensitivity factors and sensitivity methods

References

1. Saadat, H. (2004). Power System Analysis. 2nd ed. McGraw-Hill.
2. D.P. Nagrath, I.J. Kothari. (2003). Modern Power System Analysis. 3rd ed. Tata McGraw-Hill.
3. D.P. Nagrath, I.J. Kothari. (2003). Modern Power System Analysis. 3rd ed. Tata McGraw-Hill.
4. Wood A.J., Wollenberger, B.D. (1996). Power System Generation, Operation and Control. 2nd ed. John Wiley and Sons.
5. Miller, R.H, Malinowski, J.H. (1994). Power System Operation. 3rd ed. McGraw Hill.

EET412/3
ELECTRICAL MACHINE DESIGN

Course Synopsis

Basically, this Electrical Machine Design course consist of magnetism reviews and discussion on magnetic material, study about design stator, rotor and winding of electrical motor and transformer. The courses continue with electrical machine characteristic and analysis including losses and efficiency. The students also will be 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, Tapani Jokinen, Valeria Hrabovcova. (2008). Design of rotating electrical machines. John Wiley & Sons.
2. Philip Beckley. (2002). Electrical Steels for rotating machine. The institution of Electrical Engineers. ISBN 0 85296 980 5.
3. Indrajit Dasgupta. (2002). Design of Transformer. Tata McGraw-Hill Publishing Com. Lmt.
4. S.V.Kulkarni, S.A. Khaparde. (2004). Transformer Engineering Design and Practical. Marcel Dekker Inc.
5. Jimmie J. Cathey. (2001). Electric Machines, Analysis and Design applying Matlab. McGraw-Hill Publishing Com. Lmt.

EET417/3
HIGH VOLTAGE ENGINEERING

Course Synopsis

This course focus on phenomena of high voltage surges and insulation coordination for power systems, characteristics of conduction and breakdown of gas, liquid and solid dielectrics, generation of high voltages and currents, measurement of high voltages and currents, non-destructive testing (NDT) for high voltage components, detection and measurement of discharge process.

Course Outcomes

CO1:
Ability to explain the concept of high voltage engineering and calculate various breakdown parameters and identify applications of vacuum dielectrics, liquid dielectrics, solid dielectrics, and composite dielectrics.

CO2:
Ability to explain, calculate and analyze the concept of generations and measurements of high voltage AC, DC, Impulse voltage and impulse current generators.

CO3:
Ability to explain the over-voltage phenomena and the related insulation coordination problems and analyze types of high voltage testing for electrical apparatus and non-destructive materials.

References

1. S. Naidu & V. Kamaraju. (2009). High Voltage Engineering. 4th ed. Tata McGrawHill.
2. E. Kuffel & M. Abdullah. (2000). High Voltage Engineering. 2nd ed. Pergamon Press.
3. Subir Ray. (2004). An Introduction to High Voltage Engineering. Prentice-Hall of India.
4. Arrilaga, J. (1998). High Voltage Direct Current Transmission. 2nd ed. IEE.
5. Davies, T. (1996). Protection of Industrial Power Systems. 2nd ed. Newness.

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 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, explain foundation and structure of substation and test some substation equipments.

References

1. John MC Donald. (2007). Electrical Power Substations Engineering. 2nd Ed. CRC Press.
2. Colin Bayliss. (2002). Transmission and Distribution electrical engineering. Newness, Great Britain.
3. Garzon Ruben D. (2002). High Voltage Circuit Breaker. Marcel Decker Inc, USA.
4. Rao, S. (2003). Electrical Substation Engineering & Practice. Khana Publishers, New Delhi.
5. H. Lee Willis. (2000). Power Distribution Planing. Dekker/CRC Press.

EET416/3
ELECTRICAL DRIVES

Course Synopsis

This course provides the students 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 design and recommend appropriate power electronic drives parameters in electrical machines application.

References

1. Muhammad H. Rashid. (2004). Power Electronics: Circuits, Devices and Application. 2nd. Prentice Hall International Inc. New Jersey

2. Ned Mohan. (2003). Electric Drives: An Integrative Approach. MNPERE.
3. Gopal K.Dubey. (2001). Fundamentals of Electrical Drives. 2nd. Alpha Science, Kanpur.
4. El-Sharkawi A. Mohamed. (2000). Fundamentals of Electric Drives. A division of Thomson Learning, USA.
5. Vedam Subrahmanyam. (1994). Electric Drives: Concepts and Applications. Tata McGraw-Hill.

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. Wildi Theodore. (2006). Electrical Machines, Drives, and Power Systems. Pearson-Prentice Hall, New Jersey.
2. Muhammad H. Rashid. (2004). Power Electronics: Circuits, Devices and Application. 2nd. Prentice Hall International Inc. New Jersey.
3. Gopal K.Dubey. (2001). Fundamentals of Electrical Drives. 2nd. Alpha Science, Kanpur.
4. El-Sharkawi A. Mohamed. (2000). Fundamentals of Electric Drives. A division of Thomson Learning, USA.
5. Vedam Subrahmanyam. (1994). Electric Drives: Concepts and Applications. Tata McGraw-Hill.

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 explain and discuss the importance of EMC directives, EMC related directives and routes to compliance.

CO2:
Ability to explain and discuss 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 relate analytic solutions to compliance requirements.
CO4: Ability to classify EMI sources and propose solutions on practical applications including Power Electronic, analogue and digital systems.

CO4:
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.
4. D. Lohbeck. (1998). CE Marking. Newnes.
5. Laszlo Tihanyi. (1995). Electromagnetic Compatibility in Power Electronics. Elsevier Science.

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 determine the Topologies, parameters of related components and thermal management in SMPS.

CO2:
Ability to interpret and analyze the rectification techniques, SMPS wave forms, SMPS control strategies and modes control.

CO3:
Ability to use related software tools to simulate SMPS Topologies and to deter mine 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.

EET424/3
POWER ELECTRONICS FOR ENERGY SYSTEM

Course Synopsis

This course cover of quality problems that caused by the use of power electronics, power electronic inverter and waveform shaping techniques used in a typical energy system, an introduction of uninterruptile power supplies (UPS) and sustainable energy system; i.e. solar energy system and energy management.

Course Outcomes

CO1:
Ability to recognize and explain power quality problems and differentiate their mitigation devices.

CO2:
Ability to analyze inverter topologies and their performances through theoretical and simulation.

CO3:
Ability to analyze and evaluate the significance of sustainable energy.

References

1. Ewald F. Fuchs, Mohammad A. S. Masoum. (2008). Power quality in power systems and electrical machines. Academic Press/Elsevier.
2. M. H. Rashid. (2007). Power Electronics Handbook: Devices, Circuits, and Applications - Engineering Series Academic Press Series in Engineering. Academic Press.
3. G. N. Tiwari and M K Ghosal. (2005). Renewable Energy Resources. Alpha Science.
4. M. H. Rashid. (2004). Power Electronics: Circuit, Devices and Applications. Prentice Hall.
5. Barry W. Kennedy. (2000). Power Quality Primer. McGraw-Hill.

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, DESIGN and ANALYZE the principles operation of servo motor and transistor switching sequences to control servomotor and its application in industrial electronic control

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. Kissell Thomas. (2008). Industrial Electronics: Applications for Programmable Controllers, Instrumentation and Process Control, and Electrical Machines and Motor Controls. Prentice-hall Of India Pvt Ltd.
2. Terry Bartelt. (2006). Industrial Control Electronics; Devices, Systems and Application. 3rd ed. Thomson Delmar Learning.
3. Jacob, M. (2005). Industrial Control Electronics. Prentice Hall, Singapore.
4. Frank Petruzella. (2005). Programmable Logic Controllers. 3rd ed. Amazon.
5. Webb, J., Greshock, K. (1993). Industrial Control Electronics. 2nd ed. Prentice Hall.

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.

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.

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. Mc Graw 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.

References

1. John Twidell and Anthony D. Weir. (2006). Renewable Energy Resources. Taylor & Francis.
2. G. N. Tiwari and M. K Ghosal. (2005). Renewable energy resources: basic principles and applications. Alpha Science International.
3. Godfrey Boyle. (2004). Renewable Energy: Power for a Sustainable Future. Oxford University Press, Oxford.
4. Gilbert M. Masters. (2004). Renewable and Efficient Electric Power Systems. John Wiley & Sons.
5. B. K. Hodge. Alternative Energy 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.

Course Outcomes

CO1:
Ability to apply and integrate theory and practical to solve the engineering problems.

CO2:
Ability to develop suitable research methodology for the project.

CO3:
Ability to explain a project in a technical report.

CO4:
Ability to present and defend effectively project proposal to selected audience.

CO5:
Ability to identify commercialization potential for proposed project.

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.

Course Outcomes

CO1:
Ability to apply and integrate theory and practical to solve the engineering problems.

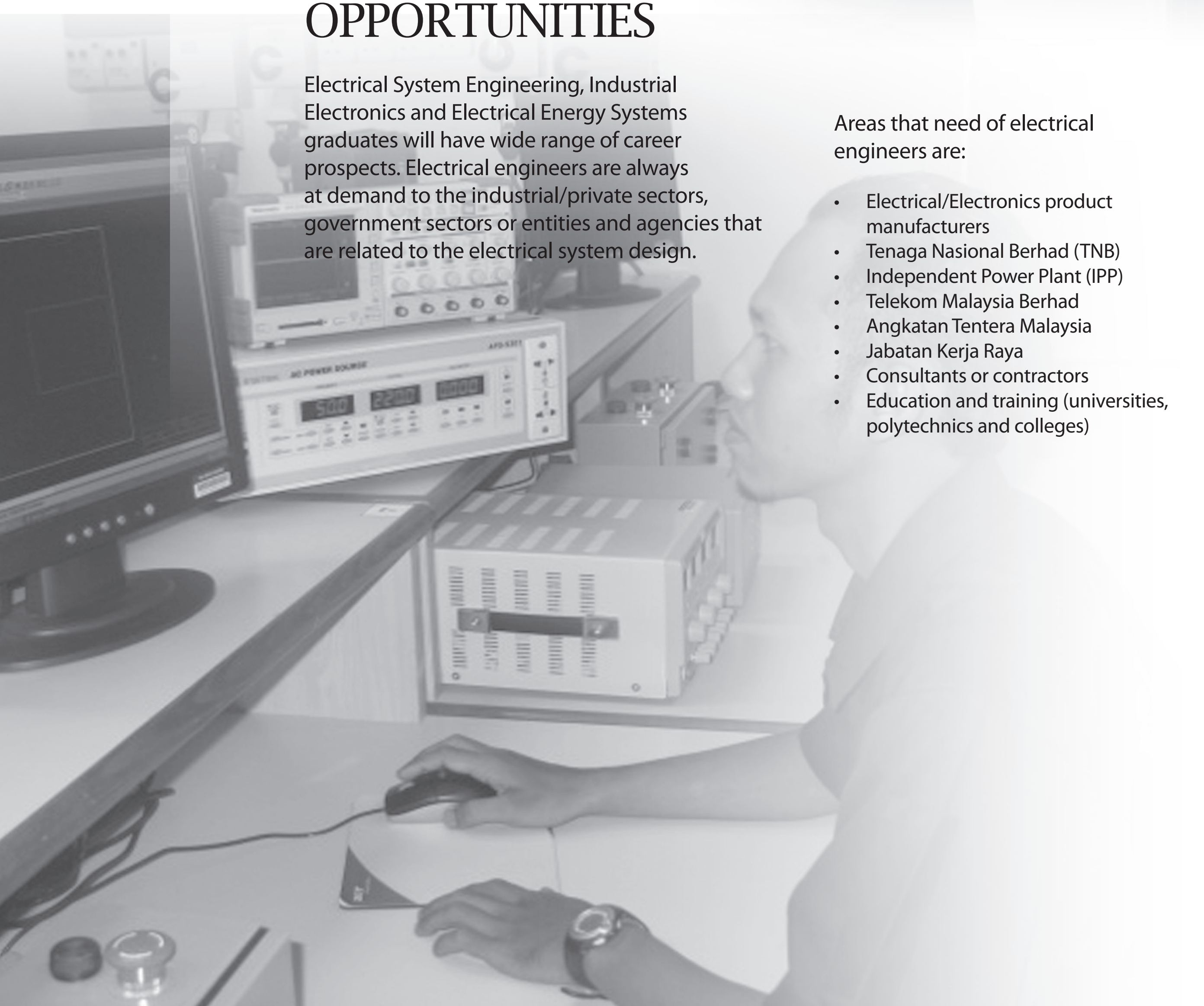
CO2:
Ability to develop suitable research methodology for the project.

CO3:
Ability to explain a complete project in a technical report (dissertation).

CO4:
Ability to present and defend effectively project findings to selected audience.

CO5:
Ability to identify commercialization potential for developed project.

CAREER
OPPORTUNITIES



Electrical System Engineering, Industrial Electronics and 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)

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)
- Doctor of Philosophy (Manufacturing Engineering)

5.

SCHOOL OF MANUFACTURING ENGINEERING

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Introduction

Initially, the School of Manufacturing, 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 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 commenced its operation in the location of the School Complex, located at Kubang Gajah, Arau. Starting in 2004, School of Manufacturing was moved to a new location located at the Jejawi Enginnering Complex along with six other schools. Then, once again this school was moved to 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 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 so far has offered two programs of study at Bachelor level, namely Bachelor of Engineering (Manufacturing) and Bachelor of Engineering (Product Design).

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 135 units of credit, where 120 unit credits include core courses, while the remaining 15 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, 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), Bachelor of Science (Manufacturing), Bachelor of Science (Product Design) and Doctor of Philosophy (Manufacturing). In principle, the school was founded with the goal of making the public to produce 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.

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PROGRAMME OBJECTIVES FOR MANUFACTURING ENGINEERING PROGRAMME

PROGRAMME EDUCATION OBJECTIVE (PEO)

Programme Objectives 1
Graduates who are leaders in the field of Manufacturing Engineering or chosen field as demonstrated via career advancement.

Programme Objectives 2
Graduates who are members of and contribute to professional society.

Programme Objectives 3
Graduates who engage in life-long learning or continuous education opportunities.

Programme Objectives 4
Graduates who contribute towards research and development.

Programme Objectives 5
Graduates who are entrepreneurial engineers.

PROGRAMME OUTCOMES (PO)

NO	HEADING	AREA	PROPOSED PROGRAMME OUTCOMES (PO)
1	Engineering Knowledge	C	Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in Manufacturing Engineering discipline.
2	Problem Analysis	C and/or CTPS	Ability to identify, formulate and solve electronic engineering problems.
3	Design and Development of Solutions	C and/or CTPS	Ability to design a system, component or process to meet desired needs.
4	Investigation	P	Ability to design and conduct experiments, as well as to analyze and interpret data.
5	Modern Tool Usage	P	Ability to use techniques, skills and modern engineering tools necessary for engineering practices
6	The Engineer and Society	EM	Ability to understand the social, cultural, global and environmental responsibilities of a professional engineer.
7	Environment and Sustainability	ES	Ability to understand entrepreneurship, the process of innovation and the need for sustainable development of the environment.

NO	HEADING	AREA	PROPOSED PROGRAMME OUTCOMES (PO)
8	Ethics	EM	Understanding of professional and ethical responsibilities and commitment to the society.
9	Individual and Team-work	TS and LS	Ability to function on multi-disciplinary teams.
10	Communication	CS	Ability to communicate effectively.
11	Lifelong Learning	LL	Understanding of the need for, and an ability to engage in life-long learning.
12	Project Management and Finance	ES	Demonstrate understanding of project management and finance principles

CURRICULUM STRUCTURE FOR BACHELOR OF ENGINEERING (HONOURS) (MANUFACTURING ENGINEERING)

YEAR	FISRT		SECOND		THIRD			FOURTH	
Semester	I	II	III	IV	V	VI		VII	VIII
ENGINEERING CORE (97)	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	EIT 302/4 Industrial Training & Engineering Innovation	EPT445/2 Final Year Project	EPT446/4 Final Year Project
	EPT152/2 Engineering Drawing	EPT112/3 Statics	EPT212/3 Dynamics	EPT235/3 Thermody namics	EPT341/3 Solid Mechanics II	EPT313/3 Machine Components Design		EPT412/3 Mechanical System Design	EPT424/2 Heat Transfer
		EPT181/2 CAD/CAM	EPT261/3 Electronics	EPT281/3 Industrial Engineering	EPT383/3 Automation and Robotics	EPT328/3 Fluid Mechanics II		EPT403/3 Advanced Materials	EPT495/2 Operational Research
		EPT182/3 Manufacturing Process I	EPT282/3 Manufacturing Process II		EPT385/3 Metrology and Quality Control	EPT361/4 Instrumentation and Control		EPT484/2 Lean Manufacturing	EPT4XX/3 Elective
		EPT183/2 Engineering Workshop			EPT384/3 Advanced Manufacturing Technology	EPT381/3 Tools and Die Design		EPT485/2 Production Planning and Control	
NON ENGINEERING (23)	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT203/3 Engineering Mathematics III	EQT271/3 Engineering Statistics	EPT371/2 Finite Element Analysis				
	EPT162/2 Computer Programming	EUT122/2 Skills and Technology in Communication						EUT443/2 Engineering Management	EUT440/3 Engineers in Society
REQUIRED UNIVERSITY (15)	EUW233/2 Islamic & Asian Civilisations & EUW410/2 University Malay Language & EUW235/2 Ethnic Relations & EUWXXX/1 Co-Curriculum Subjects		EUW212/2 University English	EUW224/2 Engineering Entrepreneurship & EUWXXX/2 Option Subjects		EUW322/2 Thinking Skills			
120	17	18	17	16	17	18	4	14	14
15	University English, Engineering Entrepreneurship, Islamic & Asian Civilisations, Ethnic Relations, Thinking Skills, University Malay Language, Co-Curiculum, Option Subjects								
Total Units for Graduation 135									

Elective: EPT487 Manufacturing Automation; EPT486 Ergonomics

PROGRAMME OBJECTIVES FOR MANUFACTURING ENGINEERING PROGRAMME

PROGRAMME EDUCATION OBJECTIVE (PEO)

Programme Objectives 1
Graduates who are leaders in the field of Manufacturing Engineering or chosen field as demonstrated via career advancement.

Programme Objectives 2
Graduates who are members of and contribute to professional society.

Programme Objectives 3
Graduates who engage in life-long learning or continuous education opportunities.

Programme Objectives 4
Graduates who contribute towards research and development.

Programme Objectives 5
Graduates who are entrepreneurial engineers.

PROGRAMME OUTCOMES (PO)

NO	HEADING	AREA	PROPOSED PROGRAMME OUTCOMES (PO)
1	Engineering Knowledge	C	Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in Manufacturing Engineering discipline.
2	Problem Analysis	C and/or CTPS	Ability to identify, formulate and solve electronic engineering problems.
3	Design and Development of Solutions	C and/or CTPS	Ability to design a system, component or process to meet desired needs.
4	Investigation	P	Ability to design and conduct experiments, as well as to analyze and interpret data.
5	Modern Tool Usage	P	Ability to use techniques, skills and modern engineering tools necessary for engineering practices
6	The Engineer and Society	EM	Ability to understand the social, cultural, global and environmental responsibilities of a professional engineer.
7	Environment and Sustainability	ES	Ability to understand entrepreneurship, the process of innovation and the need for sustainable development of the environment.

NO	HEADING	AREA	PROPOSED PROGRAMME OUTCOMES (PO)
8	Ethics	EM	Understanding of professional and ethical responsibilities and commitment to the society.
9	Individual and Team-work	TS and LS	Ability to function on multi-disciplinary teams.
10	Communication	CS	Ability to communicate effectively.
11	Lifelong Learning	LL	Understanding of the need for, and an ability to engage in life-long learning.
12	Project Management and Finance	ES	Demonstrate understanding of project management and finance principles

CURRICULUM STRUCTURE FOR BACHELOR OF ENGINEERING (HONOURS) (PRODUCT DESIGN ENGINEERING)

YEAR	FISRT		SECOND		THIRD			FOURTH	
Semester	I	II	III	IV	V	VI		VII	VIII
ENGINEERING CORE (97)	EPT103/3 Materials	EPT161/3 Electrical Technology	EPT241/3 Solid Mechanics I	EPT228/3 Fluid Mechanics I	EPT335/3 Applied Thermodynamics	EPT313/3 Machine Components Design	EIT 302/4 Industrial Training & Engineering Innovation	EPT445/2 Final Year Project	EPT446/4 Final Year Project
	EPT152/2 Engineering Drawing	EPT112/3 Statics	EPT212/3 Dynamics	EPT235/3 Thermo dynamics	EPT341/3 Solid Mechanics II	EPT314/3 Machines Mechanism		EPT 403/3 Advanced Materials	EPT424/2 Heat Transfer
	EPT191/2 Workshop and Studio Practice	EPT184/3 Manufacturing Technology	EPT261/3 Electronics	EPT262/2 Measurement and Instrumentation System	EPT363/3 Automatic Control	EPT364/3 Mechatronics		EPT427/3 Pneumatics and Hydraulics System Design	EPT495/2 Operational Research
		EPT192/3 Product Innovation	EPT283/2 Computer Aided Design	EPT293/3 Engineering Product Design I	EPT393/3 Engineering Product Design II	EPT395/3 Engineering Product Design III		EPT415/3 Vibration	EPT4XX/3 Elective
					EPT394/3 Product Ergonomic and Safety	EPT328/3 Fluid Mechanics II			
NON ENGINEERING (23)	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EQT203/3 Engineering Mathematics III	EQT271/3 Engineering Statistics	EPT371/2 Finite Element Analysis				
	EPT162/2 Computer Programming	EUT122/2 Skills and Technology in Communication						EUT443/2 Engineering Management	EUT440/3 Engineers in Society
REQUIRED UNIVERSITY (15)	EUW233/2 Islamic & Asian Civilisations & EUW410/2 University Malay Language & EUW235/2 Ethnic Relations	EUWXXX/1 Co-Curriculum Subjects	EUW212/2 University English	EUW224/2 Engineering Entrepreneurship & EUWXXX/2 Option Subjects		EUW322/2 Thinking Skills			
120	18	18	16	18	17	17	4	13	14
15	University English, Engineering Entrepreneurship, Islamic & Asian Civilisations, Ethnic Relations, Thinking Skills, University Malay Language, Co-Curiculum, Option Subjects								
	Total Units for Graduation 135								

Elective: EPT497 New Product Development; EPT498 Green Product

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)McGraw Hill.
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, safety 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 students 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.

EPT 112/3 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. Manufac turing 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 analyse 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; 1 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, 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.
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 con cepts of instru-mentation 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

Course Synopsis

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 analyse 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 313
MACHINE COMPONENTS DESIGN

Course Synopsis

EPT 313 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 mechani cal 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 Publisher1995

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; 4 edition (June 1, 2009)
4. Sabri Cetinkunt, Mechatronics, Wiley; 1 edition (January 23, 2006)
5. W. Bolton, Programmable Logic Controllers, Fifth Edition, Newnes; 5 edition (August 7, 2009)

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. 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 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 emphasise 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 (superalloys, titanium and aluminium 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 nanomaterials, 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 403/3
ADVANCED MATERIALS

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; 2 edition (March 22, 1999)
5. Jay F. Hooper, Basic Pneumatics, Carolina Academic Press (May 2003)

EPT 415/3
VIBRATION

Course Synopsis

The concept of vibration with respect to one-degree-of-freedom and second degree-of freedom, vibration transition, contuinity system and instrumention 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; 3 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.

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 ; 1 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 under stand 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

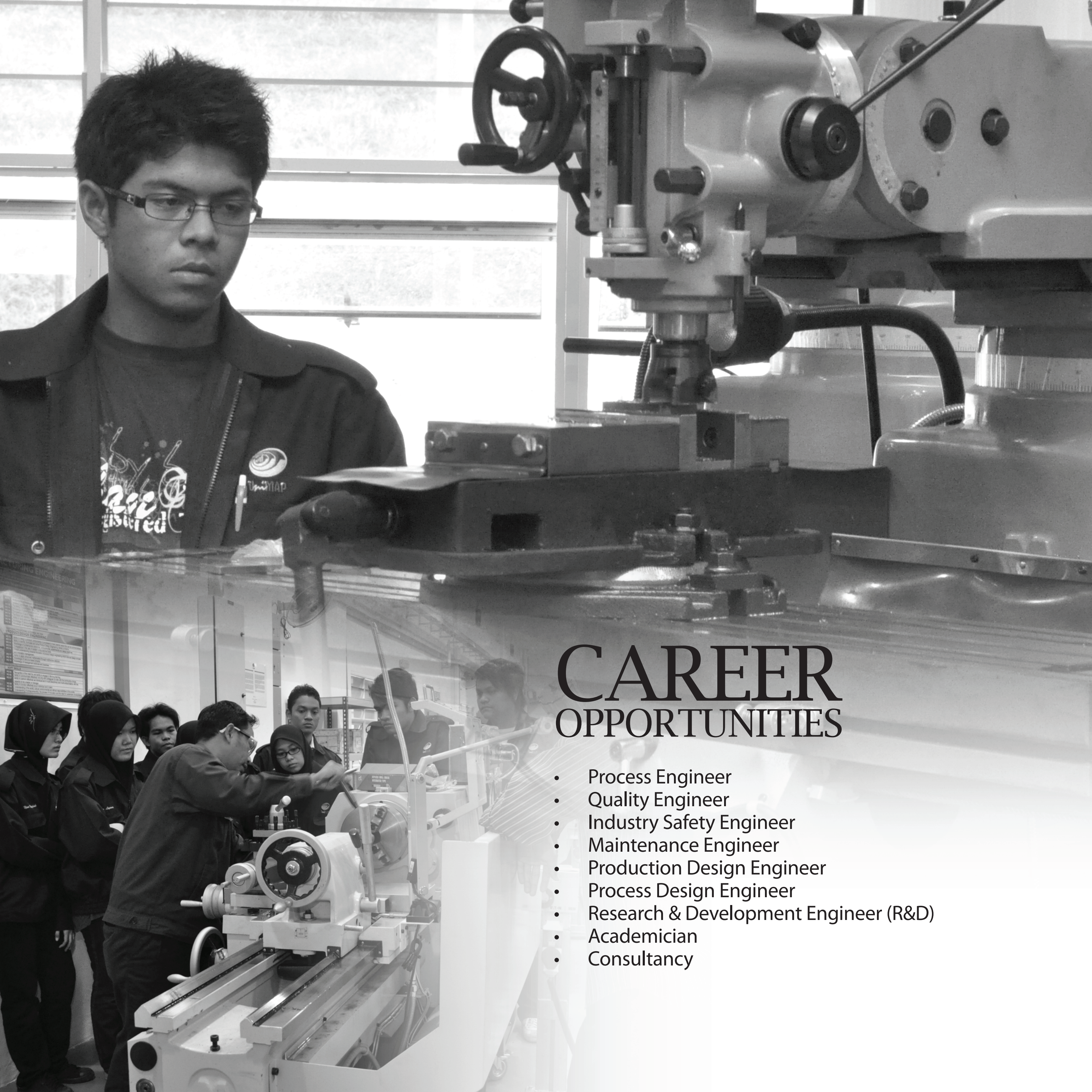
EPT 495/2
OPERATIONAL RESEARCH

Course Synopsis

The course is divided into deter ministic and stochastic categories used in the engineering field. Both catagories involve modelling 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.

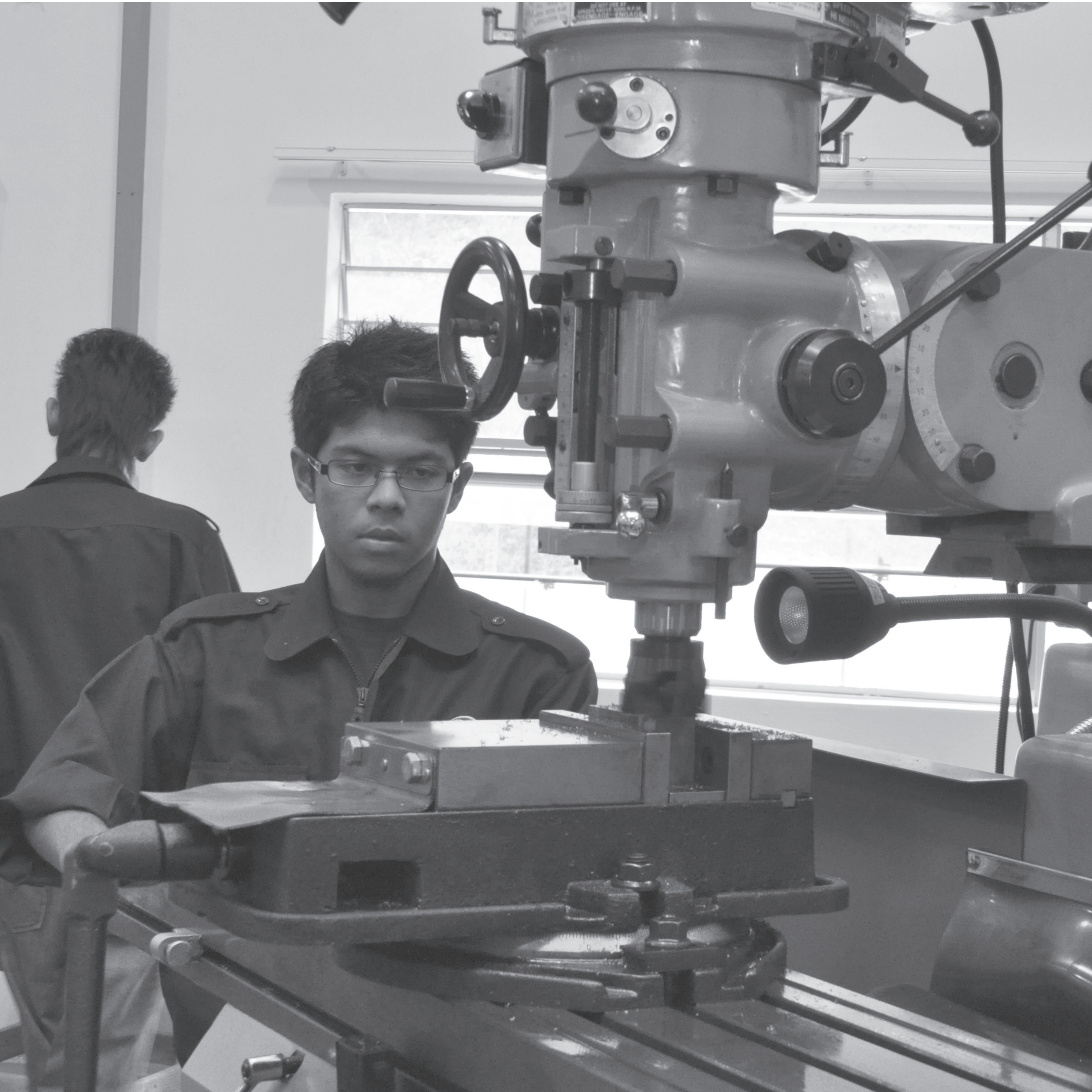
References

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



Programmes Offered :

- Diploma in Metallurgical Engineering
- Bachelor of Engineering (Materials Engineering)
- Bachelor of Engineering (Metallurgical Engineering)
- Bachelor of Engineering (Polymer Engineering)
- M.Sc (Materials Engineering)
- M.Sc (Polymer Engineering) (Mix Mode)
- Ph.D.

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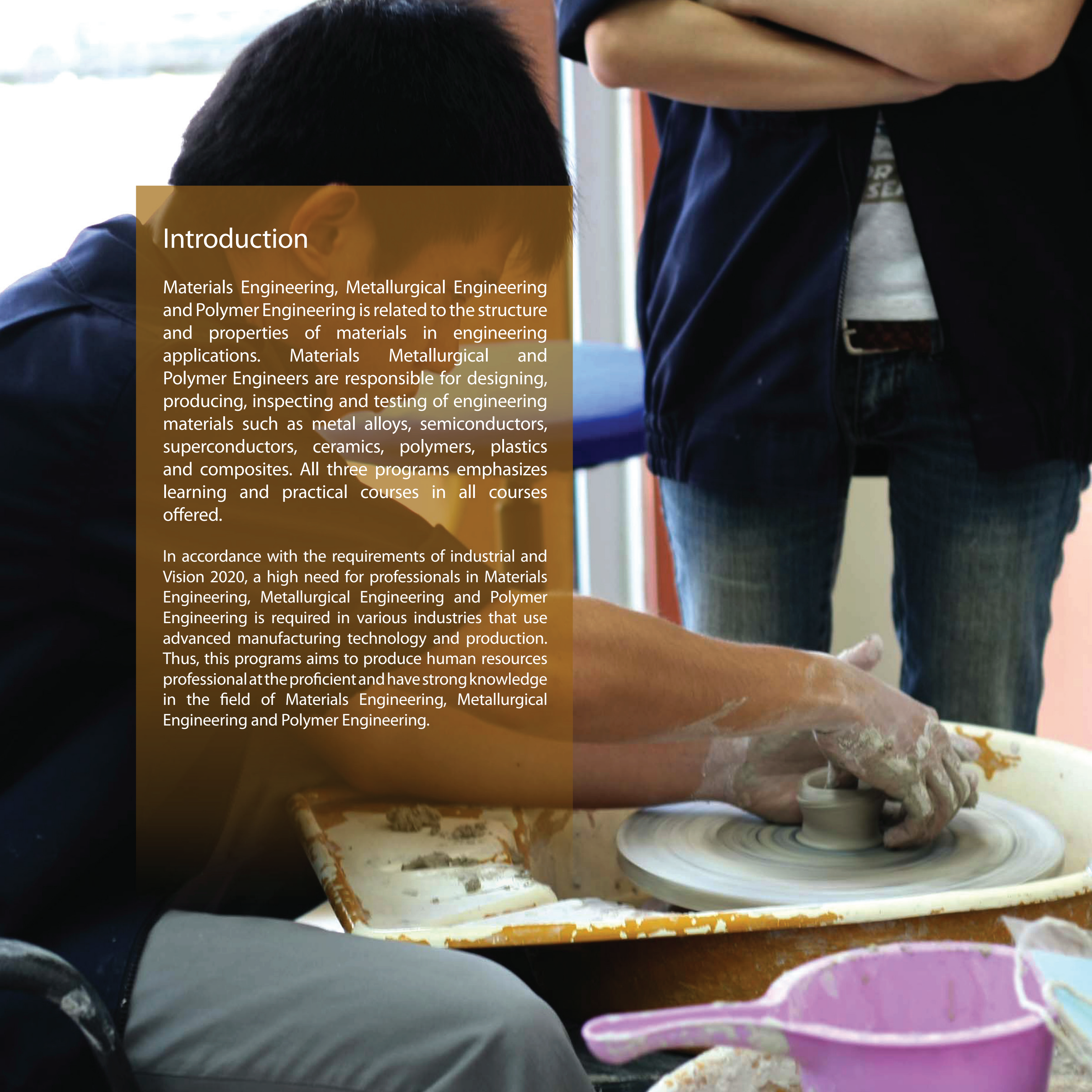

Introduction

Materials Engineering, Metallurgical Engineering and Polymer Engineering is related to the structure and properties of materials in engineering applications. Materials Metallurgical and Polymer Engineers are responsible for designing, producing, inspecting and testing of engineering materials such as metal alloys, semiconductors, superconductors, ceramics, polymers, plastics and composites. All three programs emphasizes 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.

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PROGRAMME EDUCATIONAL OBJECTIVES FOR MATERIALS ENGINEERING PROGRAMME. PROGRAMME OBJECTIVES FOR MATERIALS ENGINEERING PROGRAMME

Programme Objectives 1
Graduates who are leaders in the field of materials engineering or chosen field as demonstrated via career advancement.

Programme Objectives 2
Graduates who are members of and contribute to professional society.

Programme Objectives 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 For Materials Engineering Programme.

NO	HEADING	AREA	PROPOSED PROGRAMME OUTCOMES (PO)
1	Engineering Knowledge	C	Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in Manufacturing Engineering discipline.
2	Problem Analysis	C and/or CTPS	Ability to identify, formulate and solve electronic engineering problems.
3	Design and Development of Solutions	C and/or CTPS	Ability to design a system, component or process to meet desired needs.
4	Investigation	P	Ability to design and conduct experiments, as well as to analyze and interpret data.
5	Modern Tool Usage	P	Ability to use techniques, skills and modern engineering tools necessary for engineering practices
6	The Engineer and Society	EM	Ability to understand the social, cultural, global and environmental responsibilities of a professional engineer.
7	Environment and Sustainability	ES	Ability to understand entrepreneurship, the process of innovation and the need for sustainable development of the environment.

NO	HEADING	AREA	PROPOSED PROGRAMME OUTCOMES (PO)
8	Ethics	EM	Understanding of professional and ethical responsibilities and commitment to the society.
9	Individual and Team-work	TS and LS	Ability to function on multi-disciplinary teams.
10	Communication	CS	Ability to communicate effectively.
11	Lifelong Learning	LL	Understanding of the need for, and an ability to engage in life-long learning.
12	Project Management and Finance	ES	Demonstrate understanding of project management and finance principles

CURRICULUM STRUCTURE FOR BACHELOR OF ENGINEERING (HONOURS)
(MATERIALS ENGINEERING)

YEAR	FISRT		SECOND		THIRD			FOURTH	
Semester	I	II	III	IV	V	VI		VII	VIII
ENGINEERING CORE (97)	EBT151/3 Engineering Drawing	EBT109/3 Quality Control	EBT207/4 Materials Structure & Properties	EBT254/3 Transportation Phenomenon in Materials Processing	EBT312/3 Engineering Fluid Mechanics	EBT303/3 Process Control	EIT 302/4 Industrial Training & Engineering Innovation	*# EBT401/3 Non Destructive Testing OR # EBT425/3 Thermoelectric Materials*	*# EBT422/3 Composite Materials OR # EBT426/3 Advanced Electronic Packaging*
	EET103/4 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	EBT423/4 Materials Selection & Design
	EKT150/3 Computer Programming	EPT112/3 Statics	EBT252/4 Strength of Materials	EBT222/4 Fundamentals of Ceramics	EBT326/4 Polymer Properties	EBT322/3 Polymer Processing		*# EBT421/3 Advanced Material Engineering OR # EBT424/3 Construction Materials*	EBT446/4 Final Year Project 2
	EQT101/3 Engineering Mathematics I	EQT102/3 Engineering Mathematics II	EPT212/3 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	
NON ENGINEERING (23)	EUT122/2 Skill & Technology in Communication					EUT440/3 Engineer in Society			EUT443/2 Engineering Management
REQUIRED UNIVERSITY (15)	EUWXXX/2 Option Subject	EUW410/2 University Malay Language	EUW212/2 University English	EUW224/2 Engineering Entrepreneurship	EUW235/2 Ethnic Relation	EUW233/2 TITAS			
	EUWXXX/1 Co-Curriculum	EUW322/2 Thinking Skill							
	18	16	19	19	16	16	4	14	13

PROGRAMME EDUCATIONAL OBJECTIVES FOR METALLURGICAL ENGINEERING PROGRAMME.

Programme Objectives 1
Graduates who are leaders in the field of materials engineering or chosen field as demonstrated via career advancement.

Programme Objectives 2
Graduates who are members of and contribute to professional society.

Programme Objectives 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 For Metallurgical Engineering Programme.

NO	HEADING	AREA	PROPOSED PROGRAMME OUTCOMES (PO)
1	Engineering Knowledge	C	Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in Manufacturing Engineering discipline.
2	Problem Analysis	C and/or CTPS	Ability to identify, formulate and solve electronic engineering problems.
3	Design and Development of Solutions	C and/or CTPS	Ability to design a system, component or process to meet desired needs.
4	Investigation	P	Ability to design and conduct experiments, as well as to analyze and interpret data.
5	Modern Tool Usage	P	Ability to use techniques, skills and modern engineering tools necessary for engineering practices
6	The Engineer and Society	EM	Ability to understand the social, cultural, global and environmental responsibilities of a professional engineer.
7	Environment and Sustainability	ES	Ability to understand entrepreneurship, the process of innovation and the need for sustainable development of the environment.

NO	HEADING	AREA	PROPOSED PROGRAMME OUTCOMES (PO)
8	Ethics	EM	Understanding of professional and ethical responsibilities and commitment to the society.
9	Individual and Team-work	TS and LS	Ability to function on multi-disciplinary teams.
10	Communication	CS	Ability to communicate effectively.
11	Lifelong Learning	LL	Understanding of the need for, and an ability to engage in life-long learning.
12	Project Management and Finance	ES	Demonstrate understanding of project management and finance principles

CURRICULUM STRUCTURE FOR BACHELOR OF ENGINEERING (HONOURS) (METALLURGICAL ENGINEERING)

YEAR	FISRT		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	EIT 302/4 Industrial Training & Engineering Innovation	*#EBT401/3 Non Destructive Testing OR #EBT413/3 Welding Metallurgy*	EBT412/3 Applied Metallurgy
	EET103/4 Electrical Technology	ECT112/3 Engineering Skills	EBT251/3 Engineering Materials Chemistry	EBT213/4 Extractive Metallurgy I	EBT312/3 Engineering Fluid Mechanics	EBT314/3 Metallurgical Thermodynamics		EBT402/3 Corrosion Engineering	EBT415/4 Metallurgical Forensic Analysis
	EKT150/3 Computer Programming	EPT112/3 Statics	EBT252/4 Strength of Materials	EBT222/4 Fundamentals of Ceramics	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	EPT212/3 Dynamics	EBT253/3 Analytical Chemistry	EBT351/3 Electronic Materials Engineering	EBT316/3 Metallurgical Design		EBT417/3 Extractive Metallurgy II	
			EQT203/3 Engineering Mathematics III	EQT271/3 Statistic For Engineer				EBT445/2 Final Year Project 1	
NON ENGINEERING	EUT122/2 Skill & Technology in Communication					EUT440/3 Engineer in Society			EUT443/2 Engineering Management
REQUIRED UNIVERSITY	EUWXXX/2 Option Subject	EUW410/2 University Malay Language	EUW212/2 University English	EUW224/2 Engineering Entrepreneurship	EUW235/2 Ethnic Relation	EUW233/2 TITAS			
	EUWXXX/1 Co-Curriculum	EUW322/2 Thinking Skill							
	18	16	19	19	16	16	4	14	13

PROGRAMME EDUCATIONAL OBJECTIVES FOR POLYMER ENGINEERING PROGRAMME.

Programme Objectives 1
Graduates who are leaders in the field of materials engineering or chosen field as demonstrated via career advancement.

Programme Objectives 2
Graduates who are members of and contribute to professional society.

Programme Objectives 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 For Polymer Engineering Programme.

NO	HEADING	AREA	PROPOSED PROGRAMME OUTCOMES (PO)
1	Engineering Knowledge	C	Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in Manufacturing Engineering discipline.
2	Problem Analysis	C and/or CTPS	Ability to identify, formulate and solve electronic engineering problems.
3	Design and Development of Solutions	C and/or CTPS	Ability to design a system, component or process to meet desired needs.
4	Investigation	P	Ability to design and conduct experiments, as well as to analyze and interpret data.
5	Modern Tool Usage	P	Ability to use techniques, skills and modern engineering tools necessary for engineering practices
6	The Engineer and Society	EM	Ability to understand the social, cultural, global and environmental responsibilities of a professional engineer.
7	Environment and Sustainability	ES	Ability to understand entrepreneurship, the process of innovation and the need for sustainable development of the environment.

NO	HEADING	AREA	PROPOSED PROGRAMME OUTCOMES (PO)
8	Ethics	EM	Understanding of professional and ethical responsibilities and commitment to the society.
9	Individual and Team-work	TS and LS	Ability to function on multi-disciplinary teams.
10	Communication	CS	Ability to communicate effectively.
11	Lifelong Learning	LL	Understanding of the need for, and an ability to engage in life-long learning.
12	Project Management and Finance	ES	Demonstrate understanding of project management and finance principles

CURRICULUM STRUCTURE FOR BACHELOR OF ENGINEERING (HONOURS) (POLYMER ENGINEERING)

YEAR	FISRT		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	EBT312/3 Engineering Fluid Mechanics	EBT303/3 Process Control	EIT 302/4 Industrial Training & Engineering Innovation	EBT 431/3 Polymer Engineering Product	EBT440/3 Design of Moulds & Dies
	EET103/4 Electrical Technology	EBT 131/3 Engineering Mechanics	EBT 233/4 Plastic Materials	EBT231/4 Elastomeric Materials	EBT334/4 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 235/3 Structure & Polymer Properties	EBT 335/4 Polymer Blend & Alloys	EBT337/4 Mass & Heat Transfer in Polymer		# EBTXXX/3 Elective	EBT435/3 Polymer in Electronic Application
	EBT105/4 Organic Chemistry	ECT112/3 Engineering Skills	EBT 238/3 Physical Chemistry	EQT271/3 Engineering Statistics	EBT336/4 Thermoplastic & Thermoset Processing	EBT338/4 Latex Processing			
				EBT239/4 Thermo dynamic in Polymer				EBT445/2 Final Year Project 1	
NON ENGINEERING	EUT122/2 Skills & Technology in Communication							EUT440/3 Engineer in Society	EUT443/2 Engineering Management
REQUIRED UNIVERSITY (15)	EUWXXX/2 Option Subject	EUW 410/2 Bahasa Melayu Universiti	EUW212/2 Bahasa Inggeris Universiti	EUW224/2 Keusahawanan Kejuruteraan		EUW233/2 Titas			
	EUWXXX/1 Co-Currriculum	EUW322/2 Kemahiran Berfikir	EUW235/2 Hubungan Etnik						
	19	17	18	19	15	17	4	14	12
Total Units for Graduation 135									

Elective: EBT 433/3 Polymer Adhesive & Coating; EBT434/3 Environmental Friendly Polymer

COURSE SYLLABUS

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. Charles E. Carraher, 'Polymer Chemistry', 6th ed., Marcel Dekker, 2003.
5. Chandra, Manas, "Introduction to Polymer Science and Chemistry: A Problem Solving Approach', CRC Press/ Taylor & Francis Group, 2006.

EBT 106/4
INTRODUCTION TO POLYMER

Course Synopsis

The aim of this course is to enable the students to learn the concepts 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.
5. Young, R. J., Lovell, P.V., 'Introduction to Polymers', CRC Press, 2nd ed., 1991.

EBT 109/3
QUALITY CONTROL

Course Synopsis

Introduction to quality: Definitions 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. (2004). Introduction to Statistical Quality Control. 4th Edition Wiley.
2. Dale H. Besterfield. (2001). Quality Control, 7 th 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. (1986). Statistical Method from the Viewpoint of Quality Control. New York: Dover Publications.

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. Atomic structure: fundamental concepts, electron in atoms, atomic number and mass, atomic structure with periodic table. Atomic bonding in solids: bonding forces and energies, primary interatomic bonds, secondary bonding or Van de Waals bonding, molecules. Crystal structure: fundamental concepts, unit cells, metallic crystal structures, bulk density, polymorphism, allotropy crystal systems, crystallographic directions, crystallographic planes, linear and planar atomic densities, close-packed crystal structure. **Crystalline and Non Crystalline Materials** - Single crystals, polycrystalline materials, anisotropy, microstructure specimen preparation, optical microscope, x-ray diffraction and its application; determination of crystal structure, non-crystalline solids. **Imperfection in Solids** - Point defects in metals, point defects in ceramic, impurities in solids, defects in polymer, Dislocations (linear defects), interfacial defects, bulk or volume defect, atomic vibrations. **Introduction to Diffusion** - Diffusion mechanism, steady state diffusion, non steady-state diffusion, factors that influence diffusion, other diffusion paths, diffusion in ionic materials and polymer.

Mechanical Properties of Materials - Stress-strain behaviour, 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. **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. Callister, W.D. Jr. (2000). Materials Science and Engineering: An Introduction. 5th Ed. New York: John Wiley.
2. Smith, W.F., (1990). Principles of Materials Science and Engineerings. 2nd Ed. Singapore: McGraw Hill.
3. Donald R. Askeland & Pradeep P. Phule, (2003). The Science and ngineering of Materials. 4th Ed. Thomson Brooks/Cole.
4. Brick R.M. et al. (1977). Structure and Properties of Engineering Materials. Singapore: McGraw-Hill.
5. 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 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 wiht 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, (1997). Funda -mentals of Ceramics. McGraw-Hill New York.
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. Seramik Fizik Untuk Jurutera.
5. Bengisu, M (2001). Engineering Materials: Engineering Ceramics. Springer, New York.

EBT 231/4 ELASTOMERIC MATERIALS

Course Synopsis

The students will be able to describe and explain the class, structure/ properties of the elastomeric materials. They will also learn to identify the structure of natural rubber and synthetic rubbers and relate to their properties.

References

1. Nagdi, K., 'Rubber As An Engineering Materials: Guide For Users, Hanser Publisher, 1993.
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. Wood, P.R., 'Mixing of Vulcanisable Rubbers and and Thermoplastic Elastomers', Rapra Technology, 2004.
5. Chandra, R., Mishra, S., ' Rubber and Plastic Technology', CBS Publishers & Distributors, 1995.

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. Boris A., Rozenberg, Grigori M., Sigalov, 'Heterophase Network Polymers: Synthesis, Characterization and Properties', Taylor & Francis, 2002.
5. Gnanou, Yves, 'Organic and Physical Chemistry of Polymers', Wiley Interscience, 2008.

EBT 233/4
PLASTIC MATERIALS

Course Synopsis

This course is to enable the students to describe the concepts of plastic materials; differentiate structure/property relationship of plastic materials and provide some ideas on plastic material selection principles, testing and characterization.

References

1. Brydson, J.A., 'Plastic Materials', 7th ed., Oxford: Butterworth –Heinemann, 1999.
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.
5. Domininghaus, H.,'Plastic for Engineers: Materials, Properties, Applications', Hanser Pub., 2003.

EBT 235/3
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. Domininghaus, H., 'Plastic for Engineers: Materials, Properties, Applications', Hanser Pub., 1993.
5. Gnanou, Yves, 'Organic and Physical Chemistry of Polymers', Wiley Interscience, 2008.

EBT 238/3
PHYSICAL CHEMISTRY

Course Synopsis

The aim of this course to develop knowledge of the concepts and principles of physical chemistry in thermodynamic, kinetic, physical and chemical of polymer.

References

1. Silbey Alberty, 'Physical Chemistry', 3rd ed., John Wiley& Sons, Inc., 2001.
2. Ira N. Levine, 'Physical Chemistry', 5th ed., McGraw-Hill Companies, Inc., 2002.
3. Carl W. Garlamd, Joseph W.Nibler, David P. Shoemaker, 'Experiments in Physical Chemistry', 7th ed., Mc. Graw Hill, 1996.
4. Sperling, L. H., 'Introduction to Physical Polymer Science', 4th ed., Wiley-Interscience, 2006.
5. Gnanou, Yves, 'Organic and Physical Chemistry of Polymers', Wiley Interscience, 2008.

EBT 251/3
ENGINEERING MATERIALS CHEMISTRY

Course Synopsis

Introduction to Thermodynamics - Firstlawofthermodynamics,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. (2007). 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 P. Beer, E. Russell Johnston, Jr., John T. DeWolf. (2004). Mechanics of Materials. 3rd, McGraw Hill.
2. Hibbeler, R. C. (2003). Mechanics of Materials. 5th Edition, Prentice Hall.
3. Megson, T. H. G. (2002). Structural and Stress Analysis. 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 analytical skills.

References

1. Christian, Gary. D., (1994). Analytical Chemistry, Fifth Edition. University of Washington: John Wiley & Sons, inc.
2. Skoog, Douglas. A., West, Donald. M et al,. (2004). Fundamentals of Analytical Chemistry, Eigth Edition. Stanford University, San Jose State University, University of Kentucky and Michigan University: Thomson Learning Academic Resources Center.
3. Higson, Seamus. P. J., (2004). Analytical Chemistry. Oxford University: Oxford University Press.

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. (2001). Fundamentals of Momentum, Heat Transfer and Mass Transfer. 4th Edition, John Wiley.
2. Poirier, D.R., Geiger, G.H. (1994). Transport Phenomena in Material Processing. A Publication of TMS.
3. Thomson W.J. (2000). Introduction to Transport Phenomena. New York: Prentice Hall.
4. Deen W.M. (1998). Analysis of Transport Phenomena (Topics in Chemical Engineering). 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

Basic concept for process control system, continuous and batch control. Application of computer software is extended in order to implement control algorithm for selected processes. Instrumentation selection is introduced for process control. Managing and implementing project. Designing and implementing process control.

References

1. Dorf, R.C., Bishop, R.H.(1998). Modern control system. Addision Wesley.
2. Coughanow, D.R. (1991). Process System Analysis And Control. McGraw Hill.
3. Dunn W. (2005). Fundamentals of Industrial Instrumentation and Process Control. Singapore: McGraw-Hill.
4. Johnson C.D. (2005). Process Control Instrumentation Technology. New York: Prentice Hall.
5. Chau P.C. (2002). Process Control: A First Course with MATLAB. Cambridge: Cambridge University Press.

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 312/3
ENGINEERING 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. Clayton T, Crowe, Donald F, Elger, John A. Roberson. (2001). Engineering fluid Mechanics. 7th Edition. John 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 Ed. New York: Prentice Hall.

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 322/3
POLYMER 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. Callister, W.D. Jr. (2000). Materials Science and Engineering: An Introduction. 5th Ed. New York: John Wiley.
2. Budinski, KG. Budinski, M.K. (1999). Engineering Materials : Properties and Selection. 6th Edition. Prentice Hall.
3. Peter, C. Powell, (1999). Kejuruteraan dengan polimer. Terjemahan Azman Hassan et al, Penerbit UTM.
4. Baird D.G, Collias D.I. (1998). Polymer Processing- Principles and Design. John Wiley & Sons, Inc.
5. Richard, C.P, (1993). Polymer Engineering Principles, Properties, Processes, Test for Design. Hanser Publication.

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 thermo dynamic; Phase transforma-tion; 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 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. Callister, W.D. Jr. (2000). Materials Science and Engineering: An Introduction. 5th Ed. New York: John Wiley.
3. Vishu Shah. (1998). Handbook of Plastics Testing Technology. John Wiley & Sons, Inc.
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 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. Harry, L., 'Basic Compounding and Processing of Rubber', Rubber

Division, American Chemical Society Inc., 1985.
5. Rodgers, B., 'Rubber Compounding: Chemistry and Applications', Marcel Dekker, 2004.

EBT 334/4
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 analysis concept to identify and characterize the polymeric materials.

References

1. Ghottfried W. Ehrenstein, Gabriela Riedel, Pia Trawiel, 'Thermal Analysis of Plastic', Hanser, 2004.
2. Hatakayama, T., Zhenlai, L., 'Handbook of Thermal Analysis', John Wiley and Sons., Inc., 1998.
3. Vishu Shah, 'Handbook of Plastics Testing Technology', 2nd ed., John Wiley and Sons, Inc., 1998.
4. Roger Brown, 'Handbook of Polymer Testing: Short-Term Mechanical Tests', Rapra Technology, 2002.
5. Wolfgang Grellman, Sabine Seidler, Volker Altstadt, 'Polymer Testing', Hanser, 2007.

EBT 335/4
POLYMER BLEND AND ALLOYS

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. Gabriel, O. Shoinake, George, P. S., 'Polymer Blends and Alloys', Marcel Dekker, 1999.
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
THERMOPLASTIC AND THERMOSET 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 338/4
LATEX PROCESSING

Course Synopsis

To develop the basic knowledge and principles of latex technology, properties due to compounding, characterization and their application. This course is focus on latex compounding, production of latex concentrate and latex processing techniques.

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. S.O. Kasap , Principles of Electronic Materials and Devices, Second Edition, McGraw Hill Higher education, 2002.
2. Rao R. Tummale, Fundamentals of Microsystems Packaging, McGrawhill, 2001.
3. Gardner, Julian W., Microsensors MEMS and Smart Devices, John Wiley , c2001.
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 401/3
NON DESTRUCTIVE TESTING

Course Synopsis

Non-destructive testing (NDT) is a method used for inspection of a material's internal part. 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 offered several topics which is covering 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. (2002). Practical Non-Destructive Testing, Woodhead Publishing and Alpha Science International Ltd.2nd Edition. New Delhi: India.
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. J. H. Charles. (2001). 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 402/3
CORROSION ENGINEERING

Course Synopsis

Student will learn corrosion and surface engineering principles. Therefore, in this subject, the student will be learned 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 411/3
ENGINEERING ALLOYS

Course Synopsis

This course was 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 412/3
APPLIED METALLURGY

Course Synopsis

This course is to introduce the students 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. Matereials 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 413/3
WELDING METALLURGY

Course Synopsis

This course is designed to introduce the students welding metallurgy principles and influencing factor in welding metallurgy selected. Therefore, students will exposure 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 414/3
ELECTRONIC METALLURGY

Course Synopsis

This course is design 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. Rao. R. Tummala. (2001). Funda mentals of Microsystems Packaging. Publisher: McGraw-Hill Professional.
2. George G. Harman. (1997). Wire Bonding in Microelectronics: Materials, Processes and Equipment. Publisher: McGraw-Hill Professional.
3. Richard K. Ulrich and William D. Brown. (2006) Advance Electronic Packaging. Publisher: John Wiley & Sons.

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 417/3
EXTRACTIVE METALLURGY II

Course Synopsis

This course is design 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 explain. 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 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 422/3
COMPOSITE MATERIALS

Course Synopsis

This course is focusing on three major types of composite materials which are Ceramic Matrix Composite (CMC), Polymer Matrix Composite (PMC), and Metal Matrix Composite (MMC). 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. Mathew, F.L., Rawlings, R.D. (1998). Composite Materials: Engineering and Science. Chapman & Hall.
2. Ronal F.G. (1994). Principles of Composite Material Mechanic. Mc Graw-Hill.
3. Schwartz, M.M, Composite Materials Handbook, McGraw-Hill, 1992.

EBT 423/3
MATERIALS SELECTION AND DESIGN

Course Synopsis

This course builds an understanding of the inter-relationship between selection, materials processing, product design (material, design and processing) and product performance to develop a holistic approach to optimum selection of materials for engineering and industrial applications. The cause of product/ component failure in metals, polymers, ceramics, composites and its alleviation is studied in detail through case studies. The module also provides hands-on testing experience of measuring important mechanical properties through mini project. The course content are as follows; general methodology of design, practical issues in engineering design, practical issues in engineering design, practical issues in engineering design, materials and component failures and selection for the specific purposes.

References

1. Michael, F. Ashby. (1999). Materials Selection in Mechanical Design. Butterworth: HeinMann.
2. Pat. L. Mangonon. (1999). The principles of Materials Selection for Engineering Design. Prentice Hall.
3. Schaffer, Saxena, Antolovich, Sanders, Warner. (1999). The Science and Design of Engineering Materials. Mc Graw Hill.
4. Michael, F. Ashby & David, R. H. Jones. (1996). Bahan Kejuruteraan: Pengenalan Sifat dan Kegunaan. USM.
5. Mahmoud M. Farag. (1989). Selection of Materials and Manufacturing Process for Engineering Design. Prentice Hall.

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, Engineering Material, S. Chand & Company Ltd, 2000.

3. J. Newman, Advanced Concrete Technology: Constituent Materials, Butterworth, Heinemann, 2004.
4. Theodore W. Marotta, Basic Construction Materials, Prentice Hall, 7 Editions, 2005.
5. Sidney Mindess, J. Francis Young, David Darwin, Concrete, Prentice Hall, 2 Editions, 2003.

EBT 425/3
THERMOELECTRIC MATERIALS

Course Synopsis

This course is designed as an introduction to thermoelectric materials, concept that effect thermoelectric properties, materials selection and criteria of thermoelectric materials, analysis of thermoelectric.

References

1. D.M. Rowe. (2005). Thermoelectrics Handbook: Macro to Nano.
2. M.G. Kanatzidis, T.P. Hogan, S.D. Mahanti. (2003). Chemistry, Physics and Materials Science of Thermoelectric Materials. Beyond Bismuth Telluride (Fundamental Materials Research).
3. G. S. Nolas, J. Sharp, H. J. Goldsmid. (2001). Thermoelectrics: Basic Principles and New Materials Developments. Springer-Verlag.
4. D.M. Rowe. (1995). CRC Handbook of Thermoelectrics.
5. Nolas G.S. et al. (2010). Thermoelectrics: Basic Principles and New Materials Developments. Berlin: Springer.

EBT 426/3
ADVANCED ELECTRONIC PACKAGING

Course Synopsis

In this course, students will be exposed to the following: Introduction to few types of electronic packages such as Ball Grid Array (BGA), Land Grid Array (LGA), Flip Chip (FC), Chip Scale Package (CSP), Wafer Level-Chip Scale Package (WL-CSP), Direct Chip Attach (DCA) etc. The advantages, disadvantages and challenges of each of the above packages towards meeting the needs of the nanometre range, needs of new devices and market will be shared. On further, the types of materials used such as polymer, ceramic, metal etc. will be shared. The existence of the thermo-mechanical stresses in electronic packages and the suitable design to overcome it will be shared. Electrical, mechanical, optical, physical properties etc. including the reliability of the electronic packages and its material will be shared. Thermal management: heat transfer theory, thermal & cooling design and thermal measurement methodology that involved the software and hardware will be shared. Soldering technology: alloy, soldering technique, microstructure, interconnection, no-clean solder, lead-free solder and lead-free plating will be shared. Interconnection technology: Surface Mount Technology (SMT), Multichip Module (MCM), MEMS, sequential build-up substrate technologies, which enable connection to high-density IC packages with unique trace/via interconnection constraint will be shared. Embedded passive and active components, which significantly reduce the product size that need advanced footprint creation, placement and analysis capabilities will also be shared. Wireless industry-based driven products such as custom ASICs, off-the-shelf ICs; mixed signal, RF, and digital circuitry on the same substrate, Systems-in-package (SiPs) integration of multiple interconnect and devices technologies on a single substrate and lastly stacked die with incredible design densities which pose challenges with localized wirebonding and trace routing density will be shared.

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 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, Production and forming methods of glasses including heating, molding, drawing or rolling and annealing.

References

1. Bengisu, M (2001). Engineering Materials: Engineering Ceramics. Springer, New York.
2. Lawrence H. Van Vlack diterjemahkan oleh Zainal Arifin Ahmad. Seramik Fizik Untuk Jurutera.
3. Kenneth, G. B., Michael, K. B (1999). Engineering Materials: Properties and Selection. 6th ed. Prentice Hall International Inc. UK.
4. Ganguly C. et al. (1991). Advanced Ceramics (Key Engineering Materials) Switzerland: Trans Tech Publications.
5. Hench L.L. and West (1990). J.K. Principles of Electronic Ceramics. New York: Wiley-Interscience.

EBT 431/3
POLYMER ENGINEERING PRODUCT

Course Synopsis

To introduce the basic knowledge of polymer engineering product development. Promote an under standing on the concepts of engineering product and requirements. Provide knowledge on characterization, selection principles and application of polymer engineering product.

References

1. Lewis P.R. and Gagg C. (2010). Forensic Polymer Engineering: Why Polymer Products Fail in Service. Cambridge: Woodhead Publishing.
2. Charles, A. H. , 'Handbook of Plastics, Elastomers & Composite', 4th ed., Mc Graw Hill Companies, Inc., 2001.
3. Rosato, D. V., 'Plastics Product Material and Process selection Handbook', Elsevier Ltd, 2004.
4. Progelholf, R.C., 'Polymer Engineering Principles: Properties, Processes and Test for Design', Hanser Publishers, 1993.
5. Gabriel, O. Shoinake, George, P. S., 'Polymer Blends and Alloys', Marcel Dekker, 1999.

EBT 433/3
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 434/3
ENVIRONMENTAL FRIENDLY POLYMER

Course Synopsis

This course to introduce 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. Vannesa Goodship, 'Introduction to Plastic Recycling', Rapra Technology limited, Shawbury, 2001.
4. Gerald, S., 'Polymer and Environment', The Royal Society of Chemistry, 2003.
5. Penninger, J.M.L., 'Conversion of Polymer Wastes and Energetics', ChemTec Pub., 1994.

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. Salaneck, W.R., Stafstrom, S., 'Conjugated Polymer Surfaces and Interfaces: Electronic and Chemical Structure of Interfaces for Polymer Light Emitting Devices', Cambridge University Press, 2003.
4. Klaus Friedrich, Stoyko Fakirov, Zhong Zhang, 'Polymer Composites (Electronic Sources): From nano- to macro-scale, Springer, 2005.
5. Frances Gardiner, Eleanor Carter, 'Polymer Electronics: A Flexible Technology', iSmithers, 2009.

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.
4. De, S.K., White, J.R., 'Short Fiber-Polymer Composites', Woodhead, 1996.
5. Gupta, Rakesh K., 'Polymer and Composites Rheology', Marcel Dekker, 2000.

EBT 440/3
DESIGN OF MOULD AND DIES

Course Synopsis

This course will provide basic principles in dies and moulds. The students will select different dies and moulds for difference processing and products and also familiarize with major components of injection molds and extrusion ddies.

References

1. Rosato, D. V., 'Plastics Engineered Product Design', Elsevier Ltd., 2003.
2. Will, P., 'A-Level Product Design', Nelson Thomes Ltd., 2004.
3. Rosato, D. V., 'Plastic Engineering, Manufacturing and data Handbook', Kluwer Academic Publishers, 2001.
4. Jones, Peter, 'The mould Design Guide', Smithers Rapra Technology, 2008.
5. Douglas, M. Bryces, 'Plastic Injec tion Molding: Mold Design and Construc tion Fundamentals (Fundamentals of Injection Molding)', Society of Manufacturing Engineers, 1998.

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.

CAREER
OPPORTUNITIES

Graduates with a Bachelor of Engineering (Materials Engineering), Bachelor of Engineering (Metallurgical Engineering) and Bachelor of Engineering (Polymer Engineering) has a broad employment prospects either in the private sector/industry, departments in government or statutory bodies.

Sectors that offer employment opportunities are as follows;

- 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 offered programs are as follows;

- 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

Programmes Offered :

- Bachelor of Engineering (Honours)(Bioprocess Engineering)
- Bachelor of Engineering (Honours)(Biosystem Engineering)
- Bachelor of Chemical Engineering Technology (Honours)(Industrial Biotechnology)
- Master of Science (Bioprocess Engineering)
- Doctor of Philosophy

7. SCHOOL OF BIOPROCESS ENGINEERING

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Introduction

The field of Bioprocess Engineering, Biosystem Engineering and Industrial Biotechnology plays a significant role in industrialized countries. Graduates in this field will gain knowledge in various aspects of sustainable engineering to equip themselves in exploring the nature of employment which is ever more challenging. The programmes offered are also responsible for nurturing the sense of responsibility towards the environment, bio-ethics and the ability to market related products.

Bioprocess Engineering includes industries in the area of nutrition, agro-processing, chemicals and pharmaceutical/nutraceuticals. Biosystem Engineering gives emphasis on systems and deliverables that are efficient and sustainable. While Industrial Biotechnology programme is specifically designed to equip students with a strong academic and practical training allowing them to acquire the relevant skills needed in biotechnology field.

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BACHELOR OF ENGINEERING (HONOURS) (BIOPROCESS ENGINEERING)

PROGRAMME EDUCATIONAL OBJECTIVES (PEO) FOR BACHELOR OF ENGINEERING (BIOPROCESS ENGINEERING)

Programme Objectives 1
Graduates who are leaders in the field of chemical engineering in bioprocess or chosen field as demonstrated via career advancement.

Programme Objectives 2
Graduates who are members of and contribute to professional society.

Programme Objectives 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) for Bachelor of Engineering (Bioprocess Engineering)

NO	HEADING	AREA	PROPOSED PROGRAMME OUTCOMES (PO)
1	Engineering Knowledge	C	Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in electronic engineering discipline.
2	Problem Analysis	C and/or CTPS	Ability to identify, formulate and solve electronic engineering problems.
3	Design and Development of Solutions	C and/or CTPS	Ability to design a system, component or process to meet desired needs.
4	Investigation	P	Ability to design and conduct experiments, as well as to analyze and interpret data.
5	Modern Tool Usage	P	Ability to use techniques, skills and modern engineering tools necessary for engineering practices
6	The Engineer and Society	EM	Ability to understand the social, cultural, global and environmental responsibilities of a professional engineer.
7	Environment and Sustainability	ES	Ability to understand entrepreneurship, the process of innovation and the need for sustainable development of the environment.

NO	HEADING	AREA	PROPOSED PROGRAMME OUTCOMES (PO)
8	Ethics	EM	Understanding of professional and ethical responsibilities and commitment to the society.
9	Individual and Team-work	TS and LS	Ability to function on multi-disciplinary teams.
10	Communication	CS	Ability to communicate effectively.
11	Lifelong Learning	LL	Understanding of the need for, and an ability to engage in life-long learning.
12	Project Management and Finance	ES	Demonstrate understanding of project management and finance principles

CURRICULUM SRTUCTURE FOR BACHELOR OF ENGINEERING (HONOURS) (BIOPROCESS ENGINEERING)

YEAR	FISRT		SECOND		THIRD		EIT 302/4 Industrial Training & Engineering Innovation	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 Thermo dynamics	ERT 316/3 Reaction Engineering	ERT 320/3 Bioseparation Engineering		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 (33)	EQT 101/3 Engineering Mathematics I	EQT 102/3 Engineering Mathematics II	ERT207/4 Analytical Chemistry	EQT 271/3 Engineering Statistics				EUT443/2 Engineering Management	EUT 440/3 Engineers in Society
	ERT 106/3 Biochemistry	ERT107/3 Microbiology for Bioprocess Engineering							
	ERT 102/4 Organic Chemistry	ERT 108/3 Physical Chemistry							
REQUIRED UNIVERSITY (15)	EUW 410/2 University Malay Language	EUT 122/2 Skills & Technology in Communication	EUW 224/2 Engineering Entrepreneurship	EUW 212/2 University English Language	EUW 322/2 Thinking Skills				
	EUW 1XX/1 Co-Curricular Activity		EUW 233/2 Islamic & Asian Civilizations	EUW XXX/2 Option Subjects	EUW 235/2 Ethnic Relation				
135	16	18	18	18	18	16	4	13	14
University Required	University English, Engineering Entrepreneurship, TITAS, Ethnic Relation, Thinking Skill, University Malay Language, Co-Curiculum, Option Subject								
Total Units for Graduation 135									

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)

PROGRAMME EDUCATIONAL OBJECTIVES (PEO) FOR BACHELOR OF ENGINEERING (BIOSYSTEM ENGINEERING)

Programme Objectives 1
Graduates who are leaders in the field of mechanical engineering in biosystems or chosen field as demonstrated via career advancement.

Programme Objectives 2
Graduates who are members of and contribute to professional society.

Programme Objectives 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.

Program Outcomes (PO) for Bachelor of Engineering (Biosystem Engineering)

NO	HEADING	AREA	PROPOSED PROGRAMME OUTCOMES (PO)
1	Engineering Knowledge	C	Ability to acquire and apply knowledge of mathematics, science, engineering and an in-depth technical competence in electronic engineering discipline.
2	Problem Analysis	C and/or CTPS	Ability to identify, formulate and solve electronic engineering problems.
3	Design and Development of Solutions	C and/or CTPS	Ability to design a system, component or process to meet desired needs.
4	Investigation	P	Ability to design and conduct experiments, as well as to analyze and interpret data.
5	Modern Tool Usage	P	Ability to use techniques, skills and modern engineering tools necessary for engineering practices
6	The Engineer and Society	EM	Ability to understand the social, cultural, global and environmental responsibilities of a professional engineer.
7	Environment and Sustainability	ES	Ability to understand entrepreneurship, the process of innovation and the need for sustainable development of the environment.

NO	HEADING	AREA	PROPOSED PROGRAMME OUTCOMES (PO)
8	Ethics	EM	Understanding of professional and ethical responsibilities and commitment to the society.
9	Individual and Team-work	TS and LS	Ability to function on multi-disciplinary teams.
10	Communication	CS	Ability to communicate effectively.
11	Lifelong Learning	LL	Understanding of the need for, and an ability to engage in life-long learning.
12	Project Management and Finance	ES	Demonstrate understanding of project management and finance principles

CURRICULUM SRTUCTURE FOR BACHELOR OF ENGINEERING (HONOURS) (BIOSYSTEM ENGINEERING)

YEAR	FISRT		SECOND		THIRD			FOURTH	
Semester	I	II	III	IV	V	VI		VII	VIII
ENGINEERING CORE (94)	ERT 141/4 Fundamentals of Biosystems Engineering	ERT 146/3 Engineering Mechanics	ERT205/4 Fluid Mechanic Engineering	EQT 271/3 Engineering Statistics	ERT 349/4 Soil And Water Engineering	ERT 452/3 Vibration	EIT 302/4 Industrial Training & Engineering Innovation	ERT 445/2 Final Year Project 1	ERT446/4 Final Year Project 2
	EET103/4 Electrical Technology		ERT 249/4 Computer Aided Engineering Design For Biosystems Engineering	ERT 246/4 Hydrology And Water Resources Engineering	ERT 245/4 Heat And Mass Transfer In Biological Systems	ERT 348/3 Farm Structures		ERT 454/3 Controlled Environment Engineering	ERT 457/3 Design of Automation Systems
			ERT 247/4 Geomatic Engineering	ERT248/4 Thermo dynamics For Biosystems Engineering	ERT 350/3 Instrumentation, Measurement And Control In Biosystems	ERT 244/4 Energy And Power In Biosystems		ERT 453/4 Design Of Machine & System	#ERT XXX/3 Elective 2
				ERT 142/4 Engineering Properties of Biological Materials		ERT 351/3 Sustainable Agrosystems Engineering		#ERT XXX/4 Elective 1	EUT 440/3 Engineers in Society
								EUT 443/2 Engineering Management	
	ERT101/4 Biochemistry	ECT 112/3 Engineering Skills	EQT203/3 Engineering Mathematics III						
NON ENGINEERING (26)	EQT101/3 Engineering Mathematics I	EKT120/4 Computer Programming							
		ERT144/4 Microbiology for Biosystems Engineering							
		EQT102/3 Engineering Mathematics II							
		EUT122/2 Skills & Technology in Communication							
REQUIRED UNIVERSITY (15)	EUW 1XX/1 Co-Curricular Activity		EUW233/2 Islamic & Asian Civilizations		EUW 322/2 Thinking Skills	EUW XXX/2 Option Subject			
	EUW 410/2 University Malay Language		EUW 224/2 Engineering Entrepreneurship	EUW 212/2 University English Language	EUW 235/2 Ethnic Relation				
135	18	19	19	17	15	15	4	15	13
	University English, Engineering Entrepreneurship, TITAS, Ethnic Relation, Thinking Skill, University Malay Language, Co-Curiculum, Option Subject								
Total Units for Graduation 135									

Elective:
Elective I : ERT 455/4 Manufacturing And Production Of Biological Products ,ERT458/4 Irrigation and Drainage System
Elective II: ERT 456/3 Post Harvest Engineering , ERT 459/3 Waste Management and Utilization Engineering, ERT308/3 Food Engineering

BACHELOR OF CHEMICAL ENGINEERING TECHNOLOGY (HONOURS)

PROGRAMME EDUCATIONAL OBJECTIVES (PEO) FOR BACHELOR OF CHEMICAL ENGINEERING TECHNOLOGY (INDUSTRIAL BIOTECHNOLOGY)

Programme Objectives 1
Graduates who are able to apply knowledge and technical skills in providing practical engineering solutions

Programme Objectives 2
Graduates who are able to demonstrate professionalism and leadership and contribute to team success and manage projects in a multi-disciplinary environment.

Programme Objectives 3
Graduates who are able to advance in their career through adopting the advancements in engineering and technology as part of life-long learning experiences through ever changing environment.

PROGRAM OUTCOMES-PO

PO 1 Apply Knowledge of mathematics, science, engineering fundamentals and engineering specialization principles to defined and applied engineering procedures, processes, systems or methodologies.
PO 2 Solve broadly-defined engineering problems systematically to reach substantiated conclusions, using tools and techniques appropriate to their disciplines or area of specialization.
PO 3 Design solutions for broadly-defined engineering technology problems, and to design systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, environmental and sustainability concerns.
PO 4 Plan and conduct experimental investigations of broadly-defined problems, using data from relevant sources.
PO 5 Select and apply appropriate techniques, resources and modern engineering tools with an understanding of their limitations.
PO 6 Function effectively as individuals, and as members or leaders in diverse technical teams.
PO 7 Communicate effectively with the engineering community and society at large.
PO 8 Demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities.
PO 9 Demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices.
PO 10 Demonstrate an understanding of the impact of engineering practices, taking into account the need for sustainable development.
PO 11 Demonstrate an awareness of management, business practices and entrepreneurship.
PO 12 Recognise the need for professional development and to engage inindependent and lifelong learning.

CURRICULUM SRTUCTURE FOR BACHELOR OF CHEMICAL ENGINEERING TECHNOLOGY (HONOURS) (INDUSTRIAL BIOTECHNOLOGY)

YEAR	FISRT		SECOND		THIRD		FOURTH	
Semester	I	II	III	IV	V	VI	VII	VIII
DISCIPLINE CORE ((105)	ERT 105/3 Electrical Technology	PTT 105/3 Engineering graphic	PTT 201/4 Thermodynamics	PTT 204/3 Applied Fluid Mechanics	PTT 301/3 Safety and Health in Biological Process	PTT 308/4 Final Year Project I	PTT 401/6 Final Year Project II	PTT 406/12 INDUSTRIAL TRAINING
	PTT 102//3 Organic Chemistry 1	PTT 106/3 Microbiology	PTT 202/3 Organic Chemistry for Biotechnology	PTT 205/4 Heat & Mass Transfer	PTT 302/3 Downstream Processing Technology	PTT 309/3 Food Technology	PTT 402/3 Biotechnology Facility Design	
	PTT 103/3 Biochemistry	PTT 107/3 Physical chemistry	PTT 203/3 Biochemical Engineering	PTT 206/2 Instrumentation, Measurement and Control	PTT 303/2 Process Modeling and Simulation	PTT 310/2 Waste Management and Utilization	PTT 403/2 Biotechnology Products Commercialization	
	PTT 104/2 Introduction to Biotechnology	PTT 108/4 Mass & Energy Balance		PTT 207/4 Biomolecular and Genetic Engineering	PTT 304/3 Fermentation Technology	PTT 311/3 Enzyme Technology	Elective III/3 Elective A (A3) / Elective B (B3)	
					PTT 305/3 Cell & Tissue Culture Technology	Elective II/3 Elective A (A2) / Elective B (B2)		
					Elective I/3 Elective A (A1) / Elective B (B1)			
COMMON CORE (18)	PQT 111/3 Mathematics for Engineering Technology I	PQT 112/3 Mathematics for Engineering Technology II	PQT 271/3 Statistics for Engineering Technology					
	EMT 110/3 Engineering Material					EUT 443/3 Engineering Management	EUT 440/3 Engineers in Society	
UNIVERSITY REQUIRED (17)	EUW 212/2 University English Language	EUW 410/2 University Malay Language	EUT122/2 Skills & Technology in Communication	EUW 224/2 Engineering Entrepreneurship				
		EUW 1XX/1 Co-Curricular Activity	EUW 233/2 Islamic Civilization and Asia Civilization	EUW 235/2 Ethnic Relation				
			EUW 322/2 Thinking Skill	EUW XXX/2 Option subjects				
140	19	19	19	19	17	18	17	12
Total Units for Graduation 140								

Elective A (Specialty Products)

A1: Nutraceuticals Processing Technology	PTT 306/3
A2: Bioactive Compounds ExtractionTechnology	PTT 312/3
A3: Biopharmaceutical Technology	PTT 404/3

Elective B (Bio-catalysts)

B1: Industrial Microbiology	PTT 307/3
B2: Bioenergy Production Technology	PTT 313/3
B3: Bioremediation	PTT 405/3

COURSE SYLLABUS

ERT 101/4
BIOCHEMISTRY

Course Synopsis

The topics covered in this course include the origin of life and structure of prokaryotes and eukaryotes cells. It also covers the 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 are featured in the course. Electron transportation, citric acid cycle and photosynthesis in biological processes are briefly highlighted in this course.

Course Outcomes

CO1:
Ability to define and describe the biochemical concepts and terms associated with life.

CO2:
Ability to define, explain and differentiate the structure, classification and function of carbohydrates, lipids and nucleic acids.

CO3:
Ability to define, describe and differentiate the role of proteins in biochemistry and purification of proteins. To introduce enzymes.

CO4:
Ability to define, describe and illustrate electron transportation, citric acid cycle and photosynthesis in biological processes.

References

1. McKee, T., McKee, J. (2003). Biochemistry. 3rd Ed. McGraw Hill.
2. Voet, D.; Voet, J. G. and Pratt, W. C. (2002).Fundamentals of Biochemistry. Upgrade Edition. John Wiley
3. Elliott, W.H. & Elloitt, D.C. (2005). Biochemistry. 3rd Edition. Oford University Press.
4. Campbell, M.K. & Farrell, S.O. (2006). Biochemistry. CA: Belmont
5. Mathews, C.K., Van Holde, K.E. & Ahern, K.G. (2000). Biochemistry. 3rd Edition. San Francisco: Benjamin Cumming.

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

CO1:
Ability to explain the basic concepts theoretically and apply the knowledge of the physical and chemical properties of each functional group.

CO2:
Ability to explain theoretical organic chemical reactions of alkenes, alkynes and alkyhalides at molecular level.

CO3:
Ability to demonstrate the reactions involving alcohol, ether, aldehyde, ketone, carboxylic acid and aromatic compounds.

CO4:
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. John McMurry, Organic Chemistry 5th Edition, Brooks/Cole, 2000.
3. T.W.G., Solomons and C.B., Fryhle . (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

CO1:
Ability to explain the principle elements of DC and AC circuits such as current, voltage, power, energy, nodes, branches etc.

CO2:
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.

CO3:
Ability to calculate and analyze parameters of three phase AC system for Wye and Delta connection.

CO4:
Ability to explain the basic concept of magnetism and electromagnetism and its application in DC and AC machines.

References

1. Boylestad, Robert L., Introductory Circuit Analysis, 11th Edition, Prentice Hall, 2007.
2. Hughes, Electrical and Electronic Technology, 9th Edition, Prentice Hall, 2005.
3. Richard J. Fowler, Electricity Principles and Applications, 7th Edition, Mc Graw Hill, 2008.
4. Charles K. Alexander & Matthew N.O.Sadiku, Fundamentals of Electric Circuits, International Third Editions, McGraw-Hill.
5. Nilsson, J.W. & Riedel, S.A., Electric Circuits, 7th Edition, Pearson Prentice Hall, 2005.

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

CO1:
Ability to define and describe the biochemical concepts and terms associated with life.

CO2:
Ability to define, explain and differentiate the structure, classification and function of carbohydrates, lipids and nucleic acids.

CO3:
Ability to define, describe and differentiate the role of proteins in biochemistry and purification of proteins. To introduce enzymes.

CO4:
Ability to define, describe and 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

CO1:
Ability to define and describe important concepts and terminology in microbes and their metabolism.

CO2:
Ability to demonstrate practices in microscopy, staining, sterilization, isolation and identification of bacteria and fungi.

CO3:
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

CO1:
Ability to define and apply the phenomena, basic concepts, laws and principles in physical chemistry.

CO2:
Ability to calculate and solve a problem concerning physical chemistry.

CO3:
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 141/4
FUNDAMENTAL OF BIOSYSTEMS ENGINEERING

Course Synopsis

This course introduces students to the concepts of biosystems engineering and their applications in the biosphere, the ecosystem and the biological systems involving microbes, plants and animals. Students will learn the systems methodologies, life cycle assessment, growth and feedback, biological models and data measurement and analysis. The applications of conservation of mass and energy in determining the input, process and output components in agrosystems are also covered.

Course Outcomes

CO1:
Ability to define, explain the scope of Biosystems engineering & application to sustainable development.

CO2:
Ability to identify and describe systemic properties of biological systems; applied the system methodologies and engineering principles to evaluate the productivity of the biosystems.

CO3:
Ability to integrate the physical and biological information for engineering analytical framework & design.

CO4:
Ability to evaluate 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 142/4
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

CO1:
Ability to identify physical attributes of materials required for analysis and design of agricultural, food and biological systems.

CO2:
Ability to repeat and discuss concept, techniques and calculation of thermal and rheological properties of biological materials.

CO3:
Ability to repeat, demonstrate and calculate thermal and electromagnetic properties of biological materials.

CO4:
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 144/4
MICROBIOLOGY FOR BIOSYSTEM ENGINEERING

Course Synopsis

This course covers the fundamental concepts, historical aspects and the relationship among human, microorganisms and the environment with particular emphasis on the characteristic and taxonomy of bacteria, fungi, virus and protozoa. Basic microbiological and microscopy techniques, harmful effects of microorganisms to plants and animals and their roles in food and industrial application are also discussed.

Course Outcomes

CO1:
Ability to infer historical aspect and explain fundamental concepts of microbiology

CO2:
Ability to classify the characteristics of bacteria, fungi, virus and protozoa

CO3:
Ability to apply and follow basic microbiological techniques

CO4:
Ability to discuss the role of microorganisms in food and industrial application and their harmful effects to plants and animals

References

1. Black, J.G. 2008. Microbiology: principles and explorations 6th edition. John Wiley, New York.

2. Bauman, R. 2007. 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. Tortora, G.J., Funke, B.R. & Case, C.L. (2007). Microbiology: An Introduction. 9th Edition, The Benjamin Cummings, San Francisco, California, USA.
5. Brock, T.D., Madigan, M.T., Martinko, J.M. & Parker, J. (2003). Biology of microorganisms, 10th Edition. Prentice Hall Englewood Califfs, New Jersey.
6. Pollack, R.A., Findlay, L., Mondschein, W. & Modesto, R.R. (2002). Laboratory exercises in microbiology, John Wiley & Sons, Inc.

ERT 146/3
ENGINEERING MECHANICS

Course Synopsis

This course covers vector representation of forces, moments and couples of static equilibrium of particles, rigid bodies, and engineering structures, together with analysis of external and internal forces in structures via the methods of free-body diagrams and properties of cross-sectional areas. In addition, the course also elaborates on kinematics and kinetics of system of particles and of rigid bodies in two and three-dimensional spaces covering force and acceleration, linear and angular momentum, and energy conservation.

Course Outcomes

CO1:
Ability to apply the basic principles of statics and dynamics on mechanism and bodies

CO2:
Ability to analyze systems/problems related to forces, loads, displacement for bodies at rest

CO3:
Ability to analyze systems/problems related to forces, loads, displacement for bodies in motion

References

1. Bedford and Fowler, Engineering Mechanics: Statics and Dynamics, 5th Edition, Pearson-Prentice Hall, 2007.
2. R.C. Hibbler, Engineering Mechanics: Statics and Dynamics, 11th Edition, Peason Prentice Hall, 2006.
3. S.D. Sheppard and B.H. Tongue, Statics. Analysis and design of systems in equilibrium, Wiley, 2005.
4. B.H. Tongue and S.D. Sheppard, Dynamics. Analysis and design of systems in motion, Wiley, 2005.
5. F.P. Beer and E.R. Johnston, Vector mechanics for engineers: statics and dynamics, 8th edition, 2006.

PTT 101/3
ELECTRICAL AND ELECTRONIC TECHNOLOGY

Course Synopsis

This course introduces basic electrical circuit theory and analogue electronics. It enables students to analyze basic DC and AC circuits in addition to familiarizing with fundamental electronic components such as operational amplifiers and semiconductor diodes.

Course Outcomes

CO1:
Ability to demonstrate application of the key principles of DC circuit theory including Kirchhoff's laws of current and voltage, and rules for current and voltage division.

CO2:
Ability to explain the operation of ideal and non-ideal operational amplifier circuits and design simple operational amplifier applications.

CO3:
Ability to apply and solve simple AC series and parallel circuits using phasors and complex numbers.

CO4:
Ability to explain the operation of simple semiconductor devices.

References

1. Bird, J. (2010) Electrical Circuit Theory and Technology. 4th edn. Elsevier Boylestad, R. (2010) Introductory Circuit Analysis. 12th edn. Pearson.
2. Boylestad, Robert L., Introductory Circuit Analysis, 11th Edition, Prentice Hall, 2007.
3. Hughes, E. (2006) "Electrical and Electronic Technology" Longman.
4. Floyd, T., (2006) "Principles of Electric Circuits: Electron Flow Version" Pearson.
5. Stephen L.Herman(2006) "Electrical Transformers and Rotating Machines". Thomson Delmar Learning.

PTT 102/3
ORGANIC CHEMISTRY 1

Course Synopsis

This course covers the theories, structure, bonding, nomenclature, properties, reaction, synthesis and the importance of the various classes of organic compounds. The course then builds upon this information and explores the mechanisms of a number of organic reactions involving the studied functional groups. It provides a firm foundation for further studies in organic, biological, and biochemistry. The central theme of this course is the chemistry of the principal functional groups. The application of organic chemical process is discussed in terms of biotechnology industry.

Course Outcomes

CO1:
Ability to explain and differentiate the chemical and physical properties of each functional groups carry out theoretical reaction mechanism at molecular level.

CO2:
Ability to explain and differentiate the chemical, physical properties and reactions of alcohol, ether, aldehyde, ketone and carboxylic acids.

CO3:
Ability to apply the knowledge of organic chemical process in biotechnology industry.

References

1. Bruice, P.Y. (2007). Organic Chemistry 5th Edition. Pearson Prentice Hall.
2. John Macmurray. (2000). Organic Chemistry 5th . Brooks/Cole.
3. T.W.G. Solomon and C.B.Fryhe. (2008). Organic Chemistry. 9th Edition. John Wuley and Son. Inc.
4. George, T. Austin, Shreve. (2006). Chemical Process Industries. 5th Edition. McGraw Hill International.
5. Bruice, P.Y. (2006). Essential Organic Chemistry. Pearson International. Prentice Hall.
6. Groggins, P.H. (2001). Unit Processes in Organic Chemistry Synthesis, Tata McGraw Hill.

PTT 103/3
BIOCHEMISTRY

Course Synopsis

The topics covered in this course include the 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 and electron transportation, citric acid cycle and photosynthesis in biological processes will also be emphasized in this course.

Course Outcomes

CO1:
Ability to demonstrate basic structure, properties, functions and classification of important biomolecules.

CO2:
Ability to discuss structure, function and kinetic properties of enzymes and their roles in metabolism

CO3:
Ability to illustrate electron transportation, citric acid cycle, and photosynthesis in biological processes.

CO4:
Ability to describe enzymes and nucleic acids extraction and isolation.

References

1. Campbell, M.K. & Farrell, S.O. (2006). Biochemistry 5th Edition. Belmont, CA.
2. Voet D. & Voet, J.G. (2004). Biochemistry 3rd Edition, Wiley International Edition, New York.
3. McKee, T. & McKee, J. (2003). Biochemistry, 3rd Edition, McGraw Hill. New York.
4. Elliott, W.H. & Elliott, D.C. (2005). Biochemistry 3rd Edition. Oxford University Press
5. Mathews, C.K., van Holde, K.E. & Ahern, K.G. (2000). Biochemistry 3rd Edition.Benjamin Cumming, San Francisco.

PTT 104/2
INTRODUCTION TO BIOTECHNOLOGY

Course Synopsis

This course provides an overview of biotechnology industry, from the traditional to the recent high-technology industries. The course also highlights important and recent advances in methods and applications of biotechnology with regards to microorganisms and plants. The importance major biotechnological streams; industrial biotechnology, agricultural biotechnology, medical biotechnology and environmental biotechnology will be discussed, including recent advances and modern processes. Aspects on ethical implications, safety and intellectual will also be covered.

Course Outcomes

CO1:
Ability to explain foundations of modern biotechnology.

CO2:
Ability to demonstrate important recent advances in methods and applications of biotechnology with regards to microorganisms and plants.

CO3:
Ability to differentiate scopes and importance of various biotechnological streams.

CO4:
Ability to demonstrate understanding on ethical implications of biotechnology.

References

1. William J.T. and Michael A.P. (2009). Introduction to Biotechnology. 2nd Edition. Pearson Benjamin Cummings.
2. Susan R. Barnum. (2005). Biotechnology an introduction. 2nd edition. Thomson, Brooks/Cole Publication.
3. Acquaah, G. (2004). Understanding Biotechnology. Pearson. Prentice Hall.
4. Bougaize, D., Jewell, T.R. and Buiser, R.G. (2000). Biotechnology; Demystifying the Concept. Benjamin-Cummings Publication.
5. Rene Fester Kratz PhD, Donna Rae Siegfried. (2010). Biology For Dummies. Second Edition.
6. R.C. Sobti and Suparna S. Pachauri (2009). Essential of biotechnology. CRC press, US.

PTT 105/3
ENGINEERING GRAPHIC

Course Synopsis

This course introduces the use of technical drawing in an effective way for communicating and integrating with engineering concept. Students will learn engineering drawing to interpret design, using graphics method such as geometry, parallel projections, sectional drawing, machines drawing and working drawing. The primary software used in this course is AutoCAD.

Course Outcomes

CO1:
Ability to use the computer to produce complete drawing based on well define technical graphic standard.

CO2:
Ability to apply basic geometric construction techniques to create engineering drawing using computer aided design (CAD).

References

1. Cecil,J.J., Helsel, D., and Dennis R. S. (2008). Engineering Drawing & Design, 7th ed. McGraw-Hill.
2. Wai-Kai Chen. (2009).Computer Aided Design and Design Automation (The Circuits and Filters Handbook), CRC.
3. Alexandre C. Dimian, Costin Sorin Bildea. (2008).Chemical Process Design: Computer-Aided Case Studies, Wiley-VCH.
4. Luke Achenie, Venkat Venkatasubramanian, Rafiqul Gani. (2002). Computer Aided Molecular Design: Theory and Practice (Computer Aided Chemical Engineering), Elsevier Science.
5. Lee Ambrosius. (2007).AutoCAD 2008 3D Modeling Workbook For Dummies, For Dummies Publ.

PTT 106/3
MICROBIOLOGY

Course Synopsis

This course introduces to student the microbial world and its relationship with man and the environment. Emphasizing on the basic concepts in microbiology, aseptic techniques and microscopy. It also encompasses bacteria, fungi and virus groups, and their taxonomy. Structure and function of prokaryote and eukaryote cells, metabolism of microbes and microbial growth kinetics and fermentation process are featured in the course. Food and industrial microbiology are also featured with reference to factors contributing to productivity, spoilage and preservation.

Course Outcomes

CO1:
Ability to categorize classes of microorganisms according to diversity.

CO2:
Ability to use practical skills in fundamental microbiological techniques.

CO3:
Ability to demonstrate microbial growth and metabolism, and compare physical and chemical methods to control growth.

CO4:
Ability to compare the role of microorganisms in industrial, food and medical biotechnology.

References

1. Lansing M. Prescott, John S. Harley and Donald A. Klein. (2005). Microbiology, McGraw Hill.
2. Robert Bauman. (2006). Microbiology With Diseases by Taxonomy Second 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. Pelczar, M.J., Chan, E.C.S. and Krieg, N.R. (1993). Microbiology: concepts and applications. McGraw-Hill, Boston.

PTT 107/3
PHYSICAL CHEMISTRY

Course Synopsis

A one-semester course designed to prepare engineering students for advance knowledge in physical chemistry such as thermodynamics, chemical equilibria and chemical kinetics.

Course Outcomes

CO1:
Ability to explain and calculate the basic concepts, laws and principles in physical chemistry.

CO2:
Ability to calculate and solve a problem concerning material equilibrium, standard thermodynamic function and reaction equilibrium in ideal gas mixture.

CO3:
Ability to illustrate and solve problems concerning chemical kinetics, phase diagrams and electrochemistry.

References

1. Levine I. N. (2002). Physical Chemistry, McGraw Hill, 5th Edition.
2. Atkins, P and de Paula, Julia. (2006). Physical Chemistry. Oxford University Press, 8th Edition.
3. Bahl, B.S.; Bahl, Arun & Tuli, G.D. (2006). Essentials of Physical Chemistry. S. Chand, New Delhi.
4. Paul Monk. (2004). Physical Chemistry, John Wiley & Sons.
5. Silbey R. J., Alberty R. A., Bawendi M. G. (2005). Physical Chemistry, 4th edition. John Wiley & Son, Inc.
6. Thomas, E & Reid P. (2010). Physical Chemistry. Pearson Prentice Hall, Second Edition.

PTT 108/4
MASS AND ENERGY BALANCE

Course Synopsis

The aim of this course is to expose students on the knowledge of how they should formulate and solve materials balances in various processing systems. Essentially, the material and energy which goes into the process will be converted by physical and chemical processes, whilst some may remain unconverted. The task for the chemical and biological technologies engineer to create a process statement which identifies all the materials and energy entering, remaining and leaves the systems.

Course Outcomes

CO1:
Ability to calculate mass balance in chemical and biological process

CO2:
Ability to calculate energy balance of in chemical and biological process; calculate heat of reaction for bioprocess reaction.

CO3:
Ability to calculate mass balance in recycle, multistage and fed-batch system

CO4:
Ability to calculate mass and energy balances unsteady state condition

References

1. Himmelblau, M. D. & Riggs, J. B. (2004)."Basic Principles and Calculations in Chemical Engineering", 7th edition.Upper Saddle River : Prentice Hall.
2. Doran, P. M.(2006). "Bioprocess Engineering Principles" London: Academic Press.
3. Felder, R. M. & Rousseau, R. W. (2005)."Elementary Principles of Chemical Processes" John-Wiley, 3rd Update Edition.
4. Richardson J.F.(1994). "Chemical Engineering, Volume 3" Prentice Hall.
5. Reklaitis G.V. (1983)."Introduction to Material and Energy Balance" John Wiley.

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

CO1:
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.

CO2:
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.

CO3:
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.

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

CO1:
Analyze the fundamentals properties of thermodynamics and apply the law of thermodynamics in engineering systems.

CO2:
Calculate heat, work and other thermodynamics properties ideal fluid and manage to solve problems for real fluids using volumetric equations of state.

CO3:
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., introduction to Chemical Engineering Thermodynamics, Seventh Edition, McGraw-Hill, 2005.
2. Cengel, Y.A. and Boles, M.A., Thermodynamics-An engineering Approach, 6th edition, McGraw-Hill, 2007.
3. Daubert, Thomas E, Chemical engineering Thermodynamics, McGraw-Hill, 1985.
4. (The book is in bahasa version available at the library, translated by Prof. Mashitah Hassan, 1990)
5. K. Iynkaran, J. David and Tandy, Basic Thermodynamics – Applications and Pollution Control, 2nd edition, Pearson Prentice Hall, 2004.

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

CO1:
Ability to calculate and perform the correct statistical method for data analytical and to remember the steps in quantitative analysis.

CO2:
Ability to classify and use separation techniques and gravimetric methods for mass determination.

CO3:
Ability to differentiate and to calculate concentration of analytes of various titrimetic methods (acid-base, complexation, redox and precipitation).

CO4:
Ability to apply the chromatography principles and to interpret and calculate peak height for concentration determination.

CO5:
Ability to understand the spectroscopic principles and to calculate concentration.

References

1. Gary D. Christian (2004). Analytical chemistry. 6th Edition. Publisher: John Wiley & Sons, Inc.
2. David Harvey (2000). Modern Analytical Chemistry. Publisher: McGraw-Hill
3. D. Keeley and P.J. Haines (2002). Analytical Chemistry. Publisher: Oxford: Bios Scientific.
4. D.A. Skoog, D.M. West and F.J. Holler (1996). Fundamentals of Analytical Chemistry. Publisher: Saunders College Publication.

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

CO1:
Define the function of different types of valves; describe and discuss the operational aspects of the valves.

CO2:
Identify and analyze the ISA Symbology for the Process Flow Diagram; apply appropriate symbols and sketch the Process Flow Diagram.

CO3:
Identify and analyze the ISA Symbology for the Piping & Instrumentation Diagram; apply appropriate symbols and sketch the Piping & Instrumentation Diagram.

References

1. Smith C.A. and Corripio A., Principles and Practice of Automatic Process Control, Third Edition, John Wiley, 2006.
2. McCabe W.L., Smith J.C. and Harriott P., Unit Operations of Chemical Engineering, Seventh Edition,McGraw-Hill, 2005.
3. Skousen P.L., Valve Handbook, Second Edition, McGraw-Hill, 2004.
4. Perry R.H. and Green D.W., Perry's Chemical Engineers' Handbook, Seventh Edition, McGraw-Hill, 1997.
5. Murrill P.W., Fundamentals of Process Control Theory, Third Edition, ISA, 2000.
6. McAvinew T. and Mulley R., Control System Documentation: Applying Symbols and Identification, Second Edition, ISA, 2005.
7. Meier F.A., and Meier C.A., Instrumentation and Control Systems Documentation, ISA, 2004.

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

CO1:
Ability to solve basic engineering calculations, convert units in the same dimensions and scientifically interpret series of data.

CO2:
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.

CO3:
Ability to measure parameters, solve energy balance problems and discuss energy balance concepts.

CO4:
Ability to apply 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, Rousseau "Elementary Principles of Chemical Processes" John-Wiley, 3rd Update Edition,2005.
2. Himmelblau, Riggs " Basic Principles and Calculations in Chemical Engineering, Prentice Hall, 7th Edition,
3. Bailey and Ollis "Biochemical Engineering Fundamentals" McGraw Hill,2nd Edition, 2005
4. 2004Pauline Doran "Bioprocess Engineering Principles" Elsevier Science, 1995.
5. J.F. Richardson "Chemical Engineering, Volume 3" Prentice Hall, 1994
6. G.V. Reklaitis "Introduction to Material and Energy Balance" John Wiley, 1983.

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

CO1:
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.

CO2:
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.

CO3:
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.

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

CO1:
Ability to calculate mode of heat transferred.

CO2:
Ability to calculate mode of mass transferred.

CO3:
Ability to analyze heat transfer knowledge as well as designing heat transfer equipment.

References

1. Christie J. Geankoplis (2003). "Tran sport Processes and Separation Pro cess Principles: Includes Unit Opera tions. 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. Pauline M. Doran (2006). " Bioprocess Engineering Principles" Academic Press, London
5. Incropera, FP & De Witt, DP 2006, Fundamentals of heat and mass transfer, 6th edn, Wiley, New York

ERT 244/4
ENERGY AND POWER IN BIOSYSTEMS

Course Synopsis

The course discusses the application of various energy resources to generate power useful for processing biological materials. It focuses on the technology, production process and engineering of renewable sources of energy which includes solar, wind, wave, and energy from biomass.

Course Outcomes

CO1:
Ability to indentify factors environmental influences on biological systems including animals, plants, and harvested produce.

CO2:
Ability to analyse physical and energy requirements of engineering systems to enhance efficiencies of biological systems.

CO3:
Analysis and design of energy generation, transmission, and utilization in the production and processing of biological materials.

CO4:
Ability to evaluate feasibility of various energy alternatives.

References

1. Ayhan Demirbas, Green Energy and Technology, Springer-Verlag London Ltd, 2009
2. Caye M.Drapcho, Nghiem Phu Nhuan, Terry H. Walker, , Biofuels Engineering Process Technology, The McGraw-Hill Companies, 2008
3. Da Rosa, A. (2009). Fundamnetals of Renewable Energy Process, Academic Press, Elsevier Inc.
4. Rosillo.F, C. (2002). industrial uses of biomass energy, Taylor & Francis, London.
5. Roger H. C · Charles W. F. (2009). Ocean Energy : Tide and Tidal Power., Springer-Verlag Berlin Heidelberg.

ERT 245/4
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

CO1:
Ability to differentiate and understanding of different modes of heat transfer and mass transfer.

CO2:
Ability to understand and apply the principles and basic calculations of heat transfer by conduction, convection and radiation are featured.

CO3:
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

CO1:
Ability to apply the principles of hydrology, engineering analysis and design of water resoources 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 247/4
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

CO1:
Ability to understand the comprehensive guide to basic principles and technologies in the application of Remote Sensing Technology and geographic imformation system (GIS).

CO2:
Ability to interphasing between electronics, ICT and biological systems.

CO3:
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 248/4
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

CO1:
Ability to recognise the laws of thermodynamics for processes

CO2:
Ability to manipulate and calculate the properties of pure substances and mixtures

CO3:
Ability to apply the Clapeyron equation to pure substances using an analytical equation of state

CO4:
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 249/4
COMPUTER AIDED ENGINEERING DESIGN FOR BIOSYSTEM ENGINEERING

Course Synopsis

This course introduces and elaborates the use of drafting and modeling and acquire knowledge of computer graphics, 2-D and 3-D geometry related to drafting and design of mechanical and structural components and/or systems. The primary software used in this course is AUTODESK AutoCAD.

Course Outcomes

CO1:
This course is a companion for the course of mechanical design. In this course the proper knowledge of mechanical design will be emphasized on the strength of design analysis and optimization.

References

1. Ibrahim Zeid. (2002). CAD/CAM Theory and Practice, McGraw Hill International
2. David G. Ullman (2003). The Mechanical Design Process. 3rd Edition. McGraw-Hill.
3. Simon Dnaher (2004). The Complete Guide to Digital 3D Design. Cambridge: ILEX.
4. Julien M. Calmettes (2005). Best of 3D Virtual Product Design. Singapore: Page One Publishing Private Ltd.
5. Bruce Hannah (2004). Becoming a Product Designer. John Wiley and Sons.

PTT 201/4
THERMODYNAMICS

Course Synopsis

This course introduces students to the basic thermodynamics for engineering application and problem solving. The course covers first and second laws of thermodynamics, substances properties, closed system energy, entropy and engineering applications of gas power cycles, refrigeration, compression and heat pumps, and chemical reactions.

Course Outcomes

CO1:
Ability to recognize and apply the fundamental basic properties, as well as the law of thermodynamics.

CO2:
Ability to calculate heat, work and other thermodynamics properties ideal fluid in given processes.

CO3:
Ability to solve problems for real fluids using volumetric equations of state.

CO4:
Ability to apply thermodynamics properties from available data by using appropriate tools.

CO5:
Ability to examine specific equations of state or correlations that are appropriate for treating given problems.

References

1. Cengel, Y.A. and M.A.Boles, (2007). Thermodynamics-An engineering Approach, 36th edition, McGraw-Hill.
2. Wark,K.,and Richards,D.E.,(1999), Thermodynamics, 6th Edition., McGraw-Hill.
3. Smith, J.M., Van Ness, H.C., Abbott, M. M. (2005). "Introduction to Chemical Engineering Thermodynamics", 7th Edition,McGraw – Hill
4. Sandler, S., Chemical, Biochemical, and Engineering Thermodynamics, Wiley, 2006
5. Theodore, L., Ricci, F.,Van Vliet, T. (2009). Thermodynamics for the Practicing Engineers, Wiley.

PTT 202/3
ORGANIC CHEMISTRY FOR BIOTECHNOLOGY

Course Synopsis

This course covers the bioorganic compound and analytical techniques commonly used in biochemical works and categorized under spectroscopy, chromatography and electro analytical methods. This course also discusses proteins, lipid and other substances which may be necessary to detect and measure bioorganic compound or which can be very useful in variety of analytical methods. This course is complemented by explanation on chemical nature and methods of analysis of carbohydrates, amino acids, proteins and lipids.

Course Outcomes

CO1:
Ability to demonstrate the mechanism and synthesis of bio organics compound.

CO2:
Ability to describe the utilization of biological materials for analytical purposes.

CO3:
Ability to discuss analytical methods ions that are appropriate for treating given problems.

References

1. Bruice, P.Y.(2007). Organic Chemistry 5th Edition. Pearson Prentice Hall.
2. A. Manz, N. Pamme and D. Iossifidis. (2004). Bioanalytical Chemistry, Imperial College Press.
3. T. G. M. Schalkhammer (Ed.). (2002). Analytical Biotechnology, 1st Edition, Birkhäuser Basel.
4. R. H. Garrett and C. M. Grisham. (2010). Biochemistry, 4th Edition, Thomson Brooks/Cole.
5. D. J. Holme and H. Peck. (1998). Analytical Biochemistry, 3rd. Edition, New York, Addison Wesley Longman.

PTT 203/3
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. Kinetics of growth, death and metabolism are also covered. Batch and continuous fermentation and enzyme technology are included. The laboratory exercises introduce students to the fundamental practices in biochemical engineering.

Course Outcomes

CO1:
Ability to differentiate types of enzymes and calculate enzyme kinetics Ability to interpret ingredients and nutrition in food.

CO2:
Ability to illustrate the immobilization of enzyme process and discuss application of enzyme catalysis.

CO3:
Ability to calculate the microorganism growth kinetics in batch and continuous culture.

CO4:
Ability to calculate the stoichiometry of growth and product formation.

References

1. Shuler, Michael L., and Fikret Kargi. (2001). Bioprocess Engineering: Basic Concepts. 2nd ed. Upper Saddle River, NJ: Prentice Hall PTR. ISBN: 0130819085.
2. Henry C. Vogel and Celeste C. Tadaro, William Andrew. (2007). Fermentation and Buochemical Engineering Handboo,2 edition.
3. Jens N., John E. and Gunner L. (2003). Bioreaction Engineering Principles. New York, Kluwer Academics/Plenum Publisher.
4. Blanch, Harvey W., and D. S. Clark, eds. (1997). Biochemical Engineering. New York, NY: Marcel Dekker Incorporated. ISBN: 0824700996.
5. Shigeo Katoh and Fumitake Yushida. (2009). Biochemical Engineering: A Textbook for Engineers, Chemist and Biologist, Wiley-VCH.

PTT 204/3
APPLIED 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

CO1:
Ability to demonstrate the essential parameters describing a fluid system and recognize the common devices used in measuring pressure and flow rates and turbo machineries.

CO2:
Ability to calculate pressures, forces, and stability in static fluid systems and distinguish the link between conserved quantities and the equations of fluid mechanics.

CO3:
Ability to calculate control volumes and surfaces for developing the equations of fluid mechanics.

References

1. Cengel, Y. A. Cimbala, J. M. (2006). "Fluid Mechanics: Fundamental and Applications, First edition in SI units" McGraw-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. R. Gatignol, R. Prud'Homme. (2001). Mechanic and Thermodynamic Modeling of Fluid Interfaces, World Scientific Publishing Company.
5. Mark Levi. (2009). The Mathematical Mechanic: Using Physical Reasoning to Solve Problems Princeton University Press.

PTT 205/4
HEAT AND MASS TRANSFER

Course Synopsis

This course introduces mechanisms by which heat is transferred from one body to another. This course introduces the principles of steady and unsteady heat conductions; radiation phenomena; natural and force convections; heat transport coefficients; dimensional analysis and boundary layer. The course covers heat conduction, convection and radiation, also mass transfer with special address on biological systems. Emphases are placed on formulation and application of respective mathematical models of heat and mass transfer across both physical and biological bodies.

Course Outcomes

CO1:
Ability to illustrate the conservation laws that control mass and heat transfer.

CO2:
Ability to solve the ordinary and partial differential equations that result from the application of the conservation laws in biological systems.

CO3:
Ability to apply and solve mathematical models for physical and biological situations.

References

1. Incropera, F. P., DeWitt, D. P. (2002), Fundamental of Heat and Mass Transfer, John Wiley & Sons, Inc.
2. Cengel, Yunus A. (2003), Heat Transfer, A Practical Approach, McGraw-Hill, Inc.
3. Bird, R. B., Steward, W.E., Lightfoot, E. N. (2002), Transport Phenomena, Second Edition, John Wiley & Sons, Inc.
4. Thompson, W. J. (2000), Introduction to Transport Phenomena, Prentice Hall, Inc.
5. Yunus Cengel. (2006). Heat and Mass Transfer: A Practical Approach, McGraw-Hill Science/Engineering/ Math.

PTT 206/2
INSTRUMENTATION, MEASUREMENT AND CONTROL

Course Synopsis

The course deals with a number of advanced techniques, data interpretation and control of biotechnological processes. It covers modern on-line hardware sensor such are FIA, viable biomass measurement, membrane inlet mass spectrometry, flow cytometry, microcalorimetry. It also discusses model-based process diagnosis and control techniques including advances in bioprocess modeling and identification, data processing, software sensor design, and on-line control algorithms.

Course Outcomes

CO1:
Ability to illustrate the working principles of hardware sensors commonly used in biotechnological processes.

CO2:
Ability to interpret model based-process diagnosis in biotechnological processes modelling.

CO3:
Ability to use and analyze adaptive and predictive Control techniques in biotechnological processes.

References

1. Manabendra Bhuyan. (2006). Measurement and Control in Food Processing, CRC.
2. Kevin James. (2000). PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control, .Newnes.
3. Walt Boyes Principal in Spitzer and Boyes LLC. (2009). Instrumentation Reference Book, Fourth Edition Butterworth-Heinemann.
4. Paul Regtien, F. van der Heijden, M. J. Korsten, W Otthius. (2004). Measurement Science for Engineers Butterworth-Heinemann.

5. John Park, Steve Mackay. (2003). Practical Data Acquisition for Instrumentation and Control Systems (IDC Technology), Newnes.

PTT 207/4
BIOMOLECULAR AND GENETIC ENGINEERING

Course Synopsis

The course focuses on the molecular mechanisms that underlie the regulated expression of genes, including transcription and translation, as well as basic mechanisms of DNA replication, mutations and repair. Emphasize will be on the molecular mechanisms of DNA replication, repair, transcription, protein synthesis, and gene regulation in different organisms. Facilitates basic knowledge in gene manipulation based on current researches and development in the field of genetic engineering. Characterization and development of cloning vector will also be covered. Among other things to be included will be DNA isolation, the types of enzymes used in molecular biology, insertion of foreign DNA, preparation of host cell, transformation and screening of cloned DNA as well as the making of genomic and cDNA library.

Course Outcomes

CO1:
Ability to differentiate the mechanisms of DNA replication, transcription, and translation in prokaryotic and eukaryotic cells.

CO2:
Ability to demonstrate types of mutations and their repair mechanisms as well as to discuss gene regulation activity in prokaryotes and eukaryotes.

CO3:
Ability to analyze relevant information and experimental data in genetic engineering.

References

1. Malacinski, G. M. (2003) Essentials of Molecular Biology. 4th edition. Jones and Bartlett Publishers.
2. Karp, G. (2002) Cell and Molecular Biology- Concepts and Experiments. 3rd edition. John Wiley & Sons, Inc.
3. Walker, J. M. and Rapley, R. (2009) Molecular Biology and Biotechnology. 5th edition. RSC Publishing.
4. Brown, T. A. (2006). Gene Cloning: an introduction. 3rd edition. Stanley Thornes (Publishers) Ltd.
5. J.D. Watson, N.H. Hopkins, J.W Roberts, J. A. Seitz & A.M. Weiner. (2007). Molecular Biology of the Gene, 6th Edition, Benjamin Cummings Publishing Company Inc.

ERT 308/3
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

CO1:
Ability to interpret ingredients and nutrition in food.

CO2:
Ability to differentiate the principle of food engineering operation.

CO3:
Ability to analyze the problem that involved in food engineering operation.

References

1. R. Paul Singh, Dennis R. Heldman. (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 "Water Activity in Foods: Fundamentals and Applications", Wiley-Blackwell, 2008.
4. Williams, C., "Improving the Fat Content of Foods" Woodhead Publishing, Limited, 2006.

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

CO1:
Ability to design and formulate fermentation media and decide on the types of carbon and nitrogen source.

CO2:
Ability to recognize, compare and draw the schematic diagram for specific types of bioreactors.

CO3:
Ability to design a stirred tank bioreactor according to the specific application.

CO4:
Ability to develop scale up based on geometric similarities or constant power number.

References

1. Shuler, M. L. and Kargi, F. Bioprocess Engineering: Basic Concepts. 2nd Ed. Upper Saddle River, NJ: Prentice Hall PTR, 2001.
2. Doran, P. M. Bioprocess Engineering Principles" London: Academic Press, 2006.
3. Asenjo, J. A. and Merchuk, J. A. Bioreactor System Design. New York: Marcel Dekker Inc, 1995.
4. Najafpour, G.A. Biochemical Engineering and Biotechnology. Amsterdam: Elsevier B.V., 2007.
5. Scragg, A. H. Bioreactors in Biotechnology: A Practical Approach. Ellis Horwood, 1992.
6. Mitchell, D. A., Krieger, N. and Berovic, M. Solid-state fermentation bioreactors: Fundamentals of design and operation. Springer Berlin Heidelberg, 2006.
7. Stanbury, S.F. and Whitaker, A. Principle of Fermentation Technology. New York: Pergamon Press, 1984.

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

CO1:
Ability to categorize design equation for most common industrial reactors and calculate the rate law and rate law parameters.

CO2:
Ability to describe and calculate Residence Time Distribution (RTD) functions in non-ideal reactors.

CO3:
Ability to calculate conversion and sizing for chemical reactors and to explain steady-state isothermal reactor.

CO4:
Ability to investigate catalysis and catalytic reactions.

References

1. H.Scott Fogler. Elements of Chemical Reaction Engineering, 4th ed., Prentice Hall Inc. 2006
2. Levenspiel, O., Chemical Reaction Engineering, john-Wiley, 3rd edition, 2001.
3. Davis, M.E, Davis, R.J. Fundamentals of Chemical Reaction Engineering,1st edition,Mc Graw Hilll, 2002.

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

CO1:
Ability to explain the concepts and differentiate types of enzymes and calculate the kinetics in enzymatic processes.

CO2:
Ability to explain the metabolic pathways in microorganisms and calculate the kinetics in both batch and continuous reactors.

CO3:
Ability to describe the usage and methods for cultivating plant and animal cell culture.

CO4:
Ability to discuss and compare the bioconversion technologies for production of organic chemicals and biofuel from agricultural biomass.

References

1. Bailey, James E., and David F. Ollis. Biochemical Engineering Fundamentals. New York, NY: McGraw-Hill Education, 1986. ISBN:0070666016.
2. Blanch, Harvey W., and D. S. Clark, eds. Biochemical Engineering. New York, NY: Marcel Dekker Incorporated, 1997. ISBN: 0824700996.
3. McKee, T. and McKee, J.R. (2003). Biochemistry: The Molecular Basis of Life, 3rd Edition, McGraw Hill.
4. Shuler, Michael L., and Fikret Kargi. Bioprocess Engineering: Basic Concepts. 2nd ed. Upper Saddle River, NJ: Prentice Hall PTR, 2001. ISBN: 0130819085.

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

CO1:
Ability to apply principles; develop a basic design for gas-liquid separation equipment (Gas Absorber) and vapor-liquid separation equipment (Distillation Column).

CO2:
Ability to apply principles; develop a basic design for liquid-liquid separation equipment (Extractor) and fluid-solid separation equipments (Adsorber and Leaching Equipment).

CO3:
Ability to apply and calculate based on principles of membrane separation process and mechanical- physical separation process (filtration and centrifugation).

References

1. McCabe, W. L., Smith, J. C. and Harriott, P., Unit Operations of Chemical Engineering, McGraw-Hill, 2004.
2. Geankoplis, C.J., Transport Processes and Separation Process Principles, Prentice Hall, 2003.
3. Seeder, J.D. and Henly, E. J., Sepa ration Process Principles, John Wiley and Son, 2006.
4. Wankat, P. C., Separation Process Engineering, Pearson Education, 2006.
5. Benitez, J. Principles and Modern Applications of Mass Transfer Operations, John Wiley and Son, 2009

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

CO1:
Ability to explain, interpret, and calculate the physical, chemical, and biological properties of waste material and describe its toxicology.

CO2:
Ability to calculate and design the basic structure of waste treatment unit operations.

CO3:
Ability to interpret compare, justify and choose the correct method for a particular waste for treatment.

CO4:
Ability to interpret, justify, and propose the common waste management practice in industry and describe the legal framework structure.

References

1. Wastewater Engineering: Treatment and Reuse, Metcalf & Eddy, Inc, 4th Ed. (or latest edition if available) Mc Graw-Hill (2003).

2. Introduction to Environmental Engineering, 3rd Ed., M.L. Davis and D.A. Cornwell, Mc Graw-Hill, 1998.
3. Waste Treatment and Disposal, Paul T. Williams, 2nd Ed., John Wiley (2005).
4. Theory and Practice of water and wastewater treatment, R.L. Droste John Wiley (1997).
5. Industrial Waste Treatment, Nelson Leonard Nemerow, Elsevier Science & Technology Books (2006).
6. Waste Treatment in The Food Industry, L. K. Wang, Y.T. Hung, H.H. Lo and C. Yapijakis, Taylor and Francis (2006).
7. Waste Treatment in the Process Industries, L. K. Wang, Y.T. Hung, H.H. Lo and C. Yapijakis, Taylor and Francis (2006).
8. Handbook of Pollution Control and Waste Minimization, Abdul Ghasem.

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

CO1:
Ability to describe basic principles involved in bio separation processing and calculate certain parameter involved in bio separations units.

CO2:
Ability to compare, justify and use a correct process for a particular bio separation unit to meet product requirements.

CO3:
Ability to discuss and propose the Bio separation techniques/processes and RIPP (Recovery, Isolation, Purification and Polishing) scheme.

References

1. Harrison, R.G. Todd, P., Rudge S.R. and Petrides D.P., Bioseparations Science and Engineering, Oxford University Press, 2003.
2. Rajni Hatti-Kaul et al. Isolation and Purification of proteins (Biotechnology and Bioprocessing), Marcel Dekker Ltd. 2003.
3. Sabramanian Ganapathy, Bioseparation and Bioprocessing. A handbook, 2nd Edition, Wiley 1998.
4. Paul A. Belter, E.L. Clussler, Wei-Shou Hu, Bioseparations: Downstream Processing for Biotechnology, Wiley 1998.
5. Michael S. Verral. Downstream Processing of Natural Products, A Practical Handbook, Wiley 1996.
6. Sivasankar, B., Bioseparations: Principles and Technique, Prentice Hall, 2006.
7. Ladisch, M. R., Bioseparations Engineering: Principles, Practice and Economics, Wiley- Interscience, 2001

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

CO1:
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.

CO2:
Ability to derive and 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.

CO3:
Ability to analyze control system instrumentation and propose feedback control system for bioprocess and chemical processes.

CO4:
Ability to calculate and analyze dynamic behavior of closed-loop control system.

References

1. Seborg, D.E., Edgar, T.F., Mellicamp D.A.(2003)."Process Dynamic and Control" John-Wiley, 2nd Edition
2. Bequette,. B.W.(2003). "Process Control;Modelling, Design, and Simulation" Prentice Hall
3. Marlin, T.,(2002) "Process Control: Designing Processes and ControlSystem for Dynamic Performance" McGraw-Hill
4. Coughonowr (1991). "Process system, Analysis and Control" McGraw-Hill

ERT 322/3
SAFETY & LOSS PREVENTION IN BIOPROCESS

Course Synopsis

This course covers fundamental process of 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

CO1:
Ability to analyze the source, toxic release and dispersion models and evaluate the significance of the events.

CO2:
Ability to distinguish fires and explosion as well as examine ways to prevent it.

CO3:
Ability to analyze relief concepts as well as calculate or sizing the relief system.

CO4:
Ability to analyze and evaluate process safety to identify the hazard and risk in the industry.

References

1. Crowl, D. A., Louvar, J. F. (2002). "Chemical Process Safety; Fundamentals with Applications". Prentice Hall, Second Edition. New Jersey
2. Frank, P.L, (1980) "Loss and Prevention in the process industries", Volume 1&2, London, Butterworth
3. Coulson, J.M and Richardson, J.F, (1983)"Chemical Engineering", Volume 6, Pergamon Press, Oxford
4. Sanders, R. E. (2005). "Chemical Process Safety; Learning From Case Histories". Elsevier Butterworth Heinemann, Third Edition. Amsterdam

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

CO1:
Ability to apply and analyze engineering calculation like mass and energy balance, stoichiometry, and kinetics of the bioprocess.

CO2:
Ability to analyze process and organize unit operation in bioprocess using simulation software.

CO3:
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 348/3
FARM STRUCTURES

Course Synopsis

This course provides students with theory and application of various methods of statically determinate as well as indeterminate structural analysis as it applies to trusses, beams, and frames. This course emphasizes structural analysis applied to designing appropriate structures for agricultural produce storage, structures for animal husbandry, structures where the environment is specifically controlled to enhance animal comfort and increase productivity in agricultural practices.

References

1. R.C. Hibbeler: Structural Analysis, 6 ed., Pearson, Prentice Hall, 2006.
2. Lindley, J.A. and J. H. Whitaker, Agricultural Buildings and Structures. ASAE Publication, St. Joseph, MI, 1996.
3. Reddy, C.S.: Basic Structural Analysis, Tata McGraw-Hill, 1996.
4. Yuan-yu Hsieh and S.T. Mau: Elementary Theory of Structures, Prentice Hall, 1996.
5. Smith J.C.; Structural Analysis, harper and Row, 1988.

ERT 349/4
SOIL AND WATER ENGINEERING

Course Synopsis

This course covers the engineering properties of soil and water and it application in soil-water-plant relationshinp 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 conservtion practices.

Course Outcomes

CO1:
Ability to understand the principle of soil-water-plant relationships.

CO2:
Ability to apply soil and water engineering principle to water management irrigation practice.

CO3:
Ability to do land surveying and develop contour mapping and with application of GIS & GPS.

CO4:
Ability to apply knowledge of water management to management of natural and engineered biosystems.

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.

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

CO1:
Ability to use, suits of instruments and protocol for accurate measurement, monitoring and control (MMC) in Biosystems.

CO2:
Ability to understand and operate the automatic wheather station, water measuring stations and other recent automation system applied to biosystems.

CO3:
Ability to assemble system (MMC) for specific biosystems use.

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

CO1:
Ability to understand and apply the engineering principles to the limitation of biological systems productions.

CO2:
Ability to apply the engineering principle requirement for zero waste management.

CO3:
Ability to design systems for processing and utilization of by-products generated by the bioresource industries, including primary agriculture, food processing, and forestry.

CO4:
Ability to analyse pollution problems caused by these industries.

CO5:
Ability to identify the opportunities for recycling and utilization of by-products.

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.

PTT 301/3 SAFETY AND HEALTH IN BIOLOGICAL PROCESS

Course Synopsis

This course covers the regulatory procedure dealing with biological process. The students are also exposed to hazard identification, risk assessment, biosafety level and health surveillance program. Besides, the students also will be taught on fundamental aspect in emergency response plan relevant to biological process.

Course Outcomes

CO1:
Ability to categorize the different laboratory levels and class of biosafety.

CO2:
Ability to analyze process safety to identify the biohazard and risk in the industry.

CO3:
Ability to write and describe health surveillance program.

CO4:
Ability to use emergency response plan and biological waste decontamination guideline relevant to biological process.

References

1. US Department of Health and Human Services. (2009). Biosafety in Microbiological and Biomedical laboratories.5th edition.
2. Biosafety Manual for Texas Tech Univeristy (2005).
3. Martha J. Boss, Dennis W. Day (2003). Biological risk engineering handbook: infection control and decontamination. Lewis Publication.
4. Biological Safety: Principles and Practices, (2000) Third Edition. do Fleming & dl Hunt, Eds. ASM Press.
5. Sanders, R. E. (2005). Chemical Process Safety; Learning From Case Histories. Elsevier Butterworth Heinemann, Third Edition. Amsterdam

PTT 302/3
DOWNSTREAM PROCESSING TECHNOLOGY

Course Synopsis

This course introduces basic and advanced skills in separation technology related to biotechnology. The course covers common separation techniques which include precipitation, centrifugation, solvent extraction and different types of chromatographic techniques. Other important separation processes will also be covered.

Course Outcomes

CO1:
Ability to demonstrate methods to purify biologically processed materials.

CO2:
Ability to choose equipment and steps required in bio separation systems.

CO3:
Ability to analyze and compare alternative separation approaches and systems.

CO4:
Ability to choose appropriate instrumentation for bio separation applications.

References

1. McCabe, W. L., Smith, J. C. and Harriott, P. (2004). Unit Operations of Chemical Engineering, McGraw-HilL.
2. Harrison, R.G. Todd, P., Rudge S.R. and Petrides D.P. (2003). Bioseparations Science and Engineering, Oxford University Press.
3. Geankoplis, C.J. (2003). Transport Processes and Separation Process Principles, Prentice Hall.
4. Sivasankar, B. (2006). Bioseparations: Principles and Technique, Prentice Hall.
5. Ladisch, M. R. (2001). Bioseparations Engineering: Principles, Practice and Economics, Wiley-Interscience.

PTT 303/2
PROCESS MODELLING AND SIMULATION

Course Synopsis

The course covers material and energy balances, equipment sizing, and costing, environmental impact assessment and process design for single and continuous processes. Students are exposed to the usage of SuperPro design software for modeling and simulation purposes. Subsequently, sustainability assessment, emphasizing on economic and profitability analysis will also be covered.

Course Outcomes

CO1:
Ability to solve engineering calculation like mass and energy balance, stoichiometry, and kinetics of the bioprocess.

CO2:
Ability to apply process and differentiate unit operation in bioprocess using simulation software

CO3:
Ability to analyze economic 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.
4. Biegler, L. T., Grossmann, E. I. & Westerberg, A. W. (1997). Systematic Methods of Chemical Process Design. London: Prentice-Hall International.
5. Coulson, J.M.(John Metcalfe), Richardson, Jon Francis and Sinnott, R.K. (1999). Chemical Engineering Design" Vol.6, 3rd Edition, Butterworth-Heinemann.

PTT 304/3
FERMENTATION TECHNOLOGY

Course Synopsis

This course covers both theoretical and practical aspects of fermentation and bioprocess technology. It also describes several fermentation processes involved in the production of industrial chemical metabolites such as alcohol, organic acids, proteins, enzymes and antibodies.

Course Outcomes

CO1:
Ability to differentiate various fermentation methods including the control parameters

CO2:
Ability to calculate mass balances stoichiometry and microbial growth kinetics in batch, fed-batch and continuous fermentations.

CO3:
Ability to calculate sterilization times, aeration requirement and capacities of batch, fed-batch and continuous fermentation.

CO4:
Ability to illustrate the principles of up and down-scaling of fermentation processes and primary recovery methods.

References

1. Elmansi E.M.T, Bryce C.F.A, Demain and A.L, Allman A.R (2007) . Fermentation Microbiology and Biotechnology. 2nd edition CRC.
2. Stanbury, P.F., Whitacker, A. and Hall, S.J. (1999) Principle of Fermentation Technology. 3rd ed. Pergamon Press.
3. Scragg, A.H. (1991) Bioreactors in Biotechnology: A Practical Approach. 1st ed. Ellis Horwood Limited.
4. Micheal L. Shuler & Fikret kargi (2006).Bioprocess Engineering; basic Concepts 2 Ed. Prentice Hall.
5. Stanbury, P.F, S Whitake, A. (1984). Principles of Fermentation Technology. Pergamon Press: Oxford.

PTT 305/3
CELL AND TISSUE CULTURE TECHNOLOGY

Course Synopsis

This course will introduce the students to the basic knowledge of plant and animal cell culture. The course will cover on the media preparation, aseptic techniques and sterilization, techniques of cultivation as well as applications of plant and animal cell culture.

Course Outcomes

CO1:
Ability to operate laboratory equipments, media and sterilization methods for plant and animal culture.

CO2:
Ability to differentiate techniques involved in animal and plant tissue culture.

CO3:
Ability to apply the principle of plant and animal tissue culture technology in industrial biotechnology.

References

1. Sathyanarayana, B. N. and Varghase, D. B. (2007) Plant tissue culture: Practices and new experimental protocols. I. K. International Pvt. Ltd.
2. Razdan, M. K. (2003) Introduction to plant tissue culture. Science Publishers.
3. Freshney, R. I. (2000) Culture of animal cells: A manual basic techniques, fifth edition. New Jersey.
4. Karl-Hermann Neumann, Ashwani Kumar, Jafargholi Imani. (2009). Plant Cell and Tissue Culture - A Tool in Biotechnology: Basics and Application (Principles and Practice), Springer.
5. Edwin F. George, Michael A. Hall, Geert-Jan De Klerk (Editors). 92007). Plant Propagation by Tissue Culture, Springer.

PTT 306/3
NUTRACEUTICALS PROCESSING TECHNOLOGY

Course Synopsis

The subject covers a broad spectrum of functional foods and nutraceuticals from biological material, applications of engineering techniques in functional food production, process engineering and modeling, functional food bioavailability, to product quality. The emphasis is on (1) applications of various techniques such as high pressure, supercritical fluid, membrane, microencapsulation, and molecular distillation in the processing of functional foods; (2) stability of bioactive components and antioxidative properties during processing and shelf life; (3) improvement in bioavailability of bioactive components by physical and chemical methods; and (4) mechanisms of antioxidant action and clinical and epidemiological evidence of functionality.

Course Outcomes

CO1:
Ability to apply techniques in the processing of functional foods and nutraceuticals.

CO2:
Abilitity to analyze stability of bioactive components and antioxidative properties during processing and shelf life.

CO3:
Ability to analyze and test bioprocessing technology for production of nutraceutical compounds.

References

1. Shi.J. (2007).Functional food ingredients and nutraceuticals, Taylor & Francis Group LLC.
2. Lambert M. Surhone, Miriam T. Timpledon, Susan F. Marseken. (2010). Nutraceutical, Betascript Publishers.
3. Francisco Delgado-Vargas, Octavio Paredes-López. (2003). Natural colorants for food and nutraceutical uses, CRC Press.
4. Yoshinori Mine, Fereidoon Shahidi. (2006). Nutraceutical proteins and peptides in health and disease, CRC/ Taylor and Francis.
5. Vazhiyil Venugopal. (2008). Marine products for healthcare: functional and bioactive nutraceutical compounds from the ocean, CRC Press/Taylor & Francis.

PTT 307/3
INDUSTRIAL MICROBIOLOGY

Course Synopsis

This course explores microbiological industry development, scope of microbiological industries, microbes in microbiological industries, biomass and metabolite production, microbes in bioremediation and in waste treatment industries. The course also refreshes microbial fundamentals and strain improvement for new products and productivity ttimprovement.

Course Outcomes

CO1:
Ability to apply fundamentals of microbial physiology and metabolisms in the production processes of industrial products.

CO2:
Ability to classify microbiological processes involved in applications production of a range of industrial products.

CO3:
Ability to illustrate current development trends in the field of industrial microbiology and biotechnology.

References

1. Waites, M. J., Morgan, N. L., Rockey, J. S. and Higton, J. (2001). Industrial Microbiology: An Introduction. Ist Edition, Blackwell Science
2. Dolye, M. P., Beuchat, L. R. and Montville, T. J. (2007). Food Microbiology: Fundamentals and Frontiers 3rd Edition. American Society Microbiology.
3. Pepper, I. L. and Gerba, C.P. (2004). Environmental Microbiology: a Laboratory Manual. 2nd Edition, Academic Press.
4. Nduka Okafor. (2007). Modern Industrial Microbiology and Biotechnology, Science Publishers.
5. James M. Jay. (2000). Modern Food Microbiology (Aspen Food Science Text Series), Springer.

PTT 308/4
FINAL YEAR PROJECT 1

Course Synopsis

A short-termed research project that inclined towards engineering operations for producing new biotechnological products is necessary for a 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 mainly on fermentation, enzyme technology, bioconversion and natural products and nutraceuticals technologies.

Course Outcomes

CO1:
Ability to apply and integrate theory and practical to solve the engineering problems.

CO2:
Ability to develop suitable research methodology for the project.

CO3:
Ability to present and defend effectively project proposal to selected audience.

CO4:
Ability to identify commercialization potential for proposed project.

References

1. Lydersen, B. K., D'elia, N.A., and Nelson, K.L., (1994)Bioprocess Engineering: System, Equipment and Facilities. John Wiley and Sons, Inc., USA.
2. Stephanopolous, G., (1993) Biotechnology. Vol. 3 (Bioprocessing). VCH, Germany.
3. Andrew A. Signore and Terry Jacobs (2005). Good Design Practices for GMP Pharmaceutical Facilities. Taylor & Francis.
4. Anurag Singh Rathore, Gail Sofer, G. K. Sofer.(2005).Process Validation in Manufacturing og

Biopharmaceuticals: guidelines, current practices, and industrial case studies. Taylor & Francis.
5. Vogel, H.C., and Tadaro, C.L. (1997). Fermentation and Biochemical Engineering Handbook: Principles, Process Design, and Equipment. 2nd Edition. Noyes Publications. New Jersey.

PTT 309/3
FOOD TECHNOLOGY

Course Synopsis

This course covers multidisciplinary field of applied physical sciences 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, freezing, texturization, mechanical separation and food biotechnology.

Course Outcomes

CO1:
Ability to differentiate the principles of food engineering operations.

CO2:
Ability to interpret ingredients and nutrition in food.

CO3:
Ability to analyze problems involved in food engineering operations.

CO4:
Ability to analyze genes involved in plant development and reproduction and improvement of quality and productivity of food materials.

References

1. Food Processing Technology: Principles & Practice. Ellis-Harwood Ltd., Chichester, England. 2nd Edition 2000
2. Heller.K.J, Genetically Engineered Food :Methods and Detection. Second, Updated and Enlarged Edition, WILEY-VCH Verlag GmbH & Co. KgaA, Weinheim, 2006
3. M. Angela A. Meireles, Extracting bioactive compounds for food products, CRC Press, 2009
4. Jose L. Martinez., Supercritical fluid extraction of nutraceuticals and bioactive compounds, CRC Press, 2008.
5. Food Process Engineering - Heldman, D. R. and Singh, R. P.

PTT 310/2
WASTE MANAGEMENT AND UTILIZATION

Course Synopsis

The subject covers the main aspects of utilization of the food industry waste and the treatments necessary to discard waste to environmental acceptors. Emphasize will be on the exigency for utilization and treatment of food waste according to the ISO 14001. The technology of anaerobic fermentation for biogas production, specific degradation of solid wastes including their direct practical applicability, as well as composting of agricultural and food waste are will be addressed accordingly.

Course Outcomes

CO1:
Ability to demonstrate methods to purify biologically processed materials.

CO2:
Ability to choose equipment and steps required in bio separation systems.

CO3:
Ability to analyze and compare alternative separation approaches and systems.

CO4:
Ability to choose appropriate instrumentation for bio separation applications.

References

1. McCabe, W. L., Smith, J. C. and Harriott, P. (2004). Unit Operations of Chemical Engineering, McGraw-Hill.
2. Harrison, R.G. Todd, P., Rudge S.R. and Petrides D.P. (2003). Bioseparations Science and Engineering, Oxford University Press.
3. Geankoplis, C.J. (2003). Transport Processes and Separation Process Principles, Prentice Hall.
4. Sivasankar, B. (2006). Bioseparations: Principles and Technique, Prentice Hall.
5. Ladisch, M. R. (2001) Bioseparations Engineering: Principles, Practice and Economics, Wiley-Interscience.

PTT 311/3
ENZYME TECHNOLOGY

Course Synopsis

The course covers basic enzymology, including properties, classification, kinetics and action mechanisms and immobilization of enzyme. This course also introduces principles and techniques of enzyme extraction and purification. Topic on utilization of enzymes in industrial and medical field will also be introduced.

Course Outcomes

CO1:
Ability to explain fundamentals of enzyme kinetics.

CO2:
Ability to discuss the current and future trends of enzymes applications in bio-analysis, biotechnology and industrial sectors.

CO3:
Ability to choose appropriate techniques for extraction and purification of enzymes/proteins.

CO4:
Ability to demonstrate methods for enzyme immobilization and the charac terization of immobilized enzymes kinetics.

References

1. Wolfgang Aehle. (2007) Enzymes in Industry. John Wiley & Sons.
2. Andr´es Illanes (2008) Enzyme Biocatalysis. Springer Science + Business Media B.V.
3. Marangoni A.G. (2003) Enzyme Kinetics: A Modern Approach. John Wiley and Sons Incoperation. New York.
4. Bisswanger, H (2004) Practical Enzymology Wiley-VCH. Weinheim, Germany.
5. Cook, P.F. and Cleland, W.W (2007) Enzyme Kinetics and Mechanism. Garland Publishing Inc, US.

PTT 312/3
BIOACTIVE COMPOUNDS EXTRACTION TECHNOLOGY

Course Synopsis

The course discusses different types of extraction methods for extraction of bioactive compounds from plants. It also covers overview of the fundamentals of heat and mass transfer as well as the thermodynamics of the processes of steam distillation, distillation, low-pressure solvent extraction (solid–liquid) from vegetable matrices, high-pressure extraction from vegetable matrices, and liquid–liquid extraction and adsorption, which are processes used to obtain high-quality bioactive extracts and purified compounds from botanical sources.

Course Outcomes

CO1:
Ability to distinguish different extraction methods of bioactive compounds from plant materials.

CO2:
Ability to analyze and test various types of extraction methods

CO3:
Ability to demonstrate various bioactive compound extraction methods.

References

1. M. Angela A. Meireles. (2009). Extracting bioactive compounds for food products, CRC Press.
2. Jose L. Martinez. (2008). Supercritical fluid extraction of nutraceuticals and bioactive compounds, CRC Press.
3. Steven M. Colegate, Russell J. Molyneux. (2007). Bioactive Natural Products: Detection, Isolation, and Structural Determination, Second Edition, CRC.
4. Manuel Aguilar, Jose Luis Cortina. (2008). Solvent Extraction and Liquid Membranes: Fundamentals and Applications in New Materials (Ion Exchange and Solvent Extraction), CRC.
5. EugÃ¨ne Vorobiev. (2008) Electrotechnologies for Extraction from Food Plants and Biomaterials (Food Engineering Series), Springer.

PTT 313/3
BIOENERGY PRODUCTION TECHNOLOGY

Course Synopsis

The course explains in detail global energy sources, fossil fuels, and renewables, Biomass Feedstocks, biofuels. processing conditions and alternative applications of biorenewable feedstocks. Liquid and Gaseous Biofuels, including main liquid biofuels such as bioethanol, biodiesel, biogas, biohydrogen, liquid and gaseous fuels from the Fischer–Tropsch synthesis are addressed in detail. Discussion on Thermochemical Conversion Processes covers the utilization of biorenewables, Biofuel Economy and Biofuel Policy are also included.

Course Outcomes

CO1:
Ability to differentiate different sources and types of bioenergy.

CO2:
Ability to analyze economic and environmental impact of bioenergy.

CO3:
Ability to demonstrate production process of bioenergy.

References

1. Ayhan Demirbas. (2009). Green Energy and Technology, Springer-Verlag London Ltd.
2. Caye M.Drapcho, Nghiem Phu Nhuan, Terry H. Walker. (2008) Biofuels Engineering Process Technology, The McGraw-Hill Companies.
3. Wilfred Vermerris. (2008). Genetic Improvement of Bioenergy Crops, Springer.
4. Frano Barbir, Sergio Ulgiati. (2008). Sustainable Energy Production and Consumption: Benefits, Strategies and Environmental Costing, Springer.
5. Dwight Tomes, Prakash Lakshmanan, David Songstad. (2010). Biofuels: Global Impact on Renewable Energy, Production Agriculture, and Technological Advancements, Springer.

ERT 424/3
BIOPROCESS PLANT DESIGN 1

Course Synopsis

This course contains the preliminary design of bioprocess plant. It focuses on process creation, simulation to assist in process reation and heuristic for process analysis, synthesis of process equipment design. Simulation Software will be the main feature and implemented through out the course in the process flow sheeting and equipment design.

Course Outcomes

CO1:
Apply engineering principles like reaction engineering rules, bioreaction stoichiometry, thermodynamics, kinetics, unit operations and unit procedures and also develop the bioprocess plant system.

CO2:
Justify, synthesize and design a suitable unit operation in a bioprocess plant based on bioprocess system involved.

CO3:
Develop and solve unit operation design using modern simulation and create the Process Flow Diagram (PFD) for bioprocess plant.

References

1. Seider, W.D., Seader, J.D. and Lewin, D.R., "Process Design Principles: Synthesis, Analysis and Evaluation", New York (Latest)
2. Douglas, J.M., ''The Conceptual Design of Chemical Processes", New York, McGraw-Hill (Latest)
3. Coulson, J.M.(John Metcalfe), Richardson, Jon Francis and Sinnott, R.K. "Chemical Engineering Design" Vol.6, 3rd Edition, Butterworth-Heinemann, 1999.
4. Peters, M.S. and Timmerhaus, K.D., 'Plant Design And Economics For Chemical Engineers', 5th Edition, New York, McGraw-Hill, 2002.
5. Turton, Richard, Bailie, Richard C., Whiting Wallace B. and Shaeiwitz, Joseph A., 'Analysis, Synthesis And Design Of Chemical Processes', Prentice Hall 1997.
6. Biegler, Lorenz T., Grossmann, Ignacio E., Westerberg, Arthur W., 'Systematic Methods Of Chemical

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

CO1:
Ability to apply the concepts and analyze the requirements of GMP and Validation in bioprocess production area and develop Standard Operation Procedure (SOP).

CO2:
Ability to analyze the GMP requirement and develop and evaluate primary and secondary bioprocess engineering products, together with their Safety, Health and Environment (SHE) aspects.

CO3:
Ability to analyze the GMP requirement and HACCP and design and evaluate the Laboratory, Process Development Facilities, Pilot Manufacturing Facilities and Manufacture of food and Biopharmaceutical products.

References

1. Nally.J.D (Ed).,Good Manufacturing Practices for Pharmaceuticals, Sixth Edition, Informa Healthcare Inc, New York, USA,2007
2. Alli, I., Food, Quality Assurance, CRC PRESS, New York, 2004
3. Bliesner.D.M, ESTABLISHING A CGMP LABORATORY AUDIT SYSTEM A Practical Guide, John Wiley & Sons, Inc., Hoboken, New Jersey, 2006
4. Bjorn K. Lydersen, Nancy A. D'elia & Kim L. Nelson (Editors). Bioprocess Engineering: Systems, Equipment and Facilities, John Wiley & Sons, Inc, 1994
5. Bennet.B. Pharmaceutical Production: an Engineering guide., Institution of Chemical Engineers (IChemE), Warwickshire, UK, 2003
6. 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 scienceswhich 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

CO1:
Ability to interpret ingredients and nutrition in food.

CO2:
Ability to differentiate the principle of food engineering operation.

CO3:
Ability to analyze the problem that involved in food engineering operation.

References

1. R. Paul Singh, Dennis R. Heldman. (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 "Water Activity in Foods : Fundamentals and Applications", Wiley-Blackwell, 2008.
4. Williams, C., "Improving the Fat Content of Foods" Woodhead Publishing, Limited, 2006.

ERT 427/3
PHARMACEUTICAL PROCESS ENGINEERING

Course Synopsis

The aim of present course is to describe the principles of drug pharmacokinetics: absorption, distribution, metabolism and excretion of drugs. This course describes the scientific and technological aspects of the designing and manufacturing of pharmaceutical products.

Course Outcomes

CO1:
Explain the basic concept of drug absorption and disposition and evaluate related pharmacokinetics.

CO2:
Ability to design and demonstrate pharmaceutical production facilities.

CO3:
Ability to formulate and evaluate the pharmaceutical engineering processes in pharmaceutical formulation and production.

References

1. Bennet, B. and Cole, G. Pharmaceutical Production: An Engineering Guide. Warwickshire: Institution of Chemical Engineers (IChemE), 2003.
2. Anthony J. Hickey, David Ganderton. Pharmaceutical Process Engineering: 2nd Edition. New York: Informa Healthcare. 2009.
3. K. Sambamurthy. Pharmaceutical Engineering. New Delhi: New Age International Publishers. 2005.

4. L. Shargel, S. Wu-Pong & A.B.C. Yu. Applied Biopharmaceutics & Pharmacokinetics. McGraw Hill. 2005.
5. M. E. Aulton, Pharmaceutics. The science of dosage form design. 2nd Edition. London: Churchill Livingstone. 2002.
6. Crommelin, D.J.A., & Sindelar, R.D. Pharmaceutical Biotechnology. An Introduction for Pharmacist and Pharmaceutical Scientist. (2nd ed). London: Taylor and Francis. 2002.
7. Glick, B. R., & Pasternak, J.J. Molecular Biotechnology: Principles and Application of Recombinant DNA (2nd ed.). Washington D.C.: ASM Press. 2003.

ERT 428/4
BIOPROCESS PLANT DESIGN 2

Course Synopsis

This course encompasses modern strategies for the design of bioprocess plants including piping and instrumentation diagram (P&ID), control strategies, economic analysis, costing and profitability analysis. Students will be exposed to the software application using simulation software to simulate and analyze the designed processes. Students are to present their design project in group.

Course Outcomes

CO1:
Classify and recommend safety and risk assessment on the bioprocess plant system.

CO2:
Design the typical control strategies for the safe plant operation and recommend the waste management for any visual impact from the process effluent to meet the environmental friendliness of the products.

CO3:
Apply the technique used for estimation of plant economics and Compare economic feasibility of the process plant for project evaluation and process optimization.

References

1. Coulson, J.M.(John Metcalfe), Richardson, Jon Francis and Sinnott, R.K. "Chemical Engineering Design" Vol.6, 3rd Edition, Butterworth-Heinemann, (Latest).
2. Seider, W.D., Seader, J.D. and Lewin, D.R., "Process Design Principles: Synthesis, Analysis and Evaluation", New York, (Latest)
3. Douglas, J.M., ''The Conceptual Design of Chemical Processes", New York, McGraw-Hill (Latest).
4. Peters, M.S. and Timmerhaus, K.D., 'Plant Design And Economics For Chemical Engineers', 5th Edition, New York, McGraw-Hill, 2002.

ERT 429/3
ENERGY FROM BIORESOURCES

Course Synopsis

The aim of this course is to introduce and develop the energy that can be generated from bioresources or biomass which is the alternative way of producing energy from fossil-based fuels. This course intends to teach the students of emphasizing the use of more environmental-friendly technologies which can lead to reduction of pollution, sustain and maintain the ecology system. This course starts with the introduction of biomass resources and the characteristics of biofuels followed by the analysis of the biological processes in producing ethanol and butanol. In the subsequent weeks, the students will be taught the chemical and thermochemical processes in producing biodiesel, biohydrogen and methane biogas. This course ends with the proposal of production of biofuels from microalgae and seaweeds.

Course Outcomes

CO1:
Ability to analyze and develop the biomass resources and characteristics of biofuels. Develop ethanol and butanol production through biological processes.

CO2:
Ability to design and evaluate the thermochemical and chemical conversion of biomass to power and biofuels. Develop chemical conversion process for biodiesel production.

CO3:
Ability to evaluate the production of biohydrogen and the utilization of methane biogas. Design and evaluate the biofuels production from microalgae and seaweeds.

References

1. J. Cheng, Biomass to Renewable Energy Processes, 2010, CRC Press.

2. A. Vertes, N. Qureshi, H. P. Blaschek and H. Yukawa, Biomass to Biofuels: Strategy for Global Industries, 2010, John Wiley & Sons, Ltd.
3. A. Pandey, Handbook of Plant-based Biofuels, 2009, CRC Press.
4. R. C. Brown, Biorenewable Resources: Engineering New Products From Agriculture, 2003, Iowa State Press.
5. S. Lee, J. G. Speight and S. K. Loyalka, Handbook of Alternative Fuel Technologies, 2007, CRC Press.

ERT 430/3
DESIGN OF EXPERIMENTS

Course Synopsis

The course begins with the strategy of experimentation and introduction to basic statistical approach, then exposure to factorial design. Calculation on analysis of variance is also included as well as 2k factorial design and 2k-p fractional factorial design. Elaborate learning on Response Surface Methods (RSM) such as Central Composite Design (CCD) and Box-Behnken design for fitting a second order model. The incorporation of Design of Expert software version 7 or 8 in analyzing the chemical or biochemical process will make the students learning more effective. Finally, introduction to Taguchi approach to process optimization is discussed in brief.

Course Outcomes

CO1:
Ability to discuss general principles of factorial design.

CO2:
Ability to analyze and calculate analysis of variance and residual analysis model.

CO3:
Ability to design and calculate for fitting first order and second order model using response surface methodology.

References

1. Douglas C.Montgomery, "Design and analysis of experiments, Fourth edition", Wiley and sons inc., 1997.
2. Raymond H.Myers, Douglas C.Montgomery, "Response Surface Methodology, Process and product optimization using designed experiments", John Wiley and sons inc., 1995.
3. Douglas C.Montgomery, George C.Runger, "Applied Statistics and probability for engineers fifth edition", John Wiley and sons inc., 2011.

ERT 445/2
FINAL YEAR PROJECT 1

Course Synopsis

This is 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/or software development, device fabrication. In this subject, the students will be taught on how to prepare the research proposal. Besides that, student will be also exposed to earlier part of thesis writing such as introduction, literature review and methodology.

Course Outcomes

CO1:
Identify and create research objective also problem statement.

CO2:
Review information source then recognize, construct and justify the suitable research information.

CO3:
Report and perform the information in the form of dissertation format.

CO4:
Describe, explain and defend effectively in the form of proposal defends.

References

1. Donald H. McBurney and Theresa L. White, (2007). Research Methods, 7th Edition, Thomson Wadsworth.
2. Daniel Holtom & Elizabeth Fisher, (1999). Enjoy Writing Your Science Thesis or Dissertation, Imperial College Press.
3. Leo Finkelstein, Jr., (2008). Pocket Book of Technical Writing for Engineers and Scientist. 3rd Edition, McGraw Hill.
4. Acedemic Journals.

ERT 446/4
FINAL YEAR PROJECT 2

Course Synopsis

This is 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/or software development, device fabrication. In this subject, the students will be taught on how to discuss the research findings and determine the conclusion based on findings. In the end of this course, students will present the research findings and submit hardcover thesis.

Course Outcomes

CO1:
Identify the methodology of the research then organize and demonstrate experiments to collect research data.

CO2:
Choose the suitable research data and synthesize the data.

CO3:
Explain the data findings then describe, discuss and justify based on academic source.

CO4:
Originate, explain and defend effectively in the form of thesis requirement.

References

1. Pentz, M.and Shott,M,"Handling Experimental Data' Open University, Philadelphia.
2. Eisenberg, A., "Effetcive Technical Communication", Mc Graw-Hill, New York, 1991
3. Huckin, T., "Technical Writing and Professional Communication for Non-Native Speakers',Mc Graw-Hill, New York, 1991

ERT 452/3
VIBRATION

Course Synopsis

Introduction to the fundamental of vibration, Derivation of equation of motion. Principles of work-energy. Vibration of mechnical systems. Derivation of equivalent mass equation, rigidity and damping of mechanical systems. Vibration of free single-degree of freedom systems. Harmonic excitation of single-degree-of-freedom systems. Response of single-degree-of-freedom systems on the harmonic and periodic excitation. Vibration of transient single-degree-of-freedom systems. Derivation of equation of motion for single-undamped free vibration system. Multi-degree-of-freedom systems, Derivation of differential equation Newton's equation, Lagrange, matrix formulations, free-vibration of multi degree of freedom systems. Forced-vibration of multi-degree-of-freedom systems. String, beam and rod continuous vibration system, Rayleigh and Rayleigh-RTitz's rules. Application of finite element rules in vibration. Non linear vibration.

Course Outcomes

CO1:
Ability to apply the knowledge of frequency analysis as applicable to rotating machinery and structural vibration.

CO2:
Ability to apply on appreciate the various vibration modelling approaches applicable for Engineering systems.

CO3:
Ability to apply vibration theory in post harvest handling and other biosystems.

References

1. W. J. Palm III. (2005). Mechanical Vibration. John Wiley & Sons.
2. L. Meirovitch. (2001). Fundamentals of Vibration. McGraw-Hill.
3. D. J. Inman. (2001). Engineering Vibration. Prentice-Hall.
4. S.G. Kelly. (2000). Fundamentals of Mechanical Vibration. 2nd ed. McGraw-Hill.
5. Thompson, W. (2004). Mechanical Vibration, John Wiley and Sons.

ERT 453/4
DESIGN OF MACHINE SYSTEM IN BIOSYSTEMS

Course Synopsis

Study of agricultural and other off-road machinery with special attention to the functional design requirements of various machine operations, cost analysis, machinery selection and testing. Topics 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, application of computer aided design and finite element method in design analysis. Interactions of machines with biological systems. Application of agricultural machinery for optimal selection, operation and performance, and management of farm machinery. Viz: Tractors, tillage, seeding, chemical application, biomass and grain/fruit harvesting.

Course Outcomes

CO1:
Ability to appreciate and familiar to specialized components and analyses relevant to mechanized systems for production and processing of biological materials.

CO2:
Ability to understanding the function of components within systems.

CO3:
Ability to integrate machine and biological systems.

CO4:
Ability to apply machine components in a variety of situations and will develop conceptual designs for some of the components.

References

1. W. L. Cleghorn. (2005). Mechanics of Machines. ISBN 10:0195154525.
2. Pennock, G.R. (2003). Theory of Machines and Mechanisms, Oxford University Press.
3. Low, K.H. (2003). Mechanics of Mechanisms, Prentice Hall.
4. Kenneth, J.W. and Gary, L.K. (2004). Kinematics, Dynamics of Machinery, 2nd Ed., John Wiley and Sons.
5. Robert, L. (2004). Design of Machinery, 3rd Ed., McGraw Hill.

ERT 454/3
CONTROLLED ENVIRONMENT DESIGN II

Course Synopsis

A professional course on engineering design and analysis of structures and environmental systems common to agricultural and commercial buildings. The course involves the two broad subject areas common to a Structures and Environment program of study. The first subject area consists of wood and concrete structural design, structural load estimation, introduction to applicable building codes, grain bin storage and fastener selection. The second subject area provides an introduction to thermal environmental engineering design appropriate for agricultural production facilities, including psychrometrics, heat transfer, ventilation and heating, air distribution within buildings, control systems, and thermal loads on facilities. Upon successful completion of this course, a student shall demonstrate engineering competence in: Structural design in agriculture, with emphasis on load estimation, light timber and concrete, granular materials storage, and fasteners. Psychrometrics, physical environment for animals and plants, design of thermal environment systems. Emphasis on plant and animal interaction with the building thermal environment. Heating, ventilating, cooling and interior air distribution.

Course Outcomes

CO1:
Ability to apply basic structural engineering in planning and development of agriculture production systems under controlled environment.

CO2:
Ability to design and evaluation of farm infrastructures, agriculture buildings, greenhouses and livestock housings.

CO3:
Ability to analyse and synthesis the desicion making on the controlled environment, mechanization, automation and facility requirements of crop and livestock productions.

CO4:
Ability to integrate controlled environment and natural biosystems.

References

1. Light Agricultural and Industrial Structures. 1988 Nelson, Manbeck and Meador. Van Nostrand Reinhold, NY; (2) Environment Control for Animals and Plants. 1990 Albright. ASAE Publications, MI.
2. Bartok, J. W. (2001). Energy Conservation for Commercial Greenhouses, NRAES, New York.
3. Ibrahim, D. (20023), Microcontroller Based Temperature Monitoring & Control, Newnes, Oxford.
4. Tiwari, G.N. (2003). Greenhouse Technology for Controlled Environ ment, Alpha Science, New York.
5. Ifeacor, E.C. and Jervis, B.W. (2002). Digital Signal Processing: A Practical Approach, 2nd Ed., Prentice Hall.

ERT 455/4
MANUFACTURING AND PRODUCTION OF BIOLOGICAL PRODUCTS

Course Synopsis

Studies basic systems used in food processing including facilities, power requirements, equipment for primary and secondary processes. The specific unit operations and equipment studies include pumps and blowers, heat exchangers, drying, freezing, absorption, distillation, size reduction, and mixing. Discusses materials of construction for food process equipment and the layout of plant equipment. Principle in produck development from bio-resources will be emphasis.

Course Outcomes

CO1:
Ability to understand and apply the fundamental aspects of Good Manufacturing Practice (GMP) and their pertinent features.

CO2:
Abilitly to analyse and design of machines and machine systems for production and processing of biological materials. Including Principles of Food and Feed processing equipment.

CO3:
Ability to apply quality control procedure for production.

References

1. WHO GMP Guidelines.
2. CODEX Alimenterius – Guidelines for Standards, Switzerland. (2004). Good Pharmaceutical Manufacturing Practice: Rational and Compliance. John Sharp. John Sharp International, Woodley, BERKSHIRE, UK.

ERT 456/3
POST HARVEST ENGINEERING

Course Synopsis

Principles of size reduction, sorting and grading, dehydration, refrigeration, and air handling. Equipment and systems for materials handling, drying, and storage. Management of grain drying complex, fruits and vegetable product under local condition and related activities will be emphasis.

Course Outcomes

CO1:
Ability to apply the principle of engineering in the processes involved in conveying, storing, drying, cleaning and sorting agricultural products.

CO2:
Ability to analyse and design machines used for conveying bulk solids and liquids.

CO3:
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

Advance study on instrumentation. Emphasis on selection of measurement techniques and transducers to sense physical properties of biological materials. Application to agricultural, food processing industries and biological system. Application of biosensors in biosystems. Design of automation system and machine/gentry for biological system. Design project is required.

Course Outcomes

CO1:
Analysis of transducers for on-line measurement and control of biological processes.

CO2:
Wireless system for application farm management and biosystems.

CO3:
Ability to apply of system analysis to biologically related problems.

CO4:
Ability to use computer modeling and simulations optimization method, and decision support systems. Ability to do in silico study crop growth and interaction with variable parameters in system.

References

1. Considine, D.M. editor in chief. (1986). Standard Handbook of Industrial Automation. Chapman and Hall.
2. Warnock, I.G. (1986). Programmable Controllers: Operation and Application. Prentice-Hall.
3. Gupton, J.A. (1986). Computer Controlled Industrial Machines Process and Robots. Prentice-Hall.
4. Lansky, Z.J. et al. (1986). Industrial Pnuematic Control. Marcel-Dekker.
5. James A. Rehg. Introduction to Robotics in CIM Systems.
6. Dunn, Irving J. / Heinzle, Elmar / Ingham, John / Prenosil, Jiri E. (2003). Biological Reaction Engineering Dynamic Modelling Fundamentals with Simulation Examples. 2nd Edition, John Wiley.

PTT 401/6
FINAL YEAR PROJECT II

Course Synopsis

A short-termed research project that inclined towards engineering operations for producing new biotechnological products is necessary for a 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 mainly on fermentation, enzyme technology, bioconversion and natural products and nutraceuticals technologies.

Course Outcomes

CO1:
Ability to apply and integrate theory and practical to solve the engineering problems.

CO2:
Ability to develop suitable research methodology for the project.

CO3:
Ability to present and defend effectively project proposal to selected audience.

CO4:
Ability to identify commercialization potential for proposed project.

References

1. Lydersen, B. K., D'elia, N.A., and Nelson, K.L., (1994) Bioprocess Engineering: System, Equipment and Facilities. John Wiley and Sons, Inc., USA.
2. Stephanopolous, G., (1993) Biotechnology. Vol. 3 (Bioprocessing). VCH, Germany.
3. Andrew A. Signore and Terry Jacobs (2005). Good Design Practices for GMP Pharmaceutical Facilities. Taylor & Francis.
4. Anurag Singh Rathore, Gail Sofer, G. K. Sofer.(2005).Process Validation in Manufacturing of Biopharmaceuticals: guidelines, current practices, and industrial case studies. Taylor & Francis.
5. Vogel, H.C., and Tadaro, C.L. (1997). Fermentation and Biochemical Engineering Handbook: Principles, Process Design, and Equipment. 2nd Edition. Noyes Publications. New Jersey.

PTT 402/3
BIOTECHNOLOGY FACILITY DESIGN

Course Synopsis

This course gives complete overview on the biotechnology facilities design. Topics included in this course are the processing equipment, cleaning of process design and utilities system. This course also introduces current Good Manufacturing Practices (cGMP), regulatory features affecting process and building design and documentation for validation of biotechnology facilities.

Course Outcomes

CO1:
Ability to discuss the current and future bioprocess facility based on industry demand.

CO2:
Ability to apply cGMP regulations in biotechnology facility.

CO3:
Ability to design a bioprocess facility, undertake problem identification and solution.

References

1. Lydersen, B. K., D'elia, N.A., and Nelson, K.L., (1994). Bioprocess Engineering: System, Equipment and Facilities. John Wiley and Sons, Inc., USA.
2. Stephanopolous, G., (1993) Biotechnology. Vol. 3 (Bioprocessing). VCH, Germany.
3. Andrew A. Signore and Terry Jacobs (2005). Good Design Practices for GMP Pharmaceutical Facilities. Taylor & Francis.
4. Anurag Singh Rathore, Gail Sofer, G. K. Sofer.(2005).Process Validation in Manufacturing of Biopharmaceuticals: guidelines, current practices, and industrial case studies. Taylor & Francis.
5. Vogel, H.C., and Tadaro, C.L. (1997). Fermentation and Biochemical Engineering Handbook: Principles, Process Design, and Equipment. 2nd Edition. Noyes Publications. New Jersey.

PTT 403/2
BIOTECHNOLOGY PRODUCTS COMMERCIALIZATION

Course Synopsis

The course covers on the current status in biotechnology research and commercialization aspects of biotechnology products. Students will also learn about current issues of patenting, intellectual property and licensing of biotechnology products as well as developing business plans to meet the market needs.

Course Outcomes

CO1:
Ability to illustrate the commercial aspects of biotechnology products.

CO2:
Ability to select a potential product and prepare a business plan for that particular product.

CO3:
Ability to practice costing of biotechnology projects.

References

1. Journals of Biotechnology
2. Trends in Biotechnology
3. Lawton Robert Burns, The Business of Healthcare Innovation, Cambridge University Press, 2005
4. Shreefal S. Mehta. (2008). Commercializing Successful Biomedical Technologies: Basic Principles for the Development of Drugs, Diagnostics and Devices, Cambridge University Press.
5. Maureen D. McKelvey, Annika Rickne, Jens Laage-Hellman. (2004). The Economic Dynamics Of Modern Biotechnology, Edward Elgar Publishing.

PTT 404/3 BIOPHARMACEUTICAL TECHNOLOGY

Course Synopsis

This course attempts to provide a balanced overview of the bio pharmaceutical industry, in terms of categorizing the products currently available, and also illustrating how these drugs are produced and brought to market. It focuses on several 'traditional' pharmaceutical substances isolated from biological sources, and recently developed biopharmaceutica products. Polypep tide-based therapeutic agents, and the potential of nucleic acid-based drugs, biopharmaceutical drug delivery, genomics and proteomics are also discussed.

Course Outcomes

CO1:
Ability to categorize various biopharmaceuticals and illustrating how these drugs are produced and brought to market.

CO2:
Ability to demonstrate production process of biopharmaceuticals.

CO3:
Ability to evaluate the application of biotechnology in the development of biopharmaceuticals.

References

1. Walsh.G. (2003). Biopharmaceuticals: Biochemistry and biotechnology, John Wiley & Sons Lt.
2. Walsh, G. (2007). Pharmaceutical biotechnology : Concepts and Applications, John Wiley & Sons Ltd, Chichester, West Sussex , England.
3. Kathleen Laura Hefferon. (2009). Biopharmaceuticals in Plants: Toward the Next Century of Medicine, CRC Press.
4. Jörg Knäblein. (2005) Modern Biopharmaceuticals: Design, Development and Optimization, Wiley-VCH.
5. Feroz Jameel, Susan Hershenson. (2010). Formulation and Process Development Strategies for Manufacturing Biopharmaceuticals

PTT 405/3 BIOREMEDIATION

Course Synopsis

This course attempts to provide a balanced overview of the bioremediation. The topics covered in this courses are: type sources of contamination and pollution, bio remediation technologies in for soil and water, Types of bioremediation technologies, bioremediation of solid, liquid and gas phase and the last one is case studies for bioremediation.

Course Outcomes

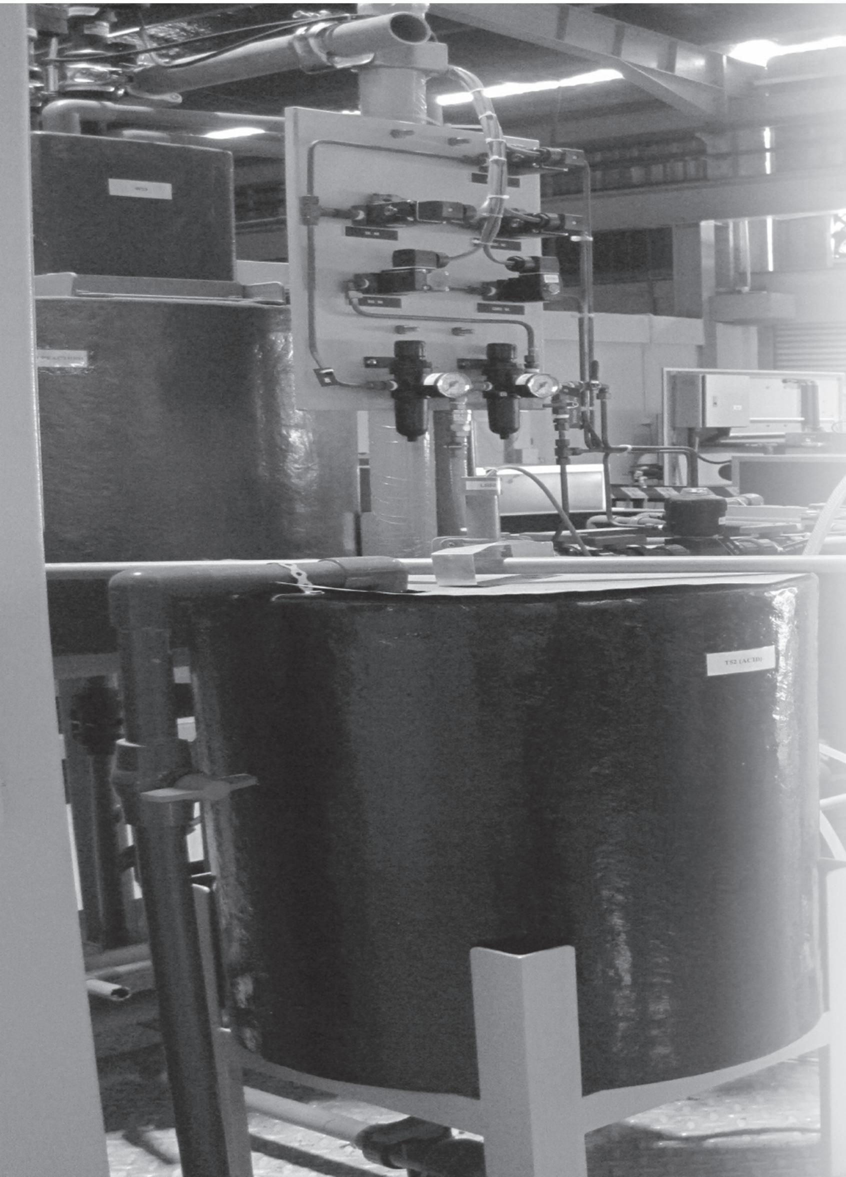
CO1:
Ability to analyze and distinguish the type of bioremediation.

CO2:
Ability to illustrate and solve the design consideration on each type of bioremediation.

References

1. Ronald L. Crawford , et al (2005) Bioremediation: Principles and Applications (Biotechnology Research). Cambridge University Press; 1 edition.
2. Ronald M. Atlas, Jim Philp. (2005). Bioremediation: Applied Microbial Solutions for Real-World Environment Cleanup, ASM Press.
3. Environmental Biotechnology : Theory and Application, Gareth M. Evans, Judith C. Furlong, WILEY,2002
4. Shree N. Singh. (2006) Environmental Bioremediation Technologies, Springer.
5. Dennis M. Filler, Ian Snape, David L. Barnes. (2008) Bioremediation of Petroleum Hydrocarbons in Cold Regions, Cambridge University Press.

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

Programmes Offered :

- Bachelor of Engineering (Environmental Engineering)
- Bachelor of Engineering (Building Engineering)
- M.Sc Environmental Engineering
- PhD Environmental Engineering

8. SCHOOL OF ENVIRONMENTAL ENGINEERING

SCHOOL OF ENVIRONMENTAL ENGINEERING
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Kompleks Pusat Pengajian Jejawi 3,
02600 Arau, Perlis.

Tel : 04- 9798626
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Introduction

The School of Environmental Engineering (PPKAS) was established in January 2006 after approval from the Ministry of Higher Education on 27 October 2005. The environmental engineering programme was first offered in the 2006/2007 academic session. A total of 30 students enrolled into this programme at that time. The first cohort from Environmental Engineering graduated in August 2010.

In line with the national industrial growth, the School of Environmental Engineering currently offers two bachelor degree programmes i.e. Bachelor of Engineering (Honours) (Environmental Engineering) and Bachelor of Engineering (Honours) (Building Engineering). The Vision and Mission of School of Environmental Engineering are stated below:

Vision

An internationally recognized academic programme.

Mission

To support national industrial aspiration towards environmental protection.

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BACHELOR OF ENGINEERING (HONOURS) ENVIRONMENTAL ENGINEERING

PEO BACHELOR OF ENGINEERING (ENVIRONMENTAL ENGINEERING)

Programme Objective 1
Graduates who are leaders in the field of environmental engineering or chosen field as demonstrated through career advancement.

Programme Objective 2
Graduates who are members and contribute to professional society.

Programme Objective 3
Graduates who pursue continuing education opportunities.

Programme Objective 4
Graduates who contribute through research and development .

Programme Objective 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 in an environmental engineering discipline.
PO 2 Ability to identify, formulate and solve engineering problems.
PO 3 Ability to design a system, component or process to meet desired needs.
PO 4 Ability to design and conduct experiments, as well as to analyze and interpret data.
PO 5 Ability to use techniques, skills and modern engineering tools necessary for engineering 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 In-depth understanding of 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.
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

BACHELOR OF ENGINEERING (HONORS)(ENVIRONMENTAL ENGINEERING)
ACADEMIC SESSION (2011/2012)

YEAR	FISRT			SECOND		THIRD			FOURTH	
Semester	I	II		III	IV	V	VI		VII	VIII
ENGINEERING CORE	EET 103/4 Electrical Technology	EKT 120/4 Computer Programming	Ecological Camp	EAT 213/4 Fluid Mechanics	EAT 237/3 Water Supply Engineering	EAT 301/4 Air Pollution Engineering	EAT 342/3 Noise Pollution Engineering	EIT 302/4 Industrial Training & Engineering Innovation	EAT XXX/3 Elective I	EAT 433/3 Environmental Engineering Design
	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		EAT XXX/3 Elective II	EAT 446/4 Final Year Project II
	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		EAT 441/3 Environmental Remediation	EAT442/2 Project Management
		ECT 112/3 Eng Skills		EAT 233/3 Environmental Engineering Skills		EAT 332/3 Environmental Impact Assessment	EAT 345/3 Hydrology		EAT445/2 Final Year Project I	
							EAT 346/4 Mass Transfer			
NON ENGINEERING	EQT 101/3 Engineering Mathematics I	EQT 102/3 Engineering Mathematics II		EQT203/3 Engineering Mathematics III	EQT 373/3 Statistic for Engineers					
	EUT 122/2 Skills and Technology in Communication									
REQUIRED UNIVERSITY	EUW XXX/1 Co-curriculum			EUW 224/2 Engineering Entrepreneurship	EUW 212/2 University English	EUW 233/2 Islamic and Asian Civilizations	EUW 322/2 Thinking Skills		EUT 440/3 Engineers in Society	EUW 235/2 Ethnic Relations
					EUW 410/2 University Malay Language					EUW XXX/2 Option Subject
135	18	18		18	16	16	18	4	14	13
TOTAL UNITS FOR GRADUATION IS 135										

ELECTIVES COURSES:
EAT 447/3 Environmental Informatics, EAT 443/3 Built Environment,
EAT 449/3Environmental Process Control & Instrumentation, EAT 448/3 Remote Sensing

EAT XXX	SUBJECT WITH LABS
EATXXX	SUBJECTS WITHOUT LABS

BACHELOR OF ENGINEERING (HONOURS) BUILDING ENGINEERING

PEO BACHELOR OF ENGINEERING (BUILDING ENGINEERING)

Programme Objectives 1
Graduates are leaders in the field of environmental engineering or chosen field as demonstrated through career advancement

Programme Objectives 2
Graduates who are members and contribute to professional society

Programme Objectives 3
Graduates who pursue continuing education opportunities

Programme Objectives 4
Graduates who contribute through research and development

Programme Objectives 5
Graduates who are entrepreneur 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 in an environmental engineering discipline.
PO 2 Ability to identify, formulate and solve engineering problems.
PO 3 Ability to design a system, component or process to meet desired needs.
PO 4 Ability to design and conduct experiments, as well as to analyze and interpret data.
PO 5 Ability to use techniques, skills and modern engineering tools necessary for engineering 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 In-depth understanding of 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.
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

BACHELOR OF ENGINEERING (HONORS)(BUILDING ENGNEERING)
ACADEMIC SESSION (2011/2012)

YEAR	FISRT			SECOND		THIRD			FOURTH	
Semester	I	II		III	IV	V	VI		VII	
ENGINEERING CORE	EET 103/4 Electrical Technology	EKT 120/4 Computer Programming	Ecological Camp	EAT 251/3 Structural Theory	EAT258/3 Building Material Engineering	EAT 314/4 Geotechnical Engineering	EAT 355/3 Computer Application in Building Engineering	EIT 302/4 Industrial Training & Engineering Innovation	EAT XXX/3 Elective I	EAT XXX/3 Elective III
	EAT 102/4 Mechanics and Material Engineering	EAT 113/4 Mechanics of Materials		EAT 213/4 Fluid Mechanics &	EAT 208/3 Environmental Law, Health and Safety	EAT 351/3 Concrete Building Design I	EAT 354/3 Steel Building Design		EAT XXX/3 Elective II	EAT 446/4 Final Year Project II
	EAT151/3 Introduction to Building Engineering	EAT 112/4 Geomatic Engineering		EAT 212/4 Soil Mechanics	EAT 253/3 Structural Analysis I	EAT 353/3 Structural Analysis II	EAT358/3 Basic Building Engineering Quantities		EAT445/2 Final Year Project I	
		ECT 112/3 Eng Skills		EAT 250/3 Building Engineering Skills	EAT 257/3 Building Services Engineering	EAT 303/4 Wastewater Engineering	EAT 352/3 Concrete Building Design II		EAT 455/3 Industrial-ized Building System	
						EAT 357/3 Construction Management				
NON ENGINEERING	EQT 101/3 Engineering Mathematics I	EQT 102/3 Engineering Mathematics II		EQT203/3 Engineering Mathemat-ics III	EQT 373/3 Statistic for Engineers					
	EUT 122/2 Skills and Technology in Communication									
REQUIRED UNIVERSITY	EUW XXX/1 Co-curriculum			EUW 224/2 Engineering Entrepreneurship	EUW 212/2 University English	EUW 233/2 Islamic and Asian Civilizations	EUW 322/2 Thinking Skills		EUT 440/3 Engineers in Society	EUW 235/2 Ethnic Relations
					EUW 410/2 University Malay Language				EUW XXX/2 Option Subject	
135	17	18		19	19	19	14	4	13	
TOTAL UNITS FOR GRADUATION IS 135										

Elective Courses:
Elective I : EAT454/3 Timber and Masonry Design OR EAT456/3 Foundation Engineering
Elective II: EAT 411/3 Advanced Concrete Building Design OR EAT 414/3 Construction Methods & Control
Elective III: EAT 453/3 Advanced Structural Analysis OR EAT 415/3 Advanced Steel Building Design

EAT XXX SUBJECT WITH LABS
EATXXX SUBJECTS WITHOUT LABS

COURSE SYLLABUS

EAT101/4
BASIC ECOLOGY

Course Synopsis

Definition of ecology, ecosystems and component of basic ecology. Energy flow in ecosystems; Organism, environmental and food chain; Physical Environment; Population characteristic, population growth, factors in population growth, competition among species, symbiosis, relationship between human and nature of population; Community structure, dominant species comparison, community process development, community equivalent and parasitism; Global Environmental Changes.

Microbiology
Introduction, soil formation and composition, microbial ecology Microorganisms: Culturing and staining methods for identification of microorganisms; microorganisms in the environment: eucaryotes and procaryotes, viruses, bacteria, viruses, algae, fungi, protozoa and worms; and microorganisms based on the sources of energy and carbon.

Biochemistry : biochemical pathways used by microorganisms for oxidation of carbohydrates, proteins, and fats in order to obtain energy for their life processes; i.e. Embden-Meyerhof-Parnas pathway; Tricarboxylic Cycle; Concept of energy; ADP and ATP; Aerobic and anaerobic metabolism; and principal microbial oxidation and reduction reactions.

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 biochemistry and metabolism pathways of microorganisms in water and wastewater treatment.

CO5:
Ability to describe the basic concepts of soil composition and metabolism pathways of microorganisms in soil.

References

1. Smith T.M. & Smith R.L.,Elements of Ecology, 6 th Edition. Pearson, 2006
2. David, E.V., Environmental Biology for Engineer and Scientist, Wiley. 2005.
3. Eugene Odum, Richard Brewer, Gary W. Barrett, Fundamentals of Ecology,
4. Ecology: From Individuals to Ecosystems Michael Begon Colin R. Townsend, John L. Harper
5. Peter Cotgreave, Irwin Forseth, Introductory ecology, Wiley-Blackwell, 2002

EAT102/4
MECHANICS AND MATERIAL ENGINEERING

Course Synopsis

Mechanics statics: Force Vector, Equilibrium of a particle, Friction, Properties of Sections: Center of Gravity and Centroid, Properties of Sections: Moment of Inertia. Mechanics dynamics: Kinematics of a Particle, and Kinetic of a Particle: Force and Acceleration, Work and Energy, Impulse and Momentum. Material: Introduction to Material Science and Engineering, The Structure of Crystalline Solids, Mechanical Properties of Metal, Phase Diagram

Labs
1. Equilibrium of beam
2. Tensile test
3. Rockwell Hardness Test

Course Outcomes

CO1:
Ability to add forces and resolve them into components using Parallelogram Law as well as Cartesian Vector

CO2:
Ability to solve particles and rigid body equilibrium problems using the equations of equilibrium

CO3:
Ability to draw shear force and bending moment diagram

CO4:
Ability to solve problems which relate to kinetic of a particle

CO5:
Ability to explain basic concepts of material strength as well as their mechanic properties

References

1. Hibbeler, R.C. Engineering Mechanics Statics. 12th Ed. , Prentice Hall, 2010.
2. Peter Schiavone, Hibbeler, R.C. Engineering Mechanics Statics Study Pack. 12th Ed. , Prentice Hall, 2010.
3. Hibbeler, R.C. Engineering Mechanics Dynamics. 12th Ed. , Prentice Hall, 2010.
4. Peter Schiavone, Hibbeler, R.C. Engineering Mechanics Dynamics Study Pack. 12th Ed. , Prentice Hall, 2010.
5. William D. Callister, Jr. Material Science and Engineering An Introduction, 5th Ed, 2000.

EAT104/4
FUNDAMENTAL OF CHEMICAL PROCESSES

Course Synopsis

Introduction to chemical engineering calculation, process variables and material balance.
Introduction to chemical process engineering: Dimensions, units and conversions, process and process variables, process flow diagram and PID diagram, chemical compositions, temperature and pressure measurements, chemical reaction terminology and applications (stoichiometry, limiting reactant, % excess reactant, degree of conversion), process material balance calculation, recycling, bypassing and combustion reaction.

Energy balances
Form of energy, first law of thermodynamics, kinetic and potential energy, energy balance on closed and open system, Steam tables. Balance on nonreactive and reactive processes. Introduction to heat transfer.

Labs:
1. HYSIS software for material balance
2. Temperature measurement
3. Heat conduction
4. Free and forced convection
5. Radiation

Course Outcomes

CO1:
Ability to understand, and solve problems related to all engineering calculation.

CO2:
Ability to understand, explain and solve problems on material balances.

CO3:
Ability to understand, explain the theory and solve calculation on energy balances and heat transfer.

References

1. Felder, RM and Rousseau, RW. (2000). Elementary Principles of Chemical Processes. 3rd Edition. : Wiley.
2. Himmelblau DM.(1996). Basic Principles and Calculations in Chemical Engineering. 6th Edition: Prentice-Hall.
3. Himmelblau , D.M.and Riggs, J.B. (1998) Basic Principles and Calculations in Chemical Engineering. 7th Ed.: Prentice Hall.
4. Jacob A. Moulijn, Michiel Makkee, Annelies van Diepen, Chemical process technology, John Wiley and Sons, 2001
5. Teh Fu Yen, Chemical processes for environmental engineering, Imperial College Press, 2007

EAT112/4
GEOMATIC ENGINEERING

Course Synopsis

In this course student will be introduce basic surveying involved in engineering. Starting from linear measurement on plane. Student 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, student will be test in real work, in geomatic camp.

Labs:
1. Introduction to Distance Measurement and Bearing
2. Introduction to Levelling Work (Collimation and Rise & Fall Method)
3. Introduction to Geomatic Instruments and Auto Level work (Sg. Batu Pahat)
4. Traversing With Compass and Theodolite
5. Introduction to Tacheometry
6. Introduction to Electronic Distance Measurement (EDM) With Total Station
7. Geomatic Camp

Course Outcomes

CO1:
Ability to understand basic concept of geomatic.

CO2:
Ability to perform surveying task and procedures.

CO3:
Ability to transform data to other format (e.g : map, excel and etc)

References

1. Ghilani Wolf., Elementary Surveying, An Introduction to Geomatics, Twelfth Edition, Pearson International Edition
2. Ab. Hamid Mohamed, Asas Ukur Kejuruteraan, Penerbit Universiti Teknologi Malaysia
3. Kavanagh, B. F., "Surveying: Principles and applications" 4th Ed, Prentice Hall, 1996.
4. Bannister, A. and Raymond, S., "Surveying" 6th Ed, Longman Scientific & Technical, 1992.
5. Jack McCormac, "Surveying" 5th Ed, John Wiley & Sons, 2004.

EAT113/4
MECHANICS OF MATERIALS

Course Synopsis

This course will be focused on mechanics of material which begins with the concept of stress and strain. The important mechanical properties of materials and separate treatments of axial load, shear, torsion, and bending are also discussed. The transverse shear along with a discussion on the state of 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. For a further summary, student will be taught the applications of beams and shaft that cover on the design and deflection parts. Besides that the buckling of column also will be exposed to the student.

Labs:
1. Torsion
2. Bending Moment
3. Strut Buckling
4. Bending Moment

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 shear formula in beam or thin-walled and compute stress caused by combined loadings.

CO4:
Ability to construct Mohr's Circle to calculate stresses on inclined planes and deduce the buckling load of columns with various types of support.

References

1. R.C Hibbeler'"Mechanics of Materials" , 7th Ed, Prentice Hall, 2008
2. Ferdinand P. Beer, E. Russell Johnston Jr., John T. DeWolf.,"Mechanics of Materials". 3rd Edition. McGraw Hill,2004.
3. Megson, T.H.G., "Structural and Stress Analysis", Butterworth: Heinemann,2002.
4. E.Popov., "Mechanics of materials", Prentice Hall, 1983
5. Gere, "Mechanics of materials, Thomson, Brookes/Cole, 2004

EAT131/4
ENVIRONMENTAL CHEMISTRY

Course Synopsis

General chemistry
Stoichiometry, General Chemistry, Physical Chemistry, Organic Chemistry, Colloidal Chemistry

Water
Water chemistry: Properties of water and solutions, physical structure and properties of water and solutions, solution equilibria, solubility product, acids and bases, and buffer solutions. Water Quality Parameters : parameters use in water and wastewater analysis; i.e. COD, BOD, DO, hardness, nutrients, turbidity, color, alkalinity, solids, chloride, oil and grease, volatile acids, iron and manganese, fluoride, and sulphate.

Solid Waste
Soil chemistry: Inorganic and organic components of soil; chemical properties of soil, inorganic and organic geochemistry

Air
Atmospheric Chemistry (stratosphere stratospheric perturbations,

troposphere, tropospheric pollution, Airglow; the mesosphere)

Labs:
1. Stoikiometry Lab 1
2. Stoikiometry Lab 2
3. Determination of alkalinity in natural waters
4. Determination of dissolved oxygen in water using the Winkler method
5. Humic soil content in water

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. Chemistry for Environmental Engineering and Science, 5th Ed., McGraw-Hill, 2003.
2. Manahan, Stanley E. Environmental Chemistry, 8th Ed., Boca Raton, Fla. ; London : CRC Press, 2005
3. Andrews, J. E. An Introduction to Environmental Chemistry, 2nd Ed., Malden, MA, Blackwell Science, 2004.
4. Dunnivant, F.M. Environmental Laboratory Exercise for Instrumental Analysis and Environmental Chemistry, Wiley-Interscience, 2004.
5. Colin Baird, Michael Cann, Environmental chemistry, W.H. Freeman, 2008

EAT151/3
INTRODUCTION TO BUILDING ENGINEERING

Course Synopsis

It analyses a building in terms of what is expected of it, the practical processes and typical methods used in its construction, the building team which implements the processes and the methods used for communicating information. With regard to maintenance and repair of existing buildings, traditional construction procedures will be given. In the beginning, the requirements of a building; appearance, durability, dimensional suitability, strength and stability, whether exclusion, sound control, thermal comfort, fire protection, lighting and ventilating, sanitation and drainage, security and cost will be given followed by building processes, building team and communication.

Course Outcomes

CO1:
Ability to describe a building in terms of what it is expected to do; its function and performance.

CO2:
Ability to discuss a building in terms of the processes required, the Building Team which implements them, and the methods used in communicating information

CO3:
Ability to comprehend a building in terms of typical construction methods, the interaction of components and the processes for assembly.

References

1. Osbourn, D. and Greeno, R., “Introduction to Building”, Fourth Edition, Pearson, Prentice-Hall, 2007.
2. Warszawski, A.,“Industrialized and Automated Building Systems: A managerial Approach”, second edition, Taylor & Francis , 2000.
3. David, V. Chadderton ,“Building Services Engineering”, Taylor & Francis , 2000.
4. K.N Derucher, G.P. Korfiatis, and A.S. Ezeldin,”Materials for Civil and Highway Engineers”, 1998 Edition, Prentice Hall, Inc., 1998
5. R.Barry, “The Construction of Buildings”. Fifth Edition, Wiley-Blackwell, 2001

EAT208/3
ENVIRONMENTAL LAW, HEALTH AND SAFETY

Course Synopsis

General
Environmental Quality Act (EQA) 1974, Prohibition and Control of Pollution

Water and wastewater
(Sewage and Industrial Effluents) Regulations 1979

Air and Noise
(Clean Air) Regulation 1978, Malaysian

Ambient Air Quality Guideline, (Motor Vehicle Noise) Regulations 1987, Factories and Machinery Act

Solid waste
(Scheduled Wastes) Regulations 2005,

Health and Safety
Occupational Safety and Health Act 1994 (Act 514), Use and Standards of Exposure of Chemicals Hazardous to Health Regulations (USECHH) 2000, Control of Industrial Major Accident Hazards Regulations (CIMAH)1996, RCRA, USEPA and Classification, Packaging and Labelling of Hazardous Chemicals Regulations (CPL)1997, Material Safety Data Sheet, Industrial Hygiene, Toxicology, and Responsible Care Codes of Management Practices

Course Outcomes

CO1:
Ability to comprehend and explain the basic and legal requirement of Malaysian major laws related to environment.

CO2:
Ability to comprehend and discuss the major regulations of Occupational Safety and Health Act enforced in Malaysia.

CO3:
Ability to describe and outline the procedures in chemical handling and management at workplace.

CO4:
Ability to identify and utilize knowledge related to health and safety in working place.

References

1. Occupational Safety and Health Act 1994 (Act 514) & Regulations and Orders, 2007 (amended at 5th April), International Law Book Services, Malaysia.
2. Environmental Quality Act & Regulations, 2006 (amended up to April), MDC Publishers Sdn. Bhd., Malaysia.
3. Brock, N.W. (1994) Introduction to chemical exposure and risk assessment. Boca Raton : Lewis Publishers.
4. Stellman, J.M. et al. (1998) Encyclopedia of Occupational Health and Safety, 4th. Ed. International Labour Services, Geneva.
5. Nielsen, R.P. (2000) OSHA Regulations and Guidelines : A Guide for Health Care Providers. Albany : Delmar/ Thomson Learning.

EAT212/4
SOIL MECHANICS

Course Synopsis

General
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.

Labs:

1. Sieve and Hydrometer Analysis
2. Liquid Limit and Plastic Limit Test
3. Constant Head Permeability Test
4. Standard Proctor Compaction Test
5. Direct Shear Test on Sand

Course Outcomes

CO1:
Ability to identify and differentiate the different types of soil and their properties and classification of soil.

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, 'Soil Mechanics' , E & FN Spon, 1997.
2. M. Budhu, 'Soil Mechanics & Foundations', Wiley, 1999.
3. David F. McCarthy,"Essentials of Soil Mechanicsand Foundations: Basic Geotechnics", 7th Edition. Prentice Hall,2006.

4. Das, B.M.,"Fundamentalis M Geotech Engineering", PWS-KENT Publishing,1999.
5. Das, B.M.,Principle of Geotechnical Engineering, 2nd Edition. PWS-KENT Publishing,1990.

EAT213/4
FLUID MECHANICS AND HYDRAULICS

Course Synopsis

This course presents the study of the mechanics of water. In fluid mechanics, other fluids, including oil and gasses are studied. The student will be taught about properties of fluids, fluid static and kinematics, Bernoulli's equation, momentum equation, analysis of flow in open channel and pipeline system. This course will also cover the transportation and metering of fluids such as pumps and turbines. At the end of the course, students should be able to apply the theory to solve problem related to flow of fluids.

Labs:
1. Osbourne Reynolds demonstration unit.
2. Flowmeter measurement apparatus.
3. Serial/Parallel pump test unit.
4. Bernoulli's theorem demonstration.
5. Flow over weirs.
6. Impact water jet.
7. Properties of Fluid.
8. Friction Loss Apparatus.

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 open channel system.

CO4:
Ability to describe and solve problems related to fluid flow in pipeline system.

References

1. Douglas, J.F., J.M. Gasiorek, and Swaffield (2001). "Fluid Mechanics – 4th edition". Prentice-Hall.
2. Young, D.F., Munson, B.R., Okiishi, T.H. & Huebsch, W.W., A Brief Introduction to Fluid Mechanics. Wiley Interscience. (2007).
3. Crowe, C.T., Elger, D.F. and Roberson, J.A.,"Engineering Fluid Mechanics", 8th Edition. John Wiley & Sons, 2005.
4. White, F.M.,"Fluid Mechanics", 5th Edition. McGraw- Hill, 2003.
5. Cimbala, J.M. and Cengel, Y.A.,"Essentials of Fluid Mechanics, Fundamentals and Application". McGraw- Hill, 2006.

EAT231/3
THERMODYNAMICS

Course Synopsis

Basic Concept of Thermodynamics
Introduction of thermodynamics system, properties of pure substance, heat and work, Laws of Thermodynamics (1st, and 2nd Law), entropy, power and refrigeration cycle.

Application of Environmental Thermodynamics
Air-Water Partitioning and Henry's Law, Air-Water Interfacial adsorption, Atmospheric Chemistry, Air-Water Equilibrium in wastewater system, Partitioning into Soil and Sediment from water, Water and Soil-Air Equilibrium, Colloid in soil and groundwater, Non-aqueous phase liquid in contaminanted aquifers, Application of Chemical Equilibrium and Chemical Kinetics.

Course Outcomes

CO1:
Ability to comprehends the basic concept of Thermodynamics

CO2:
Ability to describe and calculate thermodynamics properties in phase equilibrium.

CO3:
Understand first and second law of thermodynamics, concept of entropy base through its application to ideal and irreversible processes, and know how to apply the knowledge.

CO4:
Ability to apply thermodynamics concept on Environmental Engineering Issues.

References

1. Cengel, Y.A. and M.A.Boles, Thermo dynamics-An engineering Approach, 6th edition, McGraw-Hill, 2008.
2. Valsaraj, K. T. (2000). Element of Environmental Engineering Thermodynamics and Kinetics. 2nd Edition. Lewis Publisher – CRC Press

3. Smith J.M., Van Ness H.C (2001). Introduction to Chemical Engineering Thermodynamics. 6th edition. McGraw Hill
4. Kyle B. (1999). Chemical and Process Thermodynamics. 3rd edition. Prentice Hall
5. Thomas E., Chemical Engineering Thermodynamics, McGraw-Hill, 1985. (The bahasa version is available at the library, translated by Prof. Mashitah Hassan, 1990).

EAT232/3
FUNDAMENTAL OF ENVIRONMENTAL ENGINEERING

Course Synopsis

Water and wastewater
Water and wastewater parameters and analysis.

Solid waste
Elements of solid waste such municipal solid waste characterization, waste handling, generation rate, and disposal method

Air
Horizontal atmospheric motion, vertical motion in the atmosphere, wind, temperature inversion, fumigation, stagnation. Source of air pollution - oxidation and reduction process, stationary source, mobile source, area source

Course Outcomes

CO1:
Ability to define and calculate water and wastewater quality parameters.

CO2:
Ability to define and discuss waste generation & available method of disposal.

CO3:
Ability to discuss the effect of meteorology condition to the atmospheric quality.

CO4:
Ability to discuss the sources of air pollutants as well as their effects.

References

1. Norazian Mohamed Noor et al, Introduction to Environmental Engineering, 1st Ed., Penerbit UniMAP, 2009 2.
2. Davis M. L. and Masten S.J., Principles of Environmental Engineering. McGraw-Hill, 2004.
3. Peavy H. S., Rowe D.R., Tchobanoglous G., Environmental Engineering. McGraw-Hill, 1985.
4. Environmental Quality Act 1974 and Regulations. MDC Sdn. Bhd., 2002.
5. Mackenzie L.D. and David A.C., (2008) Introduction to Environmental Engineering 4th Edition , McGraw Hill

EAT233/3
ENVIRONMENTAL ENGINEERING SKILLS

Course Synopsis

Introduction to surveying. Covering in particular: surveying and setting out; level and levelling; traversing and distance measurement. Introduction to AutoCAD software; Drawing and editing; Layer control and properties modification; Hatching and dimensioning; Text and template drawing. Introduction to GIS and its components, basic GIS analysis, the output of GIS and finally application of GIS in environmental field.

Course Outcomes

CO1:
Ability to perform surveying task and procedures.

CO2:
Ability to practice AutoCAD software package.

CO3:
Ability to produce detail mapping using geographic information systems (GIS).

References

1. Bruce E Davis. GIS: A Visual Approach 2nd Ed. Thomson Learning, 2001
2. Kavanagh, B. F, Surveying Principles and Application, 4th Edition, Prentice Hall, 1996
3. Arthur Bannister, Stanley Raymond and Raymond Baker, SURVEYING, 7th Edition, Prentice Hall, 1998.
4. Timothy Sean Sykes. 2002. AutoCAD2002 one step at a time. Prentice Hall.
5. Ralph Grabowski. 2002. Using AutoCAD 2002. Thompson Learning.

EAT346/4
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.

Labs:
1. Determination of flooding point and loading point in gas absorption system
2. Absorption of carbon dioxide into water in gas absorption system
3. Filter press system
4. Liquid diffusion system
5. Evaporation system
6. Field trip to a selected facility related to mass transfer application

Course Outcomes

CO1:
Ability to understand and explain, and measure the diffusion processes in gases, liquids and solid in steady state

CO2:
Ability to understand, explain and measure mass transfer occurs in various phases and unsteady-state diffusion.

CO3:
Ability to apply knowledge of mass transfer in separation processes.

CO4:
Ability to understand and apply knowledge of transport and chemical substances within the three environ mental geospheres: water, air and earthen solids.

References

1. Louis J. Thibodeaux. Environmental chemodynamics: movement of chemicals in air, water, and soil. 2nd Ed. John Wiley & Sons, 1996.
2. Warren Lee McCabe, Julian Cleveland Smith, Peter Harriott. Unit operations of chemical engineering, 7th Ed.
3. Harold F. Hemond and Elizabeth J. Fechner-Levy. Chemical Fate and Transport in the Environment, 2nd Ed. Academic Press, 1999.
4. Donald G Crosby. Environmental Toxicology and Chemistry, Oxford University Press, USA, 1998.
5. Christi J. Geankoplis. Transport Processes and Unit Operations, 3rd Ed. Prentice Hall International Editions , 1995.

EAT235/3 GEOENVIRONMENTAL ENGINEERING

Course Synopsis

This course presents the principles of geoenvironmental engineering. It covers the soil properties and groundwater flow. This course also discusses the subsurface contamination, site characterization, in-situ waste containment, waste containment liner system.

Course Outcomes

CO1:
Ability to discuss and determine the component and principle available in soil properties

CO2:
Ability to utilize and apply the knowledge of groundwater flow and transportationprocess in porous media.

CO3:
Ability to apply knowledge of mass transfer in separation process.

CO4:
Ability to understand and apply knowledge of transport and chemical substances within the three environmental geospheres

References

1. Hari D. Sharma and Krishna R. Reddy, Geoenvironmental Engineering , John Wiley & Sons, 2004
2. Sarsby, R. Environmental Geotechnics, Balkema, Rotterdam, 2000.
3. Tarbuck and Lutgens, EARTH An Introduction to Physical Geology, 8th Edition, Prentice Hall, 2005
4. Lakshmi N. Reddi, Hilary I. Inyang, Geoenvironmental engineering: principles and applications, Marcel Dekker. 2000
5. Raymond Nen Yong, Geoenvironmental engineering: contaminated soils, pollutant fate and mitigation, CRC Press LLC, 2001

EAT237/3
WATER SUPPLY ENGINEERING

Course Synopsis

This course will be focused on water sources and usage, method on estimating water demand, water quality characteristics and legislations, water treatment processes and also water distribution and reticulation system. Special focus will be given on the design of raw water treatment comprising pre-treatment, primary treatment (coagulation, flocculation, sedimentation, filtration, disinfection) and advance water treatment processes. From the course, students will also be exposed to the design guidelines of water supply system which is applied in Malaysia.

Course Outcomes

CO1:
Ability to identify water sources and consumption and to forecast water demand.

CO2:
Ability to describe and evaluate water quality required in water supply system.

CO3:
Ability to identify the technology of water treatment processes and design water treatment unit.

CO4:
Ability to describe and analyze water distribution system.

References

1. Qasim, S.R., Motley, E.M. and Zhu, G. Water Works Engineering: Planning, Design, and Operation. Prentice Hall PTR, 2000.
2. The Malaysian Water Association. MWA Design Guidelines for Water supply Systems, published by MWA, 2000.
3. McGhee, T.J. Water Supply and Sewerage. 6th Ed., McGraw-Hill, 1991.
4. Viessman, W. and Hammer, M.J. Water Supply and Pollution Control. 7th Ed., Prentice Hall, 2005.
5. Hammer, M.J. and Hammer, M.J. (Jr.) Water and Wastewater Technology. 5th Ed. Prentice Hall, 2004.

EAT 250/3
BUILDING ENGINEERING SKILLS

Course Synopsis

The course equips students with the basic computer-aided drawing skill for general engineering drawing, and especially the drawing for Civil 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 civil engineering profession will be integrated through a series of these hand-on sessions.

Labs:
1) Introductions to basics engineering drawing
2) Geometrical construction
3) Projection systems
4) Isometric and oblique sketches
5) Cross-sectioned views
6) Dimensioning and geometrical tolerance
7) Working drawing and detailing
8) Introduction to Computer Aided Drafting
9) Basic Construction techniques
10) Basic Editing
11) Dimensioning 2D drawing
12) Creating 2D drawing (geometric constructions)
13) Creating 2D section views
14) Introduction to 3D solid modelling
15) To produce 2D drawing from 3D solid modelling

Course Outcomes

CO1:
Ability to understand the basic characteristic and features of the computer-aided engineering drawing and their use in design and construction industry.

CO2:
Ability to relate the basic engineering design to the actual construction via graphical presentation.

CO3:
Ability to communicate technical details via computer-aided tools.

References

1. Bertoline, G.R. and Wiebe, E.N. 2005. Fundamental of Graphics Communication, 4/e, New York: McGraw-Hill.
2. Giesecke, F.E., Mitchell, A, Spencer, H.C., Hill, I.L., Dygdon, J.T. and Novak, J.E. 2002. Technical Drawing, 12/e, New Jersey: Prentice Hall.

3. Lamit, L.G., Kitto, K.L, Shull, J.I. and Higgins, J.J. 1997. Engineering Graphics and Design: with Graphic Analysis. St. Paul, Minneapolis: West Publishing Company.
4. Dix, M. And Riley, P. 2005. Discovering AutoCAD 2005., New Jersey: Prentice Hall. Yarwood A. 2004. Introduction to AutoCAD 2004 : 2D and 3D Design. London: 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 trusses, beams, and frames. It introduces analysis of statically determinate structures for trusses. Besides that, it also introduces deformation using virtual work for trusses, beams, and frames and also integration and moment area method for the beams. Cables and arches also will be discussed at the end of this course.

Labs:
Lab 1: Deflection truss
Lab 2: Portal frame
Lab 3: Deflection of frame
Lab 4: Two Hinged Arch

Course Outcomes

CO1:
Ability to identify and analyze of statically determinate structures.

CO2:
Ability to analyse and illustrate the internal loading developed in structural members.

CO3:
Ability to analyze the deformation of statically determinate structures using geometrical method.

CO4:
Ability to compute the deformation of determinate structure based on virtual work method.

References

1. R. C. Hibbeler, "Structural Analysis", Sixth Edition, Pearson, Prentice-Hall, 2006.
2. Reddy C.S., "Basic Structural Analysis", Tata McGraw Hill Publishing Co., 1996
3. Laible J.P, "Structural Analysis", Mc Graw Hill Book Co., 1984.
4. Yuan-yu Hsieh & S. T. Mau,"Elementary Theory of Structures, Prentice Hall, 1995
5. Au T and Christiano, P, "Structural analysis", Prentice Hall, 1982

EAT253/3
STRUCTURAL ANALYSIS I

Course Synopsis

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.

Course Outcomes

CO1:
Ability to analyze of statically determine structures for beam, trusses and frame using influence line method

C02:
Ability to analyze of statically indeterminate structures for beam, trusses and frame using approximate analysis

C03:
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. R. C. Hibbeler, "Structural Analysis", Seventh Edition, Pearson, Prentice-Hall, 2009.
2. Kenneth, M. Leet., "Fundamentals of Structural Analysis". Third Edition. McGraw-Hill., 2008.
3. Reddy C.S., "Basic Structural Analysis", Tata McGraw Hill Publishing Co., 1996
4. Laible J.P, "Structural Analysis", Mc Graw Hill Book Co., 1984.
5. Yuan-yu Hsieh & S. T. Mau,"Elementary Theory of Structures, Prentice Hall, 1995

EAT257/3
BUILDING SERVICES ENGINEERING

Course Synopsis

This course is designed to provide students with an understanding of specification, design, installation and management of all the engineering services associated with the built environment. It provides students with basic knowledge in building infrastructure which includes assess road or pavement, sewerage design, drainage design, water supply design, fire resistance, acoustic, thermal resistance and conductivity, and electrical supply and installations. At the end of this course, students will be exposed to the mechanical systems that are typically installed in buildings.

Labs

1. Refrigeration trainer
2. Air – Conditional trainer
3. Heating Trainer
4. Elevator Trainer

Course Outcomes

CO1:
Ability to describe and discuss the importance of building services in their buildings' designs.

CO2:
Ability to evaluate the choice of building services components for better buildings' design and long term building operational sustainability.

CO3:
Ability to understand the Mechanical & Electrical distribution systems in modern buildings and problems related to design, operation and maintenance.

References

1. Chadderton, David V., Building Services Engineering,Hardback,April 2007, Publisher Taylor & Francis Ltd.
2. David, V. Chadderton ,"Building Services Engineering", Taylor & Francis , 2000.
3. John J. McGowan, C.E.M., "Direct Digital Control: A Guide To Distributed Building Automation", The Fairmont Press, Inc.1995
4. Hawkes, Dean : Energy efficient buildings, 2002
5. Miller, Vandome, McBrewster., "Building Services Engineering", VDM Publishing House Ltd., 2009.

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.

Labs:

1. Common specified tests on cement and aggregates
2. Concrete mix design
3. Strength and material tests.

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. "Fundamental of Building Construction: Materials and Methods", Fourth Edition. Wiley. 2008.
2. Bjorn Berge. "Ecology of Building Materials". Second Edition. Architectural Press. 2009
3. H. Zhang. "Building Materials in Civil Engineering". Wood head Publishing Limited. 2010
4. S. K. Duggal. "Building Materials". Taylor & Francis. 1997.
5. P.C.Varghese. "Building Materials". PHI Learning Pvt. Ltd. 2005

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, modeling the pollutant dispersion as well as designing air pollution control equipments.

Labs:

1. Air Pollution Control Device – Cyclone
2. Air Pollution Control Device - ESP
3. Air Pollution Control Device – Scrubber
4. Air Pollution Control Device - Absorption

Course Outcomes

CO1:
Ability to apply air pollutant concentration model to solve problems relates to air pollution control.

CO2:
Ability to discuss the general ideas in air pollution control.

CO3:
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.
4. Jon Ayres, Robert Maynard, Roy Richards (2006) Air Pollution and Health, World Scientific.
5. Godish, Thad. (2004) Air quality, Lewis Publishers.

EAT303/4
WASTE WATER ENGINEERING

Course Synopsis

This course introduce student about wastewater management. Student will be introduced about terms related with wastewater and how to calculate flow rate and population equivalent. From this calculation, student will be able to design basic sewerage. Student also will learn about physical and biological unit operation related with wastewater treatment. In this course also, student will learn how to design wastewater treatment plant with applying all the knowledge in wastewater treatment theory learned before.

Labs:

1. Aeration study
2. Membrane Filtration
3. Design project – sewerage system
4. Design project – wastewater treatment plant

Course Outcomes

CO1:
Ability to define and calculate wastewater flow rates and population equivalent (PE) and able to design sewerage.

CO2:
Ability to differentiate between physical, chemical and biological treatment.

CO3:
Ability to design basic structure of waste water treatment plan.

References

1. Metcalf & Eddy, Inc (2003). Wastewater Engineering: Treatment and Reuse. 4th Ed. McGraw-Hill.
2. Thomas Joseph Casey (1997) Unit Treatment Processes in Water and Wastewater Engineering, Wiley
3. Hamidi Abdul Aziz, (1999) Kejuruteraan Air Sisa, Utusan Publication & Distributors Sdn Bhd.
4. George Tchobanoglous, Franklin L. Burton, H. David Stensel, Wastewater Engineering: Treatment and Reuse, McGraw-Hill, 2004
5. Syed R. Qasim, Wastewater treatment plants: planning, design, and operation, CRC Press, 1999

EAT 314/4
GEOTECHNICAL ENGINEERING

Course Synopsis

The course covers the applied aspects of soils mechanics. There are three main sections to this course (1)foundations, bearing capacity, settlement, pile foundations, (2) earth-retaining structure, earth pressure, retaining structures and deep excavations and (3) slope stability, planar and non-planar movement, landslide investigations and instrumentations and slope stabilization.

Labs

1. JKR / McKintosh Probe Test
2. One dimensional Consolidation test
3. Triaxial test
4. Direct Shear test

Course Outcomes

CO1:
Ability to analyze bearing capacity and design for shallow foundations and deep foundations.

CO2:
Ability to describe and design various concrete retaining walls based on lateral earth pressure.

CO3:
Ability to conduct slope stability analysis and landslide investigations.

CO4:
Ability to discuss and identify common sampling methods for subsoil exploration.

EAT 332/3
ENVIRONMENTAL IMPACT ASSESSMENTS

Course Synopsis

Introduction to Environmental Impact Assessment; Principle and perspective of EIA; Overview on EIA: Screening, Scoping & Term Of Reference, Impact Analysis, Mitigation & Impact Management; Prediction of environmental impacts; EIA Documentation and Environmental Management Plan (EMP) ; Aims & key components of EIA implementation and follow-up; Reviewing process in EIA; Decision making in the EIA process; Social impact assessment.

Course Outcomes

CO1:
Ability to understand the steps required in performing EIA report.

CO2:
Ability to understand and apply some of the basic tools available for predicting environmental impacts.

CO3:
Ability to apply the knowledge and prepare EIA documentation.

CO4:
Ability to apply the knowledge and prepare EMP documentation.

CO5:
Ability to analyze the social impact of project activities.

References

1. Canter, L.W. (1996). Environmental Impact Assessment 2nd Ed. McGraw Hill.
2. Department of Environment (1994). EIA: Procedures and Requirements in Malaysia. Ministry of Science, Technology and the Environment, Malaysia
3. Department of Environment, (1995). A Handbook of Environmental Impact Assessment Guidelines, Department of Environment, Ministry of Science, Technology and the Environment, Malaysia.
4. John Glasson, Riki Therivel, Andrew Chadwick, Introduction to environmental impact assessment, Tylor and Francis Group, 2005
5. By Peter Morris, Riki Therivel, Methods of environmental impact assessment, Spoon Press, 2009.

EAT 341/3
SOLID AND HAZARDOUS WASTE ENGINEERING

Course Synopsis

Students will be introduced to elements of solid waste such solid waste handling, storage, collection and transport; waste treatment and disposal methods, including biological and chemical treatment, incineration, pyrolysis, 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

Course Outcomes

CO1:
Ability to discuss current waste management practices

CO2:
Ability to describe and analyze the process of solid waste reduction and treatment.

CO3:
Ability to plan and design landfill facilities

CO4:
Ability to analyze treatment processes and design treatment facilities of hazardous waste

References

1. Tchobanoglous, Theisen and Vigil, Integrated Soild Waste Management:

Principles & Management Issues, McGraw-Hill, 1993. ISBN : 0070632375
2. LaGrega, Buckingham & Evans, Hazardous Waste Management, 2nd Edition,McGraw-Hill,2001. ISBN: 0070393656.
3. Cheremisinoff and Wu(editor),Hazardous Waste Management Handbook,Technology,Perception and Recycling. PTR Prentice Hall, 1994.
4. Pfeffer, Solid Waste Management Engineering. Prentice Hall, 1992
5. Vesilind P.A., Worrell W., Reinhart., Solid waste engineering. Brooks/Cole 2002.

EAT342/3
NOISE POLLUTION ENGINEERING

Course Synopsis

Characteristics of sound, Sources, effect and regulation of noise pollution, Measurement and Analyses of noise Noise control, Fundamentals and Basic Concepts of Vibration, Undamped and Damped Free Vibrations

Labs
1. Measurement and Analyses of Noise
2. Effect Noise in Building Materials
3. Pendulum System:
   (a) Simple Pendulum System
   (b) Compound Pendulum System

Course Outcomes

CO1:
Ability to explain and discuss the concept of noise control.

CO2:
Ability to ability to analyse what is noise and vibration.

CO3:
Ability to explain and analyse noise pollution level and know how to overcome it according to the law

CO4:
Ability to describe and compute different system of vibration.

CO5:
Ability to apply knowledge and concept of vibration in solving the problem.

References

1. Baranek, L. L. and Ver, L. L. (Editor), 'Noise and Vibration Control Engineering: Principles and Appli cations', John Wiley & Sons, 2005.
2. Ambekar, A.G., Mechanical Vibrations and Noise Engineering, Prentice-Hall of India, New Delhi, 2006.
3. Lawrence K. Wang, Norman C. Pereira, Yung-Tse Hung, Advanced air and noise pollution control, Volume 2, Human Press Inc, 2005
4. Agarwal, Noise Pollution Agarwal, S. B. Nangia, 2009
5. A. Lara Sáenz, Raymond William Barrow Stephens, International Council of Scientific Unions. Scientific Committee on Problems of the Environment, John Wiley, 1986

EAT343/3
PUBLIC HEALTH AND OCCUPATIONAL HYGIENE

Course Synopsis

General
Introduction to epidemiology

Water
Safe drinking water; dilemma in compliance; the relation between chemical contaminants in drinking water and public health, control of water-borne diseases.

Air and Noise
Air pollutants and its effect, indoor air pollution, heat and temperature extreme hazard, noise and and vibration hazard.

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. "Introduction to Public Health" 1st edition, Jones & Bartlett Publishers, 2003.
2. Bernard J. Turnock, Public health: what it is and how it works, 4th Edition, Jones and Bartlett, 2009
3. Bernard J. Turnock, Essentials of public health, Jones and Bartlett, 2007

4. Kerry Gardiner, J. Malcolm Harrington, Occupational hygiene, Blackwell Publising, 2007
5. By Megan Tranter, Occupational Hygiene and Risk Management, Megan Tranter, 2004.

EAT 344/3 ENVIRONMENTAL MANAGEMENT SYSTEM

Course Synopsis

Introduction; Design and implementation of ISO 14001; Types of environmental management standards – EMS, Environmental Audit, Environmental Labeling, Environmental Performance Evaluation, Life Cycle Analysis; Risk assessment, analysis and management; Cleaner production

Course Outcomes

CO1:
Ability to describe the requirements in implementing an ISO 14001, as well as EMS costing and audits.

CO2:
Ability to describe and outline the EIA process & methods in Malaysia.

CO3:
Ability to identify and describe the measuring instruments and calibration systems in environmental management.

CO4:
Ability to identify and explain the quantitative risk assessment.

References

1. Morris, A.S. (2003). ISO 14000 Environmental Management Standards Engineering and Financial Aspects. New York: John Wiley & Sons.
2. Hillary, R. (1997). Environmental Management Systems and Cleaner Production. John Wiley & Sons Ltd.
3. Muhammad Awang (1999). Environmental Management Standards (ISO 14000) Towards a Sustainable Future: UPM Publisher.
4. Sheldon, C. and Yoxon, M. (2006). Environmental Management Systems: A Step-by- Step Guide to Implementation and Maintenance. Sterling, VA : Earthscan, 3rd ed.
5. Aminatuzuhariah Megat Abdullah, Introduction to environmental management system, UTM, 2007

EAT 345/3 HYDROLOGY

Course Synopsis

Introduces the fundamental of hydrological process such as hydrologic cycle, atmospheric circulation, precipitation, evaporation, evapotranspiration and infiltration. Analysis in hydrologic will be covered including watershed concepts, rainfall-runoff, unit hydrograph and synthetic unit hydrograph. Focus will also be on the frequency analysis which cover the probability concepts, random variables and probability distribution, return period, common probabilistic models, graphical presentation of data and regional analysis. Apart of that, flood routing chapter will cover hydrologic routing, hydrologic river and reservoir routing, movement of flood wave and kinematic wave routing.

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. V. T Chow, David R, Larry M Mays, Applied Hydrology, McGraw – Hill International, 1988
2. Bedient, Huber, Hydrology and Floodplain Analysis 4th Edition, Pearson 2008
3. Ian Watson, Alister D. Burnett, Hydrology: an environmental approach, CRC Press, 1995
4. Wilfried Brutsaert, Hydrology: an introduction, University Press, Cambridge , 2005
5. Andrew D. Ward, Stanley Wayne Trimble, Environmental hydrology, 2nd Edition, 2003

EAT351/3 CONCRETE BUILDING DESIGN I

Course Synopsis

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.

Labs:

1. Properties of cement
2. Properties of aggregate
3. Concrete mix design and test on wet concrete
4. Reinforcement properties

Course Outcomes

CO1:
Ability to explain limit state design concept and analysis of sections for bending.

C02:
Ability to design 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. Reinforced Concrete Design. 5th Ed., Palgrave, 1999.
2. IStructE. Manual for the Design of Reinforced Concrete Building Structures. The Institution of Structural Engineer. 1985
3. Kong, F.K. and Evan, R.H. Reinforced and Prestressed Concrete. 3rd Ed., Spoon Press, 1998.
4. Ray, S.S. Reinforced Concrete: Analysis and Design. Blackwell Science,
5. BS 8110: Part 1. Structural use of concrete - Code of practice for design and construction. British Standard Institution. 1997

EAT352/3
CONCRETE BUILDING DESIGN II

Course Synopsis

This course is designed to expose students to a wider scope of reinforced concrete design. As a successor to the Concrete Building Design I, the topics covered are design of staircases, footings, pile caps, retaining walls, multi storey and pre-stressed concrete design which cover topics on principle and methods of pre-stressing, stress limit, losses and selection of section. As an addition, since IBS is one of the national agenda in construction, the introduction to precast concrete building is also introduced.

Course Outcomes

CO1:
Ability to design staircases and footings and ilustrate the detailing.

CO2:
Ability to design simple retaining walls and its detailing.

CO3:
Ability to analyse principle and methods of pre-stressing, stress limit, losses and selection of section.

CO4:
Ability to design precast concrete structure.

References

1. Mosley, W.H. Bungey, J.H. and Hulse, R. Reinforced Concrete Design. 5th Ed., Palgrave, 1999.
2. IStructE. Manual for the Design of Reinforced Concrete Building Structures. The Institution of Structural Engineer. 1985
3. Kong, F.K. and Evan, R.H. Reinforced and Prestressed Concrete. 3rd Ed., Spoon Press, 1998.
4. Ray, S.S. Reinforced Concrete: Analysis and Design. Blackwell Science,
5. BS 8110: Part 1. Structural use of concrete - Code of practice for design and construction. British Standard Institution. 1997

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. 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. R. C. Hibbeler, "Structural Analysis", Seventh Edition, Pearson, Prentice-Hall, 2009.
2. Kenneth, M. Leet., "Fundamentals of Structural Analysis". Third Edition. McGraw-Hill., 2008.
3. Reddy C.S., "Basic Structural Analysis", Tata McGraw Hill Publishing Co., 1996
4. Laible J.P, "Structural Analysis", Mc Graw Hill Book Co., 1984.
5. Yuan-yu Hsieh & S. T. Mau,"Elementary Theory of Structures, Prentice Hall, 1995

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 BS, and be competent in designing a simple structure to BS. 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 describe basic concept of steel members, connections and structures behavior.

CO2:
Ability to apply the steel design concept.

CO3:
Ability to design steel structures elements.

References

1. Gray, C. S. Kent L.E Mitchell, W.A., and Godfey, W.B., "Steel Designer's manual", English Language Book Society and Granade Publishing, London, 1983.
2. Arya and Ajmani, "Design of steel Structures", Nemchand Brothers, Roorkee, 1989
3. Dayaratnam, P. "Design of steel structures", .A.H. Wheeler & Co., Ltd, Allahabad,
4. 1996.
5. Punmia, B.C., Ashok Kumar Jain & Arunkumar Jain, "Design of Steel Structures",

EAT355/3
COMPUTER APPLICATION IN BUILDING ENGINEERING

Course Synopsis

The course is designed to provide the student with an understanding of engineering drawing conventions in building engineering, and in particular, how engineering drawing can be both a design tool and a means of communicating precise instruc tions to engineers and crafts people. Special focus will be given on switching from architectural to structural drawing, applied load, transfer load, simplified analysis and design. From the course, students will also be introduce to basic computer application for structural design to get better understanding how the load applied, transfer, analyse and design.

Course Outcomes

CO1:
Ability to interpret architectural drawing and construct into structural drawing propose; to identify structural layout.

CO2:
Ability to convey with sketching, manual and computer-aid-drawing application.

CO3:
Ability to identify and analyse non-structural and structural component; to define loading distribution and transfer.

CO4:
Ability to analyse and design the structures using simplified approach and computer application.

References

1. Koel, L. Construction Print Reading. Delmar Cengage Learning. 1999
2. Macdonald, A.J. Structures and Architecture. 2nd Reed Educational and Professional. 2001
3. Kilmer, R. and Kilmer, W. O. Construction Drawings and Details for Interiors: Basic Skills. 2nd Wiley. 2001
4. BS 6399: Part 1. Loading for building - Code of practice for dead and imposed loads. British Standard Institution. 1996.
5. Omura, G. Mastering AutoCAD® 2008 and AutoCAD LT® 2008. Wiley Publishing, Inc. 2008

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. Gido & Clements., "Successful Project Management", Second Edition. Thomson, South-Western, 2003.
2. Jack R. Meredith & Samuel J. Mantel, Jr., "Project Management: A Managerial Approach", Forth Edition. John Wiley. 2000.
3. Hinze, Jimmie W., "Construction Planning and Schedule", Prentice Hall, 1998.
4. Daft, R.K.,"Management" 3rd Ed, The Dryden Press, 1993.
5. Hillebrandt, P. and Cannon, J.,"The Management of Construction Firms-Aspects of Theory", Macmillan Press Ltd, 1994.

EAT 358/3 BASIC BUILDING ENGINEERING QUALITIES

Course Synopsis

This course focuses on introduces principles area of construction law and understanding the relationship between contract documents and the construction process. This includes the contractual relationships, legal roles and responsibilities, and contract types. Legal issues that often result in construction disputes including differing site conditions, time and schedule impacts, change orders and changed conditions also will be explored. Review analysis of the method used in presenting and solving construction control and contract dispute resolution including negotiations, alternative dispute resolutions, and litigation of disputes. Procurement methods, tenders and their assessment, risk and insurance, contractual claims, the law of tort and contract, the law of evidence, statutory duties in respect of construction projects also included in this course.

Course Outcomes

CO1:
Ability to understand principles of construction law and contracts.

CO2:
Ability to review and analyze method use in presenting and solving construction disputes.

CO3:
Ability to interpret procurement methods, tenders and risk assessment related to construction.

CO4:
Ability to review and evaluate the procurement law in respect of construction projects.

References

1. Michael T. Callahan, "Procurement of Construction and Design Contracts (Construction Law Library ",, Aspen Publisher, 2005.
2. Thomas J., Currie and Hancock Smith, "Common Sense Construction Law :A Practical Guide for The Construction Professional", John Wiley, 2005.
3. R. W. Craig, "Procurement Law for Construction and Engineering Works and Services", Blackwell Science, 1999.
4. Nancy J. White, "Principles and Practices of Construction Law", Pearson, 2002.
5. Joseph D. Coleman, "Construction Documents and Contracting", Prentice Hall, 2004.

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:
Able to acquire an advanced and comprehensive overview of the behavior of concrete buildings under load.

CO2:
Able to carry out routine conception, analysis and design of typical buildings and structural elements in accordance with standard procedures.

CO3:
Able to draw and specify work for conventional building design, mechanical and electrical work.

CO4:
Able to conduct flexural analysis of continuos beam, slabs, foundation and wall.

References

1. Ambrose, J.E., "Building Structures", John Wiley & Sons, 1993.
2. Brzer, S. Pac, J., "Reinforced Concrete Design: A Practical Approach", Pearson, 2005.
3. Edward G. Nawy., "Reinforced Concrete" 5th Ed, Pearson, 2005.
4. Nunally, S.W., "Construction Methods and Management", Prentice Hall, New Jersey, 1998.
5. Polette, D., Landers, J.M., "Construction Systems", Goodheart-Wilcox Co, 1995.

EAT 414/3
CONSTRUCTION METHODS AND CONTROL

Course Synopsis

This course has been developed to provide the understanding of construction methods, strategies, equipment and machinery in a range of construction activities and an understanding of the principles involved in the design for construction activities.

Course Outcomes

CO1:
Able to understand various construction methods.

CO2:
Ability to design building infrastructures

References

1. Stephens W. Nunally, "Construction Methods and Management" 7th Ed, Prentice Hall,2006.
2. J. Illingworth, "Construction Methods and Planning" 2nd Ed, Spoon Press, 2000.
3. H. Leslie Simmons, "Construction principles, Materials, and Methods

"7th Ed, Wiley, 2000.
4. E. Van Amsterdam, "Construction Method for Civil Engineering", Juta Academic, 2000.
5. Ralph W. Liebing, "Introduction to Construction: Management and Methods", Wiley, 2007.

EAT 415/3
ADVANCED STEEL BUILDING DESIGN

Course Synopsis

This course covers the analysis and design of multi-storey braced and unbraced steel frames and types of connections used for simple, semi-continuous, and continuous construction. For un-braced steel frame wind-moment method is introduces. Besides multi-storey steel frame, this course also covers the design of composite beam, plate girder, and portal frame. For composite beam design, linear interaction method and stress block methods are discussed. For plate girder, the design covers the stiffening of the web. For portal frame, elastic and plastic designs are taught.

Course Outcomes

CO1:
Able to understand structural behavior of steel members and connections

CO2:
Able to describe buckling behavior and connection design

CO3:
Able to use software in structural steel design

References

1. Guo-Qiang Li, Jin-Jun Li. "Advanced Analysis and Design of Steel Frames". John Wiley & Sons, Ltd. 2007.
2. Jack C. MacCormac."Strucutral Steel Design". Prentice Hall. Fourth Edition. 2007
3. Dayaratnam, P., "Design of Steel Structures", A.H.Wheeler & Co. Ltd., Allahabad, 1996.
4. Ragupathy M, "Design of Steel Structures", Tata McGraw-Hill Publishing Co., Ltd.,New Delhi,1996.
5. T.J. MacGinley & T.C. Ang, 'Structural Steelwork Design to Limit State Theory', Butterworth Heinemann, 1993. (TA652 MAC)

EAT 433/3
ENVIRONMENTAL ENGINEERING DESIGN

Course Synopsis

Principles and design concepts of treatment units and processes, detailed and advanced design of environmental pollution control (i.e., treatment and disposal) systems for water, wastewater, air, noise, disposal of solid waste.

Labs:
Integrated Environmental Engineering Design

Course Outcomes

CO1:
Ability to design processes for pollution treatment as well as pollution prevention.

CO2:
Ability to design treatment units com plied to the standard practice in Malaysia

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. MWA Design Guidelines for Water supply Systems, published by MWA, 2000.
4. Susumu Kawamura, Integrated design and operation of water treatment facilities, 2nd Edition, John Wiley & Sons, 2000.
5. P. Aarne Vesilind, Wastewater treatment plant design, 2003, IWA

EAT 441/3
ENVIRONMENTAL REMEDIATION

Course Synopsis

This course provides a general over view of the environmental remedia tion with emphasis on soil, ground water 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 apply the concepts of bioremediation in soil, groundwater and contaminated site treatment.

CO2:
Ability to analyse the characteristics of

contaminants

CO3:
Ability to determine the contaminants behaviors of soil and groundwater.

CO4:
Ability to apply the knowledge of bioremediation technology to recover the contaminants

References

1. J. Rusell Boulding and Jon S. Ginn. Soil, Vadose Zone, and Groundwater contamination. Lewis Publishers (2004).
2. Pedro J.J. Alvarez and Walter A. Illman. Bioremediation and natural attenuation. Wiley (2006)
3. Mukesh Doble and Anil Kumar. Bio-treatment of industrial effluents. Elsevier (2005)
4. Donald L. Wise, Debra J. Trantolo, Edward J. Cichon, Hilary I. Inyang and Ulrich Stottmeister. Bioremediation of contaminated soils. Marcel Dekker, Inc. (2000)
5. Jacques W. Delleur. The handbook of groundwater engineering. CRC Press. (2007)

EAT 442/2
PROJECT 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.

References

1. Gido & Clements., "Successful Project Management", Second Edition. Thomson, South-Western, 2003
2. Harold Kerzner, Project Management: A Systems Approach to Planning, Scheduling, and Controlling, John Wiley & Sons, 2009.
3. James P. Lewis, Fundamentals of project management, AMACOM, 2007.
4. Dennis Lock, Project management, Gower Publishing Limited, 2007
5. David I. Cleland, Lewis R. Ireland, Project management: strategic design and implementation, Mc-Graw – Hill, 2007

EAT 443/3
BUILT ENVIRONMENT

Course Synopsis

Introduction to built environment, thermal control concept, thermodynamic principal, thermal dynamics of building, loads calculation, building impact on the environment, active HVAC systems, passive methods, electrical system, architectural acoustics

Course Outcomes

CO1:
Ability to describe and analyze the concepts of thermal control through the building envelope

CO2:
Ability to analyze heat exchange mechanisms and compute the thermal interactions in building

CO3:
Ability to construct skills in designing sustainable building performance with respect to the energy efficiency

CO4:
Ability to select and evaluate the methods of active and passive control and design approaches in a physical building environment.

References

1. Mithraratne, N. (2007), Sustainable Living: The Role of Whole Life Costs and Values, 1st Ed, Butterworth-Heinemann (Elsevier Limited).
2. Khairuddin, A.R., and Abdul A.K.H. (2004), Sustainable Built Environment Through Management and Technology, Kulliyah of Architecture & Environmental Design, UIA.
3. Kibert, C.J. (2005), Sustainable Construction: Green Building Design and Delivery, 1st Ed, John Wiley & Sons, Inc.
4. Vaughn B. (2006). The Building Environment, Active & Passive Control Systems, 3rd Edition. John Wiley 5. Baird. G (2001) The architectural expression of environmental control systems. London: Spon Press.
5. Wendy Rule McClure, Tom J. Bartuska, The built environment: a collaborative inquiry into design and

planning, John Wiley & Sons, 2007

EAT 445/2
FINAL YEAR PROJECT I

Course Synopsis

This is 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/or software development, device fabrication. In this subject. In this subject, the students will be taught on how to prepare the research proposal. Besides that, student will be also exposed to earlier part of thesis writing such as introduction, literature review and methodology.

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 problems in a systematic manner.;

CO3:
Ability to work independently in conducting and completing an academic project.

CO4:
Ability to present the final product orally and graphically.

EAT 446/4
FINAL YEAR PROJECT II

Course Synopsis

This subject is the continuity of Final Year Project I. In this subjects students will conduct experimental tasks which has been planned during the Final Year Project I. Students also will completing their thesis report during this subject. In this subject, students will be also exposed to journal writing.

EAT 447/3
ENVIRONMENTAL INFORMATICS

Course Synopsis

Overview of environmental informatics, environmental data and information management, environmental risk, environmental quality standard, modeling environmental process

Labs:
1. Modelling software for air and water pollutants transport-dispersion.
2. Disper 3 for air dispersion problems
3. Hydraulic analysis using MODFLOW
4. Environmental data optimization
5. EIA data simulation.

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

CO5:
Expose and equip students to the latest waste treatment research technology for application in their career in the future

References

1. Nicholas M.Avouris and Page, Environmental Infromatics: Methodology and Applications of Environmental Infromatics Processing 2008.
2. Nicholas M. Avouris, Bernd Page, Environmental informatics: methodology and applications of environmental, Springer, 1995
3. Lorenz M. Hilty, Environmental informatics, Elsevier, 2006
4. Jorge Marx Gómez, Michael Sonnenschein, Martin Müller, Information Technologies in Environmental Engineering:ITEE 2007 - Third International ICSC Symposium
5. A. J. Jakeman, Alexey Voinov, Andrea Emilio Rizzoli, Environmental modelling, software and decision support: state of the art and new perspectives, Elsevier,

EAT 448/3
REMOTE SENSING

Course Synopsis

Concept and foundations of remote sensing; Introduction to electromagnetic energy; Introduction to visual image interpretation; Multispectral, thermal and hyperspectral sensing; satellite and sensors; digital image processing; Microwave and lidar sensing.

Labs:
1. Interactive Display Function - ENVI
2. Classification Method - ENVI
3. Decision Tree Classification - ENVI
4. Data Fusion – ENVI

Course Outcomes

CO1:
Ability to define and describe the concept, component and application of remote sensing.

CO2:
Ability to identify and utilizes the tools required in visual image interpretation.

CO3:
Ability to analyse environmental data by using digital image processing.

CO4:
Ability to define and describe the concept, component and application of microwave and Lidar sensing

References

1. Lillesand, T. M., Kiefer, R. W. and Chipman, W. J. 2007. Remote Sensing and Image Interpretation. John Wiley & Sons.
2. A.M. Chandra & S.K. Ghosh. Remote Sensing and Geographical Information System. Alpha Science International Ltd., 2006.
3. Alan Steven Belward, Carlos R. Valenzuela., 'Remote Sensing and Geographical Information Systems for Resource Management in Developing Countries,' Kluwer Academic Publisher, 1991
4. Robert A. Schowengerdt, Remote sensing: models and methods for image processing, Academic Press, 2007
5. James B. Campbell, Introduction to remote sensing, Taylor & Francis, 2002

EAT 449/3
ENVIRONMENTAL PROCESS CONTROLAND IN STRUMENTATION

Course Synopsis

Introduction to Process Control, Control loop hardware and Instrumentation, Process Dynamics, Dynamics behavior of ideal system, PID Control System, Application of Control System in Environmental Engineering

Labs:
1. Basic Flow Control
2. PH value process control
3. Introduction to Matlab and Simulink
4. Open loop versus Close loop Simulation
5. Activated sludge process control simulation
6. Coagulation/flocculation process control simulation

Course Outcomes

CO1:
Ability to have a general understanding on process control strategies for Environmental Engineering application

CO2:
Ability to identify suitable instruments for various processes

CO3:
Ability to develop and solve dynamics model of chemical processes related to Environmental Engineering

CO4:
Ability to identify and apply the various control strategies of typical chemical and bioprocess equipment related to Environmental Engineering

References

1. J. B. Riggs and M. N. Karim "Chemical and Bio-Process Control", 3rd edition, Pearson International Edition (2007).
2. Coughanowr & Koppel, "Process System Analysis and Control", McGraw Hill, 1991
3. D.E Seborg, T. F Edgar, D.A Mellichamp, Process Dynamics Control, John Wiley and Son (2003)
4. T.E Marlin, "Process Control: Designing Processes and Control Systems for Dynamics performance, McGraw Hill (2000)
5. B. Wayne Bequette, Process control: modeling, design, and simulation, Prentice Hall PTR, 2003

EAT 455/3 INDUSTRIALIZED BUILDING SYSTEM (IBS)

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 highligted the concept of Score Calculation and submission, Principal of Modular Coordination in IBS and concepts of buildibility. Enhanement through mini project will be done to further strangthen their knowledge on subject matter.

Course Outcomes

CO1:
Ability to discuss the concept of IBS modern construction technology.

CO2:
Ability to explain the Principle of Score calculation and its submissions.

CO3:
Ability to discuss Concept of Modular Coordination in IBS.

CO4:
Ability to discusss precast concrete building design.

References

1. Abraham Warzaski. "Industralised and Automated Building Systems: A Managerial Approach". Second Edition. Tylor & Francis Group. 2005.
2. Albert G. H. Dietz. "Industrialized Building Systems for Housing". The MIT Press. 1971.
3. Ram S. Gupta. "Principles of Structural Design: Wood, Steel, and Concrete". Taylor & Francis. 2010.
4. Sarja. "Open and Industrialized Building". Taylor & Francis. 2010
5. S.G.Bruggeling, G.F. Huyghe. "Prefabrication With Concrete". Taylor & Francis, 1991

EAT 453/3 ADVANCED STRUCTURAL ANALYSIS

Course Synopsis

Stability: energy methods for single degree-of-freedom elastic systems; critical and nonlinear buckling; classification of types of basic post-buckling responses; imperfection-sensitivity. Instabilities in struts and columns: idealised and real behaviour; Rayleigh and Timoshenko methods. Instabilities in beams: lateral-torsional buckling. Introduction to plate buckling. Plasticity: moment capacity of composite sections; moment capacity reduction due to shear and axial force, plastic collapse of beams and frames; upper and lower bound theorems. Combination of mechanisms for frame analysis. Dynamics: dynamic loads, structural modelling: degrees of freedom, lumped mass. Free, damped and undamped vibrations of single degree-of-freedom elastic structures: viscous damping; logarithmic decrement. Forced vibrations: harmonically forced with and without damping: resonance; support motion and earthquake excitation. Concepts of generalised mass, stiffness, damping and force.

Course Outcomes

CO1:
Ability to discuss stability of structure including single degree-of-freedom elastic systems; critical and nonlinear buckling; classification of types of basic post-buckling responses.

CO2:
Ability to describe plasticity consisting moment capacity of composite sections; moment capacity reduction due to shear and axial force, plastic collapse of beams and frames.

CO3:
Ability to discuss dynamic loads, structural modeling and degrees of freedom.

CO4:
Ability to describe forced vibrations of structures.

References

1. Clough, R.,W., and Penzien, "Dynamics of Structures", McGraw Hill Book Co Ltd, 1986.
2. Paz Mario," Structural Dynamics - Theory and Computation", CBS publishers, 1999
3. Craig,R.R., "Structural Dynamics - An Introduction to computer Methods", John Wiley & Sons, 1989.
4. Gaylord, Edwin H., Jr., And Charles. N., "Structural Engineering Handbook", 3rd Ed, McGraw Hill, 1990.
5. K.Chopra. "Dynamics of Structures", Pearson Prentice Hall. 2007.

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. Harbhajan Singh., "Design of Masonry and Timber Structures", Abhishek Publications, 2007.
2. Chanakya Arya, "Design of Structural Elements: Concrete, Steelwork, Masonry and Timber Design to British Standard and Eurocodes", Routledge (taylor & Francis)spon, Third Edition,2009.
3. Ram S. Gupta. "Principles of Structural Design: Wood, Steel, and Concrete". Taylor & Francis. 2010.
4. Mat Lazim Zakaria, "Rekabentuk Struktur Kayu Menurut MS544", Dewan Bahasa dan Pustaka
5. Desch, H.E.,"Timber, Its Structure, Properties and Utilisation," Mac Millan Press. (Latest Edition)

EAT 456/3
FOUNDATION ENGINEERING

Course Synopsis

This course exposes students to the application of soil mechanics principles to foundation design. Topics include discussion on various types of foundations and their criteria for selection such as shallow foundation, pile, raft foundation, group piles, and laterally loaded and uplift piles. Settlement and bearing capacity considerations are employed to select and design the appropriate foundation scheme for structures. Construction of foundation, which includes excavation, shoring and bracing, and protection measures for foundation due to chemical attack, corrosion and seepage are also included.

Course Outcomes

CO1:
Ability to discuss various types of shallow and deep foundation.

CO2:
Ability to design shallow foundation.

CO3:
Ability to design deep foundation.

References

1. Braja M. Das, "Principles of Foundation Engineering", Fourth Edition, Nelson Engineering, 2007.
2. P. C., Varghese, "Foundation Engineering", Prentice-hall Of India Pvt Ltd, 2007.
3. K. Arora., "Soil Mechanics and Foundation Engineering". Standard Publishers Distributors, 2009.
4. Roslan Hashim, "A Brief Guide to Foundation Engineering", Dept. of Civil Engineering, Universiti Malaya, 2003.
5. Tomlinson M. J, "Foundation Design and Construction, 6th Edition", Longman Scientific & Technical, 1995.

Career Prospect For Environmental Engineering Programme and Building Engineering Programme

A wide range of career prospect is available for B.Eng (Hons) Environmental Engineering graduates and Bachelor of Building Engineering graduates. The sectors that offer job opportunities related to both engineering programme are as follows:

- Commodity base industries
- Petrochemical industries
- Chemical industries
- Hazardous waste, solid waste, waste water & water treatment industries
- Institution of higher learning, research institutes and education
- Institution of environmental consultancy
- Government departments such as Department of Environment, Department of Drainage & Irrigation, Department of Occupational Health & Safety, Department of Works, Department of Health, etc
- Enacted government bodies such as MARDI, PORIM, SEDC, NIOSH, etc
- Research and development (R&D) and academic institutions
- Local government & local authorities
- Enacted government bodies such as CIDB, NIOSH, etc
- Non governmental organization (NGO) both national and international

The main job opportunities are as follows:

- Environmental Engineer/Officer
- Environmental Quality Control Engineer/Officer
- Occupational, Environmental, Health & Safety Engineer/Officer
- Environmental Enforcement Officer
- Risk Assess Engineer/Executive
- Process Engineer
- Consultant Engineer/Executive
- Site/Resident Engineer
- Public Health Engineer
- Site Remediation Engineer
- Landfill Engineer
- Water Supply/Resources Engineer
- Pollution Control Engineer
- Sustainable Development Executive
- Environmental Technical Contractors
- Sales Engineer/Executive
- Environmental Entrepreneur
- Academician
- Building engineers
- Construction manager
- Consultant engineer/executive
- Facility engineer
- Project manager/executive
- Structural engineer
- Operation manager
- Design engineer
- Site Engineer
- Resident Engineer
- Construction Contractor

Programmes Offered :

- Bachelor of Business (Honours) (Engineering Entrepreneurship)
- Bachelor of Business (Honours) (International Business)

9.

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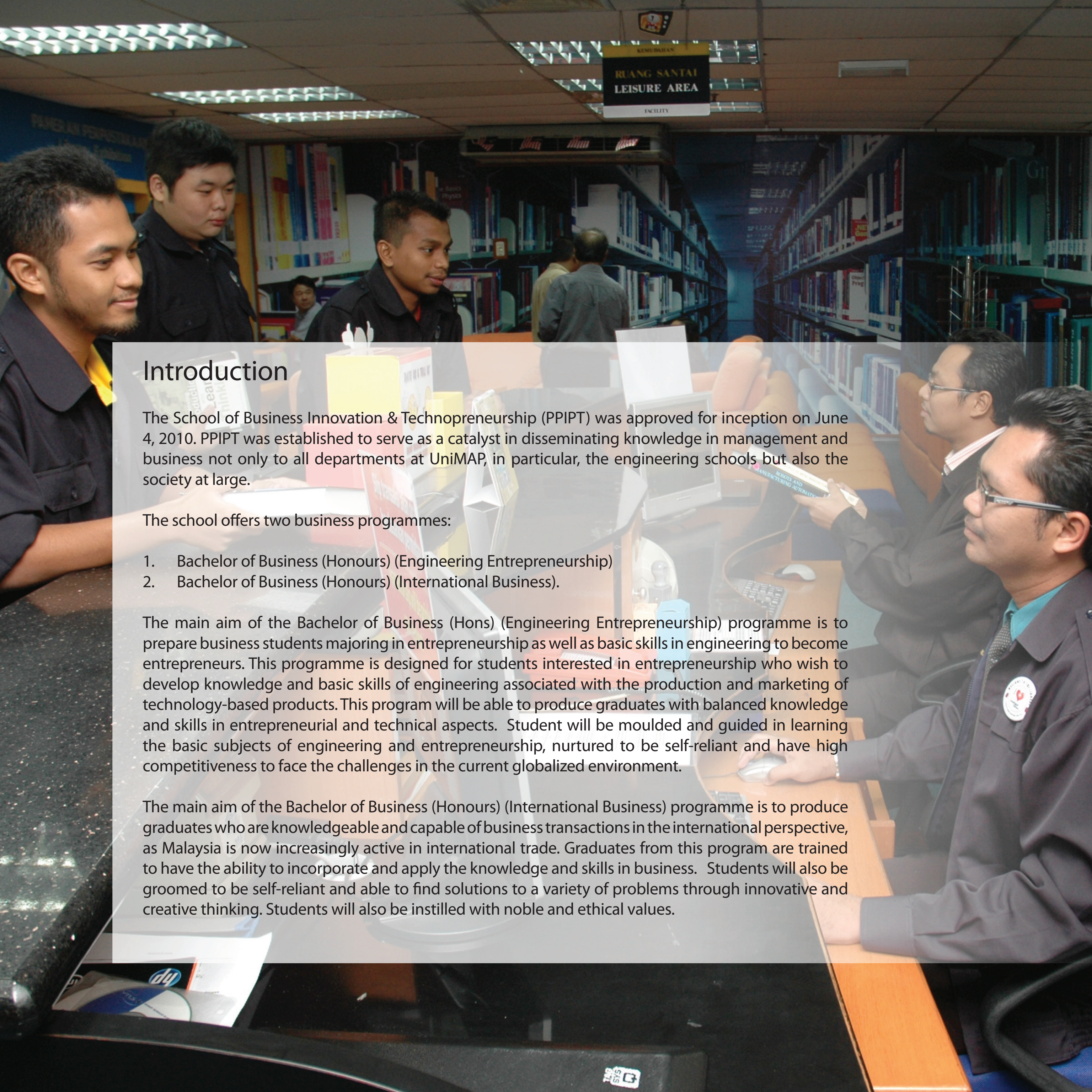

Introduction

The School of Business Innovation & Technopreneurship (PPIPT) was approved for inception on June 4, 2010. PPIPT was established to serve as a catalyst in disseminating knowledge in management and business not only to all departments at UniMAP, in particular, the engineering schools but also the society at large.

The school offers two business programmes:

1. Bachelor of Business (Honours) (Engineering Entrepreneurship)
2. Bachelor of Business (Honours) (International Business).

The main aim of the Bachelor of Business (Hons) (Engineering Entrepreneurship) programme is to prepare business students majoring in entrepreneurship as well as basic skills in engineering to become entrepreneurs. This programme is designed for students interested in entrepreneurship who wish to develop knowledge and basic skills of engineering associated with the production and marketing of technology-based products. This program will be able to produce graduates with balanced knowledge and skills in entrepreneurial and technical aspects. Student will be moulded and guided in learning the basic subjects of engineering and entrepreneurship, nurtured to be self-reliant and have high competitiveness to face the challenges in the current globalized environment.

The main aim of the Bachelor of Business (Honours) (International Business) programme is to produce graduates who are knowledgeable and capable of business transactions in the international perspective, as Malaysia is now increasingly active in international trade. Graduates from this program are trained to have the ability to incorporate and apply the knowledge and skills in business. Students will also be groomed to be self-reliant and able to find solutions to a variety of problems through innovative and creative thinking. Students will also be instilled with noble and ethical values.

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PROGRAMME EDUCATIONAL OBJECTIVE' (PEO) DAN 'PROGRAMME OBJECTIVES' (PO) BACHELOR OF BUSINESS (INTERNATIONAL BUSINESS)

PROGRAM EDUCATIONAL OBJECTIVE (PEO):

Programme Objectives 1
Graduates who are entrepreneurs.

Programme Objectives 2
Graduates who are entrepreneurial leaders in the chosen field as demonstrated through career advancement.

Programme Objectives 3
Graduates who pursue continuous educational opportunities.

Programme Objectives 4
Graduates who contribute to society.

Programme Objectives 5
Graduates who contribute through research and development.

PROGRAM OUTCOMES-PO

PO 1 Ability to apply knowledge of entrepreneurship, business management and basic engineering.
PO 2 Ability to identify problems, create solutions and innovate to improve decision making and problem solving.
PO 3 Ability to apply business operation practices and principles used in the current business environment.
PO 4 Ability to communicate effectively.
PO 5 Ability to demonstrate an in-depth understanding of entrepreneurship, the process of innovation and the need for sustainable development.
PO 6 Ability to understand professional and ethical responsibilities.
PO 7 Ability to operate with multi-disciplinary teams.
PO 8 Ability to recognize the need for, and engage in life-long learning.
PO 9 Ability to understand social, cultural and environmental responsibilities of an entrepreneur/manager.
PO 10 Ability to recognize potential utilities of engineering applications as business opportunities.

CURRICULUM STRUCTURE FOR
BACHELOR OF BUSINESS (INTERNATIONAL BUSINESS)

YEAR	**FIRST**			**SECOND**			**THIRD**	
Semester	**First**	**Second**	May – July	**First**	**Second**	May – July	**First**	**Second**
BUSINESS CORE / ELECTIVE COURSES	BFT105/3 Introduction to Business	BFT108/3 Principle of Marketing	BIT290/3 INDUSTRIAL ATTACHMENT 1	BFT201/3 International Accounting	BFT204/3 International Finance	BIT290/3 INDUSTRIAL ATTACHMENT 2	BFT337/3 International Strategic Marketing	BFT338/3 International Strategic Management
	BFT106/3 Principle Of Accounting	BFT103/3 Business Law & Ethics		BFT202/3 International Business Management	BFT203/3 International Economics		BFT206/3 International Operation Management	BFT381/3 Final Year Project 2
	BFT101/3 Business Economics	BFT104/3 E-Business		BFT223/3 International Human Resource Management	BFTxxx/3 (Elective)		BFT380/3 Final Year Project 1	BFTxxx/3 (Elective)
	BFT109/ 3 Principle of Management	BQT173/3 Business Statistics		BFT107/3 Principles of Finance	BFTxxx/3 (Elective)		BFTxxx/3 (Elective)	BFTxxx/3 (Elective)
	BQT133/3 Business Mathematics			BFTxxx/3 (Elective)	BFTxxx/3 (Elective)		BFTxxx/3 (Elective)	BFTxxx/3 (Elective)
							BFTxxx/3 (Elective)	
UNIVERSITY REQUIRED COURSES	EUT235/2 Ethnic Relations	EUT122/2 Skills and Technology in Communication		EUWxxx/2 Foreign Language (Part 1)	EUWxxx/2 Foreign Language (Part 2)		EUTxxx/2 Foreign Language (Part 3)	EUTxxx/2 Foreign Language (Part 4)
	EUW410/2 Malay Language	EUW212/2 English Language		EUT123/3 Business Communication	EUW224/2 Engineering Entrepreneurship			EUW322/2 Thinking Skills
		EUW1xx/1 Co-Curricular Activity						
		EUW233/2 Asian And Islamic Civilization						
122 units	19	19	3	20	19	3	20	19

Kursus Elektif:
Pelajar perlu mengambil kursus ELEKTIF seperti yang dicadangkan. Walau bagaimanapun, kursus ELEKTIF adalah bergantung kepada penawaran yang dibuat oleh PPIPT pada semester yang berkenaan.

PROGRAMME EDUCATIONAL OBJECTIVE' (PEO) DAN 'PROGRAMME OBJECTIVES' (PO) BACHELOR OF BUSINESS(ENGINEERING ENTREPRENEURSHIP)

PROGRAM EDUCATIONAL OBJECTIVE (PEO):

Programme Objectives 1
Graduates who are managers

Programme Objectives 2
Graduates who are entrepreneurial leaders in the chosen field as demonstrated through career advancement.

Programme Objectives 3
Graduates who pursue continuous educational opportunities.

Programme Objectives 4
Graduates who contribute to society.

Programme Objectives 5
Graduates who contribute through research and development.

PROGRAM OUTCOMES-PO

PO 1	Ability to apply knowledge of business management in the work environment
PO 2	Ability to identify problems, create solutions and innovate to improve decision making and problem solving
PO 3	Ability to apply business operation practices and principles used in the current business environment
PO 4	Ability to communicate effectively
PO 5	Ability to demonstrate an in-depth understanding of entrepreneurship, the process of innovation and the need for sustainable development
PO 6	Ability to understand professional and ethical responsibility
PO 7	Ability to operate with multi-disciplinary teams
PO 8	Ability to recognize the need for, and engage in life-long learning.
PO 9	Ability to understand the social, cultural and environmental responsibilities from a global perspective
PO 10	Ability to adapt to international business environments.
PO 11	Ability to communicate proficiently in foreign languages

CURRICULUM STRUCTURE FOR BACHELOR OF BUSINESS (ENGINEERING ENTREPRENEURSHIP)

YEAR	**FIRST**			**SECOND**		April– July (12 weeks)	**THIRD**	
Semester	**First**	**Second**		**First**	****Second**		**First**	**Second**
BUSINESS CORE / ELECTIVE COURSES	BFT101/3 Business Economics	BFT103/3 Business Law & Ethics	SEMESTER BREAK	BFT211/3 Business Innovation	BFT221/3 Operation Management	BIT291/6 INCUBATION PROGRAMME	BFT326/3 Project Management	BFTxxx/3 Elective
	BFT105/3 Introduction to Business	BFT104/3 E-Business		BFT212/3 Business Franchising & Licensing	BFT328/3 Managing Engineering and Technology		BFT214/3 Engineering Economics	BFTxxx/3 Elective
	BFT106/3 Principles of Accounting	BFT108/3 Principles of Marketing		BFT215/3 Entrepreneurial Finance	BFT213/3 New Venture Management		BFTxxx/3 Elective	BFTxxx/3 Elective
	BFT109/3 Principles of Management	BFT107/3 Principles of Finance		BFT216/3 Entrepreneurial Marketing	BFT220/3 Technology Entrepreneurship		BFTxxx/3 Elective	BFTxxx/3 Elective
	BQT133/3 Business Mathematics	BQT173/3 Business Statistics		BFT218/3 Introduction to Manufacturing Technology	BFTxxx/3 Elective		BFTxxx/3 Elective	BFTxxx/3 Elective
					BFTxxx/3 Elective		BFT219/3 Product Design & Development	
UNIVERSITY REQUIRED COURSES	EUT122/2 Skills and Technology in Communication	EUT123/3 Business Communication		EUWxxx/1 Co-Curriculum Course	STUDENTS ARE NOT ALLOWED TO TAKE UNIVERSITY REQUIRED COURSES DUE TO EARLY SEMESTER STARTS.		EUW235/2 Ethnic Relations	EUW322/2 Thinking Skills
	EUW410/2 Malay Language	EUW224/2 Engineering Entrepreneurship		EUW212/2 English Language				
				EUW233/2 Asia & Islamic Civilization				
120 units	19	20		20	18	6	20	17

* *Pelajar perlu mendaftar awal tiga (3) minggu berbanding kalendar akademik universiti bagi membolehkan pelajar mengikuti program inkubator setelah menamatkan semester ke-4.*

*Pelajar yang mendapat keputusan **MUET Band 1, 2 atau 3** perlu mengambil kursus **EUW112 Foundation English** pada **Tahun Pertama Semester 1.***
***Kursus Elektif:** Pelajar perlu mengambil kursus ELEKTIFberdasarkan jadual penawaran kursus elektif oleh PPIPT.*

COURSE SYLLABUS

BFT101/3
BUSINESS ECONOMICS

Course Synopsis

This module applies the tools of economic analysis to issues in business management, developing the student's ability to problem solving using microeconomic and macroeconomic concepts. The module will focus on the market operation for goods and services using demand and supply analysis, entrepreneurship, the emergence and growth of firms, the costs of production, the different forms of competition and game theory, the macroeconomic environment and government policy.

References

1. Nellis, J.G. and Parker, D. (2008). Principles of Business Economics, (2nd ed.), Prentice Hall, Pearson
2. Mastrianna, F.V. (2010). Principles of Economics, (15th ed.), South-Western, Cengage Learning.
3. Tucker, I.B. (2011). Survey of Economics, (7th ed.), South-Western, Cengage Learning.

BFT105/3
INTRODUCTION TO BUSINESS

Course Synopsis

This course focuses on an integrated view of business. It aims to provide students with a comprehensive and balanced overview of the interwoven nature of basic business disciplines and principles. Topics to be explored includes: business information and practices, small business management, market dynamic, competitive strategies, business plan writing, business ethics and social responsibility.

References

1. Coe, J., 'The Fundamentals of Business-to-Business Sales & Marketing' McGraw-Hill; 1st Edition, 2003.
2. Dlabay,L., Burron, J.L. and Eggland, S.A.,'Intro to Business', South-Western Educational Pub; 6th Edition, 2005.
3. Madura, J., 'Introduction to Business' South-Western College Pub; 4th Edition, 2006.
4. Nickels, W., McHugh, J. and McHugh, S., 'Understanding Business', McGraw-Hill/Irwin; 8th Edition, 2006.
5. Pride, William M., Robert J.Hughes, and Jack R. Kapoor, Introduction to Business. 10th Edition.South-Western-Cencage Learning Pub, 2009.

BFT106/3
BUSINESS ACCOUNTING

Course Synopsis

The functions of accounting within a business are to record, measure and summarize transactions in a form that will help managers in monitoring, planning, control and making decisions. Businesses are also bound by statute to report the results of their accounting externally and in a particular form. This course will cover the recording and measuring of transactions, specifically the double entry system, preparation of financial statements for different types of business organizations, interpretations of financial statements, the valuation of asset and liabilities and the framework for the preparations and presentations of financial statements.

References

1. Frank,Alan,'Business Accounting 1', Pearson Prentice Hall Pub, 2008.
2. Andrew,Wong,' Business Accounting', Pearson Prentice Hall Pub, 2007.
3. Reeve, J., Warren,C.S and Duchac, J.E., 'Principles of Accounting',Thomson South-Western , 2007.
4. Roshayani,Laily and Maznah,'Financial Accounting; An Introduction', McGraw Hill, 2007.
5. Weygandt, J.J., Kieso, D.E and Kimmel, P.D.,'Accounting Principles', John Wiley & Sons, 2007.
6. Wild, J.J., Larson, K.D and Chiappetta, B. (2006). Fundamental Accounting Principles. McGraw Hill/Irwin

BFT107/3
BUSINESS FINANCE

Course Synopsis

This subject provides an introduction to financial decision making rooted in current financial theory and in current state of world economic conditions with emphasis on capital markets and their influences on corporate financial decisions. The goal of this subject is not merely to teach the tools of a discipline or trade but also to enable students to abstract what is learned to new and yet unforeseen problems – in short, to educate students on finance.

References

1. Titman, Keown and Martin, (2011), Financial Management; Principles and Application, Pearson International Edition, Eleventh Edition, Pearson Prentice Hall Publication
2. Keown, Martin, Perry (2011). Foundations of Finance: The Logics and Practice of Financial Management,, Pearson International Edition, Sixth Edition, Pearson Prentice Hall Publications, USA
3. Brigham and Ehrhardt, (2005), Financial Management; Theory and Practice, International Sudent Edition, Eleventh Edition, South Western Cengage Learning.
4. Brigham, Houstan, Chian, Lee and Ariffin, (2010), Essentials of Financial Management, Second Edition, Cengage Learning.
5. Brigham, Houstan,Chian, Lee and Ariffin, (2011), Core Concepts of Financial Management, Cengage Learning.

BFT108/3
PRINCIPLES OF MARKETING

Course Synopsis

This course will be of interest to business program students because marketing is one of the three foundations in any business besides operation management and finance. All businesses, whether small, medium or multinational organization has a marketing component. This course will familiarize student with the important concern of marketing and the importance of how, when, why and where to promote the business.

References

1. Edward Russell,'The Fundamentals of Marketing', Paperback.
2. Hartley, R.H.,' Marketing Mistakes and Success', John Wiley and Sons, 2006.
3. Kurtz, D.L., Young, V. ,' Principles od Contemporary Marketing', Thomson South-Western, USA, 2008.
4. Nor Khalidah Abu,Yusniza Kamarulzaman,'Principles of Marketing',Oxford University Press,2009
5. Philip Kotler Gary Armstrong, 'Marketing An Introduction', 10th. Edition Pearson Education Inc.,2011
6. M. Levens,'Marketing, Defined, Explained, Applied 2nd Edition ,'Prentice Hall,2012
7. Philip Kotler Gary Armstrong,' Principles of Marketing', Prentice Hall; 14th.Eedition, 2012.

BFT109/3
PRINCIPLES OF MANAGEMENT

Course Synopsis

This course presents a thorough and systematic coverage of management theories and practices. It focuses on basic roles, skills and functions of business management, with special attention to managerial responsibility for effective and efficient achievement of goals. Special attention is given to social responsibility, managerial ethics and the importance of multi-national organizations.

References

1. Richard, L. Daft.,'New Era of Management, 9th Edition', South-Western Cengage Learning, 2010.
2. Burrow , J.L., Kleindl , B. and Everard, K.E.,'Business Principles and Management', South-Western Educational Pub, 2007.
3. Huffmire, D. W., and Holmes, J. D., 'Handbook of Effective Management: How to Manage or Supervise Strategically', Praeger Publishers, 2006.
4. Drucker, P. F. 'Management Challenges for The 21st Century,' Collins Business, 2007.
5. Schermerhorn. J, Jr.,'Management, (9th Edition)', John Wiley & Sons, Inc., 2008.

BFT110/3
ORGANIZATIONAL BEHAVIOR

Course Synopsis

This course will discuss the concepts and theories of organisation elements, management theories, individuals and group characteristics, job nature and design, motivation, leadership, conflict and communication at all organisational level. This course intends to provide students in gaining knowledge and understanding on the importance of organisational behaviour in various organizations.

References

1. Howell, J.P. and Costley, D.L., 'Understanding Behaviors for Effective Leadership. 2nd ed.', Upper Saddle River, NJ: Pearson Prentice Hall, 2006.
2. Huczynski, A. 'Organizational Behaviour: An Introductory', Pearson Education, 2007.
3. Knights, D. and Willmott, D., 'Introducing Organizational

Behaviour and Management', Thomson, 2006.

4. Langton, S. P. and Robbins, N., 'Organizational Behaviour: Concepts, Controversies, Applications', Ashgate Publishing Ltd.
5. Yukl, G., 'Leadership in Organizations. 6th ed.', Upper Saddle River, NJ: Prentice Hall, 2005.

BFT111/3
MANAGERIAL ACCOUNTING

Course Synopsis

This course introduces the basic concepts, terminologies, principles and methods of costing, budgetting and managerial decision making at operational level. This includes introduction to managerial accounting, costing behavioral and techniques, budgetting techniques and varience analysis.

References

1. Bruan, Tietz and Harrison (2010), Managerial Accounting, 2nd Edition, Prentice Hall
2. Brewer, Garrison and Noreen (2010), Introduction to Managerial Accounting, 5th Edition, McGraw-Hill
3. Horngren, Sundem, Stratton, Burgstahler and Schatzberg (2011), Introduction to Management Accounting, 15th Edition, Prentice Hall
4. Oliver and Horngren (2010), Managerial Accounting, Prentice Hall

BFT205/3
HUMAN RESOURCE MANAGEMENT

Course Synopsis

This course is divided into 12 topics. It will discuss the concepts and techniques of human resources management (HRM), legal environment in HRM, job analysis and design, staffing,human resource development, performance appraisal, compensation management, occupational safety and health, industrial relations, and employee rights and discipline.

References

1. Bingham, Christopher B., Teppo Felin, and J. Stewart Black, 'An Interview with John Pepper: What it Takes to be a Global Leader',Human Resource Management, Vol. 37, No. 4, 2000.
2. Dennis Briscoe, 'International Human Resource Management (Global HRM)',Routledge, 2008.
3. Dowling, Peter, J., Dennis, E. Welch., and Randall, S. Schuler, 'Introduction and Overview: International Human Resource Management', Cincinatti: ITP, Southwestern College Publisshing, 1999.
4. Dowling, Peter J., Denice E. Welch, and Randall S. Schuler, "Training and Development," International Human Resource Management, Cincinnati: ITP, Southwestern College Publishing,1999.
5. Pemberton, William E. ,'Human Rights: Humanistic Visions, Imperialistic Realities',University of Wisconsin-La Crosse, 2000.

BFT221/3
OPERATIONS MANAGEMENT

Course Synopsis

This course will introduce the concepts and techniques for designing, planning and controlling of manufacturing and service operations at international level. This course will provide basic definitions of all operational issues such as operation strategy, design of goods and services, managing quality, process strategy, location strategies, layout strategies, human resources and job design, supply chain management, inventory management and aggregate planning. This course intends to provide managers in gaining knowledge and understanding on the importance of operation management in organisations.

References

1. Ashwathappa, K., Bhat, K. B., 'Production and Operations Management',Himalaya Publications.
2. Finch, B. J., 'Operations Now. 3rd ed.', Tata Mc Grawhill, 2008.
3. Kachru, U., 'Production and Operations Management, Text and Cases. 1st ed.', Excel Books.
4. Mahadevan, B., 'Operations Management Theory and Practice', Pearson Education,Second impression, 2007.
5. Stevenson, W. J., 'Operations Management, 8th ed.', 2005.

BFT224/3
BUSINESS LAW & ETHICS

Course Synopsis

Law governs our daily activities. Similarly with other business transactions, these are certain rules that we have to follow. The purpose of having these laws is so that the transactions the parties have breached the law, action can be taken against the aggrieved party. Business ethics deals with what is right and wrong in organizational decisions, behavior and policies. The ethics provides the principles and guidelines that assist people in making informed choices that balance economic interests and social responsibilities. With the relevancy of the business issues, the students will be able to discuss the various laws that govern the elements of contract, the sale of goods, agency, hire purchase, partnership and the ethics of the business.

References

1. Beatrix Vohrah & Wu Min Aun,'The Commercial Law of Malaysia 2nd Edition', Kuala Lumpur Pearson Education Malaysia Sdn Bhd.
2. E.R Hardy Ivamy, 'Underhill's Principles of the Law of Partnership 12th ed', London:Butterworth , 1986.
3. Lee Mei Pheng, 'General Principles of Malaysian Law' Kuala Lumpur MLJ, 1997.
4. Pearson Prentice Hall ,' Business Ethics-Concepts and Cases 5th Edition', Prentice Hall
5. Walter C.M Woon.,'Company Law. Singapore', Longman Singapore Publishers Pte Ltd, 1998.

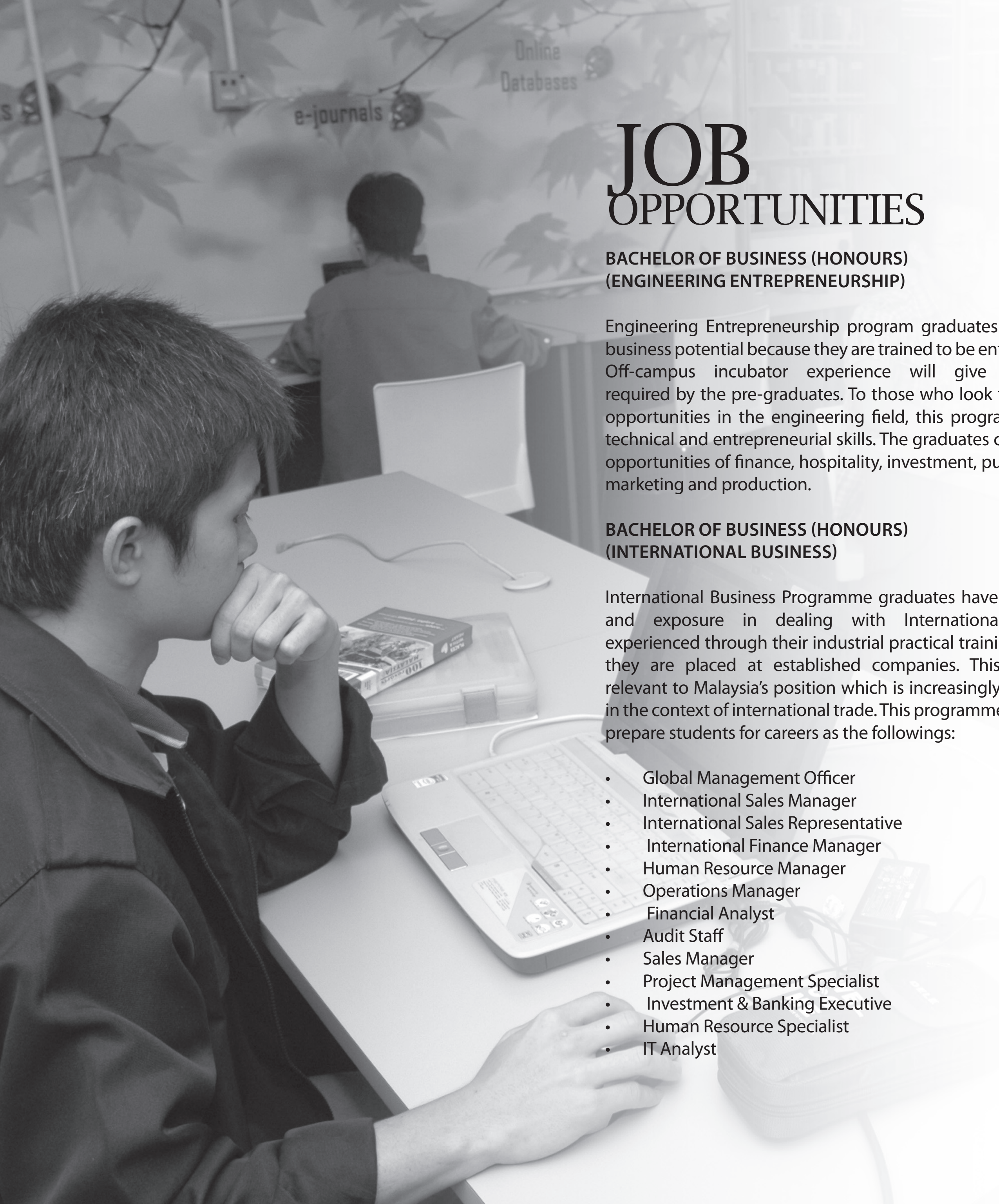
BFT318/3
RESEARCH METHODOLOGY

Course Synopsis

This course addressed the theoretical concepts of research methods in all area of business. The course introduces students to the fundamental of preparing the research and presenting the written and oral presentation. Its comprises of topics which cover the basic step of research process, data collection methods, research methodologies, data analysis, findings, discussion and report writing.

References

1. Mark Saunders, Philip Lewis and Adrian Thornhill, Research Methods for Business Students, 5th edition, Prentice Hall, 2009.
2. Cooper D. R. and Schindler P. S., Business Research Methods, 8th ed., Mc-Graw Hill, 2003.
3. Pervez Ghauri and Kjell Gronhaug (2010), Research methods in Business Studies, Prentice Hall Publications, Fourth edition.
4. Sekaran U., Research Methods for Business: A Skill-Building Approach, 5th ed., John Wiley & Sons, 2010.
5. Zikmund, Babin, Carr and Griffin, Business Research Methods, 8th edition, 2009, South-Western.



JOB OPPORTUNITIES

BACHELOR OF BUSINESS (HONOURS) (ENGINEERING ENTREPRENEURSHIP)

Engineering Entrepreneurship program graduates have good business potential because they are trained to be entrepreneurs. Off-campus incubator experience will give confidence required by the pre-graduates. To those who look for business opportunities in the engineering field, this program provides technical and entrepreneurial skills. The graduates can also find opportunities of finance, hospitality, investment, public service, marketing and production.

BACHELOR OF BUSINESS (HONOURS) (INTERNATIONAL BUSINESS)

International Business Programme graduates have knowledge and exposure in dealing with International Business, experienced through their industrial practical training whereby they are placed at established companies. This would be relevant to Malaysia's position which is increasingly recognised in the context of international trade. This programme would also prepare students for careers as the followings:

- Global Management Officer
- International Sales Manager
- International Sales Representative
- International Finance Manager
- Human Resource Manager
- Operations Manager
- Financial Analyst
- Audit Staff
- Sales Manager
- Project Management Specialist
- Investment & Banking Executive
- Human Resource Specialist
- IT Analyst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10.

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Introduction

Centre for Communication Technology and Human Development or Pusat Teknologi Komunikasi dan Pembangunan Insan (PTKPI), formerly known as Centre for Communication Skills and Entrepreneurship (PKKK) is a centre that serves all other Graduates Programs in UniMAP. Instead of offering academic programmes, PTKPI provides multiple courses that channel the knowledge of social and humanities. These Programmes compliment the engineering and business knowledge which is present in all UniMAP academic programmes. The philosophy held by PTKPI is to enhance students' generic and soft skills which include communication, languages, ICT and socio-humanities in facing the dynamic of global challenges.

PTKPI hopes to create graduates who are holistically developed in entrepreneurial skills and technical aspects, are self-reliant, committed to the field they undertake and possess high competitiveness to face the challenges in this present era of globalization.

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COURSE SYLLABUS

EUW212/2
UNIVERSITY ENGLISH

Course Synopsis

This course is designed to help students achieve confidence in extracting, evaluating and synthesizing information with a view to writing good technical documents. The emphasis will be upon writing clear, concise, accurate, conventional, appropriate materials on a worth while subject of interest or technical field as specified in the assignment. Students will learn the techniques of analysis of the writing situation, methods of investigation of the problem, the functional organization of the report itself and the writing of the report to the preparation of the final copy. Students are also required to formally present their research report orally at the end of the semester.

References

1. Ingre, D.,'Survivor's guide to technical writing. Mason, OH,' South Western, 2003.
2. Blicq, R. & Moretto, 'Technically write, 6th Ed. Upper Saddle River, New Jersey', Pearson, 2004.
3. Hutchinson, T. and Waters, A., 'English for Specific Purposes: A Learning-Centered Approach', Cambridge: Cambridge University Press, 1987.
4. Krishnaswamy, N. and Sriraman, T., 'Current English for Colleges: A Course for Undergraduate Learners', Madras : Macmillan, 1990.
5. Young, Dona J., 'Foundations of Business Communication', Boston: McGraw-Hill Irwin, 2006.

EUW224/2
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.

EUW233/2
ISLAMIC & ASIAN CIVILISATIONS

Course synopsis

This course discusses the basic concepts of knowledge civilization. In addition, students will be exposed to the universal values arising from the clash of Islamic and Asian civilizations. It also aims to create a Malaysian society that respects and understands the system of religious beliefs and customs practiced.

References:

1. Ali Mansur, 'Islam dalam Perhubungan Antarabangsa', Ter. Mahmood Zuhdi Abd. Majid, Petaling Jaya;ABIM, 1994.
2. Azhar Hj. Mad Aros et al., 'TITAS 1', Shah Alam : Fajar Bakti, 2000.
3. Azhar Hj. Mad Aros et al ., 'TITAS 2', Shah Alam : Fajar Bakti, 2000.
4. Basham / AL. (Ed.), 'A Cultural History of India/Delhi', Oxford University Press of Hawai, 1975.
5. M. Osman Bakar,' Islam and Confusianism : A Civilization Dialoge', Kuala Lumpur, 1997.

EUW235/2
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. Hopefully this course will be able to create a Malaysian society by molding complicated relationships between Malaysia and the ASEAN Region.

References

1. Abdul Aziz Bari, 'Perlembagaan Malaysia: Asas-asas dan Masalah', Kuala Lumpur: Dewan Bahasa dan Pustaka, 2000.
2. Azmi Aziz & Shamsul AB.,'The religious, the plural, the secular and the modern: A brief critical survey on Islam in Malaysia', Inter-Asia cultural studies. Volume 5. Number 3. December, 2004.
3. D.Y.U. Wu, H.Mac Queen & Yamamoto Y. (Ed).' Emerging Pluralism in Asia and the Pasific', Hong Kong The Chinese University of Hong Kong. Pg. 67-83.
4. Gullick. John M.'The indigenous political systems of Western Malaya', Revised Edition. London: Athlone Press, 1998.
5. Harrison, Paul. 'Inside the third world: with a revised overview', New York Penguin Books. (chap.3, the westernization of the world. Pg. 46-60), 1987.

EUW322/2
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 and self 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.
3. De Bono, Edward,'Pemikiran Lateral untuk Pengurusan. Kuala Lumpur', Golden Book Sdn. Bhd, 2001.
4. Mohd, Ainon & Hassan, Abdullah.,' Belajar Berfikir'. Pahang: PTS Publication, 2003.
5. Wright, Larry.,'Critical Thinking: An Introduction to Analytical Reading and Reasoning'. USA: Oxford University Press, 2001.

EUW410/2
UNIVERSITY MALAY LANGUAGE

Course Synopsis

The aim of this course is to develop an 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 civilisation of countries where the language is spoken, thus encouraging positive attitudes towards language learning.

References

1. Daniel Zakaria, 'Panduan Belajar Bahasa Inggeris-Bahasa Melaysia', Ar-RisalahProduct Sdn. Bhd: Kuala Lumpur, 2008.
2. Lee Guat Eam & Wan Rosmawati, 'Bacalah Sayang', Percetakan Surya Sdn. Bhd: Melaka, 2005.
3. Noor Asliza Abdul Rahim, Abdul Jalil Ramli, Zuhairah Idrus, Suhaidah Said,'Modul Bahasa Melayu Asas', Pusat Kemahiran Komunikasi dan Keusahawanan, Universiti Malaysia Perlis, 2009.
4. Othman Sulaiman,'Malay for Everyon', Pelanduk Publication M) Sdn Bhd Selangor, 2005.
5. Sulaiman Masri, 'Penulisan Berita Dalam Bahasa Melayu', Dewan Bahasa dan Pustaka, Kementerian Pendidikan Malaysia; Edisi Pertama, 1990.

EUW110/2
BASIC MALAY LANGUAGE (FOR INTERNATIONAL STUDENTS ONLY)

Course Synopsis

The objective of the course is to expose students to the four skills of language: listening, speaking, reading and writing. The listening and speaking skills are merged, and focuses are given not only on forms and functions, but also on pronunciation. The reading and writing skills emphasizes on accuracy and grammar, structure and semantics (meaning). Topics for essay writing provide opportunity for students to learn analysis processes, syntax and elaboration.

References

1. Daniel Zakaria,'Panduan Belajar Bahasa Inggeris-Bahasa Melaysia', Ar-RisalahProduct Sdn. Bhd: Kuala Lumpur, 2008.
2. J. Nulawadin Mustafagani, 'Asas Kemahiran Berbahasa Malaysia', Kuala Lumpur, Fajar Bakti, 199.
3. Lee Guat Eam & WanRosmawati, 'Bacalah Sayang', Percetakan Surya Sdn. Bhd: Melaka, 2005.
4. Noor Asliza Abdul Rahim, Abdul Jalil Ramli, Zuhairah Idrus, Suhaidah Said,'Modul Bahasa Melayu Asas', Pusat Kemahiran Komunikasi dan Keusahawanan, Universiti Malaysia Perlis, 2009.
5. Othman Sulaiman,'Malay for Every-one', Pelanduk Publication (M) Sdn Bhd Selangor, 2005.

OPTIONAL COURSES

EUW112/2
FOUNDATION ENGLISH

Course Synopsis

This one semester course is programmed and designed to remedy students' weaknesses in the use of English and to raise their proficiency level. It covers major aspects of grammar, writing, reading and speaking; and prepares them for the mainstream English Language Course – EUW 2I2 University English in UniMAP. Graded passages will be used to develop a reading habit and also to expose students to a wide range of English. The course will adopt a learner-centered approach in which students will be actively involved in various situations requiring communication in English. Grammar is an essential component of the course and will be incorporated into the 4 skills and taught in context. Students will also be actively involved in various situations requiring communication in English.

References

1. Atkinson, R.H. & Longman, D. G., 'College Learning and Study Skills 6th ed. USA: Wadsworth', Thomson Learning, 2006.
2. Becker, S. G. & Skidell, M. B., 'The Main Idea Reading To Learn. 3rd ed. USA', Pearson Education, Inc., 2004.
3. Bledsoe, P.S. & Selby, N. ' Essential College English: A Grammar, Punctuation and Writing Workbook. 6th Ed. U.S.',Addison Wesley Longman, Inc., 2003
4. Cummings, M.G., 'Listen, Speak, Present. Boston', Heinle & Heinle, 1994.
5. Cutting Edge: Elementary SB, Cunningham, Sarah, Moor, Peter, Longman ELT, UK, paperback, pp, CUT, Elementary student book, 2001.

EUW 115
THAI LANGUAGE 1

Course Synopsis

This course aim to introduce student to the basic structure of the Thai language.Student will be exposed to new vocabulary,simple sentence structures, speeches and texts; Listening to and producing simple dialogues based on everyday activities. Student also will be introduced to the Thai writing system, tone system and tone discrimination, reading vary simple passages and writing simple sentences.

References

1. Kiettipongse,M. (2008) Thai language for The Beginner. Bangkok. Duangkamol Publishing
2. Ponmanee, S. (2000). Learn to Read Thai. Chiangmai: Thaigreat.
3. Becker, B.P. (2003). Improving Your Thai Pronounciation. Bangkok: Paiboon Publishing.
4. Becker, B. P. (2003). Thai for Beginners. Bangkok: Paiboon Publishing.
5. Tontraseney, W. (1981). Bahasa Thai, Kuala Lumpur: Universiti Malaya.

EUW 215
THAI LANGUAGE 2

Course Synopsis

As in the first course, this course also emphasizes on listening, speaking, reading and writing. Students will be exposed to vocabulary expansion, speaking using dialogues for different purposes and different contexts. Students will be introduced to simple essential grammar and sentence structures. Students will also be exposed to reading short passages and writing longer sentences to compose shot passages.

References

1. Kiettipongse,M. (2008) Thai language for The Beginner. Bangkok. Duangkamol Publishing
2. Ponmanee, S. (2000). Learn to Read Thai. Chiangmai: Thaigreat.
3. Becker, B.P. (2003). Improving Your Thai Pronounciation. Bangkok: Paiboon Publishing.
4. Becker, B. P. (2003). Thai for Beginners. Bangkok: Paiboon Publishing.
5. Tontraseney, W. (1981). Bahasa Thai, Kuala Lumpur: Universiti Malaya.

EUW315
THAI LANGUAGE 3

Course Synopsis

This course will expand and use more complex vocabulary, exposure to sophisticated sentences to read and write longer essays. Students also will be exposed to use various material such as tapes ,short articles from magazine or internet for independent study to enhance their skill.

References

1. Kiettipongse, M. (2008) Thai language for The Beginner. Bangkok. Duangkamol Publishing
2. Ponmanee, S. (2000). Learn to Read Thai. Chiangmai: Thaigreat.
3. Becker, B.P. (2003). Improving Your Thai Pronounciation. Bangkok: Paiboon Publishing.
4. Becker, B. P. (1998). Thai for Intermidieate Learners. Bangkok: Paiboon Publishing.
5. Tontraseney, W. (1981). Bahasa Thai, Kuala Lumpur: Universiti Malaya.

EUW 415
THAI LANGUAGE 3

Course Synopsis

This course will expand and use more complex vocabulary relevant to society, religion, culture and economy ;speak and react to radio or TV broadcast, newspaper articles, passage or texts read and learn about language styles used in the media.Learn more essential grammar point to make longer essay, make note and express idea of texts read. Student also will have the idea and understand Thai culture, manner, value and beliefs through the text.

References

1. Kiettipongse, M. (2008) Thai language for The Beginner. Bangkok. Duangkamol Publishing
2. Ponmanee, S. (2000). Learn to Read Thai. Chiangmai: Thaigreat.
3. Becker, B.P. (2003). Improving Your Thai Pronounciation. Bangkok: Paiboon Publishing.
4. Becker, B. P. (2000). Thai for Advanced Reader. Bangkok: Paiboon Publishing.
5. Tontraseney, W. (1981). Bahasa Thai, Kuala Lumpur: Universiti Malaya.

EUW113/2
COMMUNICATIVE ARABIC

Course Synopsis

The course provides the students with active training in their ability to understand and use Arabic in various contexts and to read and write texts of a varying nature, in which grammar is practiced. Written and oral proficiency, writing skills and reading comprehension are considered as important as translation from and to Arabic. The course focuses on further developing the students' ability to communicate in moderately difficult and everyday situations.

References

1. Abdullah Sulaiman Al-Jarbuk, Tammam Hassan Umar , Mahmud Kamil al-Naqah, Abdullah Kamil Al-Abadi, Ali Muhammad Al-Fiqqi dan Rusydi Ahmad Taimah, ' Taklimu al-Lughah al-Arabiyyah Lighairi al-Natiqin Biha, Al-Mamlakah al-Arabiyyah al-Saudiyyah', Jamiah Ummu al-Quran, 1984.
2. Muhammad Roihan Hasbullah M.A (Hj.) 'Perbualan Bahasa Arab Untuk Peringkat Rendah dan Menengah', Kuala Lumpur, Pustaka Syuhada, 2002.
3. Sekumpulan guru-guru Bahasa Arab, 'Al-Jadid al-Lughati al-Araabiyyah Li al-Sanah al-Ula al-Ikdadiyah, Gombak Utara Selangor' , Pustaka Markiland, 1987.

4. Universiti Sains Malaysia (Pusat Bahasa & Terjemahan),Bahasa Arab 1,USM,Bahagian Bahasa Arab, 2002.
5. Zaid Al-Hamid "Pelajaran Bahasa Arab Untuk Semua, Kuala lumpur, Speedy Self Study System, 2001.
6. Fuad Ifram al-Bustaniy, "Al-Munjid Al-Tullab" Darul Syarq, Beirut, Lubnan, 1986
7. 7.Lingua Phone (2000) , Lingua Phone Institut Limited , Carlton Plaza, 111 Upper Richmond Road, London.

EUW213/2
COMMUNICATIVE ARABIC

Course Synopsis

The course provides the students with active training in their ability to understand and use Arabic in various contexts and to read and write texts of a varying nature, in which grammar is practiced. Written and oral proficiency, writing skills and reading comprehension are considered as important as translation from and to Arabic. The course focuses on further developing the students' ability to communicate in moderately difficult and everyday situations.

References :

1. H. Ridlo. Masduki (Prof.Dr.), H.Chatibul Umam (Prof. Dr.) H. Moh. Matsna (Dr.), (2000) الجامعة لطلاب العربية , Darul Ulum Press, Edaran oleh Wisma Yakin, Kuala Lumpur.
2. Nuhammad Akram Saaduddin (at all), (1990), : القلم : العربية الفصيحة للناطقين بغير ها وبها Fajar Ulung Sdn. Bhd. L.B.C. Publishers International Book Centre, Kuala Lumpur
3. Ishak Mohd. Rejab (Prof. Madya Dr.), (1987), Kursus Bahasa Arab (Bahagian 11), Yayasan Dakwah Islamiah Malaysia (YADIM), Kuala Lumpur
4. Ali al-Jarim, Mustafa Amin (1966), النحو الواضح فى قواعد اللغة العربي Mesir.
5. Elias A. Elias & Ed. E. Elias (t.t.), انكليزي-القاموس العصري , عربي Mesir.
6. Institut Agama Islam Negeri (IAIN), Sharif Hidayatullah, Jakarta, (1977) , بالنماذج العربية, Bulan Bintang , (Penerbit dan Penyebar buku-buku Teks) Jakarta Indonesia.
7. Lingua Phone (2000) , Lingua Phone Institut Limited , Carlton Plaza, 111 Upper Richmond Road, London.
8. Sono Cairo Audio , VIDEO CD, (t.t.) , الاتصالية العربية اللغة , Cairo Egypet.
9. Syed Umar al-Sagaf , Muhamad Khalil Hj. Ahmad dan Mohd. Abdul Rahim , Mohd. Abdul Rahman (2000), الثالث للمستوى العربية اللغة مذكرة , Dewan Bahasa dan Pustaka, Kuala Lumpur
10. Universiti Putra Malaysia (t.t.) , الثالث للمستوى العربية اللغة مذكرة , Fakulti Bahasa Moden dan Komunikasi.
11. Mustaffa Abdullah (terjemahan oleh Siti Rohaya Sarnap & Siti Sujinah Sarnap (2000), Cara Mudah belajar Bahasa Arab, JAHABERSA & CD, Singapore.
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).

EUW313/2
COMMUNICATIVE ARABIC

Course Synopsis

The course provides the students with active training in their ability to understand and use Arabic in various contexts and to read and write texts of a varying nature, in which grammar is practiced. Written and oral proficiency, writing skills and reading comprehension are considered as important as translation from and to Arabic. The course focuses on further developing the students' ability to communicate in moderately difficult and everyday situations. This course covers the eight (8) topics of Arabic grammar, eight (8) topics of essays and eight (8) topics of Balaghah The course covers through four fundamentals namely listening, speaking, reading and writing

References :

1. Mahmud Ismail As-sini(Dr.), (1993) العربية للناشئين : منهج متكامل لغير الناطقين بالعربية Darul Ma'arif Mamlakah 'Arabiah Saudiah, Arab Saudi.
2. Nuhammad Akram Saaduddin (at all), (1990), : القلم : العربية الفصيحة , Fajar Ulung Sdn. Bhd. L.B.C. Publishers International Book Centre, Kuala Lumpur
3. Ishak Mohd. Rejab (Prof. Madya Dr.), (1987), Kursus

Bahasa Arab (Bahagian 11), Yayasan Dakwah Islamiah Malaysia (YADIM), Kuala Lumpur
4. Ali al-Jarim, Mustafa Amin (1966), النحو الواضح فى قواعد اللغة العربية , Mesir.
5. ______1990. Linguaphone: Rakaman Kaset dan Buku Panduan. 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.

EUW413/2
COMMUNICATIVE ARABIC

Course Synopsis

The course provides the students with active training in their ability to understand and use Arabic in various contexts and to read and write texts of a varying nature, in which grammar is practiced. Written and oral proficiency, writing skills and reading comprehension are considered as important as translation from and to Arabic. The course focuses on further developing the students' ability to communicate in moderately difficult and everyday situations.

This course covers the four fundamentals namely listening, speaking, reading and writing. Other emphasis of the course are to improve vocabulary development and reading techniques, as well as basic techniques of writing focusing on narrative and descriptive essays.

References :

1. Ahmad Hassan Ziyat (…….) العربي الأدب تاريخ Darul Kutub Misriyyah, Mesir.
2. Batras Al-Bustaniy, (1989), النذير دار : بيروت العرب أدباء. , Darul Nazir, Beirut
3. Abdul Rahman Al-Barquni (1979), Darul Kitab, Beirut : الكتاب دار بيروت. المتنبي ديوان شرح
4. Syauqi Dhaif (……..), 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). فقه اللغة العربية وخصائصها Darul 'Ilmi Malayin, Beirut.

EUW114/2
MANDARIN LANGUAGE I

Course Synopsis

Mandarin Language Class EUW114 is the first course in a series of Chinese language courses and is designed for students who have NO previous knowledge in spoken or written Chinese. This course introduces elementary Mandarin Chinese pronunciation, grammar, characters, as well as commutation skills.

This course aims to enable students to communicate effectively in Chinese and to understand contemporary social/cultural differences between the Greater China region and western countries through the study of Chinese language. This course will cover nine lessons of lecture notes, including the introduction on pinyin. Students will learn greetings, numbers, directions, how to introduce oneself and one's family, how to tell dates and time, how to talk about one's hobbies, how to talk about festivals in Malaysia and shopping. Students will also learn how to write and type Chinese characters.

References

1. Boping Yuan, Sally Kathryn Church, 'Oxford Beginner's Chinese Dictionary, Oxford University Press, USA; Bilingual Edition, 2006.
2. Claudia Ross, Jing-Heng Sheng Ma, Baozhang He, ' Modern Mandarin Chinese Grammar Workbook', Routledge; Bilingual Edition, 2006.
3. William McNaughton, 'Reading & Writing Chinese: Simplified Character Edition', Tuttle Publishing; Bilingual Edition, 2005.
4. Laurence Matthews Alison Matthews, 'The First 100 Chinese Characters: Simplified Character Edition: The Quick and Easy Method to Learn the 100 Most Basic Chinese Characters', Tuttle Publishing, 2007.
5. Xinhua Dictionary With English Translation, 2007.

EUW214/2
MANDARIN LANGUAGE 2

Course Synopsis

Mandarin Language Class EUW114—Level II is designed for students who have previous knowledge in spoken or written Chinese. Students will gain listening, speaking, reading and writing skills in standard (Mandarin) Chinese, attaining approximately the second level.

Be able to understand some deliberate speech and discussion pertaining to such topics. Be able to handle successfully most communicative tasks and social situations.

This course will cover the six lessons of the textbook. Students will learn Making a Telephone Call, Asking the Way, Daily Life—Eating & drinking, In the Restaurant, Discussing one's Studies, Shopping- Buying things at the free market. Students will also learn about use Chinese dictionary.

References

1. Boping Yuan, Sally Kathryn Church, 'Oxford Beginner's Chinese Dictionary, Oxford University Press, USA; Bilingual Edition, 2006.
2. Claudia Ross, Jing-Heng Sheng Ma, Baozhang He, ' Modern Mandarin Chinese Grammar Workbook', Routledge; Bilingual Edition, 2006.
3. William McNaughton, 'Reading & Writing Chinese: Simplified Character Edition', Tuttle Publishing; Bilingual Edition, 2005.
4. Laurence Matthews Alison Matthews, 'The First 100 Chinese Characters: Simplified Character Edition: The Quick and Easy Method to Learn the 100 Most Basic Chinese Characters', Tuttle Publishing, 2007.
5. Xinhua Dictionary With English Translation, 2007.

EUW117/2
JAPANESE LANGUAGE I

Course Synopsis

This course aims to introduce students to the basic structure of the Japanese Language. Students will be exposed to new vocabulary, simple sentence patterns, speeches and texts. In this course, the basic function of Japanese Language such as writing, listening, and reading are emphasized.

References

1. Bunka Institute Of Language,'Shin Bunka Syokyu Nihongo1', Rensyu Mondai Bonjinsya, 2000.
2. The Association For Overseas Technical Scholarship (Aots),'Shin Nihongo-No Kiso 1', 3a Corpration, 1990.
3. The Association For Overseas Technical Scholarship(Aots),'Shin Nihongo-No Kiso 1', (Asian Edition) 3a Corpration,1997.
4. The Association For Overseas Technical Scholarship(Aots),'Mina No Nihongo Syokyu I', 3aCorpration,1998.
5. The Association For Overseas Technical Scholarship(Aots),'Shin Nihongo-No Kiso 1',Standard Question, 3a Corpration, 1993.

EUW217
JAPANESE LANGUAGE 2

As in the first course, this course also emphasizes on listening, speaking, reading and writing. Students will be exposed to vocabulary expansion, speaking using dialogues for different purposes and different contexts. Students will be introduced to simple essential grammar and sentence structures. Students will also be exposed to reading short passages and writing longer sentences to compose shot passages.
The syllabus ranges from the basic Japanese structures to basic Japanese cultural elements.

Text Book :
Modul Bahasa Jepun II. Ku Mohd Nabil. Pusat Kemahiran Komunikasi dan Keusahawanan, Universiti Malaysia Perlis. (monograph) 2010

Reference

1. The Association For Overseas Technical Scholarships, (1998), Minnnano nihonngo 1, Tokyo : 3A CORPORATION
2. The Association For Overseas Technical Schorlarships,(1997), Shin nihonggo no kiso1 (Asian Edition)
3. Etsuko Hirai Sachiko Miwa, (2000), Minna no nihonggo 1 Bunkei Renshuu Tyou, Tokyou : 3A CORPORATION
4. Sachie MIYAGI, Akiko MITSUI, Everyday listening in 50 days (1997) : Tokyo: Bonjinsha Corporation

EUW317
JAPANESE LANGUAGE 3

As in the second course, this course also emphasizes on listening, speaking, reading and writing. Students will be exposed to vocabulary expansion, speaking using dialogues for different purposes and different contexts. Students will be introduced to simple essential grammar and sentence

structures. Students will also be exposed to reading short passages and writing longer sentences and to compose a dialogue. Beginning Chinese characters (kanji) will be introduced.
The syllabus ranges from the basic Japanese structures to basic Japanese cultural elements.

Text Book :
Modul Bahasa Jepun III. Ku Mohd Nabil. Pusat Kemahiran Komunikasi dan Keusahawanan, Universiti Malaysia Perlis. (monograph) 2010

Reference

1. The Association For Overseas Technical Scholarships, (1998), Minnnano nihonngo 1, Tokyo : 3A CORPORATION
2. The Association For Overseas Tech nical Schorlarships,(1997), Shin nihonggo no kiso1 (Asian Edition)
3. Etsuko Hirai Sachiko Miwa, (2000), Minna no nihonggo 1 Bunkei Renshuu Tyou, Tokyou : 3A CORPORATION
4. Sachie MIYAGI, Akiko MITSUI, Everyday listening in 50 days (1997) : Tokyo: Bonjinsha Corporation

EUW417
JAPANESE LANGUAGE 4

This is the fourth of a four part program for Japanese Language Course. As in the third course, this course also emphasizes on listening, speaking, reading and writing. Students will be exposed to vocabulary expansion, speaking using dialogues for different purposes and different contexts. Students will be introduced to the advanced communicative competence. Students will also be exposed to reading, writing longer sentences and passages and to compose a dialogue. Beginning Chinese characters (kanji) will be introduced. The syllabus ranges from the basic Japanese structures to basic Japanese cultural elements.

Text Book :
Modul Bahasa Jepun IV. Ku Mohd Nabil. Pusat Kemahiran Komunikasi dan Keusahawanan, Universiti Malaysia Perlis. (monograph) 2010

Reference

1. The Association For Overseas Technical Scholarships, (1998), Minnnano nihonngo 1, Tokyo : 3A CORPORATION
2. The Association For Overseas Tech nical Schorlarships,(1997), Shin nihonggo no kiso1 (Asian Edition)
3. Etsuko Hirai Sachiko Miwa, (2000), Minna no nihonggo 1 Bunkei Renshuu Tyou, Tokyou : 3A CORPORATION
4. Sachie MIYAGI, Akiko MITSUI, Everyday listening in 50 days (1997) : Tokyo: Bonjinsha Corporation

EUW118/2
GERMAN LANGUAGE I

Course Synopsis

The course aims to equip the students with simple spoken and writing skills in German language. This will help student to carry out simple communication, reading and writing in German language. They will use simple structures to carry out simple conversations on daily topics.

References

1. Funk, Koenig,'Genial kursbuch', A. Langenscheidt, 2000.
2. Leitner, A., 'German Made Simple: Learn to Speak and Understand German Quickly and Easily',Made Simple; Revised Edition, 2006,
3. Rosenberg, J., 'German: How to Speak and Write It (Beginners' Guides)', BN Publishing, 2008.
4. Swick, Ed., 'German Demystified: A Self Teaching Guide', McGraw-Hill; 1st Edition, 2007.
5. Coggle, P., 'Teach Yourself German - in Malay - in Indonesian', Renaisans, Jakarta, Inonesia, 1997.

EUW218/2
GERMAN LANGUAGE 2

Course Synopsis

This course aims to expose students to the basic speaking and writing skills in German. This course will help students to communicate, read and write in German.

References

1. Funk, Keller. (2006). So Wie So. Muenchen:Langenscheidt Verlag
2. Funk, Koenig,'Genial kursbuch', A. Langenscheidt, 2000.
3. Leitner, A., 'German Made Simple: Learn to Speak and Understand German Quickly and Easily', .Made Simple; Revised Edition, 2006,

4. Rosenberg, J., 'German: How to Speak and Write It (Beginners' Guides)', BN Publishing, 2008.
5. Swick, Ed., 'German Demystified: A Self Teaching Guide', McGraw-Hill; 1st Edition, 2007.

EUW345/2
OCCUPATIONAL SAFETY AND HEALTY MANAGEMENT

Course Synopsis

This course is an introduction to major concepts and issues in occupational health and safety. Students identify a conceptual framework for working with populations of workers as an industrial hygienist, safety professional, injury epidemiologist, occupational physician, or occupational health nurse. The application of public health principles and decision-making processes will be discussed in relation to the prevention of injury and disease, health promotion and protection of worker populations from environmental hazards. This course relies on the synthesis of knowledge in the behavioral sciences, industrial hygiene, safety, nursing theory, toxicology and epidemiology while applying these within a program development and management framework.

References

1. Akta Keselamatan Dan Kesihatan Pekerjaan Dan Peraturan-Peraturan.
2. Akta Kilang Dan Jentera.
3. Mark A. Friend James P. Kohn, 'Fundamentals of Occupational Safety and Health', (Fundamentals of Occupational Safety & Health)', Government Institutes; 5th Edition, 2010.
4. Occupational Healty And Safety Management : A Practical Approach, Charles D. Reese, Lewis Publishers, 2003.
5. Thomas J. Anton,'Occupational Safety and Health Management', Mcgraw-Hill College; 2nd Sub Edition, 1989.

CORE COURSES

EUT122/2
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 EducationInc, 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.
4. Wood, J.T., 'Communication Mosaics: An introduction to the field of communication. 3rd Ed. Wadsworth', Thomson Learning, 2004.
5. LaBerta, C., 'Computers Are Your Future Complete'. 11th Edition, Pearson Education Inc, 2011.

EUT123/3
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.

SEMESTER 2

YEAR 1
PPIPT (Engineering Entrepreneurship)

SEMESTER 1

YEAR 2
PPIPT (International Business)

EUT440/3
ENGINEERS IN SOCIETY (FOR ENGINEERING STUDENTS ONLY)

Course synopsis

This course aims to explain the main concept in engineering ethics, risk management and occupational safety and health as well as to expose the student to the basics of law in the engineering context. The materials will be of introductory nature to enable engineers to appreciate factors that has to be taken into consideration 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 requirement related to engineering field.

References

1. Charles B. Fledderman, Engineering Ethics, E Source Prentice Hall 3rd Edition
2. Lee Mei Pheng, 'General Principles Of Malaysian Law, Third Edition',Penerbit Fajar Bakti, Shah Alam, 1998.
3. Mike W. Martin, Roland Schinzinger, 'Ethics In Engineering', Mc Graw Hill, 2005.
4. Registration Of Engineering Act 1976 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.

EUT443/2
ENGINEERING MANAGEMENT *(FOR ENGINEERING STUDENTS ONLY)*

Course Synopsis

This course aims to teach students on how to apply project management skills, 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, student will be able to identify and discuss issues and challenges faced by engineers relating to project management in the current economic scenarios.

References

1. C M Chang, 'Engineering Management: Challenges in the New Millennium', Prentice Hall, 2004.
2. O'Sullivan / Sheffin, 'Economics: Principles And Tools', Prentice Hall, 2001.
3. R. Logeswaran, Hairul Azhar, Pau Kiu Nai and Sim Hock Kheng, 'Engineers In Society', Mc Graw Hill 2nd edition.
4. S. Park Chan, 'Fundamentals Engineering Economics, 2nd.', Prentice Hall, 2008.
5. Stanley E.P Samuel J.M., Jack R.M, Scot M.S, Margaret M. Sutton, 'Project Management : Planning, Scheduling, And Controlling Project', John Wiley & Sons Inc. USA, 2008.

11.

ENGINEERING CENTRE

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Introduction

The Engineering Centre is located within the Kuala Perlis Industrial Complex. 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.

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COURSES OFFERED BY ENGINEERING CENTRE

There are two core courses offered by Engineering Centre for undergraduate's level:

- Engineering Skills (ECT111/ECT112)

And also a core course:

- 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.

COURSE SYLLABUS

ECT111
ENGINEERING SKILLS

Course 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

Course 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

12.

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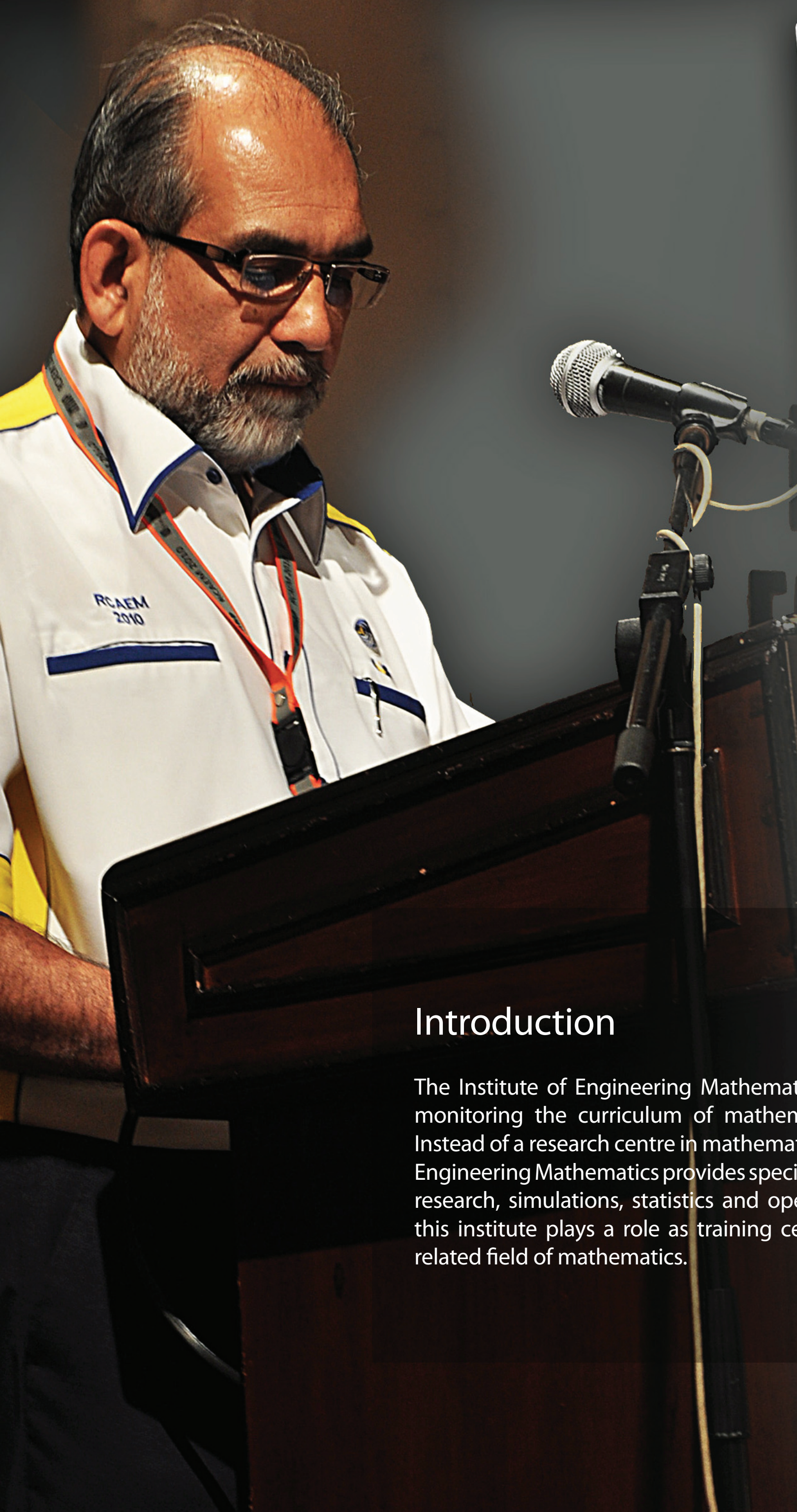

Introduction

The Institute of Engineering Mathematics is a centre of planning and monitoring the curriculum of mathematical engineering in UniMAP. Instead of a research centre in mathematical engineering, the Institute of Engineering Mathematics provides specialists in method of mathematical research, simulations, statistics and operational research. Besides that, this institute plays a role as training centre for UniMAP and others in related field of mathematics.

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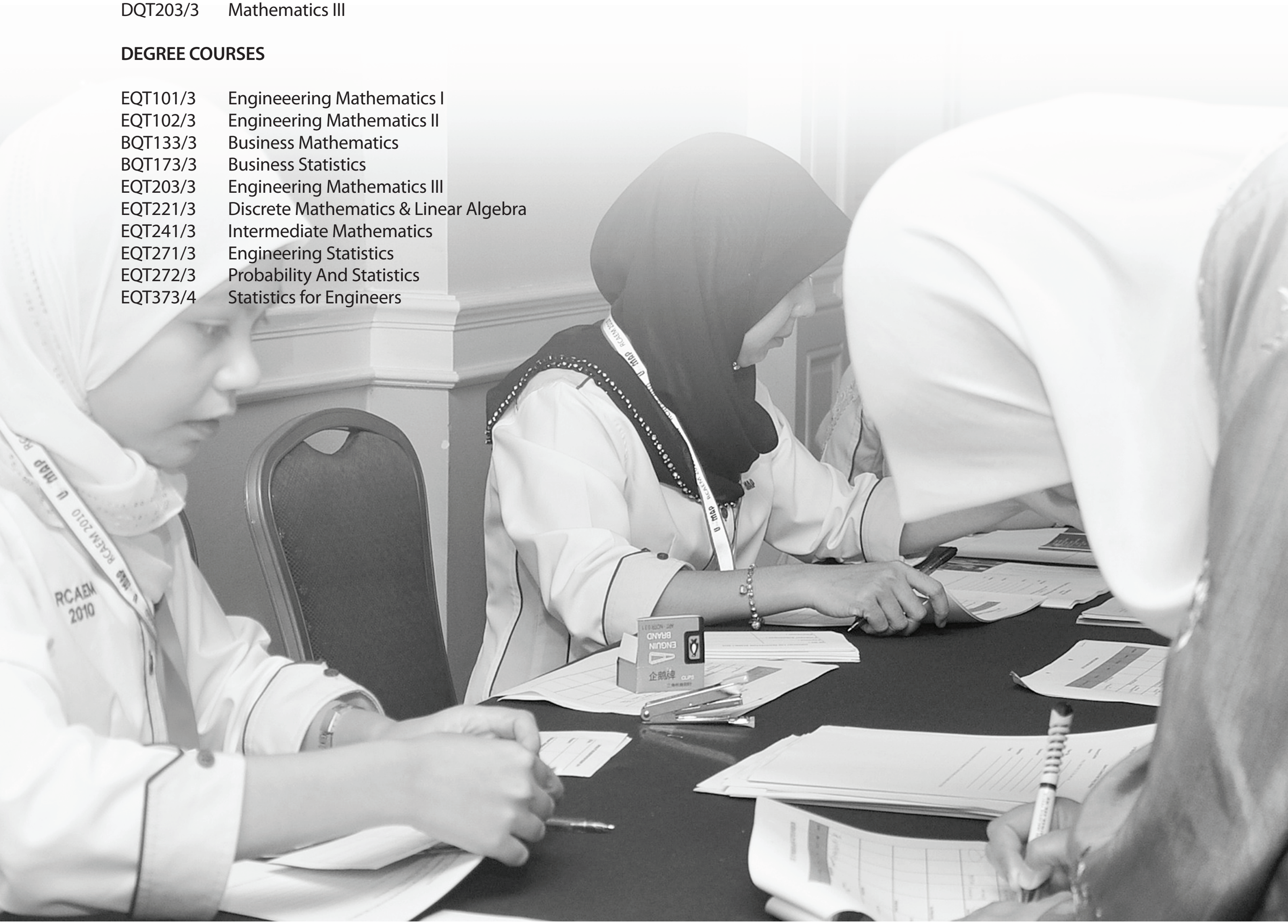
COURSES OFFERED

DIPLOMA COURSES

DQT101/3	Mathematics I
DQT102/3	Mathematics II
DQT203/3	Mathematics III

DEGREE COURSES

EQT101/3	Engineeering Mathematics I
EQT102/3	Engineering Mathematics II
BQT133/3	Business Mathematics
BQT173/3	Business Statistics
EQT203/3	Engineering Mathematics III
EQT221/3	Discrete Mathematics & Linear Algebra
EQT241/3	Intermediate Mathematics
EQT271/3	Engineering Statistics
EQT272/3	Probability And Statistics
EQT373/4	Statistics for Engineers



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

CO1:
Ability to **relate** relevant concepts and methods in algebra.

CO2:
Ability to **relate** concepts and methods in calculus.

CO3:
Ability to **evaluate** solutions of engineering problems using relevant concepts and methods.

References

1. James, G et.al.(2007): Modern Engineering Mathematics. Pearson Education, 4th edition.
2. Stroud,K.A. (2007): Engineering Mathematics. Industrial Press Inc, 6th edition.
3. Hughess. H, Andrew. M.G, Willian. G.M (2010), Calculus Single and Multivariable, John Wiley & Sons.
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. Hughess. H, Andrew. M.G, Willian. G.M (2010), Calculus Single and Multivariable, John Wiley & Sons.

EQT102/3 : ENGINEERING MATHEMATICS II

Course Synopsis

This course will introduce students to ordinary differential equations. Topics covered include solutions of ordinary differential equations including existence and uniqueness theorems, analytical methods of solutions for first and second order differential equations, Cauchy-Euler equations and also applications to modeling. The course teach students on how to solve differential equations, how to graph solutions and how to interpret solutions expressed in either algebraic or graphical form. The course will also introduce students to Laplace transforms method to solve differential equations and in the chapter four students will be introduced to Fourier Series expansion of a function. In the last chapter, students will be introduced to the method of separation of variables to solve partial differential equations problem.

Course Outcomes

CO1:
Ability to **solve** differential equations which covered first and second order ordinary differential equations and partial differential equations

CO2:
Ability to **apply** the Laplace transforms method to **solve** and **analyze** certain differential equations problems theoretically and physically.

CO3:
Ability to **apply** the fundamental understanding of Fourier series and able to **express** Fourier series and Fourier series expansions to any given function.

CO4:
Ability to **relate** the differential equations and **analyze** certain physical problems.

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.

BQT133/3 : BUSINESS MATHEMATICS

Course Synopsis

The purpose of the course is to provide the student with mathemati--

cal techniques to help them to make better decisions in the business problems. Topics include: Matrix Algebra, Financial Mathematics, Differential Calculus and Integral Calculus.

Course Outcomes

CO1:
Identify and **apply** the knowledge of matrix algebra to solve the business models.

CO2:
Identify and apply the knowledge in mathematics to solve the financial problems

CO3:
Apply the knowledge of Differential Calculus and select suitable methods to solve the business problems.

CO4:
Apply the knowledge of Integral Calculus and select suitable methods to solve the business problems

References

1. John Shannon (1995). Mathematics for Business, Economics and Finance, John Wiley and Son
2. Brechner, Robert (2008). Contemporary Mathematics for Business and Consumers, South-Western College Pub.
3. Steve Slavin, Tere Stouffer (2007). Business Math, John Wiley.
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. Hughess. H, Andrew. M.G, Willian. G.M (2010), Calculus Single and Multivariable, John Wiley & Sons.

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.

Course Outcomes

CO1:
Ability to demonstrate knowledge and understanding of elements in business statistics.

CO2:
Ability to apply knowledge and concept of business statistics in decision making.

CO3:
Ability to perform statistical analysis, estimation and inference regarding one sample.

CO4:
Ability to perform statistical analysis , estimation and inference regarding two and more samples.

References

1. Mark, L. B., Levine, D. M. & Krehbiel, T.C. (2008). Basic Business Statistics. 11th edition, Prentice Hall.
2. Bowerman, O. & Orris, P. (2008). Essentials of Business Statistics. 2nd edition, McGraw Hill/Irwin.
3. Weiers, R. M. (2007). Introduction to Business Statistics. Duxbury Press, An International Thomson Publishing Company.
4. Ronald E. W. , Raymond H. M, Sharon. L. M, Keying Ye (2002), Probability & Statistic for Engineers & Scientist, Prentice Hall.
5. Frederick L.C(2006), Statistics: A Gentle Introduction, Thousand Oaks, California, SAGE Publication.

EQT203/3 : ENGINEERING MATHEMATICS III

Course Synopsis

This course introduces the definition and concepts in vector calculus, numerical methods and introduction on basic of finite element. The topics discuss includes differentiation and integration of vectors, surface and volume integral, green's, gauss and stokes theorems, curve fitting, interpolation, numerical integration, numerical solution of differential equations, introduction to finite element for 1-D heat transfer problem. Important concepts related to vector fields, numerical method and basic 1-D finite element method are introduce in this course and then follow by the use of these concepts in solving mathematical problem.

Course Outcomes

CO1:
Ability to **apply** vector calculus concepts to solve single, double or triple integrals

CO2:
Ability to **solve** numerical problems by selecting suitable numerical methods

CO3:
Ability to **relate** the weighted residual approach and finite element method to solve engineering problem

References

1. Erwin Kreyszig (2006): Advanced Engineering Mathematics, 9th edition, John Wiley & Sons, Inc.
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.

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.

Course Outcomes

CO1:
Ability to **identify** and **choose** the suitable concepts of discrete mathematics in solving engineering problems

CO2:
Ability to **apply** the concept of linear algebra in solving engineering problems

CO3:
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.

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.

Course Outcomes

CO1:
Ability to **define** the vector integrals and **evaluate** the line, volume and surface integral using Green, Guass and Stoke theorem.

CO2:
Ability to **find** the numerical solution of the equation and **use** the suitable numerical methods to **solve** the problems.

CO3:
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. 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.

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 test, Sign test, Mann-Whitney test, Kruskal Wallis test, Wilcoxon-signed rank test and Spearman rank correlation).

Course Outcomes

CO1:
Ability to **understand, apply** and **explain** the basic concepts of statistics.

CO2:
Ability to **solve** problems using suitable statistical inference.

CO3:
Ability to **construct** the **model** and analyze the result from ANOVA table and simple linear regression.

CO4:
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.

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.

Course Outcomes

CO1:
Ability to **apply** the theory of probability and **solve** discrete and continuous random variables

CO2:
Ability to **understand** and **apply** the concepts of probability distribution.

CO3:
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.

EQT373/4: STATISTICS FOR ENGINEERS

Course Synopsis

Topics to be covered will include collection and summarization of data, measures of central tendency and dispersion, random variables, discrete and continuous probability distributions, sampling distribution, estimation, hypothesis testing, introductory linear regression, analysis of variance, introductory design of experiments and statistical process control (introduction to control charts).

Course Outcomes

CO1:
Ability to apply fundamental concepts of probability distributions and statistics.

CO2:
Ability to apply knowledge of statistics in analyze and interpret data

CO3:
Ability to apply knowledge of statistics for decision making and to solve engineering problems.

CO4:
Ability to apply knowledge of statistics for designing the engineering experiment

CO5:
Ability to relate relevant concepts and practices of statistic process control in the manufacturing processes.

References

1. Jay L.Devore. (2007).Probability and Statistics for Engineering and the Sciences. 7th Edition. Duxbury Press, Belmont.
2. Willian Navidi. (2006). Statistics for Engineers and Scientists.MaGraw Hill, New York.
3. Douglas C.Montgomery, George C.Runger.Norma F.Hubele.John Wiley (2001). Engineering Statistics. 2nd Edition. New York.
4. Robert V. Hogg, Johannes Ledolter (1992). Applied Statistics for Engineers and Physical Scientist. 2nd Edition. Macmillan.New York.
5. Ronald E. W. , Raymond H. M, Sharon. L. M, Keying Ye (2002), Probability & Statistic for Engineers & Scientist, Prentice Hall.

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Introduction

The Centre for Industrial Collaboration (CIC) was established on 18th March 2004. It was formed to enable UniMAP to achieve its goal in providing the industry with technically competent graduates. This will eventually support the nation building. CIC depicts a multifaceted organization as it offers programs and academic activities which emphasize on participation and commitment from various industrial sectors. Centralized programs and activities by CIC are recognized as the core engineering courses and activities. These programs are aimed to facilitate the upgrade of UniMAP's competitive status in designing, processing and producing various products with profound inclination toward engineering. Among the training courses offered with the involvement from industries are Industrial Exposure (IndEx), Industrial Entrepreneur (IndEnt), Industrial Training (InTra), Industrial Technical Lecture (InTeLect), Staff Internship, forum and seminars with industries. The program schedules will be notified to the students from time to time through UniMAP portal.

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COURSE TITLE : INDUSTRIAL TRAINING (INTRA)

COURSE CODE :
EIT300 (Degree Programme)
EIT301 (Student Exchange Programme)
DIT361 (Diploma Programme)

Course Synopsis

Students will be exposed to technical and application aspects as well as other aspects such as company organizational structure, departmental structure, company operation, work procedure, safety procedure, management, communication, project management and presentation. The students are also required to submit their log book and final report at the end of industrial training. Overall, the course is practical based with training duration of about 12 weeks.

References

1. UniMAP Industrial Training Guideline Rev A (July 2008)
2. UniMAP Industrial Training Log Book

COURSE TITLE : INDUSTRIAL TRAINING (INTRA)

COURSE CODE : BIT190
: BIT290

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 Rev A (July 2008)
2. UniMAP Industrial Training Log Book

COURSE TITLE : INCUBATOR PROGRAMME

COURSE CODE : BIT291

Course Synopsis

This course gives direct exposure to the students to the real entrepreneurship and business world. Students will be stationed in business incubators, namely assigned to one of the companies which has just started business and still operating in the business incubator. Students will go through the experience of starting a company / business including being exposed to the company registration procedures, banking transactions, manufacture of new product, business network construction, management of the company and so on. Students will also get exposure communicating in actual business world and this will develop their skills in constructing entrepreneurial network. Students will be required to send their log books and final reports towards the end of the Incubator Program. Generally, this course is directly practical based .

References

1. UniMAP Industrial Training Guideline Rev A (July 2008)
2. UniMAP Industrial Training Log Book

COURSE OFFERED

EIT 300/6 INDUSTRIAL TRAINING [DEGREE IN ENGINEERING PROGRAMME]

Course Synopsis

Students will be exposed 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 are also required to submit their log book and final report at the end of Industrial Training. The overall course component is practical based with training duration of about 12 weeks.

Course Outcomes

CO1:
Ability to adapt to real working environment.

CO2:
Ability to relate the oretical knowledge with application in industry.

CO3:
Ability to develop skills in work ethics, communication, management, team work etc.

CO4:
Ability to write a technical report.

References

1. UniMAP Industrial Training Guideline Rev A (July 2008)
2. UniMAP Industrial Training Log Book

BIT190/3, BIT290/3 INDUSTRIAL TRAINING [DEGREE IN BUSINESS (INTERNATIONAL BUSINESS) PROGRAMME]

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.

Course Outcomes

CO1:
Ability to display good work performance during training period

CO2:
Ability to demonstrate good personality including communication skills, leadership and work ethics during training period

CO3:
Ability to describe and demonstrate knowledge regarding host company and industrial training activities.

References

1. UniMAP Industrial Training Guideline Rev A (July 2008)
2. UniMAP Industrial Training Log Book

BIT291/6 INDUSTRIAL TRAINING [DEGREE IN BUSINESS (ENGINEERING ENTREPRENEURSHIP) PROGRAMME]

Course Synopsis

This course gives direct exposure to the students to the real entrepreneurship and business world. Students will be stationed in business incubators, namely assigned to one of the companies which has just started business and still operating in the business incubator. Students will go through the experience of starting a company / business including being exposed to the company registration procedures, banking transactions, manufacture of new product, business network construction, management of the company and so on. Students will also get exposure communicating in actual business world and this will develop their skills in constructing entrepreneurial network. Students will be required to send their log books and final reports towards the end of the Incubator Program. Generally, this course is directly practical based .

Course Outcomes

CO1:
Ability to display good work performance during incubation raining period

CO2:
Ability to demonstrate good personality including communication skills, leadership and work ethics during incubation training period

CO3:
Ability to describe and demonstrate knowledge regarding Host Company and entrepreneurial training activities.

References

1. UniMAP Industrial Training Guideline Rev A (July 2008)
2. UniMAP Industrial Training Log Book

14. CO-CURRICULUM CENTRE

CO-CURRICULUM CENTRE
Universiti Malaysia Perlis (UniMAP),
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Jalan Jejawi Sematang,
02600 Jejawi, Arau, Perlis.

Tel : 04 – 9797908/7913/7911
Fax : 04 – 9797907

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 (opposite of the Perlis JPJ building). 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 compulsory to take 1 course or 1 unit. Co-curriculum Centre currently offers up to 33 co-curriculum courses for degree students regardless of their academic programmes.

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CO-CURRICULUM COURSES OFFERED BY CO-CURRICULUM CENTRE

During their study, all the degree students must take 1 unit from the courses that had been offered by the following divisions below:

NO.	COURSE	COURSE CODE	NOTE
1	Golf	EUW101	* OFFERED IN SINGLE COURSE
2	Baseball	EUW102	
3	Woodball	EUW103	
4	Football	EUW104	
5	Netball	EUW105	
6	Tenni	EUW106	
7	Equestrian	EUW107	
8	Weightlifting	EUW108	
9	Foundations of Gamelan	EUW151	* OFFERED IN PACKAGES
	Gamelan II	EUW251	
	Gamelan III	EUW351	
10	Jazz Band I	EUW152	
	Jazz Band II	EUW252	
	Jazz Band III	EUW352	
11	Brass Band I	EUW153	
	Brass Band II	EUW253	
	Brass Band III	EUW353	
12	Angklung I	EUW154	
	Angklung II	EUW254	
	Angklung III	EUW354	
13	Arts of Creative Movement	EUW155	* OFFERED IN SINGLE COURSE
14	ROTU Army I	EUW161	
	ROTU Army II	EUW261	
	ROTU Army III	EUW361	
	ROTU Army IV	EUW461	* OFFERED IN PACKAGES
	ROTU Army V	EUW561	
	ROTU Army VI	EUW661	
15	The Malaysian Red Crescent Societies Certification Course I	EUW163	* OFFERED IN SCHEDULED PACKAGES
	The Malaysian Red Crescent Societies Certification Course II	EUW263	
	The Malaysian Red Crescent Societies Certification Course III	EUW 363	
16	SVPC- I @ Students Voluntary Police Corp	EUW 166	* OFFERED IN PACKAGES
	SVPC- 2 @ Students Voluntary Police Corp	EUW 266	
	SVPC- 3 @ Students Voluntary Police Corp	EUW 366	
	SVPC- 4 @ Students Voluntary Police Corp	EUW 466	
	SVPC- 5 @ Students Voluntary Police Corp	EUW 566	

NO.	COURSE	COURSE CODE	NOTE
	SVPC- 6 @ Students Voluntary Police Corp	EUW 666	* OFFERED IN PACKAGES
17	Seni Silat Cekak I Seni Silat Cekak II Seni Silat Cekak III	EUW171 EUW271 EUW371	
18	Taekwon-Do GTF I Taekwon-Do GTF II Taekwon-Do GTF III	EUW172 EUW272 EUW372	
19	Karate-Do	EUW173	* OFFERED IN SINGLE COURSE
20	Fencing	EUW174	
21	Swimming I	EUW180	OFFERED IN SCHEDULED PACKAGES
	Swimming II	EUW280	
	Swimming III	EUW380	
22	Lawn Bowl	EUW181	* OFFERED IN SINGLE COURSE
23	Petanque	EUW182	
24	Canoe	EUW183	
25	Badminton	EUW184	* OFFERED IN SINGLE COURSE
26	Hockey	EUW185	
27	Sepak Takraw	EUW186	
28	Rugby	EUW 187	
29	Archery	EUW 188	
30	Ping Pong	EUW 189	
31	Drama, Playwright & Acting	EUW 190	
32	Community Services	EUW 191	
33	Initiative & Innovation	EUW192	

COURSE SYLLABUS

EUW101
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.

EUW102
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.

EUW103
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/

EUW104
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.

EUW105
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.

EUW106
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.

EUW107
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.

EUW108
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.

EUW 151
BASIC 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.

EUW 251
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.

EUW 351
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.

EUW 152
JAZZ GROUP

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.

EUW 252
JAZZ GROUP 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.

EUW 352
JAZZ GROUP 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.

EUW 153
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.

EUW 253
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.

EUW 353
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.

EUW 154
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.

EUW 254
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.

EUW 354
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.

EUW 155
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.

EUW161
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

i) Modul Latihan dari Kolej Tentera Darat ATM
ii) Buku Panduan Senjata-senjata Kompeni, Kementerian Pertahanan Malaysia, 2004
iii) Buku Panduan Askar Wataniah, Kementerian Pertahanan Malaysia, 1995

EUW261
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

i) Modul Latihan dari Kolej Tentera Darat ATM
ii) Buku Panduan Senjata-senjata Kompeni, Kementerian Pertahanan Malaysia, 2004
iii) Buku Panduan Askar Wataniah, Kementerian Pertahanan Malaysia, 1995

EUW361
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

i) Modul Latihan dari Kolej Tentera Darat ATM
ii) Buku Panduan Senjata-senjata Kompeni, Kementerian Pertahanan Malaysia, 2004
iii) Buku Panduan Askar Wataniah, Kementerian Pertahanan Malaysia, 1995

EUW461
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

i) Modul Latihan dari Kolej Tentera Darat ATM
ii) Buku Panduan Senjata-senjata Kompeni, Kementerian Pertahanan Malaysia, 2004
iii) Buku Panduan Askar Wataniah, Kementerian Pertahanan Malaysia, 1995

EUW561
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

i) Modul Latihan dari Kolej Tentera Darat ATM
ii) Buku Panduan Senjata-senjata Kompeni, Kementerian Pertahanan Malaysia, 2004
iii) Buku Panduan Askar Wataniah, Kementerian Pertahanan Malaysia, 1995

EUW661
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

i) Modul Latihan dari Kolej Tentera Darat ATM
ii) Buku Panduan Senjata-senjata Kompeni, Kementerian Pertahanan Malaysia, 2004
iii) Buku Panduan Askar Wataniah, Kementerian Pertahanan Malaysia, 1995

EUW163
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.

EUW263
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.

EUW363
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.

EUW166
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
   Akta Pencegahan Jenayah 1959
8. Manual Pertolongan Cemas PBSMM
9. Manual Senjata Kecil PDRM

EUW 266
SVPC-2 @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, out door 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
   Akta Pencegahan Jenayah 1959
8. Manual Pertolongan Cemas PBSMM
9. Manual Senjata Kecil PDRM

EUW 366
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
   Akta Pencegahan Jenayah 1959
8. Manual Pertolongan Cemas PBSMM
9. Manual Senjata Kecil PDRM

EUW466
SVPC-4 @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
   Akta Pencegahan Jenayah 1959
8. Manual Pertolongan Cemas PBSMM
9. Manual Senjata Kecil PDRM

EUW566
SVPC-5 @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
   Akta Pencegahan Jenayah 1959
8. Manual Pertolongan Cemas PBSMM
9. Manual Senjata Kecil PDRM

EUW666
SVPC-6 @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
   Akta Pencegahan Jenayah 1959
8. Manual Pertolongan Cemas PBSMM
9. Manual Senjata Kecil PDRM

EUW171
SENI SILAT CEKAK

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, backgroundback, 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.

EUW271
SENI SILAT CEKAK II

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, backgroundback, 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.

EUW371
SENI SILAT CEKAK III

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, backgroundback, 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.

EUW172
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.

EUW272
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.

EUW372
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.

EUW173
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

EUW174
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

EUW180
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.

EUW280
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.

EUW380
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.

EUW181
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.

EUW182
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.

EUW182
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.

EUW184
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.

EUW185
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. Anders, 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., 'How to Play Hockey: A Step-By-Step Guide', Jarrold Sports, Jarrold Publishing, 1993.
5. Mitchell-Taverner, C., 'Field Hockey Techniques & Tactics', Human Kinetics; 2nd edition, 2004).

EUW186
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.

EUW187
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, 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

EUW188
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.

EUW189
PING PONG

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.

EUW 190
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’, Focal Press; 1st edition, 2002.
4. Marsh, M., ‘Screen Acting’, Nabu Press, 2010.
5. Tucker, P., ‘Secret of Screen Acting’, New York Routledge, 2003.

EUW191
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.

EUW192
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.