**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**
**(UTeM)**

# HAND BOOK

## DIPLOMA & BACHELOR PROGRAMMES
## FACULTY OF ELECTRICAL ENGINEERING

## ACADEMIC SESSION 2018/2019

# CONTENTS

# UNIVERSITI TEKNIKAL MALAYSIA MELAKA

## VISION

To Be One of The World's Leading Innovative and Creative Technical Universities

## MISSION

UTeM is committed to pioneer and contribute towards the prosperity of the nation and the world by;

1. Promoting knowledge through innovative teaching and learning, research and technical scholarship.
2. Developing professional leaders with impeccable moral values.
3. Generating sustainable development through smart partnership with the community and industry.

## MOTTO

EXCELLENCE THROUGH COMPETENCY

## GENERAL EDUCATIONAL GOALS

1. To conduct academic and professional programmes based on relevant needs of the industries.

2. To produce graduates with relevant knowledge, technical competency, soft skills, social responsibility and accountability.

3. To cultivate scientific method, critical thinking, creative and innovative problem solving and autonomy in decision making amongst graduates.

4. To foster development and innovation activities in collaboration with industries for the development of national wealth.

5. To equip graduates with leadership and teamwork skills as well as develop communication and life-long learning skills.

6. To develop technopreneurship and managerial skills amongst graduates.

7. To instil an appreciation of the arts and cultural values and awareness of healthy life styles amongst graduates.

# DEAN'S WELCOMING SPEECH

*Bismillahir Rahmanir Rahim*

*Assalamu'alaikum and a Very Good Day*

All praises are due to Allah s.w.t, the most Gracious, and with His Mercy the Academic Handbook of Diploma and Bachelor Degree for the Academic Session of 2018/2019 has been successfully published by the Faculty of Electrical Engineering.

First, I would like to congratulate all new students on your admission to UTeM and welcome to Faculty of Electrical Engineering. I can assure you that you have come to the right Institution of Higher Learning (IHL) and an exciting learning experience awaits you at this faculty.

In line with the faculty's motto "Towards Academic Excellence", we strive hard to produce a competent, capable, knowledgeable and ethical human capital that is able to assist the government and the industry in pushing our country towards better economy and lifestyle. In order to achieve this, the faculty decided to implement Outcome Based Education (OBE) curriculum, which has been implemented since July 2010. We hope this approach will better equip our students with the required skills upon their graduation.

This year, theFaculty offers two types of courses to undergraduate students, which consist of diploma and degree programs. The diploma program will focus on practical aspect and fulfills the Malaysian Qualification Agency (MQA) requirement for accreditation. For our degree programs, the Faculty maintains new intake for both Bachelor of Electrical Engineering and Bachelor of Mechatronics Engineering programs. The Bachelor of Electrical Engineering is a broad-based program with the specialization starts in the second semester of the third year. On the other hand, Bachelor of Mechatronics Engineering program focuses more on the mechatronics systems design and analysis. These bachelor programs have fulfilled the Board of Engineers (BEM's) requirement for an engineering program that is accredited by the Engineering Accreditation Council (EAC).

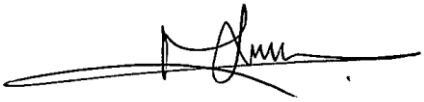
This handbook provides a brief overview about the Faculty, curriculum structure, academic advisory system, university grading system and syllabus contents of various courses; which serves as a reference for the new intake of Academic Session of 2018/2019. Hopefully, it will provide guidance for students in

planning their studies systematically in order to achieve academic excellence and eventually graduate on time with good grades.

Last but not least, I would like to extend my thanks and gratitude to all the committee members for their hard work, support and effort towards publishing this handbook.

Wassalam.

**“Towards Academic Excellence”**



**ASSOCIATE PROF. IR. DR. MD NAZRI BIN OTHMAN**
Dean,
Faculty of Electrical Engineering
Universiti Teknikal Malaysia Melaka

# FACULTY'S ORGANISATION STRUCTURE

**ASSOCIATE PROF. IR. DR. MD NAZRI BIN OTHMAN**
DEAN

**ASSOCIATE PROF. Ts. DR. MOHD LUQMAN BIN MOHD JAMIL**
DEPUTY DEAN (ACADEMIC)

**ASSOCIATE PROF. DR. HIDAYAT BIN ZAINUDIN**
DEPUTY DEAN
(STUDENT DEVELOPMENT)

**IR. DR. NORAZHAR BIN ABU BAKAR**
DEPUTY DEAN
(RESEARCH & POST GRADUATE STUDIES)

**DR. MAASPALIZA BINTI AZRI**
HEAD OF DEPARTMENT
POWER ELECTRONICS & DRIVES ENGINEERING

**DR. NORHAFIZ BIN SALIM**
HEAD OF DEPARTMENT
INDUSTRIAL POWER ENGINEERING

**DR. AZRITA BINTI ALIAS**
HEAD OF DEPARTMENT
CONTROL, INSTRUMENTATION & AUTOMATION ENGINEERING

**DR. MUHAMMAD HERMAN BIN JAMALUDDIN**
HEAD OF DEPARTMENT
MECHATRONICS ENGINEERING

**DR. FAIRUL AZHAR BIN ABDUL SHUKOR**
HEAD OF DEPARTMENT
DIPLOMA STUDIES

**NOR-ALIZA BINTI IBRAHIM**
SENIOR ASSISTANT REGISTRAR
ACADEMIC & FINANCE UNIT

**RAIHATUL JANNAH BINTI ABDULLAH**
ASSISTANT REGISTRAR
ADMINISTRATION & STUDENTS' DEVELOPMENT UNIT

# FACULTY AT A GLANCE

Faculty of Electrical Engineering (FKE) was established in early 2001 and officially began to operate from 22nd June 2001 after obtaining an authorization from Malaysia's Ministry of Education (which is currently known as Malayisia's Ministry of Higher Learning). Initially, the Faculty's temporary campus was situated at Taman Tasik Utama, Ayer Keroh and later was moved inside well structed and beautiful UTeM's main campus at Durian Tunggal in April 2005.

In order to uphold the academic pillar that being decended to the Faculty, a managerial team leaded by Dean was established and assisted by two Deputy Deans, five Heads of Department, a Chief Assistant Registrar and an Assistant Registrar. Other than that, the combination of lecturers and tutor that excel in various fields provide a strong academic background inside Faculty as well as high commitment in educating our new generation to become outstanding graduates that equipped with knowledge, technical competencies and well versed soft skills.

The Faculty of Electrical Engineering offers three (3) Undergraduate Programmes and three (3) types of Postgraduate Programmes:

Undergraduate Programmes:

1. Bachelor of Electrical Engineering (BEKG)
2. Bachelor of Mechatronic Engineering (BEKM)
3. Diploma of Electrical Engineering (DEK)

Postgraduate Programmes:

1. Electrical Engineering & Mechatronic Engineering (Research Mode)
   a) Doctor of Philosophy (Ph. D)
   b) Doctor of Engineering (D. Eng)
   c) Master of Science (M.Sc.)

2. Electrical Engineering (Mixed-Mode)
   a) Master of Electrical Engineering (Industrial Power) - MEKP
   b) Master of Electrical Engineering (Power Electronic & Drives) – MEKE

3. Electrical Engineering (Taught Course Mode)
   a) Master of Electrical Engineering – MEKG
   b) Master of Mechatronics Engineering – MEKH

# FACULTY'S MISSION, MOTTO AND OBJECTIVES

## FACULTY'S MISSION

The Faculty's mission is to provide quality technical education and professional services through broad-based knowledge, innovation and creativity based on expertise and latest technology in enhancing excellent work culture, mutual understanding and cooperation while upholding moral values in line with the national aspirations.

## FACULTY'S MOTTO

TOWARDS ACADEMIC EXCELLENCE

## FACULTY'S OBJECTIVES

1. To conduct academic programs recognized by professional bodies that meet the global standards.
2. To produce competent and responsible professionals.
3. To provide balanced academic programs in terms of theory and practical based on Outcome Based Educations (OBE).
4. To enhance smart partnerships between the Faculty with the industry through services, consultancies, and research activities.
5. To create a conducive teaching and learning environment.
6. To produce knowledgeable, outstanding visionary individuals instilled with moral values.
7. To promote a culture of publication amongst academics.

# CURRICULUM STRUCTURE

## DIPLOMA PROGRAMME

During the first year of study, the student will be equipped with fundamental courses such as mathematics, science and computer programming to provide the foundation for learning engineering courses. After that, during the second year, the student will be introduced to Electrical and Electronic Engineering courses. At the end of this second year, students are required to undergo an Industrial Training for 10 weeks. Finally, during the third year, the students shall continue learning programme core courses.

## BACHELOR PROGRAMMES

The Faculty of Electrical Engineering offers full time 4-year undergraduate programmes leading to the award of Bachelor of Electrical Engineering degree and Bachelor of Mechatronic Engineering degree. The curriculum has been developed in-line with the University's and Faculty's missions and the educational objectives. The academic curriculum aims of producing competence graduates that satisfy the industry needs. In addition, the effectiveness and quality of the curriculum through the educational content, teaching and learning are constantly monitored with appropriate assessment methods.

The academic curriculum of the Bachelor Programmes consists of both engineering and non-engineering courses. The key elements of the curriculum include the laboratory work, industrial training, capstone projects and final year projects. In addition, engineering application, integrated exposure to professional engineering practice, including management and professional ethics are also part of the programme's curriculum. In order to expose the students to engineering practice, technical talks by guest lecturers from industry, industry visits, and courses on professional ethics and conduct, are also included.

The University's compulsory courses included English for Academic Purpose, Academic Writing and English for Professional Interaction, Ethnic Relation, and Tamadun Islam dan Tamadun Asia. On the other hand, students are exposed to the third language, engineering management skills, entrepreneurship, communication skills, co-curricular activities and personality development in order to produce engineers who are competent and able to work independently with positive attitudes.

The University offers professional certification preparatory course to increase the value and marketability of the graduates, relevant to the needs of the industries. The objectives of this course are

- To increase the student competency in skills that are relevant to his / her future career;
- To increase the student competitiveness in securing jobs after graduation;
- To support the University initiative in producing holistic and balanced graduates in line with the first shift of the Malaysia Education Blueprint 2013-2025.

The professional certification preparatory course is compulsory for all bachelor degree students registered with the University starting from 2017/2018 intake and onwards. The students are expected to choose, register and complete one (1) professional certification preparation course before the end of their study. The Faculty will offer Basic Hydraulic Technology Certification Course (BEKG 4710) starting from session 2020/2021.

Rexroth
Bosch Group

As one of the world leading specialists for Drive and Control technology, Rexroth has a unique technologic expertise to be transferred to participants worldwide. Endorsed by the Drive & Control Academy Würzburg in Germany, a Basic Hydraulic Technology certification course provides participants with a basic hydraulic technology. In this certification course, participants will have experienced fundamental knowledge in hydrostatics, design of a hydraulic systems, graphical symbols, hydraulic fluids, hydraulic pumps and motors, hydraulic cylinders and hydraulic valves. Industrial related project will be exposed to the participants in order to imitate the real industrial environment employing hydraulic technologies. The duration of this course is 3 days.

Suruhanjaya Tenaga
Energy Commission

On top of that, faculty offers professional certification preparatory course for Electrical Energy Management that embedded in the Energy Utilization and Conservation course (BEKP 4853). The course is outlined and approved by Suruhanjaya Tenaga and the students will benefit from the full appreciation of the regulation and develop the management skills required for an Energy Manager towards facilitating the green aspiration of our nation. Students who obtained at least grade B+ in the Energy Utilization and Conservation course and CGPA ≥ 2.5 will be awarded with a Certificate of Energy Management. Graduates who hold this certicate can apply to be a Registered Electrical Energy Manager (REEM) certified by the Suruhanjaya Tenaga with the following additional requirements:

i. one (1) year of working experience in the related field and
ii. submit a report related to item (i)

# ADMISSION REQUIREMENTS

## MINIMUM REQUIREMENTS TO REGISTER IN DIPLOMA PROGRAMME

| FOR SPM HOLDERS | |
|---|---|
| **General Requirements** | 1. Citizen of Malaysia; and<br>2. Pass in Sijil Pelajaran Malaysia or its equivalent with at least **FIVE (5)** credits including **Bahasa Melayu/ Malaysia** |
| **Programme Specific Requirements** | 1. Fulfilled the Universities General Requirements with **FOUR (4)** credits **(Gred C)** in the following subjects:<br>• Mathematics<br>• Additional Mathematics<br>• Physics<br><br>And either one (1) of the following subjects:<br>• Additional Science/ Applied Science<br>• Science<br>• Chemistry<br>• Biology<br>• Engineering Technology<br>• Principle of Electrical and Electronic<br>• Application of Electrical and Electronic<br>• Engineering Technology or Mechanical or Electrical & Electronics Engineering Studies<br>• Electrical Automation and Diesel<br>• Computerize Machine<br>• Engineering Drawing<br>• Visual Arts or Invention and<br>2. Pass at least **(Gred E)** in English Language and<br>3. The applicant must not a colour blind or physically disabled which impair to complete practical assignments. |

## MINIMUM REQUIREMENTS TO REGISTER IN BACHELOR PROGRAMMES

| FOR DIPLOMA/EQUIVALENT HOLDERS | |
|---|---|
| **Universities General Requirements** | Pass in **Sijil Pelajaran Malaysia (SPM)** / equivalent with a credit in Bahasa Melayu/Bahasa Malaysia or Bahasa Melayu/Bahasa Malaysia July paper<br><br>**and**<br><br>**Diploma or other qualification recognised as equivalent** by the Government of Malaysia and approved by the University's Senate<br><br>**or**<br><br>Pass in **Sijil Tinggi Persekolahan Malaysia (STPM) year 2016 or previous STPM** with at least:<br><br>• **C Grade (NGMP 2.00)** in General Studies; and<br>• **C Grade (NGMP 2.00)** in **two (2) other subjects** or<br><br>Pass in **Matriculation 2016 or previous examination** with **at least a CGPA of 2.50**<br><br>**and**<br><br>**Obtained at least Band 2 in the Malaysian University English Test (MUET).** |

| FOR DIPLOMA/EQUIVALENT HOLDERS | |
|---|---|
| **Programme Specific Requirements** | Pass in **Diploma** with at least a **CGPA of 3.00** in a related field from a recognised institution and approved by the University's Senate; and<br><br>Credit exemption is subject to the discretion and approval by the Faculty and<br><br>Pass/ completed studies at Diploma level before the commencement of academic session or<br><br>Pass in **Sijil Tinggi Persekolahan Malaysia (STPM) year 2016 or previousSTPM**with at least C Grades (NGMP 2.00) in all of the following subjects:<br>• General Studies<br>• Physics /Biology<br>• Mathematics T/Further Mathematics T/ Mathematics S<br>• Chemistry<br><br>The applicant who did not take Physics at STPM level must has pass in Sijil Pelajaran Malaysia (SPM)/ equivalent with at least **4B** in Physics, or<br><br>Pass in **MOE Matriculation/ UM Foundation/ UiTM Foundationyear 2014 or previous STPM** with at least **C Grades** (NGMP 2.00) in **all** of the following subjects:<br>• Physics / Engineering Physics/Biology<br>• Mathematics T/Further Mathematics<br>• Chemistry / Engineering Chemistry<br><br>The applicant who did not take Physics at STPM level must has pass in Sijil Pelajaran Malaysia (SPM)/ equivalent with at least **4B** in Physics and<br>The applicant must not be colour blind or physically disabled which impairs to complete practical assignments. |

| FOR MATRICULATION HOLDERS | |
|---|---|
| **Universities General Requirements** | Pass in **Sijil Pelajaran Malaysia (SPM)** / equivalent with a credit in Bahasa Melayu/Bahasa Malaysia or Bahasa Melayu/Bahasa Malaysia July Paper; and<br><br>Pass in MOE Matriculation/ UM Science Foundation/ UiTM Foundation **with CGPA of at least 2.50; and**<br><br>Obtained at least **Band 2** in the Malaysian University English Test (MUET). |
| **Programme Specific Requirements** | Obtained at least **C Grade** (NGMP 2.00) in MOE Matriculation/ UM Science Foundation/ UiTM Foundation in **all** of the following subjects:<br><br>• Mathematics / Engineering Mathematics<br>• Chemistry / Engineering Chemistry / Engineering Science<br>• Physics / Engineering Physics / Biology / Electrical and Electronic Engineering Studies<br><br>and<br><br>The applicant who did not take Physics at STPM level must has pass in Sijil Pelajaran Malaysia (SPM)/ equivalent with at least **4B** in Physics.<br><br>and<br><br>The applicant must not be colour blind or physically disabled which impairs to complete practical assignments. |

| FOR STPM HOLDERS | |
|---|---|
| **Universities General Requirements** | Pass in **Sijil Pelajaran Malaysia (SPM)** / equivalent with a credit in Bahasa Melayu / Bahasa Malaysia or a credit in Bahasa Melayu / Bahasa Malaysia July Paper;<br><br>Pass in **Sijil Tinggi Persekolahan Malaysia (STPM)** with CGPA of at least 2.50 and obtained at least:<br><br>• C Grade (NGMP 2.00) in **General Studies**; and<br>• C Grade (NGMP 2.00) in **two (2)** other subjects, and<br><br>Obtained at least **Band 2** in the Malaysian University English Test (MUET). |
| **Programme Specific Requirements** | Pass in Sijil Tinggi Persekolahan Malaysia (STPM) with at least **C Grade** (NGMP 2.00) in **all** of the following subjects:<br><br>• Mathematics T/Further Mathematics T/ Mathematics S<br>• Chemistry<br>• Physics/Biology<br><br>**and**<br><br>The applicant who did not take Physics at **STPM** level must has pass in Sijil Pelajaran Malaysia (**SPM**)/ equivalent with at least **4B** in Physics.<br><br>**and**<br><br>The applicant must not be colour blind and not physically disabled which impairs to complete practical assignments. |

# GRADING SYSTEM

Student's performance in every course is evaluated based on the grade obtained. Grading system is shown in **Table 1**.

Generally, minimum passing grade for a course is Grade D. However, grade D up to C- are categorized as conditional pass and the students are allowed to improve their grade by repeating the course only once.

**Table 1:** Grading System and Point

| Grade (Achievement) | Relations between Marks Percentage and Grade Point | |
|---|---|---|
| | Marks Percentages | Grade Point |
| A (Excellent) | 80 – 100 | 4.0 |
| A- (Excellent) | 75 – 79 | 3.7 |
| B+ (Honours) | 70 – 74 | 3.3 |
| B (Honours) | 65 – 69 | 3.0 |
| B- (Pass) | 60 – 64 | 2.7 |
| C+ (Pass) | 55 – 59 | 2.3 |
| C (Pass) | 50 – 54 | 2.0 |
| C- (Conditional Pass) | 47 - 49 | 1.7 |
| D+ (Conditional Pass) | 44 – 46 | 1.3 |
| D (Conditional Pass) | 40 – 43 | 1.0 |
| E (Fail) | 0 - 39 | 0.0 |

# GRADUATION REQUIREMENT

| PROGRAMME | GRADUATION REQUIREMENT |
|---|---|
| **Diploma of Electrical Engineering** | Award of a Diploma will be made in two (2) regular semesters. Students are only eligible to be awarded a Diploma after the following conditions are met:<br>i. Students must obtain Kedudukan Baik (KB) in the last semester.<br>ii. Passed all courses required for curriculum requirements:<br>Minimum credit hour requirements for the award of a Diploma is 93 credits which consists of 71 credits of Core Program (P) courses, 16 credits of Compulsory University (W) courses and 6 credits for Elective (E) courses.<br>iii. Has applied for the award, recommended by the Faculty and approved by the Senate.<br>iv. Other requirements set by the university. |
| **Bachelor of Electrical Engineering** | Award of a Degree will be made in two (2) regular semesters. Students are only eligible to be awarded a Degree after the following conditions are met:<br>i. Students must obtain Kedudukan Baik (KB) in the last semester.<br>ii. Passed all courses required for curriculum requirements:<br>• Minimum credit hour requirements for the award of a Degree is 135 credits hour which consists of 103 credits of Core courses (P), 9 credits of Elective Program (E) courses, 4 credits of Elective University (E) courses, 5 credits of Industrial Training (P) and 14 credits of University Requirements (W) courses.<br>iii. Has applied for the award, recommended by the Faculty and approved by the Senate.<br>iv. Other requirements set by the university. |
| **Bachelor of Mechatronics Engineering** | Award of a Degree will be made in two (2) regular semesters. Students are only eligible to be awarded a Degree after the following conditions are met:<br>i. Students must obtain Kedudukan Baik (KB) in the last semester.<br>ii. Passed all courses required for curriculum requirements:<br>• Minimum credit hour requirements for the award of a Degree is 135 credits hour which consists of 106 credits of Core courses (P), 6 credits of Elective Program (E) courses, 4 credits of Elective University (E) courses, 5 credits of Industrial Training (P) and 14 credits of University Requirements (W) courses.<br>iii. Has applied for the award, recommended by the Faculty and approved by the Senate.<br>iv. Other requirements set by the university. |

# GRADUATES CAREER PROSPECTS

## DIPLOMA IN ELECTRICAL ENGINEERING

Demands for semi-professional level labour forces that are trained in electrical engineering are extremely high especially in the industrial sector. To respond to that, UTeM's Electrical Engineering diploma graduates are groomed with practical and application oriented knowledge so that they will be highly competitive in fulfilling the workforce markets.

## BACHELOR IN ELECTRICAL ENGINEERING AND MECHATRONICS ENGINEERING

Vacancies within the industries for engineers that are skilled and practical-oriented is on the rise. Lots of highly trained workforces in the entire engineering sector including Industry Power, Control, Instrumentation and Automation, Power Electronics and Drive and Mechatronics in professional level are required. Job opportunities for UTeM graduates in these fields will be more desirable by the industry once they have been equipped with the technical knowledge and strong practical skills.

Field of works for Bachelor of Electrical Engineering and Mechatronics Engineering graduates include:

- Semiconductor manufacturing industries
- Electrical items manufacturing
- High and Low Voltage components manufacturing
- Renewable Energy sector
- Oil and Gas Industries
- Consultancies Companies
- High technology industries such as aerospace industries
- Automation System manufacturing industries
- Biomedical Engineering Firms
- Software Development Sector
- Research and development Sector

Some of the career fields that are suitable include Process and Manufacturing Engineer, Design and Research Engineer, Consultancies Engineer, Testing and Quality Engineer, System Engineer and Academicians.

# SOFT SKILLS (KI)

Soft skills can be defined as the generic skills which have been identified as very critical in the global working environment apart from the fast pace of technological advancement.

The elements of Soft Skills that must be developed and implemented by each student are as follows:

1. Communication Skills (CS)
2. Creative Thinking and Problem Solving Skills (CTPS)
3. Teamwork Skills (TS)
4. Continual Learning and Information Management (LL)
5. Entrepreneurship Skills (ES)
6. Professional Ethics and Moral Values (EM)
7. Leadership Skills (LS)

Structure of Soft Skills Development in Institutional of Higher Learning Education:

1. Soft Skills Development via Formal Teaching and Learning Activities:

    - Stand Alone Course Model
    - Embedded Model
    - Combination of Embedded Model & Stand-Alone Course Model

2. Soft Skills Development via Supporting-Oriented Programme

    - Academic-Focused Supporting Programme
    - Non-Academic-Focused Supporting Programme

3. Soft Skills Development via Campus Activities and Lifestyle

    - Residential College
    - Campus Environment

# ACADEMIC ADVISORY SYSTEM

In UTeM students are free to take courses offered by the Faculty at every semester based on their capability, as long as they comply with the rules and regulations set up by the Faculty and university academic rules. Students need to plan their own study carefully with the guide of their Academic Advisor during their study in the university.

**CHARACTERISTICS OF THE SEMESTER SYSTEM**

- Students are free to take any courses offered in each semester sequentially based on their ability and conditions of course selection determined by the Faculty and university's academics regulations.
- Students should plan programs of study and learning appropriate which will need the advices from Academic Advisor during the studies.
- Students who obtained **UM (Ulang Mata pelajaran)** status for a given course (GRED E), should retake the course in the following semester or when offered by the faculty.

**THE IMPORTANCE OF AN ACADEMIC ADVISOR (PA)**

- Students need to be given a proper advice in term of courses taken under the semester system, where they are free to determine the number of courses to be taken based on their capability or in the case the student obtained a Conditional Position in the previous semester. They need to plan carefully to take courses which are suitable for them to carry and fully aware on its implication to their whole study period in the university.

- Semester system is a flexible system for a student with high, moderate or less capability to complete their study based on their own capability comply to the maximum study period set up by the university.

- The Academic Advisor is able to provide an advice not only in the academic matter, but also in the aspects of how the students can adapt themselves to the semester system, culture shock of studying in the university, time management and private matters that may affect the students' study performance.

- In the condition where the student is not with the same batch of other students during the study period due to difference in the courses taken, difficulty may be expected for him/her to discuss on the matter of study with the others. Here, the Academic Advisor is importance to provide a proper guidance.

**ROLES AND RESPONSIBILITIES OF STUDENT AND ACADEMIC ADVISOR/ PENASIHAT AKADEMIK (PA) IN THE ACADEMIC ADVISORY SYSTEM ARE AS FOLLOW:**

| Roles/Responsibilities of Academic Advisor/ Penasihat Akademik (PA) | Roles/Responsibilities of Student |
|---|---|
| • Conduct a meeting with the students at least two times for every semester. | • Always be open minded when meeting with the Academic Advisor. |
| • Make sure to student understand the academic system in UTeM. | • Attend meeting with the Academic Advisor at least two times for every semester. |
| • Provide an advice and make sure student's courses registration is based on his/her current academic result. | • Make the Academic Advisor as a mentor and always get an advice on the academic matter. |
| • Supervise the student study progress and provide guidance in making a good study planning. | • Make sure to have a good understanding on the academic system. |
| • Provide student to always be motivated in their study etc. | • Provide a copy of examination result to the Academic Advisor at each semester. |
| • Supervise the student record and file to be always updated – make sure no course is missed to fulfil the requirement for degree award. | • Get the certification of registration form, copy of certificates and reference letter from the Academic Advisor. |
| • Refer the student to the head of department for further action if necessary. | • Always keep a record on all courses that already been taken during the period of study to prevent missed course and fulfill the requirement for degree award. |
| • Advice &monitor the student to keep record of their obtained grades for a given course as shown in Appendix A, B & C (Student Audit Form). | • Students are required to keep record of their obtained grades for a given course as shown in Appendix A, B & C (Student Audit Form). |

**FLOW OF ACADEMIC ADVISORY SYSTEM IN UTEM:**

1. Academic Advisor/ Penasihat Akademik (PA)
2. Head of Department
3. Deputy Dean (Academic)
4. Dean

# LISTS OF THE FACULTY'S EXTERNAL EXAMINER, VISITING PROFESSOR, ADJUNCT PROFESSOR AND INDUSTRIAL ADVISORY PANEL

| EXTERNAL EXAMINER | QUALIFICATIONS | POSITION | APPOINTMENT PEROID |
|---|---|---|---|
| Professor Dr. Hj. Mohd Nasir Taib<br><br>(Department of Control, Instrumentasi & Automation) | 1. Doctor of Philosophy (Ph.D) in Control & Instrumentation, UMIST, United Kingdom<br><br>2. Master of Science in Control System with Distinction,University of Sheffield, United Kingdom<br><br>3. Bachelor of Engineering (Hons) in Electrical, University of Tasmania, Australia | Professor, Faculty of Electrical Engineering, UiTM | 1 November 2016 to 31 October 2018 |
| Professor Dr. Yahaya Bin Md Sam<br><br>(Department of Electrical Engineering) | 1. Doctor of Philosophy (Ph.D), Universiti Teknologi Malaysia<br><br>2. M.Sc. In Control Systems, University of Sheffield, Australia<br><br>3. B. Eng. (Hons), Electrical Engineering, Universiti Teknologi Malaysia | Senior Director Centre for Quality and Risk Management (QRiM), UTM | 2 Februari 2017 to 30 April 2019 |
| Assoc. Prof. Ts. Dr. Mohd Rusllim Mohamed<br><br>(Department of Electrical & Electronics Engineering) | 1. Doctor of Philosophy (Ph.D) in Electrical Engineering, Universiti Malaysia Pahang<br><br>2. M.Sc. In Electrical Engineering, Universiti Teknologi Tun Hussien Onn<br><br>3. B. Eng. (Hons), Electronic Engineering, University of Warwick, Coventry, United Kingdom | Director, Centre for Academic Innovation & Competitiveness (CAIC), UMP | 1 Ogos 2017 to 31 July 2019 |

| VISITING PROFESSOR | QUALIFICATIONS | POSITION | APPOINTMENT PERIOD |
|---|---|---|---|
| Professor Dr. Rini Akmeliawati<br><br>(Department of Mechatronics) | 1. Doctor of Philosophy (Ph.D), in Electrical and Electronic Engineering, University of Melbourne, Australia<br><br>2. B. Eng. (Hons), Electrical Engineering, Royal Melbourne Institute of Technology University, Australia | Chair of Intelligent Mechatronics Systems Research Unit (IMSRU), IIUM | 1 December 2017 to 31 March 2019 |
| Professor Ir. Dr. Zainal Abidin Bin Ab Kadir<br><br>(Department of Electrical Engineering) | 1. Doctor of Philosophy (Ph.D), in High Voltage Engineering, University of Manchester, United Kingdom<br><br>2. B. Eng. (Hons), Electrical & Electronic Engineering, Universiti Putra Malaysia | Deputy Dean (Research & Innovation), Faculty of Engineering, UPM | 1 June 2017 to 31 May 2019 |

| INDUSTRIAL ADVISORY PANEL | POSITION | DEPARTMENT | APPOINTMENT PERIOD |
|---|---|---|---|
| Ir. Shamsul bin Zakaria (Department of Diploma Engineering) | Senior Engineer 1 - Electrica, Edra Power Holding Sdn. Bhd | DIPLOMA | 1 August 2017 to 31 July 2019 |
| Ir. Riduan Bin Mohd Shariff (Department of Diploma Engineering) | Subject Matter Expert-Electrical, PETRONAS Penapisan Sdn Bhd | DIPLOMA | 1 August 2017 to 31 July 2019 |

| INDUSTRIAL ADVISORY PANEL | POSITION | DEPARTMENT | APPOINTMENT PERIOD |
|---|---|---|---|
| Ir. Azril Hisham bin Abu Hassan (Department of Power Electronic and Drives) | Head of Operational Excellence DNV.GL Oil & Gas | BEKG | 11 Oct 2017 to 10 Oct 2019 |
| Ir. Ammar bin Alamshah (Department of Industrial Power Engineering) | Managing Director, Rokhiza Engineering Services | BEKG | 11 Oct 2017 to 10 Oct 2019 |
| Ir. Faizal bin Abdullah | Senior Engineer, Exxonmobil Exploration & Production Malaysia | BEKG | 11 Oct 2017 to 10 Oct 2019 |
| Ir. Mohd Redzuan bin Mohd Rafiee | Manager Project, PBJV Sdn Bhd. | BEKG | 11 Oct 2017 to 10 Oct 2019 |

# DIPLOMA PROGRAMME

# DIPLOMA IN ELECTRICAL ENGINEERING (DEK)

# DIPLOMA IN ELECTRICAL ENGINEERING (DEK)

This program is intended to produce semi-professional graduates who possess strong engineering knowledge based on skills as assistant engineers. Apart from that, this program is a pathway for students with SPM qualification to further their studies to a higher level in their respective fields, especially the Electrical and Mechatronics Engineering Bachelor's Programme in UTeM.

## PROGRAMME EDUCATIONAL OBJECTIVES (PEO) - DIPLOMA PROGRAMME

Programme Educational Objective (PEO) are specific goals describing the expected achievement of graduates in their career and professional life within 4 to 6 years of graduation. Below are the PEO for the Faculty of Electrical Engineering's Diploma Programme.

| NO | PROGRAMME EDUCATIONAL OBJECTIVES (PEO) |
|---|---|
| The objectives of this program is to produce graduates that, after three to five years of completing studies, | |
| 1. | Graduates will be Assistant Engineers who are knowledgeable and technically competent in related engineering/engineering technology field as demonstrated through carier progression. |
| 2. | Graduates will be Assistance Engineers who are able to communicate profesionally with society at large and being ethical and responsible in performing leadership role in an organisation. |
| 3. | Graduates will be Assistant Engineers who have vision in developing their self and career through lifelong learning or involve in techno-preneurs sector. |

# PROGRAMME OUTCOMES (PO) - DIPLOMA PROGRAMME

Programme Outcome (PO) are statements describing what students are expected to know and be able to perform or attain by the time of graduation. These are related to the Knowledge (K), Skills (S), and Attitude (A) that students acquire throughout the programme.

Below is the list of Programme Outcomes for Faculty of Electrical Engineering's Diploma Programme:

| NO | PROGRAMME OUTCOMES (PO) |
|---|---|
| | Upon graduation, graduates should be able to :- |
| 1. | Apply fundamental knowledge of mathematics, sciences and engineering in field of electrical engineering. (K) |
| 2. | Identify, analyse and solve well-defined electrical engineering problems including troubleshooting based on provided information. (CTPS) |
| 3. | Conduct investigation and assist in the design of solution for well defined electrical engineering problems (CTPS) |
| 4. | Apply appropriate techniques, resources and engineering tools to well defined electrical engineering problem/practices. (S) |
| 5. | Demonstrate an arwareness and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities. (SSR) |
| 6. | Demonstrate the understanding for impact of engineering practises/solutions by considering need for sustainable development. (K) |
| 7. | Demostrate an understanding of professional ethics, responsibilities and norm of engineering practices. (EM) |
| 8. | Communicate and deliver ideas through technical writing and oral presentation effectively with engineering community and society at large. (CS) |

| NO | PROGRAMME OUTCOMES (PO) |
|---|---|
| | Upon graduation, graduates should be able to :- |
| 9. | Work as a team effectively and exhibit good leadership skills toward achieving goal. (TS,LS) |
| 10. | Recognise the need for professional development and to engage in independent and lifelong learning. (LL) |
| 11. | Demonstrate an awareness of management, business practices and entrepreneurship in the related field. (ES) |

## COURSE IMPLEMENTATION - DEK

The number of credits required to be awarded a Diploma is **93** credits.

This course will take two and half (2.5) years minimum which emphasis on the latest technology and up to date skills.

The composition of the credits is as follows:

| Components | | Credit Hours | Percentage |
|---|---|---|---|
| Compulsory University Course (W) | | 16 | 17.2% |
| Core Course (P) | Engineering | 60 | 76.3% |
| | Science & Mathematics | 11 | |
| Elective (E) | | 6 | 6.5% |
| **Total** | | 93 | 100% |

This course is based on practical and application oriented where the student will be involved in laboratory experiments, computer aided learning, working on practical assignments in electrical engineering workshop. UTeM is the first to conduct this type of Diploma.

# CURRICULUM STRUCTURE - DEK

Students are required to keep record of their obtained grades for a given course as shown in Appendix A (Student Audit Form - DEK) for graduation purpose.

| TYPE OF | | YEAR 1 | | | | YEAR 2 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| COURSE | SEMESTER KHAS PERMULAAN | SEMESTER 1 | SEMESTER BREAK | SEMESTER 2 | LONG SEMESTER BREAK | SEMESTER 3 | SEMESTER BREAK | SEMESTER 4 | SEMESTER BREAK | LONG SEMESTER BREAK | SEMESTER 5 | |
| CORE PROGRAM (P) | | DEKA 1212 ALGEBRA | | DEKA 1222 CALCULUS | | DEKA 2332 DIFFERENTIAL EQUATION | | DEKA 2342 ENGINEERING MATHEMATICS | DEKU 2363 INDUSTRIAL TRAINING | | DEKC 3643 AUTOMATION | |
| | | DEKA 1213 PHYSICS | | DITG 1113 COMPUTER PROGRAMMING | | DEKM 3753 ELECTRICAL MACHINES | | DEKE 3443 POWER ELECTRONICS | DEKU 2362 INDUSTRIAL TRAINING REPORT | | DEKP 3463 DIPLOMA PROJECT | |
| | | DITG 1112 COMPUTER SKILLS | | DMCG 1323 INTRODUCTION TO MECHANICAL SYSTEM | | DEKE 2443 ANALOGUE ELECTRONICS II | | DEKC 3813 CONTROL SYSTEM ENGINEERING | | | DEKP 3763 POWER SYSTEM | |
| | | DEKP 1213 ELECTRICAL CIRCUIT I | | DEKP 1223 ELECTRICAL CIRCUIT II | | DEKC 3453 MICROPROCESSOR | | DEKC 3433 COMMUNICATION ENGINEERING | | | | |
| | | DEKP 1121 ELECTRICAL WORKSHOP I | | DEKP 2241 ELECTRIC WORKSHOP II | | DEKC 2333 INSTRUMENTATION & MEASUREMENT | | DEKP 3533 ENGINEERING PRACTICE | | | | |
| | | DEKE 2333 DIGITAL ELECTRONICS | | DEKE 2433 ANALOGUE ELECTRONICS I | | | | | | | | |
| CREDIT HOUR SEMESTER | | 14 | | 15 | | 14 | | 14 | 5 | | 9 | 71 |
| ELECTIVE (E) | | | | | | | | | | | CHOOSE 2 OUT OF 3 ELECTIVE COURSE | |
| | | | | | | | | | | | DEKM 3553 INDUSTRIAL ROBOTIC | |
| | | | | | | | | | | | DEKP 3563 RENEWABLE ENERGY AND APPLICATION | |
| | | | | | | | | | | | DEKP 3553 BUILDING MAINTENANCE AND MANAGEMENT | |
| | | | | | | | | | | | 6 | 6 |
| UNIVERSITY REQUIREMENT (W) | DLHW 1012 FOUNDATION ENGLISH | DLHW 1032 MALAYSIA STUDIES | | DLHW 2422 ENGLISH FOR EFFECTIVE COMMUNICATION | | DLHW 3432 ENGLISH FOR MARKETABILITY | | DTMW 1012 FUNDAMENTAL OF ENTREPRENEURIAL ACCULTURATION | | | | |
| | DLHW 1742 LEADERSHIP | | | | | DKKX 2XX1 CO-CURRICULUM II | | | | | | |
| | DLHW 1722 PHILOSOPHY OF SCIENCE & TECHNOLOGY | DKKX 1XX1 CO-CURRICULUM I | | | | | | | | | | |
| CREDIT HOUR SEMESTER | 6 | 3 | | 2 | | 3 | | 2 | | | | 16 |
| TOTAL CREDIT | 6 | 17 | | 17 | | 17 | | 16 | 5 | | 15 | 93 |

# CREDIT HOURS - DEK

Students are required to keep record of their obtained grades for a given course as shown in Appendix A (Student Audit Form - DEK) for graduation purpose.

| SEMESTER | CODE | COURSE | CATEGORY | CREDIT HOUR |
|---|---|---|---|---|
| SEMESTER KHAS PERMULAAN | DLHW 1012 | FOUNDATION ENGLISH | W | 2 |
| | DLHW 1742 | LEADERSHIP | W | 2 |
| | DLHW 1722 | PHILOSOPHY OF SCIENCE & TECHNOLOGY | W | 2 |
| | | | **TOTAL** | **6** |
| SEMESTER 1 | DEKA 1212 | ALGEBRA | P | 2 |
| | DITG 1112 | COMPUTER SKILLS | P | 2 |
| | DEKA 1213 | PHYSICS | P | 3 |
| | DEKP 1213 | ELECTRICAL CIRCUIT I | P | 3 |
| | DEKP 1121 | ELECTRICAL WORKSHOP I | P | 1 |
| | DEKE 2333 | DIGITAL ELECTRONICS | P | 3 |
| | DLHW 1032 | MALAYSIA STUDIES | W | 2 |
| | DKKX 1XX1 | CO-CURRICULUM I | W | 1 |
| | | | **TOTAL** | **17** |
| SEMESTER 2 | DEKA 1222 | CALCULUS | P | 2 |
| | DEKP 1223 | ELECTRICAL CIRCUIT II | P | 3 |
| | DMCG 1323 | INTRODUCTION TO MECHANICAL SYSTEM | P | 3 |
| | DITG 1113 | COMPUTER PROGRAMMING | P | 3 |
| | DEKE 2433 | ANALOGUE ELECTRONICS I | P | 3 |
| | DEKP 2241 | ELECTRICAL WORKSHOP II | P | 1 |
| | DLHW 2422 | ENGLISH FOR EFFECTIVE COMMUNICATION | W | 2 |
| | | | **TOTAL** | **17** |
| SEMESTER 3 | DEKA 2332 | DIFFERENTIAL EQUATIONS | P | 2 |
| | DEKE 2443 | ANALOGUE ELECTRONICS II | P | 3 |
| | DEKC 2333 | INSTRUMENTATION & MEASUREMENT | P | 3 |
| | DEKM 3753 | ELECTRICAL MACHINES | P | 3 |
| | DEKC 3453 | MICROPROCESSOR | P | 3 |
| | DLHW 3432 | ENGLISH FOR MARKETABILITY | W | 2 |
| | DKKX 2XX1 | CO-CURRICULUM II | W | 1 |
| | | | **TOTAL** | **17** |
| SEMESTER 4 | DEKA 2342 | ENGINEERING MATHEMATICS | P | 2 |
| | DEKE 3443 | POWER ELECTRONICS | P | 3 |
| | DEKC 3813 | CONTROL SYSTEM ENGINEERING | P | 3 |
| | DEKC 3433 | COMMUNICATION ENGINEERING | P | 3 |
| | DEKP 3353 | ENGINEERING PRACTICE | P | 3 |
| | DTMW 1012 | FUNDAMENTAL OF ENTREPRENEURIAL ACCULTURATION | W | 2 |

| SEMESTER | CODE | COURSE | CATEGORY | CREDIT HOUR |
|---|---|---|---|---|
| | | | **TOTAL** | **16** |
| **SEMESTER KHAS** | DEKU 2363 | INDUSTRIAL TRAINING | P | 3 |
| | DEKU 2362 | INDUSTRIAL TRAINING REPORT | P | 2 |
| | | | **TOTAL** | **5** |
| **SEMESTER 5** | DEKP 3763 | POWER SYSTEM | P | 3 |
| | DEKC 3643 | AUTOMATION | P | 3 |
| | DEKP 3463 | DIPLOMA PROJECT | P | 3 |
| | CHOOSE ONLY TWO (2) COURSES | | | |
| | DEKM 3553 | INDUSTRIAL ROBOTIC | E | 3 |
| | DEKP 3563 | RENEWABLE ENERGY AND APPLICATIONS | E | 3 |
| | DEKP 3553 | BUILDING MAINTENANCE AND MANAGEMENT | E | 3 |
| | | | **TOTAL** | **15** |
| | | | **TOTAL CREDIT** | **93** |

P = Core Program, W = University Requirement, E = Elective

# STUDENT LEARNING TIME - DEK

| Semester | Code | Course | Face-to-Face Learning | | | | Self Learning Activities | Formal Assessment | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | | Teacher Centered (TC) | Student Centered Learning (SCL) | | | Student Direct Learning / Revision / Exercise | Continuous Learning + Final Examination | |
| | | | Lecture | Tutorial | Practical | PBL / Other SCL Activities | | | |
| Special Semester | DLHW 1012 | FOUNDATION ENGLISH | 28 | | | | 48 | 4 | 80 |
| | DLHW 1742 | LEADERSHIP | 28 | | | | 48 | 4 | 80 |
| | DLHW 1722 | PHILOSOPHY OF SCIENCE & TECHNOLOGY | 28 | | | | 48 | 4 | 80 |
| 1 | DLHW 1032 | MALAYSIA STUDIES | 28 | | | | 48 | 4 | 80 |
| | DKKX 1XX1 | CO-CURRICULUM I | | | 28 | | 12 | | 40 |
| | DEKA 1213 | PHYSICS | 28 | 24 | 15 | | 48 | 5 | 120 |
| | DEKA 1212 | ALGEBRA | 28 | 14 | | | 44 | 4 | 90 |
| | DITG 1112 | COMPUTER SKILLS | 28 | | | | 48 | 4 | 80 |
| | DEKP 1213 | ELECTRICAL CIRCUIT I | 28 | 18 | 16 | | 53 | 5 | 120 |
| | DEKE 2333 | DIGITAL ELECTRONICS | 28 | 12 | 9 | 15 | 71 | 5 | 140 |
| | DEKP 1121 | ELECTRICAL WORKSHOP I | | | 36 | | 8 | 6 | 50 |
| 2 | DLHW 2422 | ENGLISH FOR EFFECTIVE COMMUNICATION | 28 | | | | 48 | 4 | 80 |
| | DEKA 1222 | CALCULUS | 28 | 14 | | | 44 | 4 | 90 |
| | DITG 1113 | COMPUTER PROGRAMMING | 28 | 18 | 16 | | 53 | 5 | 120 |
| | DMCG 1323 | INTRODUCTION TO MECHANICAL SYSTEM | 28 | 18 | 16 | | 53 | 5 | 120 |
| | DEKP 1223 | ELECTRICAL CIRCUIT II | 28 | 16 | 18 | | 53 | 5 | 120 |
| | DEKP 2241 | ELECTRICAL WORKSHOP II | | | 36 | | 8 | 6 | 50 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | DEKE 2433 | ANALOGUE ELECTRONICS I | 28 | 18 | 16 | | 53 | 5 | 120 |
| 3 | DLHW 3432 | ENGLISH FOR MARKETABILITY | 28 | | | | 48 | 4 | 80 |
| | DKKX 2XX1 | CO-CURRICULUM II | | | 28 | | 12 | | 40 |
| | DEKA 2332 | DIFFERENTIAL EQUATIONS | 28 | 14 | | | 44 | 4 | 90 |
| | DEKM 3753 | ELECTRICAL MACHINES | 28 | 18 | 16 | | 53 | 5 | 120 |
| | DEKE 2443 | ANALOGUE ELECTRONICS II | 28 | 16 | 18 | | 53 | 5 | 120 |
| | DEKC 3453 | MICROPROCESSOR | 28 | 12 | 9 | 15 | 71 | 5 | 140 |
| | DEKC 2333 | INSTRUMENTATION & MEASUREMENT | 28 | 12 | 9 | 15 | 71 | 5 | 140 |
| 4 | DTMW 1012 | FUNDAMENTAL OF ENTREPRENEURIAL ACCULTURATION | 28 | | | | 48 | 4 | 80 |
| | DEKA 2342 | ENGINEERING MATHEMATICS | 28 | 14 | | | 44 | 4 | 90 |
| | DEKE 3443 | POWER ELECTRONICS | 28 | 16 | 18 | | 53 | 5 | 120 |
| | DEKC 3813 | CONTROL SYSTEM ENGINEERING | 28 | 16 | 18 | | 53 | 5 | 120 |
| | DEKC 3433 | COMMUNICATION ENGINEERING | 28 | 18 | 16 | | 53 | 5 | 120 |
| | DEKP 3353 | ENGINEERING PRACTICE | 28 | 6 | 30 | | 61 | 5 | 130 |
| Special Semester | DEKU 2363 | INDUSTRIAL TRAINING | | | | | 120 | | 120 |
| | DEKU 2362 | INDUSTRIAL TRAINING REPORT | | | | | 80 | | 80 |
| 5 | DEKC 3643 | AUTOMATION | 28 | 16 | 18 | | 53 | 5 | 120 |
| | DEKP 3763 | POWER SYSTEM | 28 | 18 | 16 | | 53 | 5 | 120 |
| | DEKP 3463 | DIPLOMA PROJECT | | | | 126 | 12 | 2 | 140 |
| | **CHOOSE ONLY TWO (2) EELCTIVE COURSES** | | | | | | | | |
| | DEKM 3553 | INDUSTRIAL ROBOTIC | 28 | 16 | 18 | | 53 | 5 | 120 |
| | DEKP 3563 | RENEWABLE ENERGY AND APPLICATIONS | 28 | 16 | 18 | | 53 | 5 | 120 |
| | DEKP 3553 | BUILDING MAINTENANCE AND MANAGEMENT | 28 | 16 | 18 | | 53 | 5 | 120 |
| **TOTAL HOURS** | | | **868** | **360** | **438** | **171** | **1876** | **157** | **3870** |

## DEKA 1212
## ALGEBRA

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Describe the graphs of linear equation and relate graphs of functions to their equations (PO1).
2. Solve the linear system of matrix equations using Inverse matrix Method and Cramer's Rule (PO1).
3. Perform operation on polynomial by using appropriate methods (PO1).
4. Evaluate the trigonometric functions using trigonometric concepts (PO1).
5. Solve equations of complex numbers using appropriate theorem (PO1).
6. Solve the application of engineering and science problem by applying the concepts of algebra (PO1).

**Synopsis**

This course will discuss about the functions, graphs, matrices and systems of linear equations, polynomials, trigonometry and complex numbers. This course can be serves as a fundamental mathematics course for engineering students. Through this course, the students will be exposed to various techniques in solving mathematics problems and its application in physical and engineering fields.

**References**


1. David C.L., 2006, Linear Algebra and Its Applications Fourth Edition, Pearson International.
2. Tay Choo Chuan et al, 2010, Introduction to Linear Algebra, Penerbit Universiti Teknikal Malaysia Melaka.
3. Nur Ilyana A.A., Irma Wani J., Arfah A., 2011, Linear Algebra & Calculus, Penerbit Universiti Teknikal Malaysia Melaka.
4. Abd. Wahid et al, 2009, Intermediate Mathematics, UTM.
5. Robert Blitzer et. al., 2007, Foundation Mathematics, Pearson Prentice Hall, Malaysia.


## DEKA 1213
## PHYSICS

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Explain basic concept in physics, covering aspect such as mechanics, electric and thermodynamics (PO1).
2. Use concepts systematically to solve problems (PO1).
3. Handle laboratory equipment based on correct procedures (PO3).
4. Measure accurately and present the results in a scientific report (PO3).
5. Apply physics knowledge in the engineering field (PO1).

**Synopsis**

The topics covers in this course are: Forces, Acceleration and Newton's Second Law of Motion, Motion with a Changing Velocity, Circular Motion, Conservation of Energy, Linear Momentum, Fluids, Heat, Temperature, Electric Forces and Fields, Electric Potential, Electric Current and Circuits, Magnetic Forces and Fields, Electromagnetic Induction. Experiments are categorized into 2 types; computer aided and manual. Topics covered include Mechanics, Thermal Physics, Electricity and Magnetism.

**References**


1. Giancolli DC, Physics for Scientists & Engineers With Modern Physics, 4rd Ed. Pearson Prentice Hall 2009.
2. Physics for Scientists and Engineers With Modern Physics 8th Ed, Cengage learning 2010.
3. Giambatista A., Richardson B.M and Richardson R.C., College Physics, 2nd edition. Mc-Graw Hill, 2007.
4. Walker J.S., Physics, 3rd edition, Addison Wesley, 2007.


## DEKA 1222
## CALCULUS

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Identify limits and continuity of functions using computational methods of limits (PO1).

2. Solve derivatives of algebraic, trigonometric, logarithmic and exponential functions using differentiation techniques (PO1).
3. Solve integrals of algebraic, trigonometric, logarithmic and exponential functions using integration techniques (PO1).
4. Implement differentiation and integration techniques in solving application related to science and engineering problems (PO1).

**Synopsis**

This course enhanced two main parts in Calculus: which consist of differential and integral. This course serve to give student good understanding knowledge the basic concept of derivative and integration in solving application related to science, mathematics and engineering problems.

**References**


1. Cochran et. Al, Calculus Early Transcendentals, Pearson Education Inc. 2010
2. Abd Wahid Md Raji et al, Calculus for Science and Engineering Students, Penerbit UTHM, 2009
3. Smith and Minton, Calculus (Basic Calculus for Science and Engineering), Mc Graw Hill, 2007
4. Howard Anton et al, Calculus 8th Edition, John Wiley & Sons Pte. Ltd, 2006.
5. Ron Larson et.al, Calculus An Applied Approach, Brooks/Cole Cengage Learning, 2009


## DEKA 2332
## DIFFERENTIAL EQUATIONS

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Describe the method of solving first order linear differential equation (PO1).
2. Solve second order linear differential equations with constant coefficients by using method of Undetermined Coefficient and method of Variation Parameters (PO1).
3. Solve linear differential equation with constant coefficients by the Laplace Transform method (PO1).
4. Analyze the Fourier Series of a periodic function (PO1).
5. Solve engineering problems using Laplace Transform approach, Fourier Series, Undetermine Coefficient and Variation of Parameters (PO1).

**Synopsis**

This course will discuss about the basic concepts of Differential Equation; First Order Differential Equation; Second Order Linear Differential Equation with constant coefficients; Laplace Transforms and Fourier series. The syllabuses are developed to expose the learner's on the fundamental concept of differential equations.

**References**


1. Irma Wani et al.,Differential Equation, Penerbit UTeM (2012)
2. Muzalna et. al, Module 17 Differential Equations, Penerbit UTeM 2010.
3. C. Henry Edwards & David E. Penney (2008). Differential Equations and Boundary Value Problems, Fourth Edition. Pearson Education Inc.
4. R. Kent Nagle, Edward B. Saff and Arthur David Snider, Fundamentals of Differential Equations and Boundary Value Problems, Pearson Education Inc., 5th Edition, 2008.


## DEKA 2342
## ENGINEERING MATHEMATICS

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Determine and analyze multivariable functions using differentiation techniques (PO1).
2. Solve double and triple integrals of functions and its application using Cartesian Coordinates, Cylindrical Coordinates and Spherical Coordinates (PO1).
3. Evaluate vector-valued-functions and its applications using vector calculus techniques (PO1).

**Synopsis**

This course consists of three chapters: Multivariable Functions , Multiple Integrals and Vector-valued Functions. The syllabus is extended from course Calculus by emphasize the concepts of the functions with severable variables, double and triple integrations and also vector-valued function, followed by learning various techniques in solving the problems and its application in physical and engineering fields.

**References**


1. Yudariah M.Yusof et.al, Multivariable Calculus for Independent Learners, 2nd Edition, Pearson, 2011.
2. Muzalna M. Jusoh et.al., Engineering Mathematics, 2nd Edition, Pearson, Prentice Hall, 2009.
3. Glyn James, Modern Engineering Mathematics, Prentice Hall, 2009.

**DEKC 2333**
**INSTRUMENTATION & MEASUREMENT**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Identify electrical quantities related to various measurement standards (PO2).
2. Classify errors in measurement through stastitical analysis (PO1).
3. Demonstrate experiment on DC/AC meter and bridge (PO3).
4. Explain the principle of Data Acquisation System in instrumentation (PO1).
5. Design signal conditioning element base on characteristics of sensor/transducer (PO3).

**Synopsis**
This course discusses about units and dimensions, standards, errors, static characteristic,noise and calibration in measurement. It covers most on the measurement devices such as galvanometers, ammeters, voltmeters, AC meters as well as as bridges. It also introduces the principle of data acquisation system used in instrumentation.

**References**

1. H S Kalsi, Electronic Instrumentation, Tata-McGraw-Hill Publishing, 3rd Edition, 2010.
2. UA Bakshi, AV Bakshi and KA Bakshi, Electronic Measurements and Instrumentation, Technical Publications Pune, 2009
3. S Wolf, Richard F.M Smith, Reference Manual for Electronic Instrumentation Laboratories 2nd Ed., Prentice-Hall, 2004
4. Calibration Book, Vaisala Oyj, Vaisala 2006
5. BC Nakra and KK Chaudry, Instrumentation, Measurement anad Analysis, @nd Ed., Tata Mc Graw Hill, 2004


**DEKC 3433**
**COMMUNICATIONS ENGINEERING**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Understand and apply a basic knowledge on the communication engineering (PO1).
2. Describe the modulation and demodulation techniques of AM and FM (PO3).
3. Recognize the transmission and reception process of FM & PM (PO3).
4. Explain and apply knowledge related to digital modulation/ demodulation techniques typically used in telecommunication system (PO1).

**Synopsis**
Communication systems – definitions, needs and development of communications system, types of communications system, the elements of communications system, introduction of multiplexing. Amplitude Modulation – signal analysis, modulation index, frequency spectrum, AM transmission – DSBSC, SSB, VSB transmission system. AM receiver – DSB & SSB detector, envelope detector, superhetrodyne receiver, automatic gain control. Frequency modulation – frequency deviation, modulation index, Bessel function. FM transmission – modulator circuits. FM receiver – Foster Seeley, ratio detector. External noise, internal noise, noise calculation, noise factor. Comparison between AM and FM.

**References**

1. Tomasi Wayne, Electronics Communication Systems Fundamentals Through Advanced, 5th Edition, Prentice Hall, 2002.
2. William Schweber, “Electronic Communications System a Complete Course”, 3rd Edition Prentice Hall,1998.
3. Frank R. Dungan “Electronic Communications System”, Delmar, 3rd Edition 1997.
4. Rusnani Ariffin, Communication Engineering 1, 1stEdition Monograph UiTM, 1999.
5. Warren Hioki, Telecommunications, 3rdEdition Prentice Hall,1998.


**DEKC 3453**
**MICROPROCESSOR**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Describe and explain microprocessor (Motorola 68000) architecture and its operation. Able to illustrate the interfacing circuitry of microprocessor-based systems and its supporting components (PO1).

2. Able to write and apply the 68K Microprocessor instruction set operation in assembly language (PO4).
3. Design a microprocessor system memory and peripheral device interfaces. Able to describe and distinguish the concept of the 68K hardware model (PO5).
4. Develop and construct a microprocessor based system and solve the problem related and prepare the technical report (PO2).

**Synopsis**

This course is about introduction to microprocessor architecture, instruction set, addressing mode, assembly language programming and interrupt. Interfacing technique with memory device and peripheral, parallel and serial interfacing, interfacing with ADC/DAC and data sampling technique. System simulation and emulation based on microprocessor.

**References**


1. Antonakos, J. L., The 68000 Microprocessor: Hardware and Software Principles and Applications 5th edition , Prentice Hall, 2004.
2. Clements, A., Microprocessor Systems Design: 68000 Hardware, Software, and Interfacing 3rd edition, PWS, 1997.
3. Gilmore C.M., Microprocessor: Principles and Applications, McGraw Hill, 1996.
4. Short K.L., Embedded Microprocessor Systems Design, Prentice Hall, 1998.
5. Wilcox A.D., 68000 Microcomputer Systems, Prentice Hall, 1997.


## DEKC 3643
## AUTOMATION

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Describe the concept of Automation, Programmable Logic Controller (PLC) and their components (PO1).
2. Solve well-defined problems based on provided information by using PLC, Pneumatic, Hydraulic and proper components to achieve automation (PO2).
3. Demonstrate connection based on symbols and diagram given (PO3).

**Synopsis**

This course will introduce a fundamental of the automation in manufacturing sector, their components such as actuators, sensors as well linear and rotary transportation devices. It will also covers on programmable logic controller (PLC) as the main controller including its definition, main hard components, PLC programming languages, interfacing PLC with computers. And will also learn how to integrate PLC hardware and software and their components.

**References**


1. D. Petruzella, Frank Programmable Logic Controller, 4th Ed. McGraw Hill. 2011.
2. Mikell P. Groover, Automation, Production Systems & Computer-Integrated Manufacturing, 3rd Ed. 2008.
3. Hugh Jack, Automating Manufacturing Systems. Ver 5.0 2007.
4. LA Bryan & EA Bryan, Programmable Controller: Theory and Implementation, 2nd Ed. Industrial Text, 2007.
5. IEC 61131 Standards for Programming Manuals


## DEKC 3813
## CONTROL SYSTEM ENGINEERING

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Identify the differences between open loop and closed loop system (PO1).
2. Construct a block diagram of multiple subsystems to a single block diagram representing the transfer function from input to output accordingly (PO2).
3. Develop a mathematical model, called transfer function for linear, time invariant electrical and mechanical system correctly (PO2).
4. Describe the transient response of first and second order systems quantitatively (PO1).
5. Analyze control system in time and frequency domain using root locus and bode plot (PO2).
6. Demonstrate experiments of control systems as well as to analyze and interpret data (PO3).

**Synopsis**

This course will discuss about the concepts in control system; open and closed loop system; transfer function; signal flow graphs; feedback control system; modeling for electrical system, mechanical system; analysis in time and frequency domain responses and also stability in time and frequency domain.

**References**


1. Nise, S Norman, Control Systems Engineering, 6th Edition, John Wiley & Sons Inc., United State of America, 2011.
2. Ogata, Katsuhiko, Modern Control Engineering, 5th Edition, Prentice Hall, 2011.
3. Bishop, Dorf, Modern Control Systems, 12th Edition, Prentice Hall, 2010.
4. Gopal, M, Control Systems: Principles and Design, 2nd Edition, Mc Graw Hill, 2003.
5. Syed Najib, Azrita Alias, Aliza Che Imran, Sahazati Md Rozali, Saleha Mohamed Salleh, Basic Control System, Penerbit Universiti Teknikal Malaysia Melaka, 2008.


## DEKE 2333
## DIGITAL ELECTRONICS

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Describe the concept of basic numbering system and combinational logic gates circuit (PO1).
2. Solve well-defined problems based on provided information by using basic gates, MSI, flip-flop and latch (PO2).
3. Demonstrate the ability to use appropriate engineering tool in the digital logic circuit (PO3).

**Synopsis**

This course will equip students with basic principle, techniques and conventions used in digital electronic circuit design.

**References**


1. Thomas L. Floyd, Digital Fundamentals, 10th Edition, Prentice Hall 2009.
2. Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, Digital Systems: Principles and Applications, 10th Edition, Prentice Hall 2007.
3. Albert, Malvino, Donald Leach, Digital Principlesand Applications, 5th Edition, McGraw Hill,1994.
4. David Buchla, Experiments In Digital Fundamentals, 8th Edition, Prentice Hall 2002.
5. Floyd, Instructor's Resource Manual To Accompany Digital Fundamental, Prentice Hall 2009.


## DEKE 2433
## ANALOGUE ELECTRONICS I

**Learning Outcomes**

Upon completion this course, the students should be able to:

1. Interpreate semiconductor material principle and diode application (PO1).
2. Solve the basic circuit of semiconductor devices application for BJT and FET (PO1).
3. Calculate the power amplifier circuit configuration (PO1).
4. Use appropriate engineering tools for the practical competence on diode, BJT and FET applications (PO3).
5. Work in team for the assignment and laboratories activities (PO6).

**Synopsis**

Semiconductor theories – introduction, atomic structure, covalent bonding, majority and minority carrier, pn junction. Diode – introduction, characteristics & parameters of diode, diode equivalent circuit, types of diode, analysis and application. Bipolar junction transistor (BJT) – dc analysis, introduction, construction, transistor operation, shape and symbol, configuration, limit of operation, transistor specification, dc biasing, bias stabilization. BJT- ac analysis, introduction, hybrid equivalent circuit, equivalent circuit for all biasing, amplification circuit with RS and RL, two port system. FET – introduction, structure, characteristics, types of bias, transfer characteristics curve, small signal analysis, frequency response and amplifier multi stage. Power Amplifier: Introduction to amplifier classes, circuit & operation difference for each classes, distortion within the amplifier and power transistor heat sinking.

**References**


1. Boylestad R.,L. Nashelsky, Electronic Devices and Circuit Theory, Pearson Education Inc., Eleventh Edition 2013.
2. Thomas L. Floyd, Elecronic Devices : Conventional Current Version, Pearson Education Inc., Nineth Edition, 2012.

3. K. Marian, A. Aminian, Electronic Devices : A Design Approach, Prentice Hall, 2004.
4. Robert T. Paynter, Introductory Electronic Devices and Circuits, Prentice Hall, Seventh Edition, 2006.
5. A. Jemila Rani, Electronic Devices and Components, IBS Buku Sdn Bhd, 2006.

## DEKE 2443
## ANALOGUE ELECTRONICS II

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Apply the operation of operational amplifier (PO1).
2. Apply the DC power supply and voltage regulator circuit (PO1).
3. Apply the operation and characteristics of active filter (PO1).
4. Analyze the operation and characteristics of feedback circuit and oscillator (PO2).
5. Conduct and demonstrates practical experiments of operational amplifier, voltage regulator, feedback circuit, oscillator and active filter (PO3).
6. Exhibit communication skills through report writing (PO4).

**Synopsis**

This course introduces the basic electronics elements mainly used in the industry. The topics that will be covered including the operational amplifier, DC power supply, feedback circuit, oscillator and active filter. Introduction to the use of P-spice simulation software for circuit designing as well as hardware experiments during laboratory will be implemented.

**References**

1. Ramakant A. Gayakwad, Op-Amps and Linear Integrated Circuits, 4th Edition, Prentice Hall, 2000.
2. David L. Terrell, Op Amps: Design, Application, and Troubleshooting, 2nd Edition, Butterworth- Heinemann, 1996.
3. Thomas L. Floyd, Electronic Devices, 6th Edition ; Prentice Hall, 1999.
4. William D. Stanley, Operational Amplifiers with Linear Integrated Circuits, 4th Edition, Prentice Hall 2002.
5. Robert T. Paynter, Introductory Electronic Devices and Circuits, 6th Edition, Prentice Hall 2003.
6 Thomas E. Kissel, Industrial Electronics, Prentice Hall 2003.

## DEKE 3443
## POWER ELECTRONICS

**Learning Outcomes**

Upon completion this course, the students should be able to:

1. Describe the principle and operation of power electronics, power semiconductor devices and converters (PO1).
2. Apply the semiconductor power switches in industrial application (PO2).
3. Apply the characteristics and performance of rectifiers, choppers and inverters (PO2).
4. Demonstrate the ability of using appropriate tools in power electronics converters (PO3).
5. Exhibit effective communication skills through project presentation (PO4).

**Synopsis**

This course is about the basic principles of power electronics, semiconductor power switches, single-phase and three-phase inverter, the application of semiconductor devices as power electronics converters such as AC to DC, AC to AC, DC to DC and DC to AC converters, circuits as DC drives, AC drives and snubbers.

**References**

1. Daniel W. Hart, Introduction to Power Electronics International Edition, Mc-Graw Hill 2011.
2. Muhammad H. Rashid. Power Electronics – Circuits, Devices, and Applications, 3rd Edition, Prentice Hall, 2004.
3. Issa Batarseh, Power Electronic Circuits, John Wiley & Sons, 2004.
4. Ned Mohan, Tore M. Undeland, William P. Robbins, Power Electronics – Converters, Applications and Design, 3rd Edition, John Wiley and Sons, 2003.
5. V.R Moorthi, Power Electronics- Devices, Circuits, and Industrial Applications, Oxford, 2005.

## DEKM 3553
## INDUSTRIAL ROBOTICS

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Identify the configuration and components of industrial robots system (PO2).

2. Apply the forward, inverse and dynamic kinematics equations and computer control for industrial robotics systems (PO1).
3. Apply specific robotic programming and simulations for industrial robots used in industrial automation systems (PO3).
4. Identify robotics technologies in an industrial environment (PO2).

**Synopsis**

Introduction to robotics, classification of robots, basic components of robot systems, basic concepts of kinematics and dynamics, mechanical structure of robot systems, robot drives and motion control system using stepper motor, servo motor, servo amplifier and pneumatics, sensory devices such as position, force and torque, tactile, basic robot programming, robot simulations and industrial robot applications. Experiments will include application of MATLAB, simple robot development and robot programming and simulation using a real industrial robot.

**References**


1. K.H. Low, Robotics: Principles and Systems Modeling, 2nd edition, Prentice Hall, 2004.
2. Fuller, J.L., Robotics: Introduction, Programming and Projects, 2nd ed., Prentice Hall, 1998.
3. Craig, J.J., Introduction to Robotics Mechanics and Control, 3nd ed., Addison Wesley Longman, 2001.
4. Ned Mohan, Tore M. Undeland, William P. Robbins, Power Electronics – Converters, Applications and Design, 3rd Edition, John Wiley and Sons, 2003.
5. Man Zhilong, Robotics, 2nd. edition, Prentice Hall, 2005.


## DEKM 3753
## ELECTRICAL MACHINES

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Explain the types, physical construction and working principles of electrical machines (PO1).
2. Distinguished the characteristics of electrical machines (PO2).
3. Demonstrate and analyze the performance of electrical machines during laboratory session (PO3).
4. Identify types of electrical machines applications (PO2).

**Synopsis**

Introduction to DC and AC type of electrical machines which cover physical construction and equivalent electrical circuit diagrams and the motor starters as well. The machine performances like torque, speed and efficiency are investigated. The starting and control techniques are also investigated so that better machine selection for an appropriate application.

**References**


1. Stephen J. Chapman, Electric Machinery Fundamentals, 5th ed., McGraw-Hill, 2011
2. B.S. Guru, H.R.Hiziroglu, Electric Machinery And Transformers, Oxford University Press, 2001.
3. Fitzgerald, Kingsley, Umans, Electric Machinery, 6th ed., McGraw-Hill, 2003.
4. Theodore Wildi, Electric Machines, Drives & Power System, 6th ed., Prentice Hall, 2005.


## DEKP 1121
## ELECTRICAL WORKSHOP I

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Apply the knowledge of domestic wiring installation, relay control circuit and electronic soldering processes (PO1).
2. Construct the domestic wiring installation, relay control circuit and electronic soldering processes (PO2).

**Synopsis**

This course will expose student to basic domestic wiring, relay control, basic electronic components and installation. Concentration is given on the safety aspects and quality of works.

**References**


1. Ir Md Nazri, Aminudin, Md Hairul Nizam, Engineering Practice: Wiring System & Motor Starter, Modul 2, UTeM, 2007.
2. Teo Cheng Yu, Principle and Design of Low Voltage System, 2nd Ed, Byte Power Publications, Singapore, 2009.
3. Acceptability of Electronic Assemblies (Revision C, 2000).


## DEKP 1213
## ELECTRICAL CIRCUIT I

**Learning Outcome**
Upon completion of this course, the student should be able to:
1. Calculate current, voltage and power across any elements in a circuit accurately (PO1).
2. Apply basic law such as voltage divider, current divider, equivalent resisitance and wye delta transformation in circuit analysis (PO1).
3. Apply method analysis such as nodal and mesh in analysing electrical circuits (PO2).
4. Apply circuit theorems in analysing electrical circuits (PO2).
5. Analyze circuits using appropriate simulation tools (PO3).

**Synopsis**
This course will cover the active and passive elements, resistive circuit (Kirchoff's and Ohm's Laws), linear circuits, Thevenin's and Norton's Theorems, Superposition Theorem, Nodal and Mesh analysis. Power in electrical circuit and maximum power transfers. Basic concepts to alternating current, sinusoidal and phasors theory - complex representation and phase and also introduction to PSpice for circuit's analysis.

**References**

1. C.K. Alexander and M.N.O. Sadiku, Fundamentals of Electric Circuits, 3rd Ed, McGraw-Hill, (2006).
2. J.W. Nilsson and S.A. Riedel, Electric Circuits, 8th Ed, Pearson Education, Inc, (2008).
3. T.L. Floyd, Principles of Electric Circuits, 8th Ed, Pearson Education, Inc, (2007).
4. R.C. Dorf and J.A. Svoboda, Introduction to Electric Circuits, 7th Ed, John Wiley & Sons, (2006).


## DEKP 1223
## ELECTRICAL CIRCUIT II

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Solve the transient analysis first order and second order electrical circuit correctly (PO2).
2. Describe the principle of ac voltage and current generation, RMS, average value, and RLC circuits for single phase system (PO2).
3. Aplly mesh, nodal and several circuit theorems to solve electrical AC circuits (PO2).
4. Determine the parameter of two port network (PO2)
5. Demonstrate experiments of electrical circuits using appropriate hardware and simulation tools (PO3).
6. Exhibit soft skills such as communication skills through report writing (PO4).

**Synopsis**
Transient analysis 1st order and 2nd order circuits. Principle of AC voltage and current generation, RMS,average values, and RLC circuits for single phase systems. Apply Mesh, Nodal and several circuit theorems such as Superposition, Thevenin, Norton and Maximum Power Transfer to solve electrical AC circuits. Two port network: Z, Y, H & ABCD parameter. Interconnections parameter conversion.

**References**

1. C.K. Alexander and M.N.O. Sadiku, Fundamentals of Electric Circuit, 4th Ed 2009, McGraw Hill.
2. J.W.Nilson, S.A.Riedel, Electric Circuits, 8th Ed 2008, Pearson Education, Inc.
3. T.L. Floyd, Principles of Electric Circuits, 8th Ed 2007, Pearson Education, Inc.
4. J. D. Irwin and R. M. Nelms, Engineering Circuit Analysis, 10th Ed 2011, John Wiley & Sons.


## DEKP 2241
## ELECTRICAL WORKSHOP II

Learning Outcomes
Upon completion of this course, the student should be able to:
1. To apply and use electronic and engineering software tools (PO3).
2. Demonstrate appropriate skills required to solve the problem adequetly (PO2).
3. Exhibit soft skill through the experiment project (PO4).

Synopsis
In this workshop students will be exposed to three basic engineering software; PSpice, AutoCAD and Proteus. For the first session, student will be introduced to circuitry simulation software, PSpice. From given circuitry, students need to simulate and measure the current and voltage at certain load. After that, student will be exposed to the 2D basic engineering drawing in which involve creating, editing and plotting using computer aided drawing software, AutoCAD and for the last session, student will be introduced to Proteus software in which this software able to simulate in real time microcontroller circuitry design before assemble the hardware.

**References**


1. Leach, J. A. AutoCAD 2010 Instructor: a student guide to complete coverage of AutoCAD's commands and features, McGraw-Hill, New York, 2010.
2. Tront, J.G. Pspice for basic circuit analysis, McGraw-Hill, New York, 2007.
3. Aminurrashid N., Mohd Hanif C.H.,Mohd Razali M.S.,& Sulaiman, S. Proteus Professional Design, FKE Resource. Utem.2011.


## DEKP 3533
## ENGINEERING PRACTICE

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Apply the basic principle and requirements for low voltage electrical wiring system (PO1).
2. Apply the regulation and standard requirements for low voltage electrical wiring system (PO1).
3. Categorize the types and characteristics of the low voltage circuit breakers and power cables (PO1).
4. Experiment the basic inspection, testing and commissioning of low voltage electrical wiring system installation according to BS7671 standards (P03).
5. Demonstrate basic works of low voltage electrical wiring and motor starter installation (PO2).

**Synopsis**

The purpose of this course is to introduce students with principle and fundamental on industrial wiring, commercial building wiring, cables and circuit breaker selection, switchboard and distribution board. This course will cover the procedures on safety, basic design, setting up protection relays, inspection, testing and commissioning of an electrical installation. The experiments will cover the 3-phase industrial wiring system and also construction of basic motor starter circuit.

**References**


1. Teo Cheng Yu, Principle and Design of Low Voltage System, 2nd Ed, Byte Power Publications, Singapore, 2009.
2. Ir Md Nazri, Aminudin, Md Hairul Nizam, Engineering Practice: Wiring System & Motor Starter, Modul 2, UTeM, 2007.
3. IEE Wiring Regulation 16th Edition.
4. Ismail Kasikci, Analysis and Design of Low Voltage Power Systems, Wiley-VCH, 2004.
5. Ray C. Mullin and Robert L. Smith, Electrical wiring commercial, 10th Ed, 1999.


## DEKP 3463
## DIPLOMA PROJECT

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Apply basic mathematics, sciences and engineering knowledge to complete the project (PO1).
2. Think objectively, critically and analytically in determining and solving problems systematically (PO2).
3. Manage time, cost and equipment skilfully (PO3).
4. Exhibit effective communication skills through project presentation (PO4).

**Synopsis**

This course gives student an opportunity to practice the knowledge that they have learnt. At the end of semester, students are required to present their project achievement in oral presentation and submit a comprehensive project report. Student's performance will be evaluated base on project achievement and project report.

**References**

Depend on each student project's references.

## DEKP 3553
## BUILDING MAINTENANCE AND MANAGEMENT

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Describe the concept and elements of building services and systems for mechanical, electrical plumbing, building drawings and measurements.
2. Construct the line of communication, telephone and IT network (ICT), escalators and lifts, fire detection and protection, water, drainage and plumbing.
3. Construct and develop of electrical systems required for safe and energy sustaining operation of buildings.
4. Construct appropriate lightning protection schemes, LV systems, distribution boards and switchgear, HVAC, security and alarm systems.

**Synopsis**

This course covers the concept of building services and systems for mechanical, electrical, plumbing engineering, building floor plans, elevations and building regulations, by-laws and code of practice. Then it also covers communication lines, telephones and IT networks, escalators and lifts, fire detection and protection, water, drainage and plumbing. The students are also exposed to energy conservation and energy efficiency for environmental protection. Finally, the students will be introduced to concept of the lightning protection, low voltage (LV) systems, distribution boards and switchgear, heating, ventilation and air conditioning (HVAC), security and alarm systems.

**References**


1. LalJayamaha, Energy-Efficient Building Systems: Green Strategies for Operation and Maintenance, Amazon.com, 2007.
2. Shengwei Wang, Intelligent Buildings and Building Automation, Amazon.com, 2009.
3. Stein B. Reynolds J.S. & McGuinness W.J. Mechanical and Electrical Equipment for Buildings, 7th Edition, Volume 1 & 2, John Wiley & Sons.
4. Greeno R. (1996) Building Services and Design, Longman.
5. Chadderton D, Building Services Engineering, Spon Press, 2004.


## DEKP 3563
## RENEWABLE ENERGY AND APPLICATIONS

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Define and compare various forms of renewable energy and their application.
2. Identify the difference between types photovoltaic materials and its electrical characteristic.
3. Describe the design and installation procedure for solar photovoltaic, wind turbine and hydropower system.

**Synopsis**

The course intends to expose to the students the most recent development on the sustainable electrical systems development. This includes context, drivers and the up-to-update government policy. In addition, this course also introduces the students various form of sustainable energy resources and their connection to the systems. Furthermore, the economics and financial aspects of distributed generation will also be included. The students will also be exposed to different types of photovoltaic materials and its electrical characteristics and the design procedure of solar photovoltaic.

**References**


1. Gilbert M. Masters, "Renewable and Efficient Electric Power Systems", Wiley-IEEE Press, July 2004.
2. N. Jenkins, J.B. Ekanayake and G. Strbac, Distributed Generation, Stevenage IET, 2010.
3. Felix A. Farret, M. Godoy Simões, "Integration of Alternative Sources of Energy", John Wiley & Sons, Jan 17, 2006.
4. Ali Keyhani, "Design of Smart Power Grid Renewable Energy Systems", John Wiley & Sons, Jun 24, 2011.
5. Ann-Marie Borbely, Jan F. Kreider, "Distributed Generation: The Power Paradigm for the New Millennium" CRS Press 2001


## DEKP 3763
## POWER SYSTEM

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Describe the basic concept of power system and their components (PO1).
2. Describe the basic principle and parameter calculation for transmission and distribution system (PO2).
3. Calculate the fault level and short circuit current in symmetrical and asymmetrical faults (PO2).
4. Demonstrate the ability to use appropriate engineering tools in electrical power system (PO2).

**Synopsis**

The purpose of this course is to introduce students with basic concept of power system components such as generation, transmission and distribution. The calculation of basic electrical also covered in this course such as per-unit system, power factor, voltage regulation, efficiency and fault analysis.

**References**


1. Marizan Sulaiman, Analisis Sistem Kuasa, Penerbit USM, 2004.
2. Glover and Sharma, Power System Analysis and Design, Thomson learning, 2013.
3. Hadi Saadat, Power System Analysis, 2nd edition, 2002.

**DEKU 2363**
**INDUSTRIAL TRAINING**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Acquire an early stage working experience that is related to electrical engineering (PO6).
2. Develop and practice the positive attitude and be prepared for a real working environment (PO1).
3. Enhance and apply professional skills and knowledge that are highly relevant to the needs of today's workforce and industry (P05).
4. Contribute creative ideas in solving engineering problems (PO2).
5. Present a report in oral and written about working experiences (PO4).

**Synopsis**
Industrial training is compulsory to students of Diploma in Electrical Engineering after semester 4 (2nd year) for a 10-week (minimum) training. The students will undergo the internship at companies they are assigned / have chosen. During the training period, the students will be continuously supervised by the industrial supervisor as well as supervision by the lecturers from university (one time visit). For the duration of the placement, students are required to record their daily activities in the logbook that been provided by Faculty. After completing the industrial training, students have to submit a formal and full report following the UTeM format, regarding their training and experience they have got in the companies. Companies supervisor report, logbook and final report is the component for industrial evaluation for the grade either pass or fail.

**References**

1. Dasar Latihan Industri KPT, 2010
2. Dasar Latihan Industri UTeM, 2013
3. Dokumen Jawatankuasa Latihan Industri FKE


**DEKU 2362**
**INDUSTRIAL TRAINING REPORT**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Relate the activities and task given by supervisor during the industrial training to engineering knowledge (PO1).
2. Write a technical report regards the experience obtained from industrial training (PO4).
3. Engage the technical report with the need of life long learning (PO7).

**Synopsis**
All Diploma students are required to undergo industrial training as part of their curiculum to complete their two and half (2 1/2) years course after semester 4 of studies for a 10-weeks period of training at respective industrial companies. It is compulsory for all students to undergo the Industrial Training Programme. In general, the aim of industrial training is to give exposure, experience and professional skills to various aspects of engineering discipline, in particular in electrical engineering related industries. The students are also expected to be familiarized with efficient, accountable and ethical conduct as they will be supervised directly under the company's personnel as well as supervisors from the faculty. Apart from that, the assessment will be made by the appointed faculty supervisors & the industry supervisors. A PO survey is also embedded inside the assessment form by the industry supervisors. There will also be a survey by the students prior to completion of their training. After completing the industrial training, students have to submit a formal report following the faculty format. Evaluation will be based on final report is for grading evaluation.

**References**

1. Dasar Latihan Industri KPT, 2010
2. Dasar Latihan Industri UTeM, 2013
3. Dokumen Jawatankuasa Latihan Industri FKE


**DITG 1112**
**COMPUTER SKILLS**

**Learning Outcomes**
Upon completion this course, students will be able to:
1. Describe the elements of computer hardware, software, networking and internet technology (PO1).
2. Assemble the computer system (PO3).
3. Troubleshoot the computer problems related to hardware, software and network installation (PO2).
4. Demonstrate basic skills in using application software (PO3).

**Synopsis**
This course is designed to give an exposure to students about the fundamental of Information Technology, such as

computer component, operating system, application software, multimedia technology, system development life cycle, networking, and Internet technology. The introduction of computer consists of computer history, evolution and specification and the computer hardware. The software system is designed to equip the students with the application software such as word processing, spreadsheets, desktop publishing, database, basic programming, and system methodology. In this course, the students will also be introduced to data communication, networking and the Internet.

**References**


1. Shelly G.B., Vermaat M.E., Quasney J.J., Sebok S.L. and Freund S.M., Discovering Computers, Complete: Your Interactive Guide to the Digital World, Course Technology Inc., 2011.
2. LaBerta C., Complete: Computers Are Your Future, 12th Edition, Prentice Hall, 2011.
3. Capron, H.L, Computers: Tools for Information Age, 6th Ed., Addison Wesley,1999.
4. Williams, Brian K. and Sawyer, Stacey C., Using Information System, 6th Ed., McGraw Hill, 2005.
5. Turban E., Introduction to Information Technology, 2nd Ed., John Wiley & Son, 2003.


## DITG 1113
## COMPUTER PROGRAMMING

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Describe the fundamental principle of problem solving, programming techniques and programming structures in program development (PO1).
2. Explain problem solutions based on the principles of problem solving, programming technique and programming structures (PO1, P02)
3. Produce program codes by applying suitable programming structure and techniques (PO1, P02, PO5)

**Synopsis**

This course covers the introductory topics in programming using computer language. It includes the introduction to computers and programming, the fundamentals of programming, problem solving and software development. Data types and operators, selection, repetition, function,array, file, structured data and pointer are among the topics covered in the course.

**References**


1. Gaddis, T., (2011), “Starting Out with C++ Brief Version: From Control Structures ThroughObjects 7th. Edition”, Pearson Education.
2. Etter, D.M., Ingber, J.A., (2008), "Engineering Problem Solving with C++", 2nd Edition, Pearson Education.
3. Hanly, J.R, (2002), “Essential C++ for Engineers and Scientists”, Addison Wesley.


## DMCG 1323
## INTRODUCTION TO MECHANICAL SYSTEM

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Define the general terms in basic mechanical system engineering (PO1).
2. Explain the general principles of static and mechanics (PO3).
3. Analyze the mechanical properties of materials (PO3).
4. Describe the basic concepts of thermodynamics (PO1).
5. Conduct and demonstrate the basic practical works of mechanical system (PO4, PO6).

**Synopsis**

Introduction to basic concepts in static and mechanics as a study of physical sciences, system of units, scalars and vectors, free body diagram, various types of structures, stress, strain, principles of dynamics based on kinetic and kinematics and basic concepts of thermodynamics.

**References**


1. Hibbeler, R.C., 2010, *Engineering Mechanics-Statics,* 12th Editions, Prentice Hall.
2. Beer, F.P., 2010, *Vector Mechanics for Engineers, Dynamics SI Units*, 9th Edition, McGraw-Hill.
3. Hibbeler, R.C., 2010, *Engineering Mechanics-Dynamics,* 12th Editions, Prentice Hall.
4. Beer, F.P., Johnston E.R, DeWolf J.T and Mazurek D.F, 2009, Mechanics of Materials 5th Editions in SI Units, McGraw-Hill.
5. Cengel, Y. A. and Boles, M. A., 2011, *Thermodynamics: An Engineering Approach*, 7th Edition, McGraw Hill.
6. Sonntag , R. E., 2009, Borgnakke, C., and Van Wylen, G. J., *Fundamentals of Thermodynamics*, 7th Edition, John Wiley & Sons Inc.

7. Wark, K., 1999, *Thermodynamics*, 6th Edition, McGraw-Hill.
8. Gupta, S.C., 2008, *Thermodynamics*, Pearson.

## SERVICE COURSES (FPTT, PBPI & CO-CURRICULUM UNIT)

### DLHW 1012 FOUNDATION ENGLISH

**Learning Outcomes**

1. Interpret information from various types of oral texts.
2. Express ideas and thoughts orally in group discussions.
3. Distinguish different types of reading texts of varying length and complexity.
4. Produce an article based on non-linear texts in pairs.
5. Apply appropriate grammar elements in quizzes.

**Synopsis**

This course is designed to help students to improve their proficiency in the English language and to communicate effectively in both spoken and written forms. Five main aspects: listening, speaking, reading, writing and grammar are taught in an integrated approach to build confidence among the learners to become efficient speakers of English in their tertiary education

**References**

1. Bixby, J. & McVeigh, J. (2011). *Skills for Success: Reading and Writing.* New York: Oxford University Press.
2. Hooi Carol (2013). *Mastering MUET*. (3rd. Edition) Johor Bahru: Penerbitan Pelangi Sdn. Bhd.
3. Swan, M. & Walter, C. (2011). *Oxford English Grammar Course: Basic.* New York: Oxford University Press.

### DLHW 1722 PHILOSOPHY OF SCIENCE & TECHNOLOGY

**Learning Outcomes**

Setelah selesai matapelajaran ini, para pelajar seharusnya boleh:

1. Menyatakan konsep ilmu, falsafah sains dan teknologi dalam perspektif Islam.
2. Menerangkan perkaitan antara prinsip falsafah sains dan teknologi dengan proses pembangunan masa kini.
3. Membincangkan isu dan cabaran semasa sains dan teknologi serta kesannya terhadap permasalahan social.

**Synopsis**

Mata pelajaran ini membincangkan tentang konsep ilmu, konsep falsafah, sains dan teknologi yang berunsurkan inovasi menurut sarjana Islam dan barat. Selain itu, mata pelajaran ini juga menekankan tentang metodologi dalam sains Islam, konsep dan pencapaian tamadun Islam dalam bidang matematik, astronomi, fizik, kimia, perubatan, konsep penciptaan alam dan kosmologi dalam Islam, pencapaian dalam bidang telekomunikasi terkini dan isu-isu sains semasa.

**References**

1. Abdul Rahman Abdullah. (2010). *Wacana falsafah sains sejarah dan pemikiran.* Pulau Pinang*:* Pusat Kajian Pengurusan Pembangunan Islam Universiti Sains Malaysia.
2. Abdul Rahman Haji Abdullah. (2010*). Wacana falsafah sains: Sejarah dan pemikiran*. Pulau Pinang: Pusat Kajian Pengurusan Pembangunan Islam (ISDEV), Universiti Sains Malaysia.
3. Azizan Baharuddin & Maisarah Hasbullah. (2010).*Pendidikan sejarah dan falsafah sains di Institusi Pengajian Tinggi Awam*. Kuala Lumpur: Dewan Bahasa dan Pustaka.
4. Azizan Baharuddin & Maisarah Hasbullah. (2010).*Pendidikan sejarah dan falsafah sains di Institusi Pengajian Tinggi Awam*. Kuala Lumpur: Dewan Bahasa dan Pustaka.

### DLHW 2422 ENGLISH FOR EFFECTIVE COMMUNICATION

**Learning Outcomes**

1. Demonstrate interpersonal skills through speeches and role-play based on a situational context.(PO4)
2. Explain product descriptions and manual instructions in group.(PO4)
3. Apply appropriate course-verb agreement, tenses, active and passive voices as well as transitional markers in written examination.(PO6)

**Synopsis**

This course is designed to provide students with the necessary communication skills to communicate effectively. The skills covered are speaking, reading and writing. The elements of grammar are taught to complement the topics covered in this course. The documents covered are product descriptions and manual instructions. Students demonstrate interpersonal skills through speeches and role-play. The

elements of problem-based learning (PBL) are especially exercised during the oral presentation of the product and manual descriptions as well as role-play.

**References**


1. Azar, B. S. (2010). *Understanding and using English grammar*. New York: Longman.
2. Dobrin, S. I., Keller, C. J., & Weisser, C. R. (2008). *Technical communication in the twenty-first century*. New Jersey: Pearson Prentice Hall.
3. Gerson, S. J., & Gerson, S. M. (2010). *Workplace writing: Planning, packaging and perfecting communication.* US: Prentice Hall.
4. Hajibah Osman et al. (2011). *Effective communication skills*. Shah Alam: UPENA.
5. Lannon, J. M., & Gurak, L. J. (2011). *Technical Communication.* US: Longman.
6. Mohd Nor, N., Mansor, S., & Atin, J. (2010). *Technical English skills*. Malaysia: August Publishing Sdn. Bhd.


## DLHW 3432
## ENGLISH FOR MARKETABILITY

**Learning Outcomes**

1. Produce a reflective writing (A2), resume, job application letter/ online job application letter and short report.
2. Response appropriately to questions during mock interview session.
3. Analyse possible solutions based on the given problem in a group discussion.
4. Use appropriate types of communication using a variety of sentences based on the workplace contexts.

**Synopsis**

This course aims to introduce and expose students to the basic tenets of communication specifically the oral and written communication required at the workplace. Students will be provided with the opportunity to produce a reflective writing, resume, job-application letter, e-message and report. They will also be able to participate in an interview, and to discuss and explain information in group discussions. Students will be exposed to situations where they learn to function as individuals and team members by communicating in spoken and written forms using appropriate language in a variety of workplace contexts.

**References**


1. Dobrin, S. I., Keller, C.J., & Weisser, C. R. (2008). *Technical communication in the twenty-first century*. NJ: Pearson Prentice Hall.
2. Fisher, R., Larkin, S. & Jones, S. (2010). *Using talk to support writing*. UK: Sage Publication Limited.
3. Gail, F. & Lockwood, J. (2010). *Globalization, communication and the workplace: talking across the world.* UK: Continuum International Publishing.
4. Gerson, S. J. & Gerson, S. M. (2010). *Workplace writing*. New Jersey: Prentice Hall.
5. Hajibah Osman et al. (2011). *Effective communication skills*. Shah Alam: UPENA.
6. Samsiah A.H.,Rosyati A.R. (2012). *Mastering English for employment*. Cengage Learning Asia.


## DTMW 1012
## FUNDAMENTAL OF ENTERPRENEURIAL ACCULTURATION

**Learning Outcomes**

Di akhir kursus ini pelajar akan dapat:

1. Menerap budaya keusahawanan berdasarkan teori keusahawanan, revolusi usahawan, sejarah pembangunan usahawan dan perkembangan keusahawanan di Malaysia.(PO6)
2. Memperakui dan mengaplikasikan kemahiran keusahawanan seperti kreativiti, inovasi, pro-aktif, mengambil risiko, mengenalpasti peluang, pemasaran dan rangkaian untuk memasuki / menembusi pasaran. (PO6)
3. Melaksanakan penganjuran seminar keusahawanan dan kerja lapangan perniagaan di samping membuat pembentangan projek perniagaan serta berkongsi pengalaman berkaitan pelaksanaan projek perniagaan kumpulan masing-masing. (PO6)

**Synopsis**

Kursus ini akan membekalkan pelajar dengan motivasi dan kemahiran utama keusahawanan. Di samping itu, pelajar juga akan mendapat kemahiran tentang prinsip-prinsip dan amalan yang diperlukan untuk memulakan, mengembangkan dan memperkukuhkan sesebuah perniagaan. Aktiviti pengajaran, pembelajaran dan aplikasi yang menerapkan teori dan amalan akan membantu pelajar menguasai kompetensi yang perlu sebelum menceburkan diri dalam bidang perniagaan. Kursus ini juga membantu pelajar membentuk jaringan / rangkaian perniagaan melalui perbincangan perniagaan, simulasi dan seminar. Pelajar akan didedahkan dengan isu-isu yang berkaitan dengan

pemasaran, pengurusan strategi dan risiko. Di samping itu, pelajar akan dibekalkan dengan kemahiran yang perlu untuk menyediakan penyata aliran tunai dan asas dalam membangunkan / menyediakan perancangan perniagaan.

**References**


1. Acs, Z.J. & Audretsch, D.B. (2011). Handbook of Entrepreneurship Research: An Interdisciplinary Survey and Introduction. 2nd Ed. Springer
2. Read, S., Sarasvathy, S., Dew, N., Wiltbank, R. & Ohlsson A.V (2011). Effectual Entrepreneurship.Routledge: Taylor & Francis Group.
3. Hisrich, D.R., Peters, M.P. and Shepherd, D.A. (2005). Entrepreneurship, McGraw Hill IE
4. UiTM Entrepreneurship Study Group. (2004). " Fundamental of Entrepreneurship" Prentice Hall
5. Mankani,D.(2003). Technopreneurship, Prentice Hall.
6. Ab Aziz Yusof, (2003). Prinsip Keusahawanan, Prentice Hall.
7. Nor Aishah Buang, (2002). Asas Keusahawanan, Penerbit Fajar Bakti Sdn. Bhd.
8. Kuratko, D.F. and Hodgetts, R.M. (2001). Entrepreneurship: A Contemporary Approach, 5th Edition, South-Western: Ohio.


**DKXX XXX1**
**CO-CURRICULUM I &II**

*Please refer to the Pusat Bahasa & Pembangunan Insan (PBPI) handbook for further information on the offered courses.*

# BACHELOR PROGRAMME

# PROGRAMME EDUCATIONAL OBJECTIVES (PEO) - BACHELOR PROGRAMME

Programme Educational Objective (PEO) are specific goals describing the expected achievement of graduates in their career and professional life after 5 years of graduation. Three main concepts for PEO for the Faculty of Electrical Engineering's Bachelor Programme consist of Apply engineering knowledge and contribution to respected field, the achievement in technical career as well as lifelong learning.

| **BACHELOR OF ELECTRICAL ENGINEERING (BEKG)** | |
|---|---|
| The objectives of this program is to produce, after 5 years of graduation, | |
| 1. | Graduate who practice electrical engineering knowledge in broad applications related to product manufacturing sector, services, management, operations and research. |
| 2. | Graduate who are successful in career, and practice professional ethical, excellent leadership quality and able to work independently. |
| 3. | Graduate who engage with lifelong learning and adapt to constantly evolving technology and entrepreneurial skill in decision making. |

| **BACHELOR OF MECHATRONICS ENGINEERING (BEKM)** | |
|---|---|
| The objectives of this program is to produce, after 5 years of graduation, | |
| 1. | Graduate who practice mechatronics engineering knowledge in broad applications related to manufacturing, operation, project development, services, maintenance, management and research development. |
| 2. | Graduate who are successful in career, possess excellent leadership quality, able to work independently and practice professional ethical conduct. |
| 3. | Graduate who engage with lifelong learning and adapt to constantly evolving technology and entrepreneurial skill. |

# PROGRAMME OUTCOMES (PO) - BACHELOR PROGRAMME

Programme Outcome (PO) are statements describing what students are expected to know and be able to perform or attain by the time of graduation. These are related to the Knowledge (K), Skills (S), and Attitude (A) that students acquire throughout the programme.

Below is the list of Programme Outcomes for Faculty of Electrical Engineering's Bachelor Programme:

| NO | PROGRAMME OUTCOMES (PO) |
|---|---|
| 1. | Ability to apply knowledge of mathematics, science, engineering fundamentals and an electrical/mechatronics engineering to the solution of complex electrical and related engineering problem. (K,A) |
| 2. | Ability to identify, formulate, research literature and analyse complex electrical/mechatronics engineering problems reaching substantiated conclusion. (K,S,A) |
| 3. | Ability to design solutions for complex electrical/mechatronics engineering problems and design systems or components or processes that meet requirement with appropriate consideration for public health and safety, cultural, societal, and environmental. (K,S,A) |
| 4. | Ability to conduct investigation into complex electrical/mechatronics engineering problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions. (K,S,A) |
| 5. | Ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities, with an understanding of the limitations. (K,S) |
| 6. | Ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice. (K,A) |

| NO | PROGRAMME OUTCOMES (PO) |
|---|---|
| 7. | Ability to demonstrate the understanding for impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge and need for sustainable development. (K,A) |
| 8. | Ability to apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. (K,A) |
| 9. | Communicate effectively on complex engineering activities with the engineering community and with society at large through presentation or technical writing. (S,A) |
| 10. | Ability to function effectively either as a member or a leader in a team and in multi- disciplinary environment. (S,A) |
| 11. | Ability to recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. (K,A) |
| 12. | Ability to demonstrate knowledge and understanding of engineering economics, management principles and entrepreneurship skills as applied in the electrical engineering profession. (K,A) |

# BACHELOR OF ELECTRICAL ENGINEERING (BEKG)

# BACHELOR OF ELECTRICAL ENGINEERING (BEKG)

The Bachelor of Electrical Engineering (BEKG) consists of areas related to the electrical engineering including industrial power and high voltage, renewable energy, control and automation systems, electrical machine, and power electronics and drives.

## PROGRAMME IMPLEMENTATION - BEKG

This programme would take four (4) years minimum and consist of at least 135 credit hours. The programme will emphasis on Electrical Engineering with the composition of the credits are as follows:

| Components | | Credit Hours | Percentage |
|---|---|---|---|
| University Requirements (W) | | 14 | 10.37% |
| Core (P) | Common | 38 | 28.15% |
| | Program | 65 | 48.15% |
| | Industrial Practical | 5 | 3.70% |
| Electives (E) | University | 4 | 2.96% |
| | Program | 9 | 6.67% |
| **Total** | | 135 | 100% |

This programme emphasizes on theoretical and tutorials, computer-aided learning, and problem based learning (PBL). It also encourages active and cooperative learning activities other than carrying out assignments, job workshops, industrial training and final year project.

# CURRICULUM STRUCTURE - BEKG

Students are required to keep record of their obtained grades for a given course as shown in Appendix B (Student Audit Form - BEKG) for graduation purpose.

# COMPULSORY FOR LOCAL STUDENTS ONLY
* COMPULSORY FOR INTERNATIONAL STUDENTS ONLY
** OPTIONAL

| TYPE COURSE | YEAR 1 | | | | YEAR 2 | | | |
|---|---|---|---|---|---|---|---|---|
| | SEMESTER 1 | | SEMESTER 2 | | SEMESTER 3 | | SEMESTER 4 | |
| COMMON CORE & PROGRAM CORE (P) | BMFG 1313 ENGINEERING MATHEMATICS I | SEMESTER BREAK | BMCG 1013 DIFFERENTIAL EQUATIONS | LONG SEMESTER BREAK | BEKG 2443 ENGINEERING MATHEMATICS II | SEMESTER BREAK | BENG 2143 ENGINEERING STATISTICS | LONG SEMESTER BREAK |
| | BITG 1233 COMPUTER PROGRAMMING | | BENG 1413 DIGITAL ELECTRONICS | | BMCG 1523 ENGINEERING GRAPHICS AND CAD | | BMCG 2432 INTRODUCTION TO MECHANICAL ENGINEERING | |
| | BEKG 1123 PRINCIPLES OF ELECTRIC AND ELECTRONICS | | BEKG 1233 PRINCIPLES OF INSTRUMENTATION AND MEASUREMENT | | BEKU 2333 ELECTRIC CIRCUIT II | | BEKG 2433 ELECTRICAL SYSTEMS | |
| | BMFG 1213 ENGINEERING MATERIALS | | BEKU 1123 ELECTRIC CIRCUIT I | | BEKE 2333 ANALOGUE ELECTRONICS | | BEKP 2453 ELECTROMAGNETIC THEORY | |
| | BEKB 1131 ENGINEERING PRACTICE I | | | | BEKC 2433 SIGNAL & SYSTEMS | | BEKC 2453 COMMUNICATION SYSTEMS | |
| | | | BEKB 1231 ENGINEERING PRACTICE II | | BEKB 2331 ELECTRICAL ENGINEERING LABORATORY I | | BEKB 2431 ELECTRICAL ENGINEERING LABORATORY II | |
| CREDIT HOUR SEMESTER | 13 | | 13 | | 16 | | 15 | |
| ELECTIVE (E) | BLHL 1XX2 ELECTIVE I (UNIVERSITY) | | | | | | | |
| | | | | | | | | |
| CREDIT HOUR SEMESTER | 2 | | | | | | | |
| UNIVERSITY REQUIREMENTS (W) | BKKX XXX1 CO-CURRICULUM I | | BKKX XXX1 CO-CURRICULUM II | | BLHW 2452 ACADEMIC WRITING | | #BLHW 2712 ETHNIC RELATIONS | |
| | | | #BLHW 1702 TITAS<br>*BLHW 1742 MALAYSIAN STUDIES | | ** BKKX XXX1 CO-CURRICULUM (SUKSIS) | | *BLHW 2752 MALAYSIAN CULTURE | |
| | | | BLHW 1442 ENGLISH FOR ACADEMIC PURPOSE | | | | ** BKKX XXX1 CO-CURRICULUM (SUKSIS) | |
| CREDIT HOUR SEMESTER | 1 | | 5 | | 2 | | 2 | |
| TOTAL CREDIT HOUR SEMESTER | 16 | | 18 | | 18 | | 17 | |

| TYPE COURSE | YEAR 3 | | | | YEAR 4 | | | |
|---|---|---|---|---|---|---|---|---|
| | SEMESTER 5 | | SEMESTER 6 | SPECIAL SEMESTER | SEMESTER 7 | | SEMESTER 8 | |
| COMMON CORE & PROGRAM CORE (P) | BEKE 3533 ELECTRICAL MACHINE | SEMESTER BREAK | BEKE 4753 ELECTRICAL DRIVES | BEKU 3695 INDUSTRIAL TRAINNING | BEKU 4861 ENGINEERING SEMINAR | SEMESTER BREAK | BENG 4322 ENGINEER AND SOCIETY | |
| | BEKC 3523 CONTROL SYSTEMS ENGINEERING | | BEKC 3663 INSTRUMENTATION AND CONTROL | | BEKU 4792 FINAL YEAR PROJECT I | | BEKU 4894 FINAL YEAR PROJECT II | |
| | BEKC 3543 MICROPROSESSOR | | BEKP 4883 HIGH VOLTAGE ENGINEERING | | BEKP 4843 RENEWABLE ENERGY | | BEKP 4853 ENERGY UTILLIZATION AND CONSERVATION | |
| | BEKE 3543 POWER ELECTRONICS | | BEKB 3673 INTEGRATED DESIGN PROJECT | | BMFG 4623 ENGINEERING ECONOMY AND MANAGEMENT | | | |
| | BEKP 4773 POWER SYSTEMS ANALYSIS | | BEKB 3551 ELECTRICAL ENGINEERING LABORATORY III | | | | | |
| CREDIT HOUR SEMESTER | 15 | | 13 | 5 | 9 | | 9 | 108 |
| ELECTIVE (E) | | | BEKX XXX3 ELECTIVE I (PROGRAM) | | BXXX XXX2 ELECTIVE II (UNIVERSITY) | | BEKX XXX3 ELECTIVE III (PROGRAM) | |
| | | | | | BEKX XXX3 ELECTIVE II (PROGRAM) | | | |
| CREDIT HOUR SEMESTER | | | 3 | | 5 | | 3 | 13 |
| UNIVERSITY REQUIREMENTS (W) | BLHW 3462 ENGLISH FOR PROFESSIONAL INTERACTION | | | | | | BTMW 4012 ENTERPRENEUR-SHIP TECHNOLOGY | |
| CREDIT HOUR SEMESTER | 2 | | | | | | 2 | 14 |
| TOTAL CREDIT HOUR | 17 | | 16 | 5 | 14 | | 14 | 135 |

i. ***CHOOSE THREE (3) COURSES FROM ELECTIVE PROGRAM
ii. CHOOSE ONE (1) COURSE FROM THIRD LANGUAGE
iii. CHOOSE ONE (1) COURSE FROM GENERAL UNIVERSITY

| | | | | | |
|---|---|---|---|---|---|
| ELECTIVE PROGRAM | INDUSTRIAL POWER | BEKP 3683 DISTRIBUTION SYSTEM DESIGN | BEKP 4873 POWER SYSTEM PROTECTION | | |
| | CONTROL, INSTRUMENTATION & AUTOMATION | BEKC 3673 INDUSTRIAL CONTROL AND AUTOMATION | BEKC 4773 INTELLIGENT CONTROL SYSTEMS | BEKC 4683 DIGITAL CONTROL SYSTEMS | BEKM 4863 INDUSTRIAL ROBOTICS |
| | POWER ELECTRONICS & DRIVES | BEKE 3673 INDUSTRIAL POWER ELECTRONICS | BEKE 3663 POWER ELECTRONICS SYSTEM | BEKE 4763 MODERN ELECTRICAL DRIVES | BEKE 4873 ELECTRIC MACHINE DESIGN |
| ELECTIVE UNIVERSITY | I THIRD LANGUAGE | BLHL 1212 BAHASA MANDARIN 1 | BLHL 1612 BAHASA KOREA 1 | BLHL 1112 BAHASA ARAB 1 | BLHL 1412 BAHASA JERMAN 1 |
| | | BLHL 1312 BAHASA JEPUN 1 | *BLHL 1012 BAHASA MELAYU KOMUNIKASI 1 | | |
| | II GENERAL | BXXX XXX2 PEMIKIRAN KRITIS DAN KREATIF | BXXX XXX2 KOMUNIKASI ORGANISASI | BXXX XXX2 PSIKOLOGI INDUSTRI DAN ORGANISASI | BXXX XXX2 KEMAHIRAN PERUNDINGAN |
| | | BXXX XXX2 FALSAFAH SAINS DAN TEKNOLOGI | BXXX XXX2 SOSIOLOGI INDUSTRI | | |

*** Subjected to the courses offer by the faculty in the current semester

# EQUIVALENT CODE AND PRE-REQUISITE - BEKG

Students are required to keep record of their obtained grades for a given course as shown in Appendix B (Student Audit Form - BEKG) for graduation purpose.

# COMPULSORY FOR LOCAL STUDENTS ONLY
* COMPULSORY FOR INTERNATIONAL STUDENTS ONLY
** OPTIONAL

| SEMESTER | CODE | COURSE | CATEGORY | CREDIT HOUR | EQUIVALENT CODE | PRE-REQUISITE |
|---|---|---|---|---|---|---|
| SEMESTER 1 | BLHL 1XX2 | ELECTIVE I (UNIVERSITY) | W | 2 | | |
| | BKKX XXX1 | CO-CURRICULUM I | W | 1 | | |
| | BMFG 1313 | ENGINEERING MATHEMATICS I | P | 3 | | |
| | BITG 1233 | COMPUTER PROGRAMMING | P | 3 | | |
| | BEKG 1123 | PRINCIPLES OF ELECTRIC AND ELECTRONICS | P | 3 | | |
| | BMFG 1213 | ENGINEERING MATERIALS | P | 3 | | |
| | BEKB 1131 | ENGINEERING PRACTICE I | P | 1 | | |
| | | | **TOTAL** | **16** | | |
| SEMESTER 2 | #BLHW 1702<br>*BLHW 1742 | TITAS<br>MALAYSIAN STUDIES | W | 2 | | |
| | BLHW 1442 | ENGLISH FOR ACADEMIC PURPOSE | W | 2 | | |
| | BKKX XXX1 | CO-CURRICULUM II | W | 1 | | |
| | BMCG 1013 | DIFFERENTIAL EQUATIONS | P | 3 | | |
| | BENG 1413 | DIGITAL ELECTRONICS | P | 3 | | |
| | BEKG 1233 | PRINCIPLES OF INSTRUMENTATION AND MEASUREMENT | P | 3 | | |
| | BEKU 1123 | ELECTRIC CIRCUIT I | P | 3 | | |
| | BEKB 1231 | ENGINEERING PRACTICE II | P | 1 | | |
| | | | **TOTAL** | **18** | | |
| SEMESTER 3 | BLHW 2452 | ACADEMIC WRITING | W | 2 | | |
| | BEKG 2443 | ENGINEERING MATHEMATICS II | P | 3 | | |
| | BMCG 1523 | ENGINEERING GRAPHIC AND CAD | P | 3 | | |
| | BEKU 2333 | ELECTRIC CIRCUIT II | P | 3 | | |

| SEMESTER | CODE | COURSE | CATEGORY | CREDIT HOUR | EQUIVALENT CODE | PRE-REQUISITE |
|---|---|---|---|---|---|---|
| | BEKE 2333 | ANALOGUE ELECTRONICS | P | 3 | | |
| | BEKC 2433 | SIGNAL & SYSTEMS | P | 3 | | |
| | BEKB 2331 | ELECTRICAL ENGINEERING LAB I | P | 1 | | |
| | | | **TOTAL** | **18** | | |
| **SEMESTER 4** | #BLHW 2712<br>*BLHW 2752 | ETHNIC RELATIONS<br>MALAYSIAN CULTURE | W | 2 | | |
| | BENG 2143 | ENGINEERING STATISTICS | P | 3 | | |
| | BEKG 2433 | ELECTRICAL SYSTEMS | P | 3 | | |
| | BMCG 2432 | INTRODUCTION TO MECHANICAL ENGINEERING | P | 3 | | |
| | BEKC 2453 | COMMUNICATION SYSTEMS | P | 3 | | |
| | BEKP 2453 | ELECTROMAGNETIC THEORY | P | 2 | | |
| | BEKB 2431 | ELECTRICAL ENGINEERING LAB II | P | 1 | | |
| | | | **TOTAL** | **17** | | |
| **SEMESTER 5** | BLHW 3462 | ENGLISH FOR PROFESSIONAL INTERACTION | W | 2 | | |
| | BEKE 3533 | ELECTRICAL MACHINE | P | 3 | | |
| | BEKC 3523 | CONTROL SYSTEMS ENGINEERING | P | 3 | | |
| | BEKC 3543 | MICROPROCESSOR | P | 3 | | |
| | BEKE 3543 | POWER ELECTRONICS | P | 3 | | |
| | BEKP 4773 | POWER SYSTEMS ANALYSIS | P | 3 | | |
| | | | **TOTAL** | **17** | | |
| **SEMESTER 6** | BEKX XXX3 | ELECTIVE I (PROGRAM) | P | 3 | | |
| | BEKE 4753 | ELECTRICAL DRIVES | P | 3 | | |
| | BEKC 3663 | INSTRUMENTATION AND CONTROL | P | 3 | | |
| | BEKP 4883 | HIGH VOLTAGE ENGINEERING | P | 3 | | |
| | BEKB 3673 | INTEGRATED DESIGN PROJECT | P | 3 | | |
| | BEKB 3551 | ELECTRICAL ENGINEERING LABORATORY III | P | 1 | | |
| | | | **TOTAL** | **16** | | |

| SEMESTER | CODE | COURSE | CATEGORY | CREDIT HOUR | EQUIVALENT CODE | PRE-REQUISITE |
|---|---|---|---|---|---|---|
| **SPECIAL SEMESTER** | BEKU 3695 | INDUSTRIAL TRAINING | P | 5 | | |
| | | | **TOTAL** | **5** | | |
| **SEMESTER 7** | BMFG 4623 | ENGINEERING ECONOMY AND MANAGEMENT | P | 3 | | |
| | BEKU 4861 | ENGINEERING SEMINAR | P | 1 | | |
| | BEKU 4792 | FINAL YEAR PROJECT I | P | 2 | | |
| | BEKP 4843 | RENEWABLE ENERGY | P | 3 | | |
| | BXXX XXX2 | ELECTIVE II (UNIVERSITY) | E | 2 | | |
| | BEKX XXX3 | ELECTIVE II (PROGRAM) | E | 3 | | |
| | | | **TOTAL** | **15** | | |
| **SEMESTER 8** | BTMW 4012 | ENTERPRENEURSHIP TECHNOLOGY | W | 2 | | |
| | BENG 4322 | ENGINEER AND SOCIETY | P | 2 | | |
| | BEKU 4894 | FINAL YEAR PROJECT II | P | 4 | | BEKU 4792 |
| | BEKP 4853 | ENERGY UTILLIZATION AND CONSERVATION | P | 3 | | |
| | BEKX XXX3 | ELECTIVE III (PROGRAM) | E | 3 | | |
| **TOTAL** | | | | **14** | | |
| **MINIMUM TOTAL CREDIT** | | | | **135** | | |

## LIST OF ELECTIVE COURSES FOR BACHELOR OF ELECTRICAL ENGINEERING WITH HONOURS PROGRAMME (BEKG)

| COURSE | ELECTIVE SPECIALIZATION | CODE | COURSE NAME | CREDIT | EQUIVALENT CODE | PRE-REQUISITE |
|---|---|---|---|---|---|---|
| ELECTIVE PROGRAM | INDUSTRIAL POWER | BEKP 3683 | DISTRIBUTION SYSTEM DESIGN | 3 | BEKP 4783 | BEKG 2433 |
| | | BEKP 4873 | POWER SYSTEM PROTECTION | 3 | | |
| | CONTROL, INSTRUMENTATION & AUTOMATION | BEKC 3673 | INDUSTRIAL CONTROL AND AUTOMATION | 3 | BEKC 4763 | BEKC 3553 |
| | | BEKC 4773 | INTELLIGENT CONTROL SYSTEMS | 3 | BEKC 4873 / BEKC 4783 | |
| | | BEKC 4683 | DIGITAL CONTROL SYSTEMS | 3 | | |
| | | BEKM 4863 | INDUSTRIAL ROBOTICS | 3 | | |
| | POWER ELECTRONICS & DRIVES | BEKE 3663 | POWER ELECTRONICS SYSTEM | 3 | | BEKE 3533 |
| | | BEKE 3673 | INDUSTRIAL POWER ELECTRONICS | 3 | BEKE 4883 | BEKE 3533 |
| | | BEKE 4763 | MODERN ELECTRICAL DRIVES | 3 | | |
| | | BEKE 4873 | ELECTRIC MACHINE DESIGN | 3 | | |
| ELECTIVE UNIVERSITY | THIRD LANGUAGE | BLHL 1212 | BAHASA MANDARIN 1 | 2 | | |
| | | BLHL 1612 | BAHASA KOREA 1 | 2 | | |
| | | BLHL 1112 | BAHASA ARAB 1 | 2 | | |
| | | BLHL 1412 | BAHASA JERMAN 1 | 2 | | |
| | | BLHL 1312 | BAHASA JEPUN 1 | 2 | | |
| | | *BLHL 1012 | BAHASA MELAYU KOMUNIKASI 1 | 2 | | |
| | GENERAL | BXXX XXX2 | PEMIKIRAN KRITIS DAN KREATIF | 2 | | |
| | | BXXX XXX2 | KOMUNIKASI ORGANISASI | 2 | | |
| | | BXXX XXX2 | PSIKOLOGI INDUSTRI DAN ORGANISASI | 2 | | |
| | | BXXX XXX2 | KEMAHIRAN PERUNDINGAN | 2 | | |
| | | BXXX XXX2 | FALSAFAH SAINS DAN TEKNOLOGI | 2 | | |
| | | BXXX XXX2 | SOSIOLOGI INDUSTRI | 2 | | |

P = Core, E = Elective, W = University Requirements

**Selection Guideline of Elective Courses -** Refer to Curriculum Structure - BEKG

# STUDENT LEARNING TIME (SLT) - BEKG

| Semester | Code | Course | Face-to-Face Learning | | | | Self-Learning Activities | Formal Assessment | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | | Teacher Centered (TC) | Student Centered Learning (SCL) | | | Student Direct Learning / Revision / Exercise | Continuous Learning + Final Examination | |
| | | | Lecture | Tutorial | Practical | PBL / Other SCL Activities | | | |
| 1 | BLHL 1XX2 | ELECTIVE I (UNIVERSITY) | 22 | 3 | | 6 | 45.5 | 3.5 | 80 |
| | BKKX XXX1 | CO-CURRICULUM I | | | | 16 | 22 | 2 | 40 |
| | BMFG 1313 | ENGINEERING MATHEMATICS I | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BITG 1233 | COMPUTER PROGRAMMING | 28 | 3.25 | 20 | | 63.25 | 5.5 | 120 |
| | BEKG 1123 | PRINCIPLES OF ELECTRIC AND ELECTRONICS | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BMFG 1213 | ENGINEERING MATERIALS | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKB 1131 | ENGINEERING PRACTICE I | | | 20 | | 18 | 2 | 40 |
| 2 | #BLHW 1702 *BLHW 1742 | TITAS MALAYSIAN STUDIES | 22 | 3 | | 6 | 45.5 | 3.5 | 80 |
| | BLHW 1442 | ENGLISH FOR ACADEMIC PURPOSE | 22 | 3 | | 6 | 45.5 | 3.5 | 80 |
| | BKKX XXX1 | CO-CURRICULUM II | | | | 16 | 22 | 2 | 40 |
| | BMCG 1013 | DIFFERENTIAL EQUATIONS | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BENG 1413 | DIGITAL ELECTRONICS | 36 | 5.5 | | 6 | 67.5 | 5 | 120 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | BEKG 1233 | PRINCIPLES OF INSTRUMENTATION AND MEASUREMENT | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKU 1123 | ELECTRIC CIRCUIT I | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKB 1231 | ENGINEERING PRACTICE II | | | 20 | | 18 | 2 | 40 |
| 3 | BLHW 2452 | ACADEMIC WRITING | 22 | 3 | | 6 | 45.5 | 3.5 | 80 |
| | BEKG 2443 | ENGINEERING MATHEMATICS II | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BMCG 1523 | ENGINEERING GRAPHIC AND CAD | 28 | 3.25 | 20 | | 63.25 | 5.5 | 120 |
| | BEKU 2333 | ELECTRIC CIRCUIT II | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKE 2333 | ANALOGUE ELECTRONICS | 36 | 5.5 | | 6 | 67.5 | 5 | 120 |
| | BEKC 2433 | SIGNAL & SYSTEMS | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKB 2331 | ELECTRICAL ENGINEERING LAB I | | | 20 | | 18 | 2 | 40 |
| 4 | #BLHW 2712 *BLHW 2752 | ETHNIC RELATIONS MALAYSIAN CULTURE | 22 | 3 | | 6 | 45.5 | 3.5 | 80 |
| | BENG 2143 | ENGINEERING STATISTICS | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKG 2433 | ELECTRICAL SYSTEMS | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BMCG 2432 | INTRODUCTION TO MECHANICAL ENGINEERING | 28 | 3.25 | | | 45.25 | 3.5 | 80 |
| | BEKC 2453 | COMMUNICATION SYSTEMS | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKP 2453 | ELECTROMAGNETIC THEORY | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKB 2431 | ELECTRICAL ENGINEERING LAB II | | | 20 | | 18 | 2 | 40 |
| 5 | BLHW 3462 | ENGLISH FOR PROFESSIONAL INTERACTION | 22 | 3 | | 6 | 45.5 | 3.5 | 80 |
| | BEKE 3533 | ELECTRICAL MACHINE | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKC 3523 | CONTROL SYSTEMS ENGINEERING | 42 | 5.5 | | | 67.5 | 5 | 120 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | BEKC 3543 | MICROPROCESSOR | 36 | 5.5 | 6 | | 67.5 | 5 | 120 |
| | BEKE 3543 | POWER ELECTRONICS | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKP 4773 | POWER SYSTEMS ANALYSIS | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKX XXX3 | ELECTIVE I (PROGRAM) | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKE 4753 | ELECTRICAL DRIVES | 33 | 5.5 | | 9 | 67.5 | 5 | 120 |
| 6 | BEKC 3663 | INSTRUMENTATION AND CONTROL | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKP 4883 | HIGH VOLTAGE ENGINEERING | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKB 3673 | INTEGRATED DESIGN PROJECT | 1 | | | 41 | 73 | 5 | 120 |
| | BEKB 3551 | ELECTRICAL ENGINEERING LABORATORY III | | | 20 | | 18 | 2 | 40 |
| Special Semester | BEKU 3695 | INDUSTRIAL TRAINING | | | | | 200 | | 200 |
| 7 | BMFG 4623 | ENGINEERING ECONOMY AND MANAGEMENT | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKU 4861 | ENGINEERING SEMINAR | 14 | 6 | | | 18 | 2 | 40 |
| | BEKU 4792 | FINAL YEAR PROJECT I | 3 | | | 6.5 | 67 | 3.5 | 80 |
| | BEKP 4843 | RENEWABLE ENERGY | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BXXX XXX2 | ELECTIVE II (UNIVERSITY) | 22 | 3 | | 6 | 45.5 | 3.5 | 80 |
| | BEKX XXX3 | ELECTIVE II (PROGRAM) | 42 | 5.5 | | | 67.5 | 5 | 120 |
| 8 | BTMW 4012 | ENTERPRENEURSHIP TECHNOLOGY | 22 | 3 | | 6 | 45.5 | 3.5 | 80 |
| | BENG 4322 | ENGINEER AND SOCIETY | 22 | 3 | | 6 | 45.5 | 3.5 | 80 |
| | BEKU 4894 | FINAL YEAR PROJECT II | 4 | | | 7 | 141.75 | 7.25 | 160 |
| | BEKP 4853 | ENERGY UTILLIZATION AND CONSERVATION | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKX XXX3 | ELECTIVE III (PROGRAM) | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | | **TOTAL HOURS** | **1495** | **202** | **146** | **161.5** | **3172.75** | **222.75** | **5400** |

# SUBJECT DETAILS FOR BACHELOR PROGRAMME (BEKG)

**BEKB 1131**
**ENGINEERING PRACTICE I**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Construct basic electric components for single phase domestic wiring installation. (PO5)
2. Construct and demonstrate relay control circuits. (PO5)
3. Apply the basic concept for electrical simulation using Pspice and PROTEUS simulation tools. (PO5)
4. Describe the knowledge of domestic wiring, relay control circuit and simulation using Pspice and PROTEUS in writing and/or oral. (PO9)
5. Work in a group during implementation of wiring installation, relay circuits, simulation projects and present the work results. (PO10)

**Synopsis**
This course will expose students to basic single phase domestic wiring, relay control circuits and basic concept for electrical simulation using Pspice and PROTEUS. Students are required to concentrate on the safety aspects and quality of works during the workshop sessions.

**References**

1. Ir Md Nazri, Aminudin, Md Hairul Nizam, Engineering Practice: Wiring System & Motor Starter, Module 2, UTeM, 2007.
2. Teo Cheng Yu, Principle and Design of Low Voltage System, 2nd Ed., Byte Power Publications, Singapore, 2009.
3. IEEE Regulation 16th Edition. Akta Bekalan Elektrik (447 Pindaan 2001).
4. Paul Tobin, PSpice for Circuit Theory and Electronic Devices, 2007.
5. K.A. Charles, N.O. Sadiku, Fundamentals of Electric Circuits, 3rd Ed. , McGraw Hill, 2007.


**BEKB 1231**
**ENGINEERING PRACTICE II**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Construct three phase motor starter control circuit. (PO5)
2. Apply the basic concept for electrical schemetic diagram using AUTOCAD tools. (PO5)
3. Apply the basic microcontroller programming language for dynamic mechanism application. (PO5)
4. Demonstrate and present the results in oral and technical report writing. (PO9)
5. Work in a group during implementation of wiring installation, relay circuits, simulation projects and present the work results. (PO10)

**Synopsis**
This course will let students to practice with Arduino and AUTOCAD simulation tools to solve simple engineering problem. Students also will be introduced with three phase motor starter which is cover on DOL, Forward-Reverse and STAR/DELTA connection.

**References**

1. Massimo Banzi, Getting Started with Arduino, 2nd Ed., O'reilly, 2011.
2. K.A. Charles, N.O. Sadiku, Fundamentals of Electric Circuits, 6th Ed., McGraw Hill, 2016.
3. James Leach, AutoCAD 2016 - Instructor, SDS Publications, 2016.
4. Ir Md Nazri, Aminudin, Md Hairul Nizam, Engineering Practice: Wiring System & Motor Starter, Modul 2, UTeM, 2007.

**BEKB 2331**
**ELECTRICAL ENGINEERING LABORATORY I**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Construct series and parallel RLC circuits using electrical components and PSPICE simulation correctly
2. Measure the electrical characteristics of single-phase and three-phase RLC circuit using appropriate measurement equipments precisely
3. Identify and describe basic characteristics and operation of digital components such basic gates and it's combinational, adder, and flip-flops clearly.
4. Identify and describe basic circuit and operation of analogue application circuit such as active filter, amplifier, voltage regulator, and oscillator clearly.
5. Exhibit communication skills from lab report writing

**Synopsis**
Students will conduct experiments of single-phase and three-phase circuits with RLC load combinations to measure the electrical quantities such as voltage, current and power. The measurement values will be used to calculate the reactive power, apparent power and power factor. Students are also expected to analyze the performance and characteristics of the system during transient and resonance conditions by using PSPICE simulation. The laboratory experiments also consist of practical and simulation activities which are conducted to enhance student skills and theoretical knowledge in analogue electronics and digital electronics system topics. The experiments include small signal amplifier, power amplifier, oscillator, basic gates, combinational logic circuit, binary adder, and flip-flop.

**References**

1. K.A. Charles, N.O. Sadiku, Fundamentals of Electric Circuits, 3rd Ed. 2007, McGraw Hill.
2. James W. Nilsson, Susan Riedel, Electric Circuits, 9th Ed. 2010, Prentice Hall
3. Allan Robbins, Wilhelm C. Miller, Circuit Analysis: Theory and Practice, 4th Ed. 2006, Thomson Delmar Learning
4. Tocci, R.J, Digital Systems: Principles and Applications, 10th ed., Prentice Hall, 2009.
5. Thomas L. Floyd, Digital Fundamentals, Prentice Hall, 10th Ed.
6. Boylestad and Nashelsky, Electronic Devices and Circuit Theory, 10th ed., Prentice Hall, 2009.
7. Floyd, T., Electronic Devices, 11th, Edition Prentice Hall, 2009.


**BEKB 2431**
**ELECTRICAL ENGINEERING LABORATORY II**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Simulate Discrete-Time & Continuous-Time Signal as well as Fourier series using MATLAB / SIMULINK software. (PO5)
2. Simulate power system (generation / transmission/distribution) using PSCAD (PO5).
3. Contruct transmission line components as well as voltage, current, and power measurements equipment properly and safety in laboratory environment (PO5).
4. Exhibit the problem solving skill and critical thinking during any issues (PO2).
5. Demostrate soft skill such as spirit of teamwork (P10).
6. Write and present technical report systematically (PO9).

**Synopsis**
This laboratory provides students with practical activities of signal and system theory as well as power system engineering theory. The laboratory session will cover the simulation of introduction to MATLAB & SIMULINK, Discrete-Time & Continuous-Time Signal and Fourier series using MATLAB software. It also cover the simulation of introduction to power system using PSCAD and also an experiment that provides practical approach of fundamental of power system especially in generation and transmission equipments.

**References**

1. M.J. Roberts, Signals and System Analysis Using Transform Methods and MATLAB, 2nd Ed., McGraw Hill, 2012
2. Hadi Saadat, Power Sytem Analysis, Third Edition, Mc-Graw Hill, 2010.
3. Keduki, E., Munson, D. C. Analog Signals and Systems, 1st Ed., Pearson Education, 2009


**BEKB 3551**
**ELECTRICAL ENGINEERING LABORATORY III**

**Learning Outcomes**
Upon completion of this course, the student should be able to:

1. Construct of blanking time circuit for full-bridge converter, DC motor drive accurately.
2. Describe the performance of synchronous and induction machine properly.
3. Analyze the performance of the open-loop and close-loop system according to specification.

**Synopsis**

This course is intended to provide the student knowledge about the fundamental of power electronics, electrical machines and control systems through experimental works. The experiments are designed to expose student on the pratical aspects of the above mentioned fields.

**References**


1. Nise, S. Norman, Control Systems Engineering, 6th Edition, John Wiley & Sons Inc., United State of America, 2011.
2. Muhamad H.Rashid. Power Electronics – circuits, Devices, and Application, 3rd Edition, Prentice Hall, 2005.
3. Mc Pearson and Laramont, An Introduction to Electrical Machine and Transformer, 2nd ed., John Wiley & Sons, 1990.
4. LabVolt user and instruction manuals.


## BEKB 3673
## INTEGRATED DESIGN PROJECT

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Design electrical or electronic systems, components or processes that meet desired requirements by following engineering design process and with appropriate consideration for public health and safety, cultural, societal, environmental and sustainability factors. (PO3)
2. Utilize modern engineering and IT tools in facilitating solution to complex electrical engineering problems with an understanding of the limitations.
3. Evaluate the impact of the designed product, components or processes, in terms of safety, environmental and sustainability factors. (PO7)
4. Apply project management and financial knowledge effectively in completing the electrically integrated design project.
5. Demonstrate effectively teamwork skills in completing design project. (PO10)

**Synopsis**

Electrical engineering project is integrated design project where student have to design project where students have to design an electrical and electronic engineering project including project management, project planning, project feasibility study, design selection, design costing and sizing, analysis and evaluation. The course focuses on the implementation and integration of product/conceptual design development to produce a comprehensive final technical report, including engineering proposals and drawings, specifications and bills of quantities, cost estimates of development projects given to students, working in groups. Apart from basic electrical and electronic design, students are also required to integrate their knowledge of other engineering such as (but not limited to) circuit design and analysis, including component selections, project scheduling techniques and sustainable development considerations into their overall project work. At the end of this course, the students will be able to comprehend the needs and requirements for product design procedures and are able to appreciate the importance of integration and synthesis of various of electrical engineering knowledge.

**References**


1. Dieter, G.E. & Schmidt, L.C.(2013). Engineering Design, 5th Edition, McGraw Hill.
2. Ulrich, K.T. & Eppinger, S.D.(2008). Product Design and Development, 4th Edition, McGraw Hill.
3. John P. Bentley, Principles of Measurement Systems, 4th Ed., Prentice Hall, 2005.
4. Cross, Nigel, (2010) Engineering Design Methods, Wiley.
5. W.Bolton, Mechatronics electronic control systems in mechanical and electrical engineering, 4th Ed., Prentice Hall, 2008.
6. Kutz, Myer, Mechanical Engineers Handbook - Manufacturing and Management , 3rd ed., John Wiley 2006.


## BEKC 2433
## SIGNAL AND SYSTEM

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Apply the basic knowledge of signals and systems for continuous-time and discrete-time signals. (PO1)
2. Analyze the linear time-invariant (LTI) systems in time-domain and frequency-domain. (PO2)

3. Analyze the LTI systems using Z-Transform method. (PO2)

Synopsis
This course will discuss about the introduction to signals and systems; classification of signals and systems; linear time-invariant systems and convolutions; Fourier series and Fourier transform; Fourier analysis for continuous-time and discrete-time signals; and Z-transforms method.

**References**

1. Philips, C. L., Parr, J. M., Signals, Systems and Transforms, 5th Ed., Prentice Hall, 2014.
2. Oppenheim, A. V., Willsky, A. S., Signals and Systems, 2nd Ed., Prentice Hall, 2014.
3. M.J. Roberts, Signals and System Analysis Using Transform Methods and MATLAB, 2nd Ed., Mc Graw Hill, 2012).


## BEKC 2453
## COMMUNICATION SYSTEMS

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Explain and apply the basic principles and components of telecommunication and data communication systems. (PO1)
2. Apply knowledge and analyze related to Analog and Digital Communication techniques that are typically used in telecommunication systems (PO2, C4, CTPS3).
3. Explain the concept of computer system network, network technology and multiplexing / demultiplexing (PO1, C4).

**Synopsis**
Topics covered are: Introduction to Telecommunications, Transmission Modes, Power Measurements, Electromagnetic Frequency Spectrum, Bandwidth and Information Capacity, Amplitude Modulation Transmission & Reception, Single-Sidebands Communications Systems, Angle Modulation Transmission & Reception, FM Stereo, Noise in Telecommunication Systems, Digital Communication, Digital Transmission, PCM, Digital Modulation / Demodulation, ASK, FSK, PSK, Data Communication & Computer Network. Frequency Division Multiplexing, Time Division Multiplexing, Space Division Multiplexing.

**References**

1. Anis Niza Ramani, Arfah Syahida Mohd Nor, Ezreen Farina Shair, Sazuan Nazrah Mohd Azam and Musa Yusup Lada, Basic Analog Communication System, First Edition, Penerbit Universiti UTeM, 2013
2. Ahmad Fairuz Muhammad Amin, Hyreil Anuar Kasdirin, Zulhani Rasin, Wan Mohd Bukhari Wan Daud and Nur Maisarah Sobran, Introduction to Digital Communication System, First Edition, Penerbit Universiti UTeM, 2013
3. Wayne Tomasi, Electronics Communications Systems Fundamentals Through Advanced, Prentice Hall, Fifth Edition, 2004.
4. Jeffrey S. Beasley, Modern Electronic Communication, Pearson, 9th Edition, 2008.
5. Behrouz A. Forouzan, Data Communication and Networking, 4th Edition, McGraw Hill, 2007.


## BEKC 3543
## MICROPROCESSOR

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Describe and explain microprocessor (Motorola 68000) architecture and its operation. Able to illustrate the interfacing circuitry of microprocessor-based systems and its supporting components. (PO1)
2. Write and apply the 68k Microprocessor instruction set operation in assembly language. (PO5)
3. Describe and distinguish the concept of the Motorola 68000 microprocessor system with memory and peripheral device interface. (PO1)
4. Develop and construct a microprocessor-based system and solve the problem related and prepare the technical report. (PO3)

Synopsis
This course is about hardware and microprocessor handling, type of microprocessor systems, system handler and timing diagrams. The course covers the concept of MC68000 microprocessor software architecture, programming, assembly language and basic instruction, data transferring instruction, program control and subroutine, arithmetic and logic operations. It touches most on programming techniques, designing a microcomputer system, interfaces with memory and I/O devices. Students will experience PBL approach in this course where a PO-PBL will be introduced to the student.

**References**


1. Antonakos, J.L., The 68000 Microprocessor: Hardware and Software Principles and Applications, 5th Edition, Prentice Hall, (2004).
2. Spasov, P., Microcontroller Technology: The 68HC11 and 68HC12, 5th Edition, Prentice Hall, (2004).
3. Tocci, R.J., Digital Systems: Principles and Applications, 9th Edition, Prentice Hall, (2004).


## BEKC 3523
## CONTROL SYSTEMS ENGINEERING

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Understand and interpret control systems characteristics and specifications. (PO1)
2. Analyze the problems of a system and point out the proposed solution. (PO2)
3. Design and construct the compensators in time domain, frequency domain and state variable feedback systems. (PO3)

Synopsis

This course address compensator design in control systems engineering. Typically, the design of active and passive compensators using root locus technique; passive compensator using root locus and frequency response technique; closed loop frequency response of unity feedback system; state feedback design using pole placement technique as well as integral control and observer design. In particular, we will concentrate on systems that can be modeled by Ordinary Differential Equations (ODEs), and that satisfy certain linearity and time-invariance conditions.
Student is encouraged to have sufficient knowledge in differential equations, introduction to control systems and signals and systems.

**References**


1. Dorf, R.C., Bishop R.H., Modern Control Systems, 12th Edition, Pearson, 2014
2. Nise, N.S., Control Systems Engineering, 7th Edition, John Wiley & Sons Inc., United State of America, 2015.
3. Ogata Katsuhiko, Modern Control Engineering, 5th Edition, Prentice Hall, 2010.


## BEKC 3663
## INSTRUMENTATION AND CONTROL

**Learning Outcomes**

Upon completion of this course, the student should be able to:

4. Apply and analyze the appropiate instrumentation elements for a data acquisition system. (PO1)
5. Design compensators and controllers for control systems in time and frequency domain. (PO3)
6. Apply feedback control systems in real-time. (PO5)

Synopsis

This course introduces students to the important areas of instrumentation and controller design. In the instrumentation part, students will be exposed to the concepts of data acquisition system (such as sensors & transducers, signal conditioning & processing, A/D and D/A conversion, interfacing standards and data presentation). In controller system design, students will also be exposed to the PI, PD, PID, Lead-lag design using root-locus technique, full state feedback control technique and observer design. At the end of the course, student will have well-understanding and hands-on experience of a real-time control system design to implementation through an established data acquisition system.

**References**


1. Nise, S Norman, Control Systems Engineering, 6th Edition, John Wiley & Sons Inc., United State of America, 2011
2. Bishop, Dorf, Modern Control Systems, 11th Edition, Prentice Hall, 2011
3. Larry, D. J, Foster A. C, Electronic Instruments and Measurements, 2nd Edition, Prentice hall, Simon & Schuster (Asia), 1995.
4. Ogata Katsuhiko, Modern Control Engineering, 5th Edition, Prentice Hall, 2010.
5. H.S. Kalsi, Electronic Instrumentation, 3rd Ed., McGraw Hill, 2010.


## BEKC 4773
## INTELLIGENCE CONTROL SYSTEMS

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Explain the essential concepts, principles and theories relating to Artificial Intelligence (AI) in general, and for fuzzy logic and neural networks in particular. (PO1)
2. Design basic fuzzy logic or neural network systems according to the engineering problem. (PO3)
3. Demonstrate and analyze through simulations the performance of fuzzy logic and/or neural network using Simulink/MATLAB or other specified tools. (PO4)
4. Describe the latest technology and current issues of AI systems.(PO9)

**Synopsis**

Introduction of intelligent systems using Artificial Intelligent system such as fuzzy logic, neural network and expert system. Focus on popular techniques of AI i.e artificial neural networks, fuzzy logic and genetic algorithms. Development of algorithms, which have capabilities such as learning, reasoning, etc.

Problem solving through expert engines and database for expert performances. Automation of data acquisition from human experience and explanation of problem solving behavior. A series of simulations of fuzzy logic and neural network algorithms using SIMULINK/MATLAB or other software packages.

**References**


1. KazuoTanaka; Introduction to Fuzzy Theory towards Application, Russel Books, 1991.
2. Kenji Sugawara; Artificial Intelligence; Morikita; 1997.
3. Satish Kumar; Neural Networks A Classroom Approach; International Edition; McGraw Hill; 2005.
4. Simon Haykin; Neural Networks A Comprehensive Foundation; 2nd Edition; Prentice Hall; 1999.
5. George F. Luger; Artificial Intelligence, Structures and Strategies for Complex Problem Solving; 6th Edition; Addison Wesley; 2005.
6. Timothy J. Ross; Fuzzy Logic With Engineering Applications; McGraw-Hill International Editions; 1997.


## BEKC 4683
## DIGITAL CONTROL SYSTEMS

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Transform continuous-time signals into discrete-time signals and to represent LTI digital control systems in z-domain. (PO1)
2. Analyze the stability and performance of digital control systems in time, frequency, and z domains. (PO2)
3. Analyze the digital control systems represented in state space model. (PO1, PO2)
4. Design a digital PID controller and digital lead-lag compensators using root locus and frequency response methods, and state feedback using a pole-placement method. (PO2, PO3)

**Synopsis**

This course consists of discussions about an introduction to digital control systems, the relationship between continuous-time and discrete–time control systems, digital system coding, sampling process, quantization and z-transform, and digital control system representations. The notions of controllability, observability, and stability of digital control systems and analyses in time, frequency, and z domains are also included in this course. The design of digital PID controllers, lead-lag compensators, and state feedback and observer gain via a pole placement are covered in this course. The analyses and design of digital control systems are performed using MATLAB and Simulink. Students are encouraged to gain scientific knowledge of contemporary issues related to this course.

**References**


1. Katsuhiko Ogata, Dicrete-time Control System, 2nd Edition, Prentice Hall, 1995.
2. Benjamin C. Kuo, Digital Control Systems, 2nd Edition, Oxford, 1992.
3. C.L. Philips and H.T Nagle, Digital Control System Analysis and Design, 5th Edition, Pearson Education, 2005.


## BEKE 2333
## ANALOGUE ELECTRONICS

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Explain the operation of BJT/FET amplifier (PO1,C2).
2. Analyze the frequency response of BJT/FET circuit (PO2, C4).
3. Design the signal amplification, power amplifiers, oscillator, electronic filtering and voltage regulator circuit. (PO3,C5).

Synopsis
This course is about the basic principle of analogue electronic circuits mostly performing the concepts of amplification. The course courses contain the concepts of amplifier, BJT as one of devices usually used in amplifiers, small signal amplifier, power amplifiers (class A and class AB), oscillator, active filters and voltage regulators (shunt and series).

**References**


1. Bolysted, R., Nashelsky, L., Electronic Devices and Circuit Theory, 12th Edition, Prentice Hall, 2012.
2. Floyd, T., Electronic Devices, 9th, Edition Prentice Hall, 2012.
3. Aliminian, A., Kazimierczuk, M. K., Electronic Devices: A Design Approach, 1st Edition, Prentice Hall, 2004.
4. Russell, L. M., Robert, D., Foundations of Electronics Circuits and Devices, 5th Edition, Thomson Delmar Learning, 2007.


## BEKE 3543
## POWER ELECTRONICS

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Demonstrate the principle, theory and concept of power electronic devices, rectifiers, dc to dc converters and inverters. (PO1)
2. Develop and design power rectifiers, dc to dc converters and inverters by incorporating the power electronic devices and components for various engineering applications. (PO3)

Synopsis
This course will discuss the characteristics of power switching devices so that the suitable devices and components can be selected in designing the power electronic converters. Various topologies of power electronic converters such as rectifiers, dc-dc choppers (non-isolated and isolated), dc-ac inverter (single and three phase) and their principle operation will be discussed. The performance parameters of the power converters, i.e. average and rms values, power, efficiency, total harmonic distortion (THD) and etc. will be analyzed through the mathematical calculation and simulation using PSpice and Matlab. In addition, several switching techniques including pulse width modulation (PWM) and their effect on the converter performance will also be covered.

**References**


1. Daniel W. Hart, *Introduction to Power Electronics*, Prentice Hall. ***(Text Book)***
2. Muhammad H. Rashid. Power Electronics – Circuits, Devices, and Applications, 3rd Edition, Prentice Hall, 2006.
3. Issa Batarseh, *Power Electronic Circuits*, John Wiley & Sons, 2004.
4. Ned Mohan, Tore M. Undeland, William P. Robbins, *Power Electronics–Converters, Applications and Design*, 3rd Edition, John Wiley and Sons, 2003.


## BEKE 3673
## INDUSTRIAL POWER ELECTRONICS

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Explain the operation, function and interaction between the components and sub-systems used in power electronic applications. (PO1)
2. Understand and analyze the application of power electronics in renewable energy, power system, industrial appliances and transportation. (PO2)
3. Model, analyze and design the power electronic application systems. (PO3)

**Synopsis**

This course will discuss the principles of power generation, power application, and power quality improvement by means of power electronic devices. The basic operation and design of power supply and gate driver will be reviewed at glance. Subsequently, students will be given fundamental knowledge on how to design common power electronic systems used in industrial applications. The basic operation and designed of switched mode power supply (SMPS), power electronics in solar applications, high voltage direct current (HVDC), flexible AC Transmission Systems (FACTS), electric/hybrid vehicles and active filter will be exposed to the students.

**References**


1. Daniel W. Hart. “Power Electronics”, McGraw Hill. 2011.
2. Muhammad H. Rashid. ”Power Electronics Handbook: Devices, Circuits, and Applications”. Elsevier Inc. 2011.

3. Ali Emadi, Abdolhosein Nasiri, Stoyan B. Bekiarov – Uniterruptible Power Supplies And Active Filters, CRC Press, 2005.
4. Chris Mi, Abul Masrur, David Gao. "Hybrid Electric Vehicles: Principles and Applications with Practical". John Wiley & Son. 2011.
5. J. Arrillaga, Y. H. Liu, N. R. Watson, "Flexible power transmission: the HVDC options".John Wiley & Son. 2007.
6. Chan-Ki Kim, Vijay K. Sood, "HVDC transmission: power conversion applications in power systems". John Wiley & Son. 2009.
7. Hirofumi Akagi, Edson Hirokazu Watanabe, Mauricio Aredes, "Instantaneous Power Theory and Applications to Power Conditioning", Wiley-IEEE Press, 2007.

## BEKE 4753
## ELECTRICAL DRIVES

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Explain the characteristics and dynamic modeling of machine and drives.(PO1)
2. Choose suitable converter topology to be used for different types of electric machines. (PO2)
3. Design control strategy to drive the machine for optimum performance. (PO3)
4. Analyze the performance parameters of the drives.(PO9, PO10)

**Synopsis**

This course will discuss the electric drives, switch-mode converters, quadrants operation, current-controlled converters, modeling and transfer function of DC motor, converters of DC drive, closed-loop control of DC drives. It also covers the basic operations and dynamic modeling of Induction Motor, including scalar control, vector control and implementation of motor drive using microprocessor

**References**

1. Seung-Ki Sul, Control of Electric Machine Drive System, John Wiley & Sons, 2011.
2. Piotr Wach, Dynamics and control of electrical drives, springer 2011.
3. Mukhtar Ahmad, High Performance AC Drives: Modelling Analysis and Control, Springer, 2010
4. André Veltman, Duco W. J. Pulle, R. W. A. A. De Doncker, Fundamentals of electrical drives, Springer, 2007.
5. Austin Hughes, Electric motor and drives: Fundamentals, types and application, Newnes, 3rd edition, 2006.

## BEKE 4763
## MODERN ELECTRICAL DRIVES

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Explain power electronics conversion in AC drives. (PO1,C2)
2. Analyze the dynamic motor of 3 phase AC machine. (PO2, C4)
3. Design the controller and evaluate the performance of AC drive systems. (PO3, C5)

**Synopsis**

This course will discuss the electric drives components, machine reference frame principle, vector transformation, direct vector control of synchronous motor and induction motor drives, dynamic modeling of AC motors, three-phase PWM Voltage Source Inverter fed AC motor drives and direct torque induction motor drives. Closed-loop speed control, current control and voltage control strategies including hysteresis current control, ramp-comparison and space-vector modulation. Students will experience POPBL approach in this course.

**References**

1. I. Boldea, Syed A. Nasar and S.A. Nasar, Electric drives, CRC/Taylor & Francis, 2nd edition, 2006.
2. Mukhtar Ahmad, High Performance AC Drives: Modelling Analysis and Control, Springer, 2010.
3. Austin Hughes, Electric motor and drives: Fundamentals, types, and application, Newnes, 3rd edition, 2006.
4. Seung-Ki Sul, Control of Electric Machine Drive System, John Wiley & Sons, 2011.
5. Andre Veltman, Duco W. J. Pulle, R. W. A. A. De Doncker, Fundamentals of electrical drives, Springer, 2007.

Piotr Wach, Dynamics and control of electrical drives, Springer 2011.

**BEKE 4873**
**ELECTRIC MACHINE DESIGN**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Demonstrate fundamental understanding of the interaction of the electromagnetic and mechanical engineering disciplines related to electrical machine design.
2. Identify of the differences in construction, performance and operation between the main topologies of electrical machines.
3. Select and employ techniques to design an electrical machine and select the appropriate materials for the application at hand.

**Synopsis**
This module is a continuation of the material covered in electrical machines. The module will cover the machine sizing considering power electronic and mechanical issues, magnetic materials including soft and hard materials and winding design, operating principle and basic design principles of different machine types and topologies including surface and buried permanent magnet radial machines, axial flux and reluctance machines.

**References**

1. P.C.Sen, Principles of Electric Machines and Power Electronics,Wiley, 2013.
2. Jacek F. Gieras, Electrical Machines, Drives And Power Systems, CRC Press, 2009.
3. J.R. Hendershot & T.J.E. Miller, Design of Brushless Permanent-Magnet Machines, Motor Design Books LLC, 2010.
4. Duane Hanselman, Brushless Motors: Magnetic Design, Performance, and Control of Brushless DC and Permanent Magnet Synchronous Motors, E-Man Press LLC, 2012.


**BEKG 1123**
**PRINCIPLES OF ELECTRIC AND ELECTRONICS**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Explain the basic electrical and electronics principles, circuit schematics and components. (PO1)
2. Demonstrate the electrical and electronic knowledge to solve the series and parallel circuits in DC and phasor approach for AC circuit. (PO1)
3. Explain the principle knowledge of semiconductor devices for Diode, BJT and Op Amp.(PO1)
4. Apply the electronic knowledge to solve the Diode, BJT and Op-Amp circuits.(PO1)

**Synopsis**
This course will discuss about the basic principles of electrical and electronics; Introduction to electric element, symbol and components. KCL, KVL, Node and Mesh in solving DC series and parallel circuits. Introduction in magnetism, electromagnetism and AC characteristic. Introduction to semiconductors, atomic structures, energy band, P-type and N-type. Study on structure, principle and application of diode, BJT and Op-Amp circuits.

**References**

1. Thomas L. Floyd, Principles of Electric Circuits, Pearson, 9th Ed. (2010).
2. Thomas L. Floyd and David M. Buchala, Electric Circuits Fundamentals, Pearson, 8th Ed. (2010). Boylestad, R.L.; Nasheslsky, L, Electronic Devices and Circuit Theory, Pearson Prentice Hall, (2010).


**BEKG 1233**
**PRINCIPLES OF INSTRUMENTATION AND MEASUREMENT**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Describe the principle, various terms and standards in measurement. (PO1)
2. Explain the principle of measurement devices.(PO1)
3. Apply the suitable bridge techniques to measure component values such as resistance, inductance and capacitance. (PO1)
4. Explain the operation, function and applications of the transducers/sensors.(PO1)

**Synopsis**
This course discusses about units and dimensions, standards, errors, static characteristic, noise and calibration in measurement. It covers most on the measurement devices such as galvanometers, ammeters, voltmeters, wattmeter, temperature, force and torque and pressure measurement as well as accelerator meter. It also introduces oscilloscope and sensors for instrumentation application.

**References**


1. HS Kalsi, Electronic Instrumentation, 3rd Ed., Tata McGraw Hill, 2010.
2. UA Bakshi, AV Bakshi and KA Bakshi, Electronic Measurements and Instrumentation, Technical Publications Pune, 2009.
3. Donald Calibration Book, Vaisala Oyj, Vaisala 2006.
4. S Wolf, Richard F.M Smith, Reference Manual for Electronic Instrumentation Laboratories 2nd Ed., Prentice-Hall, 2004.


## BEKG 2433
## ELECTRICAL SYSTEMS

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Explain the major components of an electrical power system (generation, transmission, and distribution system)(PO1)
2. Calculate the AC voltage and current characteristic in AC circuits. (PO1)
3. Analyze the single and three phase circuits by emphizing on complex power and power factor correction (PO2)
4. Analyze the magnetic, single phase transformer and three phase transformer equivalent circuits. (PO2)

Synopsis

This course introduces students to topics such as alternating current circuit analysis, phasor representation, RMS value, average power, reactive power, active power, apparent power, power factor and power factor correction for single phase and balance three phase system. In addition, magnetic circuit, construction and operation of transformer will be discussed in this course.

**References**


1. Hughes, Electrical Technology, 10th Edition, Prentice Hall, 2008
2. B.L. Theraja, A.K. Theraja, A Textbook of Electrical Engineering, Pt 1 - Pt 4, S. Chand & Co. Ltd, 2000
3. Alexander, Sadiku, Fundamentals of Electric Circuits, 5th edition, 2013.
4. J. Duncan Glover, Mulukutla S. Sarma, Thomas J. Overbye, Power System Analysis And Design, Fifth Edition, Cengage Learning, 2011


## BEKG 2443
## ENGINEERING MATHEMATICS II

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Describe the fundamental concepts of multivariable functions, multiple integrals and vector calculus
2. Solve the mathematical problems that involve function of several variable, multiple integrals and vector calculus.
3. Apply the knowledge of advanced engineering mathematics to deal with the engineering problems

Synopsis

This course consists of three chapters: Function of Several Variables: Functions of Two or More Variables, Limit and Continuity, Partial Derivatives, Total Differential, Chain Rule, Implicit Differentiation and Local Extrema. Multiple Integrals: Double Integral, Double Integral Over Non-rectangular Regions, Double Integral in Polar Coordinates, Triple Integral, Triple Integral in Cylindrical and Spherical Coordinates and Moment and Centre of Gravity. Vector Calculus: Vector fields, Line integral, Green's theorem, Curl and Divergence, Parametric surfaces and their Areas, Surface integrals, Stoke's theorem and Divergence theorem.

**References**


1. Yusof, Y. M., Baharun, S. And Rahman, R. A., 2013. Multivariable calculus for Independent learners. Pearson, Malaysia.
2. Croft, A., Davison, R., Hargreaves, M. and Flint, J., 2012. Engineering Mathematics. Pearson Higher Ed, USA.
3. Anton, H., Bivens, I., and Davis, S., 2010. Calculus Multivariable, 8th edition. John Wiley & Sons, USA.
4. Stewart, J., 2015. Calculus. Cengage Learning, USA.
5. Stroud, K. A., and Booth, D. J., 2011. Advanced Engineering Mathematics. Palgrave Macmilan, UK.


## BEKM 4863
## INDUSTRIAL ROBOTICS

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Apply knowledge in physics and mathematics to the solution of complex kinematics (forward, inverse, jacobian, singularity) problem. (PO2)
2. Design a robotic manipulator workcell for manufacturing purposes. (PO3)
3. Apply knowledge in mathematics to the solution of complex trajectory generation motion. (PO1)
4. Apply knowledge in control engineering to the solution of robotics control problem. (PO1)

**Synopsis**

This course introduces robotics fundamentals including kinematics (forward, reverse, jacobian, and singularity), dynamics and trajectory generation of robots. Fundamental mathematics, scientific and mechatronics engineering knowledge will be applied in this course to the solution of complex robotic problems. In developing the solution of the robotics problem, student will be exposed to the influential factors that might affect the design of the solution including societal, economical, safety, cultural, as well as environmental factors. Student will be exposed to the basics of industrial robotics.

**References**


1. Craig, J. J., Introduction to Robotics, Mechanics and Control, 3rd Ed., Addison Wesley Longman, 2014.
2. Groover, W., Industrial Robotics: Technology, Programming and Applications, McGraw Hill, 1986.


## BEKP 2453
## ELECTROMAGNETIC THEORY

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Apply vector analysis in order to solve problems regarding electromagnetic phenomena. (PO1, C3)
2. Explain the principle of electrostatics and calculate basic & intermediate electrostatic problems. (PO2, C3)
3. Explain the principle of magnetostatics and calculate basic & intermediate magneto static problems. (PO2, C3)
4. Identify and utilize the Maxwell's equation in static and dynamic electromagnetic fields. (PO1, C3)

**Synopsis**

This course begins by teaching about vector calculus, an essential mathematical tool for gaining a quantitative understanding of the electromagnetic phenomena. It is then followed by the study of electrostatic fields; covering Coulomb's Law, Gauss's Law, conductors, dielectrics, and electric boundary conditions. Next, magnetostatic fields are covered; its sub-topics include Biot-Savart's Law, Ampere's Law, magnetic forces and torque, and magnetic boundary conditions. After that, the course will examine the situations in which electric and magnetic fields are dynamic (i.e. varies with time) using Maxwell's equations.

**References**


1. Fawwaz T. Ulaby, Fundamental of Applied Electromagnetics 7th edition, Pearson Education, 2015.
2. Matthew N.O. Sadiku, Elements of Electromagnetics, 6th edition, Oxford University Press, 2014.
3. David J. Griffith, Introduction to Electrodynamics, 4th edition, Pearson Education, 2014.
4. William H. Hayt Jr, John A Buck , Engineering Electromagnetics, 8th edition, McGraw-Hill, 2012


## BEKP 3653
## POWER SYSTEM AND HIGH VOLTAGE

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Analyze the problems on power system regarding to generation and transmission line models. (PO2)
2. Apply per unit system to produce quantities and elements for single-line diagram. (PO2)
3. dentify and analyze the conduction and breakdown theory in gas, solid and liquid dielectrics. (P03)
4. Describe and explain the various topics pertaining to high voltage application and technology. (PO1)

**Synopsis**

This course is divided into two parts, power systems and high voltage engineering. The first part gives an introduction on power system generation, transmission line model and per unit system. The second part on the other hand, focuses on conduction and breakdown of high voltage insulation systems as well as high voltage application and technology.

**References**


1. Hadi Saadat, Power System Analysis, International ed., McGraw Hill, 2004.
2. Grainger and Stevenson Jr, Power System Analysis, International ed., McGraw Hill, 1994.
3. M S Naidu and V Kamaraju, High Voltage Engineering, McGraw Hill 2004.

4. E. Kuffel, W. S. Zaengl and J. Kuffel, High Voltage Engineering: Fundamentals, Newnes, 2000.

**BEKP 3683**
**DISTRIBUTION SYSTEM DESIGN**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Justify the standard and regulation related to electrical installation and its safety. (PO4)
2. Design a low voltage system by using standard design procedures. (PO3)
3. Apply the concept and technical specification of low voltage protection system. (PO3)
4. Analyze and breaking down the information of design parameters into component parts. (PO3)

**Synopsis**
This course presents the principles and design of electrical distribution system. It covers various issues of distribution system which includes regulations and standards related to electrical installation. Characteristics and specifications for circuit breakers, cable size selection, and method of earthing and earthing arrangement are described in detail. The students are also exposed to the use of standard design procedures and the type of testing and troubleshooting required for low voltage systems. The students will also be exposed on the concepts of protection and its devices in low voltage system.

**References**
1. Teo Cheng Yu, Principle and Design of Low Voltage System, Byte Power Publication, 1995.
2. Ir Md Nazri, Aminudin, Md Hairul Nizam, Engineering Practice: Wiring System & Motor Starter, Modul 2 UTeM, 2007.
3. Brian Scaddan, Inspection, Testing & Certification, Third Edition, Newes, 2001.
4. IEE Wiring Regulation 17th Edition

**BEKP 4773**
**POWER SYSTEMS ANALYSIS**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Describe and apply the per unit system in order to generate impedance and reactance diagram from one-line diagram. (PO1)
2. Apply Gauss Seidel, Newton-Raphson & Fast Decoupled method for power flow analysis. (PO1)
3. Formulate synchronous machines transient models to analyse a fault. (PO2)
4. Apply the concept of Thevenin impedance and bus impedance matrix to analyse balanced fault and the concept of symmetrical components to analyse unbalanced faults/loads in power systems. (PO2)
5. Formulate synchronous Machine's models for stability analysis. (PO2)

**Synopsis**
The Power System Analysis covers transient/dynamic nature of power systems such as fault analysis, load flow and stability analysis. Fundamental theories and mathematical equations on transient phenomena of synchronous machines are discussed. This leads to the analysis of balanced and unbalanced faults in power systems. Solutions for unbalanced faults are approached using fundamental of symmetrical components. The course also covers the fundamental concept of the behavior of synchronous machines after a disturbance, i.e, steady-state and transient stability.

**References**
1. "Grainger and Stevenson Jr, Power System Analysis, McGraw Hill, 1994.
2. Sarma and Glover, Power System Analysis and Design, 3rd ed. Brooks/Cole, 2002.
3. Hadi Saadat, Power System Analysis, International ed. McGraw Hill, 1999.
4. Marizan Sulaiman, Analisis Sistem Kuasa, Penerbit USM, 2004."
5. Sarma and Glover, Power System Analysis and Design, 3rd ed. Brooks/Cole, 2002.
6. Hadi Saadat, Power System Analysis, 2nd Ed. McGraw Hill, 2002.
7. Marizan Sulaiman, Analisis Sistem Kuasa, Penerbit USM, 2004.

**BEKP 4843**
**RENEWABLE ENERGY**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Discuss the context, drivers and policy in relation to the future development of electrical systems.

2. Define and compare various forms of distributed generators and their connection to the systems.
3. Differentiate between different type photovoltaic materials and its electrical characteristics.
4. Design grid-connected PV systems.

**Synopsis**

The course intends to expose the students the most recent renewable energy development both technically and economically. This includes context, drivers and the up-to-update government policy. In addition, this course also introduces the students various form of renewable energy resources and their associated impact to the electricity systems. The students will also be exposed to different types of photovoltaic technology. Finally, this course includes the detail design of grid-connected PV systems and the performance evaluation.

**References**


1. Gilbert M. Masters, "Renewable and Efficient Electric Power Systems", Wiley-IEEE Press, July 2004.
2. N. Jenkins, J.B. Ekanayake and G. Strbac, Distributed Generation, Stevenage IET, 2010.
3. Felix A. Farret, M. Godoy Simões, "Integration of Alternative Sources of Energy", John Wiley & Sons, Jan 17, 2006.
4. S. Shaari, A. Maliki, S. Irwan, N. Zaini, "SEDA Grid-Connected Photovoltaic Systems Design Course", 2014.
5. MS 1837: 2010 'Installation of Grid-Connected Photovoltaic (PV) System (First Revision).


## BEKP 4853
## ENERGY UTILLIZATION AND CONSERVATION

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. To categories various energy conversion techniques and their respective efficiency.
2. To explain the concept of electrical tariff charged to residential, commercial and industrial consumers in Malaysia.
3. To analyze power factor correction method applied to industrial power application.
4. To classify and analyze power quality problems and its associated solution in power system.
5. To apply energy auditing techniques and procedures on consumer buildings.

**Synopsis**

This course introduce the utilization of electrical power at distribution level. Materials encountered in the course include tariff structure and cost rate charge to resident, commercial and industrial consumers, economic management system for electrical energy, power quality and harmonics, renewable energy and energy auditing.

**References**


1. Hadi Saadat, Power System Analysis, 2nd Ed., Mc Graw Hill, 2002.
2. Wildi,T., Electrical Machines, Drives and Power Systems, 5th Ed., Prentice Hall, 2002.
3. Marizan Sulaiman, Ekonomi dan Pengurusan Sistem Kuasa, Utusan Publications & Distributors Sdn. Bhd., 1999.
4. Gilbert M.Masters, Renewable and Efficient Electric Power Systems, Wiley, 2005.


## BEKP 4873
## POWER SYSTEM PROTECTION

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Apply the basic principles of power system protection. (PO1)
2. Analyze the use of Current Transformer (CT), Voltage Transformer (VT), fuse and circuit breaker for protection through technical justification. (PO2)
3. Design the coordination for protection system scheme. (PO3)
4. Design appropriate protection schemes for electrical equipment such as transformer, generator and motor. (PO3)

**Synopsis**

This course introduces the power system protection and devices, protection method and safety in power system analysis. Enhancement to various type of protection schemes and device such as protection relay, CTs, VTs, short circuit current management, overcurrent protection, relay coordination, unit protection, transformer protection, busbar protection, motor protection and generator protection will be discussed.

**References**

1. Khim Sang, Wong, Power Distribution and Protection, Second Edition, Prentice Hall 2003.
2. Y.G. Paithankar, Fundamentals of Power System Protection, Prentice Hall of India, 2004.
3. Glover ,Sarma, Power System Analysis and Design, Third Edition, Brooks/Cole 2011.

**BEKP 4883**
**HIGH VOLTAGE ENGINEERING**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Identify and analyze the conduction and breakdown theory in gas, solid and liquid dielectrics. (PO1)
2. Explain the fundamental knowledge of generation and measurement of high voltage AC, DC and impulse. (PO1)
3. Examine the high voltage testing, insulation coordination and diagnostics on materials and electrical apparatus. (PO3)
4. Analyze the overvoltage phenomenon in electric power system. (PO2)

**Synopsis**
This course intends to give the students the required knowledge regarding high voltage engineering. It covers the phenomena of high voltage surge and insulation coordination of power systems, characteristics of conduction and breakdown of dielectrics and generation of high voltage. Relevant measurement and testing technique for high voltage components are also included. In addition, the students are also exposed to lightning phenomena and their protection.

**References**
1. M.S. Naidu & V. Kamaraju, Fourth Edition, McGraw Hill, 2009.
2. Dieter Kind & Kurt Feser, High Voltage Test Techniques, Newnes, 2nd ed., 2001.
3. E. Kuffel, W.S. Zaengl & J. Kuffel, High Voltage Engineering Fundamentals, Newnes, 2nd ed., 2000.

**BEKU 1231**
**ELECTRIC CIRCUIT I**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Analyse electrical circuit using Ohm's Law and Kirchhoff's Laws. (PO1)
2. Analyze complex electric circuits using Mesh and Nodal analysis methods. (PO1)
3. Analyze complex electric circuits using several ciruit theorems such as Superposition, Thevenin, Norton and Maximum Power Transfer Theorems. (PO1))

**Synopsis**
This course introduces the students to Ohm's Laws, Kircchoff's Laws and use them to calculate current, voltage and power in electrical circuitries. Students also learn the analytical methods namely mesh and nodal analysis, as well as apply Thevenin theorem, Norton theorem, Superposition and the Maximum Power Transfer in circuit analysis. The applications of the above tools will cover both dc and ac circuits.

**References**
1. K.A. Charles,N.O. Sadiku, Fundamentals of Electric Circuits, 5th Ed. McGraw Hill,2013
2. Robbins and Miller, Circuit Analysis and Practice, 3rd.Ed., Thomson and Delmar, 2003
3. Nilsson and Riedel, Electric Circuits, Prentice Hall, Electric Circuits (9th Edition), 2010.

**BEKU 2333**
**ELECTRIC CIRCUIT II**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Apply first order and second order technique for RLC circuits transient analysis. (PO1)
2. Apply Laplace transforms method and its frequency response in electrical circuit analysis. (PO1)
3. Analyze the frequency response of RLC circuits and the characteristics of RLC filters. (PO2)
4. Analyze various topology of two-port network in electrical circuit analysis. (PO2)

**Synopsis**
This course introduces the students to Ohm's Laws, Kircchoff's Laws and use them to calculate current, voltage and power in electrical circuitries. Students also learn the analytical methods namely mesh and nodal analysis, as well as apply Thevenin theorem, Norton theorem, Superposition and the Maximum Power Transfer in circuit analysis. The

applications of the above tools will cover both dc and ac circuits.

**References**


1. K.A. Charles,N.O. Sadiku, Fundamentals of Electric Circuits, 5th Ed. McGraw Hill,2013
2. Robbins and Miller, Circuit Analysis and Practice, 3rd.Ed., Thomson and Delmar, 2003
3. Nilsson and Riedel, Electric Circuits, Prentice Hall, Electric Circuits (9th Edition), 2010.
4. Thomas L. Floyd. Electric Circuits Fundamnetals. 8th Edition, Pearson, 2009.


## BEKU 4792
## FINAL YEAR PROJECT 1

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Conduct proper literature survey and identify the problems, objectives and scope of project clearly (PO2)
2. Select, plan and execute a proper methodology in problem solving (PO4)
3. Present the project proposal in written and in oral format effectively (PO9)
4. Work systematically and commit to professional ethics (PO11)

**Synopsis**

This course is the first part of the Final Year Project. In this course, students are expected to propose a project under a supervision of a lecturer. Students need to conduct literature review and come out with a proposal. Student has to present the proposed project and submit the proposal at the end of semester.

**References**

Depend on each student project's references.

## BEKU 4861
## ENGINEERING SEMINAR

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Identify the professional engineering knowledge, practices and responsibilities. (PO6)
2. Collect and sort relevant information with regards to the given technical talk. (PO7)
3. Discuss current engineering issues and practices that impacting engineering professionals. (PO8)

**Synopsis**

The main purpose of this course is to instill the recognition of the need for and the ability to engage in life-long learning among students. Through presentation by invited speakers from the industry and academia, students will be exposed to topics such as professional engineering bodies and knowledge of in contemporary issues in related engineering fields. Presentation by successful alumni describing how their careers developed after obtaining their undergraduate degrees will also be included.

## BEKU 4894
## FINAL YEAR PROJECT II

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Identify, formulate, research literature and analyze problem. (P02)
2. Conduct investigation using research based knowledge and methods. (P04)
3. Apply ethical principles in project implementation (P08)
4. Present the results in written and in oral format effectively. (P09)
5. Identify basic entrepreneurship skills in project management. (PO12)
6. Apply reasoning informed by contextual knowledge. (P06)
7. Engage in independent and lifelong learning. (PO11)

**Synopsis**

This course is the second part of Final Year Project I, in second semester. Students will continue their project from FINAL YEAR PROJECT I during the second semester, and they should accomplish the projects completely either in hardware, software or both of them. Students needs to write-up a good final report (in thesis format), as a part of the course's assessment.

**References**

Depend on each student project's references.

## BENG 1413
## DIGITAL ELECTRONICS

**Learning Outcomes**
Upon completion of this course, the student should be able to:

1. Describe the basic concept of digital circuits that form complex electronic systems (PO1).
2. Formulate and analyze the basic digital circuits based on combinational and sequential components. (PO2)
3. Communicate effectively through effective report writing or oral presentation. (PO9)

Synopsis
This course comprises of several topics such as number systems and codes, logic gates and Boolean algebra, combinational logic circuits, MSI logic circuits and flip flops, and integrated circuit logic families.

**References**

1. Thomas L. Floyd. Digital Fundamentals. 10th Edition, Prentice Hall, 2008.
2. Ronald J. Tocci, N. Widmer, G. Moss. Digital Systems, Principles and Applications. 11th Edition, Prentice Hall, 2010.
3. Roger l. Tokheim. Digital Electronics, Principles and Applications. McGraw-Hill, 2008.


## BENG 2143
## ENGINEERING STATISTICS

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Apply the concepts of data description and probability, normal and sampling distributions, estimation and hypothesis testing, ANOVA, regression and non-parametric tests to solve mathematical problems
2. Analyze engineering data using descriptive statistics
3. Deduce statistical inference for engineering problems by using the techniques of estimation, hypothesis testing and regression

**Synopsis**
Topics covered: Data description and probability, Normal and Sampling Distributions, Estimation and Hypothesis Testing for one and two populations, ANOVA, Simple Linear Regression, Multiple Linear Regression, Polynomial Regression, Non-parametric Statistics and Software application (SPSS).

**References**

1. Sh. Sara, Hanissah, Fauziah, Nortazi, Farah Shahnaz, Introduction To Statistics & Probability A Study Guide, 2008.
2. Prem S.Mann, Introductory Statistics Using Technology, 5thEdition, John Wiley, 2007.
3. Douglas C. Montgomery, George C.Runger, Applied Statistics and Probability for Engineers,5th Edition, John Wiley, 2010.
4. Richard Johnson, John Freund, Irwin Miller,Miller And Freund's Probability and Statistics for Engineers, 8th Edition, Pearson – Prentice Hall, 2010.
5. Jay L. Devore, Probability and Statistics for Engineering and the Sciences, 7th Edition, Thomsons – Duxbury, 2008.


## BENG 4322
## ENGINEER AND SOCIETY

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Apply ethical principles and commitment, to professional ethics, responsibilities and norms of engineering practice (PO8).
2. Apply reasoning informed by contextual knowledge to assess health, safety and legal issues and its subsequent responsibilities, relevant to professional practice (PO6).
3. Understand the needs for sustainable development and the impact of engineering solutions on society and environment (PO7).

**Synopsis**
This course will discuss about:
Ethics and professionalism, engineers and society, professional ethics, code of ethics, ethics dealing with human relations, BEM, IEM, regulations on professional conduct, route to professional status, engineers as an employee or employer, decision making, competence of practicing engineering, accountability, liability, engineer's legal liability specified in contract law, engineers and the environment, sustainability, etc.

**References**

1. Charles B. Fleddermann, Engineering Ethics, 3rd Ed, Prentice Hall, 2008.

2. Mike W Martin, Roland Schinzinger, Ethics in Engineering, 4th Ed, McGraw-Hill, 2005.
3. John Canning, Workplace Safety for Occupational Health and Safety (Safety at Work Series V4), 2007.
4. Safe Work in 21st Centuries (Educational and Training for the Next Decade Occupational Health and Safety Personnel) National Academy Press, 2006.
5. Arazi Idrus, Shaharin A. Sulaiman, Mohd Faris Khamidi, Engineers in Society, Mc Graw Hill Education 2010.
6. The Institution Of Engineer, "Engineering Professionalism and Ethics" 4th Ed, 1995.

## SERVICE COURSES (FTMK)

### BITG 1233
### COMPUTER PROGRAMMING

**Learning Outcomes**

In the end of the course, student will be able to:

1. Identify the fundamental principles of problem solving, programming techniques and structures in program development.(PO1)
2. Explain the principles of problem solving and programming techniques to solve given problems.(PO3)
3. Construct computer program codes by applying suitable programming structures and techniques. (PO5)

**Synopsis**

This course covers the introductory topics in programming using C++ language. It includes the introduction to computers and programming, the fundamentals of programming, problem solving and software development. Data types and operators, selection, repetition, function, array, file, structured data and pointer are among the topics covered in the course.

**References**

1. Gaddis, T., (2011), "Starting Out with C++ Brief Version: From Control Structures Through Objects 7th. Edition", Pearson Education.
2. Abdullah, N. et. al, (2014), "Lab Module Computer Programming BITG 1113", FTMK, UTeM.
3. Friedman, Koffman (2011), "Problem Solving, Abstraction and Design using C++", 6th Edition, Pearson Education.
4. Etter, D.M., Ingber, J.A., (2012), "Engineering Problem Solving with C++", 3rd Edition, Pearson Education.
5. Hanly, J.R, (2002), "Essential C++ for Engineers and Scientists", 2nd Addison Wesley

## SERVICE COURSES (FKM)

### BMCG 1013
### DIFFERENTIAL EQUATIONS

Learning Outcomes

Upon completion of this course, the student should be able to:

1. Describe the basic concept of first and second order differential equations, Laplace Transform and Fourier series.
2. Select an appropriate technique to solve problems involving differential equations.
3. Apply the concept of differential equations in solving engineering problems.

**Synopsis**

This course provides an introductory knowledge to differential equations and its applications. The students are introduced to the first order differential equations and solve using analytical methods of separable variable and linear equations and also using numerical methods such as Euler's method and second order Runge-Kutta method. Upon completion, the students are then introduced to the second order linear differential equations with constant coefficients and learn the methods of solving and its applications. The course is extended to the following chapters which include Laplace transform, Fourier series and partial differential equations and solving using numerical methods which is finite difference method (Elliptic , Parabolic).

**References**

1. Muzalna M. J., Irmawani J., Rahifa R., Nurilyana A. A. (2010). Module 2: Differential Equations, Penerbit UTeM.
2. Khoo, C.F., Syed Ahmad, S.S., Othman, Z. & Lok, Y.Y. ((2009). Numerical Methods Third Edition. Pearson Prentice Hall.
3. Edwards C. H., Penny D.E. & Calvis D. (2016). Differential Equations and Boundary Value Problems, Fifth Edition. Pearson Education Inc.

4. Polking J., Boggess A. and Arnold D.. (2014). Differential Equations with Boundary Value Problems. Pearson Education Inc.
5. Zill D.G. & Wright S.W. (2013). Differential Equations with Boundary-Value Problems, Eighth Edition. Brooks/Cole.

## BMCG 1523
## ENGINEERING GRAPHICS AND CAD

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Acquire and apply fundamental knowledge of mechanical engineering drawing format and types.(PO1)
2. Produce mechanical engineering drawings by using standard manual drafting tools and Computer Aided Design (CAD) software based on given problem. (PO1, PO5, PO9)
3. Communicate effectively through the applications of mechanical engineering drawing.(PO5, PO9)
4. Recognize the need to undertake lifelong learning in mechanical engineering drawing applications.

Synopsis

The course concentrates on manual drafting and Computer Aided Drafting (CAD) software. For manual drafting, students will be exposed to the basic drafting tools, techniques and the application in producing various types of engineering drawing. For computer aided design, CAD engineering drawing software is exercised to produce engineering drawing. The students will be exposed to CAD interface, editing commands, coordinate system, template preparation and layer in order to produce various types of engineering drawing.

**References**

1. Er. R. K. Dhawan, 2010, Engineering Graphics (In First Angle Projection), 1st Ed., S. Chand Technical, India.
2. Mohd Rizal Alkahari et. al., 2009, Modul Lukisan Berbantu Komputer, Penerbit Universiti Teknikal Malaysia Melaka, Melaka.
3. Giesecke, F.E., Mitchell, A., Spencer, H.C., Hill, I.L., Dygdon, J.T., and Novak, J.E., 2008, Technical Drawing, 13th Ed., Prentice Hall, New York.
4. Jensen C. H., 2002, Interpreting Engineering Drawings: 6th Edition, Delmar Thomson Learning, New York.
5. Mohd Ramzan Zainal, Badri Abd Ghani and Yahya Samian, 2000, Lukisan Kejuruteraan Asas, Penerbit Universiti Teknologi Malaysia, Skudai.

## BMCG 2432
## INTRODUCTION TO MECHANICAL ENGINEERING

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Define the general terms in basic mechanical system engineering.
2. Explain the general principles of static and mechanics.
3. Describe the basic concepts of dynamics.
4. Apply property tables and draw diagrams for pure substances.
5. Identify the properties of ideal gas using ideal-gas equation of state.
6. Analyze work and heat in the application of closed and open systems.
7. Investigate the performance of refrigeration cycles.

**Synopsis**

This course consists of the basic principle of Statics: General principles & Force vector.
Mechanics: Stress & Strain. Dynamics:Kinematics and kinetics of Particles, applying Newton's 2nd Law and Thermodynamics: Property tables of pure substances, closed and open system with respect to first and second law of Thermodynamics and refrigeration cycles.

**References**

1. Hibbeler, R.C, Engineering Mechanics: Statics, 12th Editions, Prentice Hall.(2009)
2. Beer, F. P., Vector Mechanics for Engineers, Dynamics SI Units, 9th Edition, McGraw-Hill, (2010)
3. Smith W. F., Foundation of Materials Science and Engineering, 5th Edition, McGraw Hill.(2009)
4. Hibbeler, R.C, Engineering Mechanics, Dynamics, 11 Editions, Prentice hall.(2007)
5. Cengel, Y.A and Boles, M.A, Borgnakke, C., and Van Wylen, G.J., Fundamentals of Thermodynamics, 6th Edition, John Wiley & Sons Inc.(2003)

**BMFG 1313**
**ENGINEERING MATHEMATICS**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Describe the fundamental concepts of matrices, eigenvalues and eigenvector, complex numbers, interpolation, differentiation, integration and vector-valued functions (PO1).
2. Solve the mathematical problems that involve matrices, eigenvalues and eigenvector, complex numbers, interpolation, differentiation, integration and vector-valued functions by using an appropriate technique (PO1).
3. Apply the knowledge of engineering mathematics to deal with the engineering problems (PO1).

**Synopsis**
This course consists of three chapters: Functions of Several Variables, Multiple Integrals and Vector-valued Functions. The syllabus is developed by introducing the concepts of the functions with severable variables, integration and also vector-valued function, followed by learning various techniques in solving the problems and its application in physical and engineering fields.

**References**

1. James, G., Modern Engineering Mathematics, 5th edition, Pearson, 2015.
2. Khoo, C.F., Sharifah Sakinah, S.A., Zuraini, O. and LOk, Y.Y., Numerical Methods, 3rd edition, Pearson Prentice Hall, 2009.
3. Muzalna M.J., Irma Wani J. Rahifa R. and Norazlina A.R., Engineering Mathematics, 2nd edition, Prentice Hall, 2009.
4. Kreyszig, E., Advance Engineering Mathematics, 10th edition, John Wiley, 2010.
5. Guo W., Advance Mathematics for Engineering and Applied Sciences, Pearson, 2015.


**BMFG 1213**
**ENGINEERING MATERIALS**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Explain the basic concepts of engineering materials in terms of interatomic bonding and crystal structure.(PO1)
2. Analyze the properties of engineering materials based on its structure.(PO2)
3. Describe the processing methods for engineering materials.(PO2)

Synopsis
This course introduces basic concepts of engineering materials that covers introduction to engineering materials, interatomic bonding, crystalline structure and imperfections and diffusion in solid. Introduction to the binary phase diagrams are also provided. Explanation on different types of engineering material (i.e. metal, ceramic, polymer, composites and functional), its mechanical properties, basic processing and applications are also included.

**References**

1. Callister, W.D. Jr. (2014) Materials Science and Engineering - An Introduction, 9th Edition. John Wiley & Sons Inc.
2. Askeland, D.R., Fulay, P.P. and Wright, W.J., (2012), The Science and Engineering of Materials, 6th Edition. Thomson.
3. Smith, W.F. (2010) Principle of Materials Science & Engineering, 5th Edition, Mc. Graw Hill.
4. Shackelford, J.F. (2009) Introduction to Materials Science for Engineering, 7th Edition, Prentice Hall.


**BMFG 4623**
**ENGINEERING ECONOMY AND MANAGEMENT**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Describe the role of engineering economy and the concepts of time value of money.
2. Apply the concepts, principle and techniques in engineering economy: Present worth, Annual Worth, and Future worth in projects evaluation;

3. Analyze cost effectiveness for making decision of alternative investments using: Rate of return single and multiple alternatives, and Benefit cost ratio;
4. Evaluate the project risk in engineering design project.

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**Synopsis**

This course covers engineering economics and managing risk in an organization. Engineering economics discusses about the time value of money and interest relationships, which are useful to define certain project criteria that are utilised by engineers and project managers to select the best economic choice among several alternatives. Projects examined will include both product and service-producing investments. The effects of escalation, inflation, and taxes on the economic analysis of alternatives are also discussed. Management of risk incorporates the concepts of probability and statistics in the evaluation of alternatives. This allows management to determine the probability of success or failure of the project.

**References**


1. Whitman D. and Terry R. (2012) Fundamentals of Engineering Economics and Decision Analysis, Morgan & Claypool Publishers.
2. W.G. Sullivan, E.M. Wicks, C.P. Koelling, "Engineering Economy", Prentice Hall International, 14th Ed., 2009.
3. Hartman, Joseph C. (2006) Engineering Economy and the Decision-Making Process, Prentice Hall.


## SERVICE COURSES (PBPI & CO-CURRICULUM UNIT)

### BLHC 4032 CRITICAL AND CREATIVE THINKING

**Learning Outcomes**

In the end of the course, student will be able to:

1. Identify the basic principles of critical and creative thinking skills to solve everyday problems (PO6)
2. Provide feedback on issues related to the development of critical and creative thinking skills (PO6)
3. Solve problems of case studies on current issues related to their field of study (PO7)
4. Analyze future market requirements and propose a solution based products.(PO7).

**Synopsis**

This course is designed to expose students to the principles foundation in critical and creative thinking. Students will apply the methods of critical thinking and creative problem-solving through a student-centered approach including approaches of problems based learning (PBL). Students will be guided in the final project where the analysis of future market requirements will be implemented and proposed solutions are based on the product market requirements from multiple perspectives and thinking outside the box.

**References**


1. Aziz Yahya, Aida Nasirah Abdullah, Hazmilah Hasan, Raja Roslan Raja Abd Rahman. (2011) Critical and Creative Thinking Module 2. Melaka. Penerbit UTeM.
2. Buzan, T. (2009). Mind maps for business : revolutionise your business thinking and practice, New York : Pearson BBC Active.
3. Claxton, G., Lucas, B. (2007). The Creative Thinking Plan, London: BBC Books.


### BLHL 1012 MALAY COMMUNICATION I

**Learning Outcome**

Upon completion of this course, the student should be able to:

1. Memberikan respon terhadap perbualan biasa dan situasi-situasi lain.
2. Mengaitkan bunyi-bunyi atau ucapan dalam Bahasa Melayu dari segi nahu, fonologi dan kemahiran lisan tentang diri sendiri, keluarga, rakan-rakan and aktiviti harian.
3. Membincangkan secara mudah tentang sesuatu topik semasa.
4. Membina ayat dan bertutur dalam bahasa Melayu dengan gramatis.

**Synopsis**

Kursus ini memperkenalkan susuk tatabahasa bahasa Melayu. Pelajar didedahkan dengan aspek-aspek nahu, klausa, terminologi, binaan ayat, penjodoh bilangan dan unsur sastera. Diharapkan pelajar dapat menguasai pertuturan atau berkomunikasi dengan baik dan mudah berdasarkan kemampuan pelajar asing.

**References**


1. Amy Buttner. (2013). *Aktivitas, permainan dan strategi penilaian untuk kelas bahasa asing.* PT Indeks, Jakarta, Indonesia.
2. Yong ChynChye, Rohaidah Mashudi dan Maarof Abd Rahman. (2012). *Bahasa Kebangsaan untuk pelajar*

*luar negara (Malay Language for International Students).* Kuala Lumpur: Pearson Malaysia Sdn Bhd.
3. Zarina Othman, Roosfa Hashim dan Rusdi Abdullah (Peny.). (2012). *Modul Komunikasi Melayu Antarabangsa.* Bangi, Selangor: Penerbit Universiti Kebangsaan Malaysia.

**BLHL 1XX2**
**ARABIC**

**Learning Outcomes**
In the end of the course, student will be able to:
1. Use the basic Arabic grammar correctly and apply the information from the text (PO7)
2. Construct sentences and apply selected vocabulary in a report.(P09)
3. Demonstrate communication skills. (P07)

**Synopsis**
This basic Arabic course adopts the communicate approach and introduces the phonology, grammar, vocabulary and writing system. Students will be exposed to basic reading materials in the languages.

**References**
1. Abdul Rahim (2004). Pembelajaran Bahasa Arab bagi golongan yang bukan Arab, (Bil.1) Kuliah Bahasa Arab Universiti Islam Madinah, Saudi Arabia.
2. Yaakob, M., Mohd Salleh, A.H & Mahpol, S. (2003). Al-ibtikar, (Bil.1) Sepang, Selangor: Penerbitan Salafi.
3. Abdul Masih, G.M. (2001). Mu'jam Kawaid Al-Lugatul Arobiah Fi Jadawal Walauhat. Maktabah Lubnan.
4. Yaakob, A.B. (2000). Mausuah An-Nahwu Wassorp Wali'raf. Beirut, Lubnan : Darul Ilmi Lilmalayin.
5. Mohd. Rejab I. (2000). Kursus Bahasa Arab. Yayasan Dakwah Islamiah Malaysia (YADIM).
6. Arifin Jami'an, M. (1994). Bahasa Arab, Kursus mudah dan cepat. Dinie Publisher.

**BLHL 1XX2**
**JAPANESE**

**Learning Outcomes**
In the end of the course, student will be able to:
1. Use grammar and classify the features of Japanese phonology correctly.(P07)
2. Demonstrate correct pronunciation.(P07)
3. Construct sentences and demonstrate writing skills.(P09)

**Synopsis**
This course is designed for students who do not have any background in Japanese. It provides students with the knowledge to enable them to understand and communicate in the oral and written forms. This course encompasses the listening, speaking, reading and writing components. The grammar introduced is related to the language used daily by the Japanese. In addition, two types of Japanese language writing systems; Hiragana and Katakana are also introduced. Students are also exposed to elementary reading materials.

**References**
1. Minna no Nihongo 1, 3A Corporation, 2002.
2. Minna no Nihongo 1, Translation & Grammatical Notes, 3A Corporation, Tokyo, 2002.
3. Shin Nihongo No Kiso 1-Grammatical Notes In English, 2001, Association for Japanese-Language Teaching.
4. Shin Nihongo No Kiso 1-English Translation Asian Edition, 2000, Association for Japanese -Language Teaching.
5. The Association for Overseas Technical Scholarship (AOTS), 2000, Shin Nihongo No Kiso 1-English Translation, Asia Edition.
6. Japanese For Young People 1 Kana Workbook, 2000, Association for Japanese-Language Teaching.

**BLHL 1XX2**
**MANDARIN**

**Learning Outcomes**
In the end of the course, student will be able to:
1. Demonstrate the ability to converse in Mandarin with correct and accurate pronunciation and intonation.(P07)
2. Use the rules of Chinese writing and the theory of word and sentence formation. (P09)
3. Interpret the information in the simple text.(P07)

**Synopsis**
This course is designed for students who do not have any background in Mandarin. It provides students with the knowledge to enable them to understand and communicate in the oral and written forms. This course encompasses the listening, speaking, reading and writing components. This course aims to help students to obtain enough exposure of the Mandarin phonetics (Han yu pin yin). The grammar introduced is related to the language used daily by Chinese. Particular care is also taken to ensure that the complexity of the dialogues is gradually developed using simple to complex sentences.

**References**

1. Ang Lay Hoon, Ooi Bee Lee (2008) Basic Chinese For Everyone. Selangor: Pelanduk Publications.

**BLHW 1702**
**TAMADUN ISLAM DAN TAMADUN ASIA (TITAS)**

**Learning Outcomes**

In the end of the course, student will be able to:

1. Menjelaskan konsep asas ketamadunan (P06)
2. Menghubungkait sejarah dengan kemajuan tamadun bangsa di dunia (P011)
3. Menganalisis isu dan cabaran peradaban dunia (P011)

**Synopsis**

Mata pelajaran ini menjelaskan tentang ilmu ketamadunan yang mencukupi pengenalan ilmu ketamdunan, Tamadun Melayu teras Tamadun Malaysia dan Tamadun Islam. Selain itu, turut dibincangkan berkaitan Tamadun China, Tamadun India serta isu-isu semasa dan masa depan dunia berbagai tamadun.

**Rujukan**

1. Osman Bakar.(2009). Modul PengajianTamadun Islam & Tamadun Asia. Kuala Lumpur: Penerbit Universiti Malaya.
2. Sazalin Arif, Ahmad Ridzwan Mohd Noor, Mahadi Abu Hassan, Nooraini Sulaiman & Ali Hafizar Mohammad Rawi. (2007). Tamadun Islam danTamadun Asia. Kuala Lumpur: McGraw-Hill (Malaysia) Sdn. Bhd.
3. Hashim Musa. (2005). Pemerkasaan Tamadun Melayu Malaysia Menghadapi Globalisasi Barat. Kuala Lumpur: Penerbit Universiti Malaya

**BLHW 1742**
**MALAYSIAN STUDIES**

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Explain the political and economic structure of Malaysia.(PO11)
2. Respond to the uniqueness of the Malaysian's historical and cultural heritage.(PO7)
3. Compare the Malaysian experience and achievement with their home countriesin various aspects.(PO9)

**Synopsis**

By going through this course, students will be exposed to a wealth of information on Malaysia. They will gain information on Malaysian's historical background, political system and socio-economic structure. Additionally, this course highlights the Malaysian government's development plans and major policies in economic, industrial and socio-cultural aspects. It also gives emphasis on the attitude and commitment of the Malaysian government towards the regional and international issues as reflected in its foreign policy.

**References**

1. Abdul Rahman Embong. (2010). *Malaysian studies:Llooking back moving forward: Selected speeches, public statements and other writings*. Kuala Lumpur: Persatuan Sains Sosial Malaysia
2. Abdul Razak Baginda. (2009). *Malaysia at 50 and Beyond*. Kuala Lumpur: Malaysian Strategic Research Centre.
3. Ambri Buang. (2009). *Dasar-dasar utama kerajaan Malaysia*. Kuala Lumpur: Institusi Tadbiran Awam Malaysia.

**BLHW 2712**
**ETHNIC RELATIONS**

**Learning Outcomes**

In the end of the course, student will be able to:

1. Menganalisis peranan hubungan etnik dan kepentingannya dalam proses pembangunan Malaysia.(P06)
2. Menghubungkait respons tentang isu dan cabaran etnik budaya di Malaysia.(P011)
3. Merumus isu-isu perpaduan dan cadangan untuk memperkasakannya di Malaysia.(P011)

**Synopsis**

Mata pelajaran ini memfokuskan perbincangan tentang konsep-konsep asas budaya dan hubungan etnik. Ia juga member pendedahan perkembangan hubungan etnik bagi mewujudkan masyarakat menurut acuan Malaysia. Selain itu, matapelajaran ini dapat member kefahaman dalam menangani cabaran global yang berkaitan hubungan budaya dan etnik di peringkat Malaysia.

**References**

1. Shamsul Amri Baharuddin. (2007). Modul Hubungan Etnik. UPENA, KPTM
2. Abdul Aziz Bari. (2008). Perlembagaan Malaysia. Shah Alam: Arah Publication Sdn. Bhd.

3. Mohd Taib Hj Dora. (2005). Liberalisasi Komuniti. Melaka: Penerbit Universiti Teknikal Malaysia Melaka

**BLHW 2752**
**MALAYSIAN CULTURE**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Discuss issues related to Malaysian culture. (PO11)
2. Present issues related to Malaysian culture. (PO7)
3. Reflect the scenario of cultural diversity in Malaysia.(PO11)
4. Describe an element inMalaysian culture(PO6)

**Synopsis**
This course exposes international students to the socio-cultural background of Malaysia which includes ethnic composition, religions, traditions and values. Other elements like music, arts, cuisine, costume, ethnic games, celebrations and national festivals are also highlighted. Student Centered Learning (SCL) methods such as group discussion and presentation will be used in order to assist international students in developing their understanding and appreciation of Malaysian culture.

**References**
1. Heidi Munan. (2010). *Cultural Shock. A Guide to Customs and Etiquette*. Kuala Lumpur: The New Straits Times Press.
2. Heidi Munan. (2010). *Malaysian Culture Group*. Kuala Lumpur: Book Group.
Guan Yeoh Seng. (2011). *Media, Culture and Society in Malaysia*. Kuala Lumpur: Routledge.

**BTMW 4012**
**ENTERPRENEURSHIP TECHNOLOGY**

**Learning Outcomes**
In the end of the course, student will be able to:
1. Recognize the importance of entrepreneurship, the role of entrepreneurship in today's society, and the technical knowledge of the entrepreneurial process.(PO11)
2. Explain the basic concepts of interdisciplinary competences in management, and create technology-based businesses. (PO12)
3. Present a business plan project and develop an entrepreneurial profile.(PO9, PO11)

**Synopsis**
The course provides students with technological knowledge about entrepreneurship as well as the skills to turn such knowledge into practice. The teaching and learning (T&L) activities include case study and field work with the aim to inculcate entrepreneurship values and entrepreneurship acculturation with a view to successfully launch and subsequently manage their enterprises. Students will be exposed with the support systems available or government agencies in starting new ventures, including the tactics commonly employed by entrepreneurs starting a business. The course allows students to critically evaluate business in terms of technical feasibility, investment potential, and risks.

**References**
1. Barringer, B.R, and Ireland, R.D. (2012). Entrepreneurship 4th Edition. Pearson.
2. Scarborough, N.M. (2011). Essentials of Entrepreneurship and Small Business Management 6th.Edition. Pearson.
UiTM Entrepreneurship Study Group. Revised Edition (2010). Fundamentals of Entrepreneurship. Pearson

**BKXX XXX1**
**CO-CURRICULUM I &II**

*Please refer to the Pusat Bahasa & Pembangunan Insan (PBPI) handbook for further information on the offered courses.*

# BACHELOR OF MECHATRONICS ENGINEERING (BEKM)

# BACHELOR OF MECHATRONICS ENGINEERING - BEKM

The Bachelor of Mechatronics Engineering is a synergistic combination of several engineering disciplines; namely electrical & electronic, mechanical, control, and computer systems design. This program aims to produce graduates who are competent in creating, designing and producing mechatronics products that consist of mechanical and electronic systems which require control of the computer system.

## PROGRAMME IMPLEMENTATION - BEKM

This programme would take four (4) years minimum and consist of at least 135 credit hours. The programme emphasise on Mechatronics Engineering with the composition of the credits are as follows:

| Components | | Credit Hours | Percentage |
|---|---|---|---|
| University Requirements (W) | | 14 | 10.4% |
| Core (P) | Common | 35 | 25.9% |
| | Program | 71 | 52.6% |
| | Industrial Practical | 5 | 3.7% |
| Electives (E) | University | 4 | 3.0% |
| | Program | 6 | 4.4% |
| **Total** | | 135 | 100% |

This programme emphasizes on theoretical and tutorials, computer-aided learning, and problem-based learning (PBL). It also encourages active and cooperative learning activities other than carrying out assignments, job workshops, industrial training and final year project.

# CURRICULUM STRUCTURE - BEKM

Students are required to keep record of their obtained grades for a given course as shown in Appendix C (Student Audit Form - BEKM) for graduation purpose.

# COMPULSORY FOR LOCAL STUDENTS ONLY
* COMPULSORY FOR INTERNATIONAL STUDENTS ONLY
** OPTIONAL

| TYPE COURSE | YEAR 1 | | | | YEAR 2 | | | |
|---|---|---|---|---|---|---|---|---|
| | SEMESTER 1 | | SEMESTER 2 | | SEMESTER 3 | | SEMESTER 4 | |
| COMMON CORE & PROGRAM CORE (P) | BMFG 1313 ENGINEERING MATHEMATICS I | SEMESTER BREAK | BMCG 1013 DIFFERENTIAL EQUATIONS | LONG SEMESTER BREAK | BEKG 2443 ENGINEERING MATHEMATICS II | SEMESTER BREAK | BENG 2143 ENGINEERING STATISTICS | LONG SEMESTER BREAK |
| | BEKG 1123 PRINCIPLES OF ELECTRIC AND ELECTRONICS | | BENG 1413 DIGITAL ELECTRONICS | | BITG 1233 COMPUTER PROGRAMMING | | BEKE 2422 ANALOGUE ELECTRONICS APPLICATIONS | |
| | BMFG 1213 ENGINEERING MATERIALS | | BMCG 1523 ENGINEERING GRAPHICS AND CAD | | BEKU 2333 ELECTRIC CIRCUIT II | | BEKC 3533 INTRODUCTION TO CONTROL SYSTEM | |
| | BMCG 1123 STATICS & MECHANICS OF MATERIAL | | BEKU 1123 ELECTRIC CIRCUIT I | | BEKG 1233 PRINCIPLES OF INSTRUMENTATION AND MEASUREMENT | | BEKC 3543 MICROPROCESSOR | |
| | BEKB 1131 ENGINEERING PRACTICE I | | BMCG 1253 DYNAMICS & MECHANISM | | BEKM 2342 INTRODUCTION TO MECHATRONIC | | BEKC 2433 SIGNAL & SYSTEMS | |
| | | | BEKB 1231 ENGINEERING PRACTICE II | | BMCG 2372 FLUID MECHANICS | | BEKM 2321 MECHANICAL ENGINEERING LABORATORY | |
| | | | | | BEKU 1231 ELECTRICAL & ELECTRONICS ENGINEERING LABORATORY | | | |
| CREDIT HOUR SEMESTER | 13 | | 16 | | 17 | | 15 | |
| ELECTIVE (E) | | | | | | | | |
| CREDIT HOUR SEMESTER | | | | | | | | |
| UNIVERSITY REQUIREMENTS (W) | BLHW 1442 ENGLISH FOR ACADEMIC PURPOSE | | BKKX XXX1 CO-CURRICULUM II | | | | BLHW 2452 ACADEMIC WRITING | |
| | BKKX XXX1 CO-CURRICULUM I | | | | | | ** BKKX XXXX CO-CU (SUKSIS) | |
| | | | | | | | | |
| CREDIT HOUR SEMESTER | 3 | | 1 | | | | 2 | |
| TOTAL CREDIT HOUR SEMESTER | 16 | | 17 | | 17 | | 17 | |

| TYPE COURSE | YEAR 3 | | | | YEAR 4 | | | |
|---|---|---|---|---|---|---|---|---|
| | SEMESTER 5 | | SEMESTER 6 | SPECIAL SEMESTER | SEMESTER 7 | | SEMESTER 8 | |
| COMMON CORE & PROGRAM CORE (P) | BEKM 3453 MICROCONTROLLER TECHNOLOGY | | BEKM 3653 INTEGRATED DESIGN PROJECT | BEKU 3695 INDUSTRIAL TRAINNING | BEKU 4861 ENGINEERING SEMINAR | | BENG 4322 ENGINEER AND SOCIETY | |
| | BEKM 3543 ELECTROMECHANICAL SYSTEMS | | BEKC 4753 PLC & AUTOMATION | | BEKU 4792 FINAL YEAR PROJECT I | | BEKU 4894 FINAL YEAR PROJECT II | |
| | BEKC 3643 CONTROL SYSTEM ENGINEERING | | BMCG 3643 HYDRAULIC & PNEUMATIC SYSTEMS | | BEKM 4763 ROBOTICS | | | |
| | BEKG 2433 ELECTRICAL SYSTEMS | | BMCG 3653 THERMODYNAMICS & HEAT TRANSFER | | BEKC 2453 COMMUNICATION SYSTEMS | | | |
| | BMFG 4623 ENGINEERING ECONOMY AND MANAGEMENT | | | | | | | |
| | BEKC 2421 CONTROL SYSTEMS LABORATORY | SEMESTER BREAK | BEKM 3641 MECHATRONICS ENGINEERING LABORATORY I | | BEKM 4751 MECHATRONICS ENGINEERING LABORATORY II | SEMESTER BREAK | | |
| CREDIT HOUR SEMESTER | 16 | | 13 | 5 | 10 | | 6 | 111 |
| ELECTIVE (E) | | | | | BEKX XXX3 ELECTIVE I (PROGRAM) | | BEKX XXX3 ELECTIVE II (PROGRAM) | |
| | | | | | BLHL 1XX2 ELECTIVE I (UNIVERSITY) | | BXXX XXX2 ELECTIVE II (UNIVERSITY) | |
| CREDIT HOUR SEMESTER | | | | | 5 | | 5 | 10 |
| UNIVERSITY REQUIREMENTS (W) | BLHW 3462 ENGLISH FOR PROFESSIONAL INTERACTION | | # BLHW 1702 TITAS | | * BLHW 1742 MALAYSIAN STUDIES | | BTMW 4012 TECHNOPRENEURSHIP | |
| | | | * BLHL 1012 MALAY COMMUNICATION I | | | | # BLHW 2712 ETHNIC RELATIONS | |
| | | | | | | | * BLHW 2752 MALAYSIAN CULTURE | |
| CREDIT HOUR SEMESTER | 2 | | 2 | | 0 | | 4 | 14 |
| TOTAL CREDIT HOUR | 18 | | 15 | 5 | 15 | | 15 | 135 |

| CHOOSE 0NE (1) COURSE FROM ANY OF ELECTIVE PROGRAM I; AND<br>CHOOSE 0NE (1) COURSE FROM ANY OF ELECTIVE PROGRAM II; AND<br>CHOOSE ONE (1) COURSE FROM ANY OF ELECTIVE UNIVERSITY I (THIRD LANGUAGE); AND<br>CHOOSE ONE (1) COURSE FROM ANY OF ELECTIVE UNIVERSITY II (GENERAL) | | | | | |
|---|---|---|---|---|---|
| **ELECTIVE PROGRAM** | **I** | BEKM 4783<br>MACHINE VISION | BEKC 4773<br>INTELLIGENT CONTROL SYSTEMS | | |
| | **II** | BEKC 4683<br>DIGITAL CONTROL SYSTEMS | BEKC 4883<br>ADVANCED MANUFACTURING SYSTEMS | BEKM 4823<br>DATA COMMUNICATIONS & COMPUTER NETWORKING | |
| **ELECTIVE UNIVERSITY** | **I**<br>**THIRD LANGUAGE** | BLHL 1212<br>BAHASA MANDARIN 1 | BLHL 1612<br>BAHASA KOREA 1 | BLHL 1112<br>BAHASA ARAB 1 | BLHL 1412<br>BAHASA JERMAN 1 |
| | | BLHL 1312<br>BAHASA JEPUN 1 | *BLHL 1012<br>BAHASA MELAYU KOMUNIKASI 1 | | |
| | **II**<br>**GENERAL** | BXXX XXX2<br>PEMIKIRAN KRITIS DAN KREATIF | BXXX XXX2<br>KOMUNIKASI ORGANISASI | BXXX XXX2<br>PSIKOLOGI INDUSTRI DAN ORGANISASI | BXXX XXX2<br>KEMAHIRAN PERUNDINGAN |
| | | BXXX XXX2<br>FALSAFAH SAINS DAN TEKNOLOGI | BXXX XXX2<br>SOSIOLOGI INDUSTRI | | |

# CREDIT HOUR AND PRE-REQUISITE - BEKM

Students are required to keep record of their obtained grades for a given course as shown in Appendix C (Student Audit Form - BEKM) for graduation purpose.

# COMPULSORY FOR LOCAL STUDENTS ONLY
* COMPULSORY FOR INTERNATIONAL STUDENTS ONLY
** OPTIONAL

| SEMESTER | CODE | COURSE | CATEGORY | CREDIT | EQUIVALENT CODE | PRE-REQUISITE |
|---|---|---|---|---|---|---|
| SEMESTER 1 | BLHW 1442 | ENGLISH FOR ACADEMIC PURPOSE | W | 2 | | |
| | BKKX XXX1 | CO-CURRICULUM I | W | 1 | | |
| | BMFG 1313 | ENGINEERING MATHEMATICS I | P | 3 | BEKA 1233 | |
| | BEKG 1123 | PRINCIPLES OF ELECTRIC AND ELECTRONICS | P | 3 | BEKE 1133 | |
| | BMFG 1213 | ENGINEERING MATERIALS | P | 3 | | |
| | BMCG 1123 | STATICS & MECHANICS OF MATERIAL | P | 3 | | |
| | BEKB 1131 | ENGINEERING PRACTICE I | P | 1 | | |
| | | | **TOTAL** | **16** | | |
| SEMESTER 2 | BKKX XXX1 | CO-CURRICULUM II | W | 1 | | |
| | BMCG 1013 | DIFFERENTIAL EQUATIONS | P | 3 | BEKA 2333 | |
| | BENG 1413 | DIGITAL ELECTRONICS | P | 3 | BEKU 1243 | |
| | BMCG 1523 | ENGINEERING GRAPHICS AND CAD | P | 3 | | |
| | BEKU 1123 | ELECTRIC CIRCUIT I | P | 3 | | |
| | BMCG 1253 | DYNAMICS & MECHANISM | P | 3 | | |
| | BEKB 1231 | ENGINEERING PRACTICE II | P | 1 | | |
| | | | **TOTAL** | **17** | | |
| SEMESTER 3 | BEKG 2443 | ENGINEERING MATHEMATICS II | P | 3 | | |
| | BITG 1233 | COMPUTER PROGRAMMING | P | 3 | | |
| | BEKU 2333 | ELECTRIC CIRCUIT II | P | 3 | | |
| | BEKG 1233 | PRINCIPLES OF INSTRUMENTATION AND MEASUREMENT | P | 3 | BEKC 1123 | |
| | BEKM 2342 | INTRODUCTION TO MECHATRONIC | P | 2 | | |
| | BMCG 2372 | FLUID MECHANICS | P | 2 | | |
| | BEKU 1231 | ELECTRICAL & ELECTRONICS ENGINEERING LABORATORY | P | 1 | | |
| | **BKKX XXX1 | CO-CURICULUM (SUKSIS) | W | | | |
| | | | **TOTAL** | **17** | | |

| SEMESTER | CODE | COURSE | CATEGORY | CREDIT | EQUIVALENT CODE | PRE-REQUISITE |
|---|---|---|---|---|---|---|
| SEMESTER 4 | BLHW 2452 | ACADEMIC WRITING | W | 2 | | |
| | BENG 2143 | ENGINEERING STATISTICS | P | 3 | | |
| | BEKC 2433 | SIGNAL & SYSTEMS | P | 3 | | |
| | BEKE 2422 | ANALOGUE ELECTRONICS APPLICATIONS | P | 2 | | |
| | BEKC 3533 | INTRODUCTION TO CONTROL SYSTEM | P | 3 | | |
| | BEKC 3543 | MICROPROCESSOR | P | 3 | | |
| | BEKM 2321 | MECHANICAL ENGINEERING LABORATORY | P | 1 | | |
| | **BKXX XXX1 | CO-CURICULUM (SUKSIS) | W | | | |
| | | | **TOTAL** | **17** | | |
| SEMESTER 5 | BLHW 3462 | ENGLISH FOR PROFESSIONAL INTERACTION | W | 2 | | |
| | BMFG 4623 | ENGINEERING ECONOMY AND MANAGEMENT | P | 3 | | |
| | BEKG 2433 | ELECTRICAL SYSTEMS | P | 3 | BEKP 2443 | |
| | BEKM 3453 | MICROCONTROLLER TECHNOLOGY | P | 3 | | BEKC 3543 |
| | BEKM 3543 | ELECTROMECHANICAL SYSTEMS | P | 3 | | |
| | BEKC 3643 | CONTROL SYSTEM ENGINEERING | P | 3 | | BEKC 3533 |
| | BEKC 2421 | CONTROL SYSTEMS LABORATORY | P | 1 | | |
| | **BKXX XXX1 | CO-CURICULUM (SUKSIS) | W | | | |
| | | | **TOTAL** | **18** | | |
| SEMESTER 6 | #BLHW 1702<br>*BLHL 1012 | TITAS<br>MALAY COMMUNICATION I | W | 2 | | |
| | BEKM 3653 | INTEGRATED DESIGN PROJECT | P | 3 | | |
| | BEKC 4753 | PLC & AUTOMATION | P | 3 | | |
| | BMCG 3643 | HYDRAULIC & PNEUMATIC SYSTEMS | P | 3 | | |
| | BMCG 3653 | THERMODYNAMICS & HEAT TRANSFER | P | 3 | | |
| | BEKM 3641 | MECHATRONICS ENGINEERING LABORATORY I | P | 1 | | |
| | | | **TOTAL** | **15** | | |
| SPECIAL SEMESTER | BEKU 3695 | INDUSTRIAL TRAINING | P | 5 | | |
| | | | **TOTAL** | **5** | | |
| SEMESTER 7 | BEKU 4861 | ENGINEERING SEMINAR | P | 1 | | |
| | BEKU 4792 | FINAL YEAR PROJECT I | P | 2 | | |
| | BEKM 4763 | ROBOTICS | P | 3 | | |
| | BEKC 2453 | COMMUNICATION SYSTEMS | P | 3 | BEKC 3633 | |
| | BEKM 4751 | MECHATRONICS ENGINEERING LABORATORY II | P | 1 | | |

| SEMESTER | CODE | COURSE | CATEGORY | CREDIT | EQUIVALENT CODE | PRE-REQUISITE |
|---|---|---|---|---|---|---|
| | BXXX XXX2 | ELECTIVE I (UNIVERSITY) | E | 2 | | |
| | | **ELECTIVE PROGRAM I** | E | 3 | | |
| | BEKM 4783 | MACHINE VISION | | | | |
| | BEKC 4773 | INTELLIGENT CONTROL SYSTEMS | | | BEKC 4873 / BEKC 4783 | |
| | | | **TOTAL** | **15** | | |
| **SEMESTER 8** | BTMW 4012 | TECHNOPRENEURSHIP | W | 2 | | |
| | #BLHC 2712 *BLHW 2752 | ETHNIC RELATIONS MALAYSIAN CULTURE | W | 2 | | |
| | BENG 4322 | ENGINEER AND SOCIETY | P | 2 | | |
| | BEKU 4894 | FINAL YEAR PROJECT II | P | 4 | | BEKU 4792 |
| | BXXX XXX2 | ELECTIVE II (UNIVERSITY) | E | 2 | | |
| | | **ELECTIVE PROGRAM II** | E | 3 | | |
| | BEKC 4683 | DIGITAL CONTROL SYSTEMS | | | | |
| | BEKC 4883 | ADVANCED MANUFACTURING SYSTEMS | | | | |
| | BEKM 4823 | DATA COMMUNICATIONS & COMPUTER NETWORKING | | | | |
| | | | **TOTAL** | **15** | | |
| | | | **MINIMUM TOTAL CREDIT** | **135** | | |

P = Core, E = Elective, W = University Requirements

# STUDENT LEARNING TIME (SLT) - BEKM

| Semester | Code | Course | Face-to-Face Learning | | | | Self Learning Activities | Formal Assessment | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | | Teacher Centered (TC) | Student Centered Learning (SCL) | | | | | |
| | | | Lecture | Tutorial | Practical | PBL / Other SCL Activities | Student Direct Learning / Revision / Exercise | Continuous Learning + Final Examination | |
| 1 | BLHW 1442 | ENGLISH FOR ACADEMIC PURPOSE | 22 | 3 | | 6 | 45.5 | 3.5 | 80 |
| | BKKX XXX1 | CO-CURRICULUM I | | | | 16 | 22 | 2 | 40 |
| | BMFG 1313 | ENGINEERING MATHEMATICS I | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKG 1123 | PRINCIPLES OF ELECTRIC AND ELECTRONICS | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BMFG 1213 | ENGINEERING MATERIALS | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BMCG 1123 | STATICS & MECHANICS OF MATERIAL | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKB 1131 | ENGINEERING PRACTICE I | | | 20 | | 18 | 2 | 40 |
| 2 | BKKX XXX1 | CO-CURRICULUM II | | | | 16 | 22 | 2 | 40 |
| | BMCG 1013 | DIFFERENTIAL EQUATIONS | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BENG 1413 | DIGITAL ELECTRONICS | 36 | 5.5 | | 6 | 67.5 | 5 | 120 |
| | BMCG 1523 | ENGINEERING GRAPHICS AND CAD | 28 | | 28 | | 59 | 5 | 120 |
| | BEKU 1123 | ELECTRIC CIRCUIT I | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BMCG 1253 | DYNAMICS & MECHANISM | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKB 1231 | ENGINEERING PRACTICE II | | | 20 | | 18 | 2 | 40 |
| 3 | BEKG 2443 | ENGINEERING MATHEMATICS II | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BITG 1233 | COMPUTER PROGRAMMING | 28 | | 28 | | 59 | 5 | 120 |
| | BEKU 2333 | ELECTRIC CIRCUIT II | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKG 1233 | PRINCIPLES OF INSTRUMENTATION AND MEASUREMENT | 42 | 5.5 | | | 67.5 | 5 | 120 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | BEKM 2342 | INTRODUCTION TO MECHATRONIC | 28 | 3.25 | | | 45.25 | 3.5 | 80 |
| | BMCG 2372 | FLUID MECHANICS | 28 | 3.25 | | | 45.25 | 3.5 | 80 |
| | BEKU 1231 | ELECTRICAL & ELECTRONICS ENGINEERING LABORATORY | | | 20 | | 18 | 2 | 40 |
| 4 | BLHW 2452 | ACADEMIC WRITING | 22 | 3 | | 6 | 45.5 | 3.5 | 80 |
| | BENG 2143 | ENGINEERING STATISTICS | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKC 2433 | SIGNAL & SYSTEMS | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKE 2422 | ANALOGUE ELECTRONICS APPLICATIONS | 28 | 3.25 | | | 45.25 | 3.5 | 80 |
| | BEKC 3533 | INTRODUCTION TO CONTROL SYSTEM | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKC 3543 | MICROPROCESSOR | 36 | 5.5 | 6 | | 67.5 | 5 | 120 |
| | BEKM 2321 | MECHANICAL ENGINEERING LABORATORY | | | 20 | | 18 | 2 | 40 |
| 5 | BLHW 3462 | ENGLISH FOR PROFESSIONAL INTERACTION | 22 | 3 | | 6 | 45.5 | 3.5 | 80 |
| | BMFG 4623 | ENGINEERING ECONOMY AND MANAGEMENT | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKG 2433 | ELECTRICAL SYSTEMS | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKM 3453 | MICROCONTROLLER TECHNOLOGY | 36 | 5.5 | 6 | | 67.5 | 5 | 120 |
| | BEKM 3543 | ELECTROMECHANICAL SYSTEMS | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKC 3643 | CONTROL SYSTEM ENGINEERING | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKC 2421 | CONTROL SYSTEMS LABORATORY | | | 20 | | 18 | 2 | 40 |
| 6 | #BLHW 1702<br>*BLHL 1012 | TITAS<br>MALAY COMMUNICATION I | 22 | 3 | | 6 | 45.5 | 3.5 | 80 |
| | BEKM 3653 | INTEGRATED DESIGN PROJECT | 39 | | 27 | 20 | 29 | 5 | 120 |
| | BEKC 4753 | PLC & AUTOMATION | 1 | | | 41 | 73 | 5 | 120 |
| | BMCG 3643 | HYDRAULIC & PNEUMATIC SYSTEMS | 36 | 5.5 | 6 | | 67.5 | 5 | 120 |
| | BMCG 3653 | THERMODYNAMICS & HEAT TRANSFER | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKM 3641 | MECHATRONICS ENGINEERING LABORATORY I | 42 | 5.5 | | | 67.5 | 5 | 120 |
| Special Semester | BEKU 3995 | INDUSTRIAL TRAINING | | | | | 200 | | 200 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 7 | BEKU 4861 | ENGINEERING SEMINAR | 14 | 6 | | | 18 | 2 | 40 |
| | BEKU 4792 | FINAL YEAR PROJECT I | 3 | | | 6.5 | 67 | 3.5 | 80 |
| | BEKM 4763 | ROBOTICS | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKC 2453 | COMMUNICATION SYSTEMS | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKM 4751 | MECHATRONICS ENGINEERING LABORATORY II | | | 20 | | 18 | 2 | 40 |
| | BXXX XXX2 | ELECTIVE I (UNIVERSITY) | 22 | 3 | | 6 | 45.5 | 3.5 | 80 |
| | BEKM 4783 | MACHINE VISION | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKC 4773 | INTELLIGENT CONTROL SYSTEMS | | | | | | | |
| 8 | BTMW 4012 | TECHNOPRENEURSHIP | 22 | 3 | | 6 | 45.5 | 3.5 | 80 |
| | #BLHC 2712 *BLHW 2752 | ETHNIC RELATIONS MALAYSIAN CULTURE | 22 | 3 | | 6 | 45.5 | 3.5 | 80 |
| | BENG 4322 | ENGINEER AND SOCIETY | 22 | 3 | | 6 | 45.5 | 3.5 | 80 |
| | BEKU 4894 | FINAL YEAR PROJECT II | 4 | | | 7 | 141.75 | 7.25 | 160 |
| | BXXX XXX2 | ELECTIVE II (UNIVERSITY) | 22 | 3 | | 6 | 45.5 | 3.5 | 80 |
| | BEKC 4683 | DIGITAL CONTROL SYSTEMS | 42 | 5.5 | | | 67.5 | 5 | 120 |
| | BEKC 4883 | ADVANCED MANUFACTURING SYSTEMS | | | | | | | |
| | BEKM 4823 | DATA COMMUNICATIONS & COMPUTER NETWORKING | | | | | | | |
| **TOTAL HOURS** | | | **1484** | **196.75** | **186** | **146.5** | **3164** | **222.75** | **5400** |

**BEKB 1131**
**ENGINEERING PRACTICE I**

**Learning Outcomes**
Upon completion of this course, the student should be able to:

6. Construct basic electric components for single phase domestic wiring installation. (PO5)
7. Construct and demonstrate relay control circuits. (PO5)
8. Apply the basic concept for electrical simulation using Pspice and PROTEUS simulation tools. (PO5)
9. Describe the knowledge of domestic wiring, relay control circuit and simulation using Pspice and PROTEUS in writing and/or oral. (PO9)
10. Work in a group during implementation of wiring installation, relay circuits, simulation projects and present the work results. (PO10)

**Synopsis**
This course will expose students to basic single phase domestic wiring, relay control circuits and basic concept for electrical simulation using Pspice and PROTEUS. Students are required to concentrate on the safety aspects and quality of works during the workshop sessions.

**References**

6. Ir Md Nazri, Aminudin, Md Hairul Nizam, Engineering Practice: Wiring System & Motor Starter, Module 2, UTeM, 2007.
7. Teo Cheng Yu, Principle and Design of Low Voltage System, 2nd Ed., Byte Power Publications, Singapore, 2009.
8. IEEE Regulation 16th Edition. Akta Bekalan Elektrik (447 Pindaan 2001).
9. Paul Tobin, PSpice for Circuit Theory and Electronic Devices, 2007.
10. K.A. Charles, N.O. Sadiku, Fundamentals of Electric Circuits, 3rd Ed., McGraw Hill, 2007.


**BEKB 1231**
**ENGINEERING PRACTICE II**

**Learning Outcomes**
Upon completion of this course, the student should be able to:

6. Construct three phase motor starter control circuit. (PO5)
7. Apply the basic concept for electrical schemetic diagram using AUTOCAD tools. (PO5)
8. Apply the basic microcontroller programming language for dynamic mechanism application. (PO5)
9. Demonstrate and present the results in oral and technical report writing. (PO9)
10. Work in a group during implementation of wiring installation, relay circuits, simulation projects and present the work results. (PO10)

**Synopsis**
This course will let students to practice with Arduino and AUTOCAD simulation tools to solve simple engineering problem. Students also will be introduced with three phase motor starter which is cover on DOL, Forward-Reverse and STAR/DELTA connection.

**References**

5. Massimo Banzi, Getting Started with Arduino, 2nd Ed., O'reilly, 2011.
6. K.A. Charles, N.O. Sadiku, Fundamentals of Electric Circuits, 6th Ed., McGraw Hill, 2016.
7. James Leach, AutoCAD 2016 - Instructor, SDS Publications, 2016.
8. Ir Md Nazri, Aminudin, Md Hairul Nizam, Engineering Practice: Wiring System & Motor Starter, Modul 2, UTeM, 2007.

**BEKC 2421**
**CONTROL SYSTEM ENGINEERING LABORATORY**

**Learning Outcomes**
Upon completion of this course, the student should be able to:

1. Design experiments according to the requirement of Control and Instrumentation System Engineering experiments.(PO4)
2. Analyze and interpret data and synthesize information related to Control and Instrumentation System Engineering experiments.(PO4)
3. Demonstrate practical competence in using Control and Instrumentation System Engineering software and apparatus.(PO5)
4. Report the findings in a way that is appropriate to the targeted audience. (PO9)

**Synopsis**
This laboratory provides students with practical activities related to signal and system as well as control and instrumentation theories. Students will carry out experiments regarding AC and DC bridges using oscilloscope, as well as modelling of open and closed loop system by using Lab-Volt Temperature Process Control Trainer. The simulation part covers practical application involving Real-time implementation based on problem-based learning design using MATLAB, SIMULINK, and Control System Toolbox, as well as simulation of Discrete-Time & Continuous-Time Signal and Fourier series using Symbolic Toolbox. Student will be exposed to methods to conduct and report investigation work including design of experiment, analysis of data, synthesis of information and evaluation of findings.

**References**

1. Course File BEKM 2433 (Signal & System), FKE, UTeM, (2012).
2. Course File BEKC 3533 (Introduction to Control System), FKE, UTeM, (2012).
3. Course File BEKM 2453 (Instrumentation Systems), FKE, UTeM, (2012).


**BEKC 2433**
**SIGNALS & SYSTEMS**

**Learning Outcomes**
Upon completion of this course, the student should be able to:

1. Differentiate the classification of basic continuous-time and discrete-time signals and systems.(PO1,PO2)
2. Describe and analyze linear time-invariant (LTI) systems in time-domain by examine their inputs and outputs.(PO1,PO2)
3. Describe and analyze linear time-invariant (LTI) systems in frequency-domain by examine their inputs and outputs.(PO1,PO2)
4. Compute and determine a system output in either time or frequency given the system input and description of the system using Laplace Transform and/or *Z*-Transform .(PO1,PO2)

**Synopsis**
This course will discuss about the introduction to signals and systems; classification of signals and systems; linear time invariant systems and convolution; Fourier analysis for continuous time and discrete time signals; Fourier series and Fourier transform; Laplace-Transform and *z*-Transform.

**References**

1. M.J., Roberts, Signals and System Analysis Using Transform Methods and MATLAB, 2nd Edition, McGraw-Hill, (2012).
2. Keduki, E., Munson, D.C., Analog Signals and Systems, 1st Edition, Pearson Education, (2009).
3. Philips, C.L., Parr, J.M., Signals, Systems and Transforms, 4th Edition, Pearson Education, (2008).
4. Oppenheim, A.V., Willsky, A.S., Signals and Systems, 2nd Edition, Prentice Hall, (1996).


**BEKC 2453**
**COMMUNICATION SYSTEMS**

**Learning Outcomes**
Upon completion of this course, the student should be able to:

1. Explain and apply the basic principles and components of telecommunication and data communication systems.(PO1)
2. Apply knowledge and analyze related to Amplitude Modulation/Demodulation techniques that are typically used in telecommunication systems.(PO2)
3. Apply knowledge and analyze related to Angle Modulation/Demodulation techniques that are typically used in telecommunication systems.(PO1)

4. Apply knowledge and analyze related to Digital modulation/Demodulation techniques that are typically used in telecommunication systems.(PO2)
5. Explain the concept of computer system network, network technology and multiplexing / demultiplexing.(PO1)

**Synopsis**

Topics covered are: Introduction to Telecommunications, Transmission Modes, Power Measurements, Electromagnetic Frequency Spectrum, Bandwidth and Information Capacity, Amplitude Modulation Transmission & Reception, Single-Sidebands Communications Systems, Angle Modulation Transmission & Reception, FM Stereo, Noise in Telecommunication Systems, Digital Communication, Digital Transmission, PCM, Digital Modulation / Demodulation, ASK, FSK, PSK, Data Communication & Computer Network. Frequency Division Multiplexing, Time Division Multiplexing, Space Division Multiplexing.

**References**


1. Jeffrey S. Beasley, Modern Electronic Communication, Pearson, 9th Edition, 2008.
2. Behrouz A. Forouzan, Data Communication and Networking, 4th Edition, McGraw Hill, 2007.
3. John Proakis, Essentials of Communication Systems Engineering, Prentice Hall, 2005.


## BEKC 3533
## INTRODUCTION TO CONTROL SYSTEMS

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Describe the basic features and configuration of control systems. (PO1)
2. Derive the mathematical model of physical system in frequency and in time-domain.(PO1)
3. Analyze the transient response, steady state performance and stability for first and second order linear systems.(PO2)
4. Able to employ root locus method and its role in control system design.(PO1)
5. Analyze the asymptotic approximation bode plots performances for first and second order systems.(PO2)

**Synopsis**

This course will discuss about the concepts in control system; open and closed loop system; transfer function; block diagram reduction and signal flow graphs; modeling for electrical system, mechanical system and electromechanical system; transient and steady-state performance for first, second and high order systems; Routh Hurwitz criteria for stability; steady-state error analysis; Root Locus and Bode plot.

**References**


1. Nise, S. Norman, Control Systems Engineering, 6th Edition, John Wiley & Sons Inc., United State of America, (2011).
2. Syed Najib Syed Salim, Maslan Zainon, Control System Engineering, 1st Edition, Penerbit UTeM, (2011).
3. Bishop, Dorf, Modern Control Systems, 10th Edition, Prentice Hill, (2008).

Syed Najib Syed Salim et. al., Basic Control Systems (Theory & Worked Examples), 1st Edition, Penerbit UTeM, (2008).


## BEKC 3543
## MICROPROCESSOR

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Describe and explain microprocessor (Motorola 68000) architecture and its operation. Able to illustrate the interfacing circuitry of microprocessor-based systems and its supporting components.(PO1)
2. Write and apply the 68k Microprocessor instruction set operation in assembly language.(PO5)
3. Describe and distinguish the concept of the Motorola 68000 microprocessor system with memory and peripheral device interface.(PO1)
4. Develop and construct a microprocessor-based system and solve the problem related and prepare the technical report.(PO3)

**Synopsis**

This course is about hardware and microprocessor handling, type of microprocessor systems, system handler and timing diagrams. The course covers the concept of MC68000 microprocessor software architecture, programming, assembly language and basic instruction, data transferring instruction, program control and subroutine, arithmetic and logic operations. It touches most on programming techniques, designing a microcomputer system, interfaces

with memory and I/O devices. Students will experience PBL approach in this course where a PO-PBL will be introduced to the student.

**References**


1. Antonakos, J.L., The 68000 Microprocessor: Hardware and Software Principles and Applications, 5th Edition, Prentice Hall, (2004).
2. Spasov, P., Microcontroller Technology: The 68HC11 and 68HC12, 5th Edition, Prentice Hall, (2004).
3. Tocci, R.J., Digital Systems: Principles and Applications, 9th Edition, Prentice Hall, (2004).


## BEKC 3643
## CONTROL SYSTEM ENGINEERING

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Formulate control systems characteristics and interpret control specifications. (PO1)
2. Analyze the problems of a system and justify the proposed solution.(PO2)
3. Design and evaluate the compensators in time domain, frequency domain and state variable feedback systems.(PO3)

**Synopsis**

This course addresses compensator design in control systems engineering. Typically, the design of active and passive compensators using root locus technique; passive compensator using root locus and frequency response technique; closed loop frequency response of unity feedback system; state feedback design using pole placement technique as well as integral control and observer design. In particular, we will concentrate on systems that can be modeled by Ordinary Differential Equations (ODEs), and that satisfy certain linearity and time-invariance conditions.
Student is encouraged to have sufficient knowledge in differential equations, introduction to control systems and signals and systems.

**References**


1. Bishop, Dorf, Modern Control Systems, 11th Edition, Prentice Hall, 2011.
2. Nise, S Norman, Control Systems Engineering, 6th Edition, John Wiley & Sons Inc., United State of America, 2011.
3. Gopal, Control Systems: Principles & Design, 3rd Edition, Tata McGraw Hill, 2008.
4. Ogata Katsuhiko, Modern Control Engineering, 5th Edition, Prentice Hall, 2010.
5. Graham C. Goodwin, Stefan F. Graebe, Mario E. Salqado, Control System Design. Prentice Hall, 2001.


## BEKC 4753
## PLC & AUTOMATION

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Explain the principles and fundamentals of programmable logic controllers (PLCs) and elements of automations system. (PO1)
2. Use tools and equipments for PLC programming that related to industrial applications.(PO5)
3. Design a basic automated PLC based system with consideration for specific needs.(PO3)
4. Demonstrate communication skill through team work activities effectively.(PO9)

**Synopsis**

This course will expose students with knowledge and skills of PLC including its principles and fundamental, main hard components, PLC programming languages, interfacing PLC with computers, integrating PLC hardware and software to design an automation system, introduction to automation system in manufacturing process, computer-integrated manufacturing (CIM) and industrial communication networking.

**References**


1. D. Petruzella, Frank Programmable Logic Controller, 4th Ed., McGraw Hill, 2011.
2. Mikell P. Groover, Automation, Production Systems & Computer-Integrated Manufacturing, 3rd Ed., 2008.
3. Hugh Jack, Automating Manufacturing Systems, Version 5.0, 2007.
4. L. A. Bryan & E. A. Bryan, Programmable Controller: Theory and Implementation, 2nd Ed., Industrial Text, 2007.
5. IEC 61131 Standards – PLCOpen.


## BEKC 4683
## DIGITAL CONTROL SYSTEMS

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Transform continuous-time signals into discrete-time signals and to represent LTI digital control systems in z-domain.(PO1)
2. Analyze the stability and performance of digital control systems in time, frequency, and z domains.(PO2)
3. Analyze the digital control systems represented in state space model.(PO1, PO2)
4. Design a digital PID controller and digital lead-lag compensators using root locus and frequency response methods, and state feedback using a pole-placement method.(PO2, PO3)

**Synopsis**
This course consists of discussions about an introduction to digital control systems, the relationship between continuous-time and discrete –time control systems, digital system coding, sampling process, quantization and z-transform, and digital control system representations. The notions of controllability, observability, and stability of digital control systems and analyses in time, frequency, and z domains are also included in this course. The design of digital PID controllers, lead-lag compensators, and state feedback and observer gain via a pole placement are covered in this course. The analyses and design of digital control systems are performed using MATLAB and Simulink. Students are encouraged to gain scientific knowledge of contemporary issues related this course.

**References**

1. Katsuhiko Ogata, Dicrete-time Control System, 2nd Edition, Prentice Hall, 1995.
2. Benjamin C. Kuo, Digital Control Systems, 2nd Edition, Oxford, 1992.
3. C.L. Philips and H.T Nagle, Digital Control System Analysis and Design, 5th Edition, Pearson Education, 2005.


## BEKC 4773
## INTELLIGENT CONTROL SYSTEMS

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Explain the essential concepts, principals and theories relating to Artificial Intelligence (AI) in general, and for fuzzy logic and neural networks in particular.(PO1)
2. Design basic fuzzy logic or neural network systems according to the engineering problem.(PO3)
3. Demonstrate and analyze through simulations the performance of fuzzy logic and/or neural network using Simulink/MATLAB or other specified tools.(PO4)
4. Describe the latest technology and current issues of AI systems.(PO9)

**Synopsis**
Introduction of intelligent systems using Artificial Intelligent system such as fuzzy logic, neural network and expert system. Focus on popular techniques of AI i.e artificial neural networks, fuzzy logic and genetic algorithms. Development of algorithms, which have capabilities such as learning, reasoning, etc.
Problem solving through expert engines and database for expert performances. Automation of data acquisition from human experience and explanation of problem solving behavior. A series of simulations of fuzzy logic and neural network algorithms using SIMULINK/MATLAB or other software packages.

**References**

1. KazuoTanaka; Introduction to Fuzzy Theory towards Application, Russel Books, 1991.
2. Kenji Sugawara; Artificial Intelligence; Morikita; 1997.
3. Satish Kumar; Neural Networks A Classroom Approach; International Edition; McGraw Hill; 2005.
4. Simon Haykin; Neural Networks A Comprehensive Foundation; 2nd Edition; Prentice Hall; 1999.
5. George F. Luger; Artificial Intelligence, Structures and Strategies for Complex Problem Solving; 6th Edition; Addison Wesley; 2005.
6. Timothy J. Ross; Fuzzy Logic With Engineering Applications; McGraw-Hill International Editions; 1997.


## BEKC 4883
## ADVANCED MANUFACTURING SYSTEM

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Explain the principles of advanced manufacturing system. (PO1)
2. Clasify the various types of manufacturing operations, models and metrics applicable in industry.(PO4)

3. Analyze the process of quality control in manufacturing systems & evaluate the FMS bottleneck models by using Quantitative Analysis. (PO3)
4. Design a solution for a manufacturing system which is applicable to industries. (PO3)
5. Apply knowledge through soft skills presentation & technical writing related to manufacturing system operations. (PO1)

**Synopsis**

This course is introduction to industrial field topics such as production system, manufacturing system, manufacturing operation, manufacturing models and metrics besides exposure to manual assembly lines and automated assembly lines which applicable in industry. The analysis of quality control and quantitative analysis in FMS bottleneck models in this and product design using CAD/CAM in production system.

**References**


1. Groover, M. P., "Automation, Production Systems, and Computer-Integrated Manufacturing", 3rd Ed., Prentice Hall, 2008.
2. Groover, M. P., "Fundamentals of Modern Manufacturing: Materials, Processes, and Systems", John Wiley & Sons Inc, 2007.
3. Kalpakjian, S. & Schmid, S., "Manufacturing, Engineering, and Technology", 5th Ed., Addison-Wesley, 2005.


## BEKE 2422
## ANALOGUE ELECTRONICS APPLICATION

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Apply knowledge of mathematics and electronic device to the solution of small signal analysis and power amplification (PO1)
2. Design active filter circuit, voltage regulator and oscillator in electrical engineering problem. (PO1)

**Synopsis**

This course covers the application of electronic device components in producing the electronic analogue application. The electronic analogue application that we focus on are small signal analysis, power amplification, active filter, voltage regulator and oscillator. In power amplification, there are three class of power amplifier will be introduced which is power amplifier class A, class B and class AB. After that student will be exposed to active filter which combined the usage of transistor or op-amps with RC,RL or RCL circuit in producing the low-pass filter, high-pass filter, band-pass filter and band-stop filter. The wave generation using op-amp and timer 555 will be introduced in oscillator part. Lastly, concept of voltage regulator will be introduced based on transistor for linear shunt and series regulator as well as the integrated circuit voltage regulator.

**References**


1. Floyd, T., Electronic Devices, 9th, Edition Prentice Hall, 2014.
2. Bolysted, R., Nashelsky, L., Electronic Devices and Circuit Theory, 11th Edition, Prentice Hall, 2014.
3. Aliminian, A., Kazimierczuk, M. K., Electronic Devices: A Design Approach, 1st Edition, Prentice Hall, 2004.
4. Russell, L. M., Robert, D., Foundations of Electronics Circuits and Devices, 4th Edition, Thomson Delmar Learning, 2003.


## BEKG 1123
## PRINCIPLES OF ELECTRIC AND ELECTRONICS

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Explain the basic electrical and electronics principles, circuit schematics and components. (PO1)
2. Demonstrate the electrical and electronic knowledge to solve the series and parallel circuits in DC and phasor approach for AC circuit. (PO1)
3. Explain the principle knowledge of semiconductor devices for Diode, BJT and Op Amp.(PO1)
4. Apply the electronic knowledge to solve the Diode, BJT and Op-Amp circuits.(PO1)

**Synopsis**

This course will discuss about the basic principles of electrical and electronics; Introduction to electric element, symbol and components. KCL, KVL, Node and Mesh in solving DC series and parallel circuits. Introduction in magnetism, electromagnetism and AC characteristic. Introduction to semiconductors, atomic structures, energy band, P-type and N-type. Study on structure, principle and application of diode, BJT and Op-Amp circuits.

**References**

1. Thomas L. Floyd, Principles of Electric Circuits, Pearson, 9th Ed. (2010).
2. Thomas L. Floyd and David M. Buchala, Electric Circuits Fundamentals, Pearson, 8th Ed. (2010).
3. Boylestad, R.L.; Nasheslsky, L, Electronic Devices and Circuit Theory, Pearson Prentice Hall, (2010).

## BEKG 1233
## PRINCIPLES OF INSTRUMENTATION AND MEASUREMENT

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Describe the principle, various terms and standards in measurement. (PO1)
2. Explain the principle of measurement devices.(PO1)
3. Apply the suitable bridge techniques to measure component values such as resistance, inductance and capacitance. (PO1)
4. Explain the operation, function and applications of the transducers/sensors.(PO1)

**Synopsis**

This course discusses about units and dimensions, standards, errors, static characteristic, noise and calibration in measurement. It covers most on the measurement devices such as galvanometers, ammeters, voltmeters, wattmeter, temperature, force and torque and pressure measurement as well as accelerator meter. It also introduces oscilloscope and sensors for instrumentation application.

**References**

1. HS Kalsi, Electronic Instrumentation, 3rd Ed., Tata McGraw Hill, 2010.
2. UA Bakshi, AV Bakshi and KA Bakshi, Electronic Measurements and Instrumentation, Technical Publications Pune, 2009.
3. Donald Calibration Book, Vaisala Oyj, Vaisala 2006.
4. S Wolf, Richard F.M Smith, Reference Manual for Electronic Instrumentation Laboratories 2nd Ed., Prentice-Hall, 2004.

## BEKG 2433
## ELECTRICAL SYSTEMS

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Explain the concepts of the electric power system components (generation, transmission and distribution) and various power generation system and energy sources. (PO1)
2. Analyze the basic principle of electrical system (single and three-phase system) including power factor corrections. (PO1)
3. Apply the per-unit calculation to analyze electrical power system of different voltage levels. (PO2)
4. Analyze the characteristics for electric machine principles, including AC Synchronous generator and transformer (PO2).
5. Apply the characteristics and performance of electrical transmission line and distribution system (PO5).

**Synopsis**

This course introduces the overall components of power system to the students. First, the concepts of single and three-phase system is emphazied, followed by the modelling of power systems components such as generator, transformer and transmission line for analytical purposes. The per unit calculation is then used to analyze the system modelled.

**References**

1. Glover, Sarma & Overbye, Power System Analysis and Design, 5th ed., Cengage Learning, 2012
2. Hadi Saadat, Power System Analysis, 2nd ed., Mc-Graw Hill, 2004.
3. William D. Stevenson, Jr., Elements of Power System Analysis, 4th ed., Mc-Graw Hill, 1998.
4. Grainger and Stevenson Jr, Power System Analysis, Mc-Graw Hill, 1994
5. DP Kothari, IJ Nagrath, Modern Power System Analysis, 3rd Ed, 2005
6. Arthur R. Bergen, Power System Analysis, 2nd ed., Prentice Hall, 2000

## BEKG 2452
## NUMERICAL METHODS

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Use various numerical methods to find roots for nonlinear equations and solve for linear systems. (PO1)
2. Determine polynomials using interpolation and curve fitting (PO1)

3. Apply numerical methods in differentiation, integration, ordinary differential equations and partial differential equations to solve the mathematical problems. (PO1)
4. Implement numerical methods in solving engineering problems. (PO1)

**Synopsis**

Topics covered: Errors; Solution of Nonlinear Equations; Solution of Linear Systems; Interpolation and Curve Fitting; Eigenvalues and Eigenvectors; Numerical Differentiation; Numerical Integration; Solution of Ordinary Differential Equations; Solution of Partial Differential Equation.

**References**


1. Burden R. And Faires J.D. (2011). Numerical Analysis, 9th edition, USA: Brooks/Cole, Cengage Learning.
2. Chapra S.C. and Canale R.P (2010). Numerical Methods for Engineers, 6th edition, New York: McGraw-Hill.
3. Khoo C.F., Sharifah Sakinah, S.A, Zuraini, O. and Lok Y. Y. (2009). Numerical Methods, 3rd edition, Petaling Jaya: Pearson Prentice Hall.
4. Chapra S.C. (2008). Applied Numerical Methods with Matlab for Engineers and Scientists, 2nd edition, New York: McGraw-Hill


## BEKM 2321
## MECHANICAL ENGINEERING LABORATORY

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Conduct investigation on the experiments which includes statics and mechanics of material, dynamics and mechanisms, and fluid mechanics correctly using mechanical resources.(PO4)
2. Analyze data gathered during experiments using software tools.(PO5)
3. Communicate effectively through technical report writing.(PO9)

**Synopsis**

This mechanical laboratory experiments will cover three courses, Statics and Mechanics of Material, Dynamics and Mechanisms and Fluid Mechanics. Axially loaded test, shear and torsion tests will cover the Statics and Mechanics of Material course. Laboratory experiments for Dynamics and Mechanisms consists of accelerated rotational movement, belt drives and gear efficiency and Fluid Mechanics will cover Bernoulli theorem and Reynolds number.

**References**


1. Beer, F.P., Vector Mechanics for Engineers, Dynamics SI Units, 8th Edition, McGraw-Hill, (2007).
2. Yuan, C.S., Fluid Mechanics I, Pearson Prentice Hall, Malaysia, (2006).
3. Equipments user manual.


## BEKM 2342
## INTRODUCTION TO MECHATRONICS SYSTEMS

**Learning Outcomes**

Upon completing this course, the student should be able to:

1. Explain basic concept of mechatronic systems. (PO1).
2. Explain the working principles of mechatronic systems. (PO1)
3. Analyze selection and integration of mechatronics components. (PO2)
4. Identify and analyse basic mechatronics system. (PO2)

**Synopsis**

This course introduce the concept of mechatronic system and its element and integration. Topics that are covered includes the following:

Introduction to sensors and transducers, performance terminology, static and dynamic characteristics. Example of relevant sensors, selection of sensors. Inputting data by switches. Introduction to signal conditioning, operational amplifier, protection, filtering, wheatstone bridge, digital signal, multiplexers, data acquisition, digital signal processing, pulse modulation.Displays, data presentation elements, magnetic recording, displays, data acquisition systems, testing and calibration.

Introduction to actuation systems, introduction to pneumatic and hydraulic systems, directional control valves, pressure control valves, cylinders, process control valves, rotary actuators.

Introduction to meachanical systems, types of motion, kinematic chain, cams, gear trains, ratchet and pawl, belt and chain drives, bearings, mechanical aspects of motor selection. Introduction to electrical systems, mechanical swtiches, solid-state switches, solenoids, D.C. motors, A.C. motors, stepper motors. Mathematical models, machanical system building blocks, electrical system building blocks, fluid system building blocks, thermal system building blocks. System model of engineering systems, rotational-

translational systems, electromechanical systems and hydraulic-mechanical systems. Brief description of mechatronics system related topics: system transfer function, frequency response, closed loop controller, digital logic, microprocessor, assembly language, C language, input/output systems or interfacing, programmable logic controllers, communication systems, fault finding.

**References**


1. Bolton, W., Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, 4th Edition., Prentice-Hall, (2008).
2. Medriam, J.L., Engineering Mechanics: Static, 5th Edition, John Wiley & Sons, (2003).
3. Saeed B. Niku, Introduction to Robotics, Prentice-Hall, (2001).
4. Devdas, S., Richard, A.K., Mechatronics System Designs, PWS, (1997).
5. Robert L. Norton, Machine Design An Integrated Approach 3rd Edition, Pearson Prentice Hall, (2006).


## BEKM 3453
## MICROCONTROLLER TECHNOLOGY

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Describe and explain a microcontroller's (PIC16F877A) architecture, peripherals subsystem and its operations and able to use programming software to modify internal registers, perform input/output tasks, compiling programming codes with simulation to determine the success of the program.(PO1)
2. Distinguish the available PIC Timers Modules and apply it for the interrupt capabilities. Able to explain and identify the interrupt sources use in Microcontroller. (PO1)
3. Differentiate the differences of Direct Current motor, Servo motor and Stepper motor for choosing the PIC's correct motor controlling method. (PO2)
4. Explain and apply the Analog to Digital Module application for PIC integration on analog sensors with LCD and keypad programming. Able to describe and apply the USART serial communication programming for RS232 and PIC's internal and external EEPROM programming.(PO2)
5. Develop and integrate a microcontroller based system application and analyze the problem related for troubleshooting for problem solving recommendation and prepare the technical report. (PO3,PO5,PO9)

**Synopsis**

Basic concept of microcontroller in terms of the architecture, usage and the differences between microcontroller and microprocessor. Exploring the available PIC Modules such as Timers, Analog to Digital Converter, Pulse Width Modulation, EEPROM, USART and interrupt capabilities for external or internal peripheral and hardware controlling. Students will practically implemented the knowledge to apply in the project oriented Problem Based Learning.

**References**


1. Peatman, J.B., Design with PIC microcontrollers, 8th ed., Prentice Hall, 1998.
2. Milan Verle., PIC Microcontroller – Programming in C, Mikroelektronika
3. Mazidi, A. M., McKinlay, R. D. and Causey, D., PIC Microcontroller and Embedded Systems: Using Assembly and C for PIC18, Pearson Education, 2008.
4. Tocci, R. J., Digital Systems: Principles and Applications 9th edition, Prentice Hall, 2004.
5. Datasheet PIC16F877 and PIC16F877A from www.microchip.com


## BEKM 3543
## ELECTROMECHANICAL SYSTEM

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Defined and desrible the types, construction, operation and application of electrical machines(PO1)
2. Indentified and explain the AC & DC drives of electrical machines (PO1)
3. Investigate and analyze the characteristic and performance of electrical machines (PO4)
4. Design electrical machines parameters for applications according to the desired needs within realistic constraints. (PO3)

**Synopsis**

This course will investigate the operation, construction, equivalent circuit and application of transformer and electrical machines which includes DC machines, Induction machines and Synchronous machines. The parameters,

characteristics, efficiency, control technique and performance of these electrical machines are analyzed. The AC and DC drives of electrical machines are also introduced.

**References**


1. Chapman, Stephen J. 'Electric Machinery Fundamentals', 5th Ed., McGraw Hill, 2011
2. Wildi T., 'Electrical Machines, Drives and Power systems', Prentice Hall, 2002.
3. P.C. Sen, 'Principles of Electrical Machines and Power Electronics', John Wiley, 1996.


**BEKM 3641**
**MECHATRONICS ENGINEERING LABORATORY I**

**Learning Outcomes**

Upon completion of this laboratory course, the student should be able to:

1. Design and analyze a controller for mechatronics system by using PLC. (P04)
2. Design and demonstrate the appropriate solution to actuate a mechatronic system by using pneumatic and hydraulic circuits. (PO5)
3. Analyze and evaluate the accuracy of the integrated PLC and electropneumatic system performance by using statistical method. (PO4, PO5)
4. Exhibit technical writing to solve complex problem. .(PO9)

**Synopsis**

In this lab session, students are exposed to the lab works of major fluid power technologies; pneumatics and hydraulics as well as the lab works in automation using Programmable Logic Controller (PLC). In fluid power technology, students will learn the operation of a single acting and double acting cylinder, the application of electro-pneumatic and electro-hydraulic control technology, the application of pressure relief valve and flow control valve as well as the logic "AND" and "OR" operation. In automation, the students will be enlightened to draw the ladder diagram, perform console programming and mnemonic code using PLC as well as designing and executing timer and counter application. Finally, students will carry out the pneumatic and hydraulic control programming using PLC.

**References**


1. Craig, J.J., Introduction to Robotics Mechanics and Control, 3rd Ed, Addison Wesley Longman, 2005.
2. Petruzella F. D., „Programmable Logic Controller", McGraw Hill, 2005.
3. Course Files of BEKC 4753 and BMCG 3643, FKE, UTeM.
4. Equipments user manual.


**BEKM 3653**
**INTEGRATED DESIGN PROJECT**

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Design mechatronic systems, components or processes that meet desired requirements by following engineering design process and with appropriate consideration for public health and safety, cultural, societal, environmental and sustainability factors. (PO3)
2. Evaluate the impact of the designed systems, components or processes, in terms of environmental and sustainability factors. (PO7)
3. Exhibit communication skills in the completion of a design project.(PO9)
4. Demonstrate effectively as a teamwork in completing design project. (PO10)

**Synopsis**

This course introduces a practical guideline for systematic design process of a mechatronic system. This includes component selection, interfacing, data acquisition, interfacing standards, data presentation, safety features and so on in designing a typical mechatronic product. Simulation and integration of elements in the mechatronic systems such as sensor, controller, actuator, mechanics and structures also are dealt. This course also touches on some specialized design element for the mechatronic based product and system modelling while inculcates student to communicate and function effectively in their group. As a result students will gain appreciation for the interdisciplinary cooperation and for the complex and essential roles played by various members of product development teams.

**References**

1. Dieter, G.E. & Schmidt, L.C.(2013). Engineering Design, 5th Edition, McGraw Hill.
2. Ulrich, K.T. & Eppinger, S.D. (2008). Product Design and Development, 4th Edition, McGraw Hill.
3. John P. Bentley, Principles of Measurement Systems, 4th Ed., Prentice Hall, 2005.
4. Cross, Nigel, (2010) Engineering Design Methods, Wiley.
5. W.Bolton, Mechatronics electronic control systems in mechanical and electrical engineering, 4th Ed., Prentice Hall, 2008.
6. Kutz, Myer, Mechanical Engineers Handbook - Manufacturing and Management, 3rd ed., John Wiley 2006.

## BEKM 4751
## MECHATRONICS ENGINEERING LABORATORY II

**Learning Outcomes**

Upon completion of this laboratory course, the student should be able to:

1. Identify and describe robot specification and workspace properly.(P04)
2. Design procedures to manipulate robot movement by using teach pendant/console and RoboTalkTM programming software. (P04)
3. Design procedure to develop a robotic gripper and test it using Rhino robot. (P04)
4. Analyze and evaluate the accuracy, repeatability and reliability of the robot performances by using statistical method. (P04)

**Synopsis**

In this course, students are exposed to the lab works related to the development and application of mechatronic/robotic system. Firstly, student will learn the robotic system.specification. After that, students will design procedures to develop a robotic gripper and program the robot to a specific task. In the design process, students will be exposed to the engineering tools such as Solid Work, teach pendant/console programming and RoboTalkTM software. Student design should take into account the appropriate sensor, controller and actuator for their design for safety purpose. At the end of the lab work, students will analyze and evaluate the accuracy, repeatibility and reliability of the robot performances by using statistical method.

**References**

1. Craig, J.J., Introduction to Robotics Mechanics and Control, 3rd Ed, Addison Wesley Longman, 2005.
2. Rhino Robotics Ltd., Mark III - 8 Axis Controller Owners Manual for Windows, Version 2.00.00, 2000.
3. Rhino Robotics Ltd., Owners Manual XR-3, XR-4 and SCARA, Version 2.00.01, 1995.
4. Rhino Robotics Ltd., RobotTalkTM for Windows User's Manual for Mark III Controller, Version 2.00.0.
5. Richard, G., Sandra, D., Understanding and Using Scientific Evidence: How to Critically Evaluate Data, 1st Edition, SAGE Publications, 2003

## BEKM 4763
## ROBOTICS

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Apply knowledge in physics and mathematics to the solution of complex kinematics (forward, inverse, jacobian, singularity) problem. (PO1)
2. Apply knowledge in physics and mathematics to the solution of complex dynamics problem. (PO1)
3. Apply knowledge in mathematics to the solution of complex trajectory generation motion. (PO1)
4. Apply knowledge in control engineering to the solution of robotics control problem.(PO1)

**Synopsis**

This course introduces robotic fundamentals including kinematics (forward, reverse, jacobian, singularity), dynamics and trajectory generation of robots. Fundamental mathematics, scientific and mechatronics engineering knowledge will be applied in this course to the solution of complex robotic problems. In developing the solution of the robotics problem, student will be exposed to influential factors that might affect the design of the solution including societal, economical, safety, cultural, as well as environmental factors. Throughout the semester, student will be exposed to MATLAB / SCILAB in simulating the robotics model.

**References**

1. Craig, J. J., Introduction to Robotics, Mechanics and Control, 3rd Ed., Addison Wesley Longman, 2014
2. Stadler, W., Analytical Robotics and Mechatronics, McGraw Hill, 1995.
3. Fuller, J. L., Robotics: Introduction, Programming and Projects, 2nd Ed., Prentice Hall, 1998.
4. Man Zhihong, Robotics, Prentice Hall, 2nd ed., 2005.

**BEKM 4783**
**MACHINE VISION**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Describe the application areas, restrictions, and structure of machine vision systems.(P01)
2. Identify the operation of digital images: capture them and extract basic visual information from images.(P03)
3. Analyze and apply the basics of machine learning and approaches to decision making.(P02)
4. Implement an algorithm using an image processing and image understanding tools.(PO9)
5. Exhibit soft skills such as communication skills, spirit of teamwork and life-long learning.(PO6, PO11)

**Synopsis**
This course is to introduce the theory, applications and techniques of machine vision to students, and to provide students with an understanding of the problems involved in the development of machine vision systems. The course begins with low level processing and works its way up to the beginnings of image interpretation. This approach is taken because image understanding originates from a common database of information. The learner will be required to apply their understating of the concepts involved through the process of building applications that manipulate bi-level and grey scale images through the use of suitable packages (e.g. Matlab or OpenCV).

**References**

1. Rafael C.Gonzalez, Richard E.Woods, Digital Image Processing, Prentice Hall, (2002).
2. Jain, R. J., R. Kasturi and B. G. Schunck., Machine Vision. New York: McGraw-Hill, Inc, (1995).
3. Davis, E. R., Machine Vision. 2nd Ed. San Diego, California: Academic Press, (1997).


**BEKM 4823**
**DATA COMMUNICATIONS & COMPUTER NETWORKING**

**Learning Outcomes**
Upon completion of this course,the student should be able to:
1. Explain and apply the schemes and methods used for tasks in data communication of computer network. (PO1)
2. Describe and analyze the coding schemes, transmission modes, transmission methods, communication modes, error detection methods, flow control, and error control in a network.(PO2)
3. Classify the OSI model, IEEE 802.x model, transmission media, network services, repeater, bridges, router and gateways.(PO3)
4. Describe and analyze the network operation and technology of LAN, wireless Lan, Wan and routing.(PO3)
5. Design a basic network configuration for local area network (LAN).(PO3)

**Synopsis**
Topics covered are: Introduction to Computer Network, Data Communications, Network Structure, Local Area Network, Wide Area Network, Interconnection, Internetworking. That include the network models / topology / type and technology and its application. Characteristics of analog signals, digital signals, coding schemess, transmission modes, transmission methods, communication modes, bandwidth and signal transmission, digital signal encoding, error detection method, error and flow control, datalink control, multiplexing, synchronous & asynchronous transmission. Standard organization and OSI model, LAN topology, wired & wireless LAN, circuit switching, packet switching and comparison. Interconnection issues and architecture. Repeater, bridge, router & gateway. Structure of network layer. Internet Protocol, TCP/IP ans ISO Internet Protocol.

**References**

1. Behrouz A. Forouzan, Data Communication and Networking, McGraw Hill, 4th Edition 2007.
2. W.Stalling, Data and Data Communications, Prentice Hall, 8th Edition, 2007.
3. S.Tanenbaum, Computer Networks, Prentice Hall, 4th Edition, 2003.
4. F.Halsall, Data Communications, Computer Networks and Open Systems, 4th Edition, Addison Wesley, 5th Edition, 1997.


**BEKP 2333**
**CIRCUITS ANALYSIS**

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Analyse electrical circuit using Ohm's Law and Kirchhoff's Laws
2. Apply Mesh and Nodal methods for dc and ac circuits' analysis.
3. Analyze dc and ac circuits using Superposition, Thevenin, Norton and Maximum Power Transfer Theorems.

**Synopsis**

This course introduces the students to Ohm's Laws, Kirchhoff's Laws and use them to calculate current, voltage and power in electrical circuitries. Students also learn the analytical methods namely mesh and nodal analysis, as well as apply Thevenin theorem, Norton theorem, Superposition and the Maximum Power Transfer in circuit analysis. The applications of the above tools will cover both dc and ac circuits.

**References**


1. Thomas L. Floyd, Principles of Electric Circuits, Pearson, 9th Ed. (2010)
2. Thomas L. Floyd and David M. Buchala, Electric Circuits Fundamentals, Pearson, 8th Ed. (2010)
3. Bolysted, R., Nashelsky, L., Electronic Devices and Circuit Theory, 11th Edition, Prentice Hall, 2010.


## BEKU 1231
## ELECTRICAL & ELECTRONICS ENGINEERING LABORATORY

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Measure the electrical characteristics of single-phase and three-phase ac circuit precisely (P03)
2. Construct the combination of logic circuit and ICs using suitable and appropriate components(PO5)
3. Construct RLC circuits using electrical components with appropriate tools(PO5)
4. Exhibit soft skills such as communication skills through technical writing. (PO9)

**Synopsis**

Students will perform experiments to support the theory such as to observe the capacitor charge and discharge process, build and analyze the second order circuit using PSPICE. The experiments also include the single phase and three phase circuits with resistive and inductive loads and measurement of voltage, current, power, power factor and single phase transformer. Lastly student will conduct experiments with logic circuit integration, ICs and flip-flops circuit.

**References**


1. K.A. Charles, N.O. Sadiku, Fundamentals of Electric Circuits, 3rd Ed. 2003, McGraw Hill.
2. Robbins and Miller, Circuit Analysis and Practice, 3rd Ed. 2004, Thomson and Delmar.
3. Nilsson and Riedel, Electric Circuits, 6th Ed. 2000, Addison- Wesley, Prentice Hall.
4. Hughes, Electrical Technology, 10th Ed. Prentice Hall.
5. Bird, J.O., Electrical Circuit Theory and Technology, Newnes, 1997.
6. File Subjek BEKP 1423 (Teknologi Elektrik).
7. File Subjek BEKU 2333 (Litar Elektrik 2).
8. File Subjek BEKU 1413 (Elektronik Digit & Sistem).
9. Thomas L. Floyd, Digital Fundamentals, Prentice Hall, 10th Ed., 2014..
10. Ronald J. Tocci, Digital Systems: Principles and Applications, Prentice Hall, 11th Ed., 2014.


## BEKU 3695
## INDUSTRIAL TRAINING

**Learning Outcomes**

Upon completion of this course, the students should be able to:

1. Able to communicate (oral, written and and response effectively by delivering ideas and contents clearly.(PO9)
2. Able to demonstrate technical knowledge (PO1)
3. Able to identify and analyses problem, proposes creative solutions and chooses appropriate strategies to solve the problem (PO2)
4. Able to work effectively in a group by understanding and performing the role as a team member (PO10)
5. Able to apply good professional and ethical practices performed in the company.(PO8)
6. Able to search, manage and synthesize information (PO11)

**Synopsis**

All bachelor degree students are required to undergo industrial training as part of their curiculum to complete their four (4) years course for the Bachelor of Electrical

Engineering (BEKP, BEKC, BEKE) and Bachelor of Mechatronic Engineering (BEKM). It is compulsory for all degree program students to undergo the Industrial Training Programme.In general, the aim of industrial training are to give exposure , experience and professional skills to various aspects of engineering discipline, in particular in electrical engineering related industries. The students are also expected to be familiarized with efficient, accountable and ethical conduct as they will be supervised directly under the company's personnel as well as supervisors from the Faculty. Apart from that, the assessment will be made by the appointed Faculty supervisors & the industry supervisors. A PO survey is also embedded inside the assessment form by the industry supervisors.There will also be a survey by the students prior to completion of their training.

**References**


1. Dasar Latihan Industri KPT, 2010
2. Dasar Latihan Industri UTeM, 2013
3. Dokumen Jawatankuasa Latihan Industri FKE


## BEKU 4792
## FINAL YEAR PROJECT I

**Learning Outcomes**

Upon completion of this course, student should be able to:

1. Conduct proper literature survey and identify the problems, objectives and scope of project clearly (PO2)
2. Select, plan and execute a proper methodology in problem solving (PO4)
3. Present the project proposal in written and in oral format effectively (PO9)
4. Work systematically and commit to professional ethics (PO11)

**Synopsis**

This course is the first part of the Final Year Project which requires two semesters to complete. For the first semester as of this course, student(s) and supervisor(s) are expected to have two way communications which later comes to an agreement of project topic leading to project supervision and project learning process collectively. At the end of the semester, students are required to deliver first year progress report which generally covers abstract, problem statement, objectives, scope of works, literature review, proposed methodology, early results and general conclusion. Sessions for oral presentation is also held to measure student's level of understanding and capability on carrying specified project.

**References**

Engineering, science and other scientific/technical resources i.e. books, journal, article, patent information

## BEKU 4861
## ENGINEERING SEMINAR

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Recognize the need for life-long learning in the careers of professionals in the field.
2. Recognize the range of career option available
3. Demonstrate the ability to discuss range of contemporary issues impacting engineering professionals
4. Discuss the role of professional societies in the career of professional in the field

**Synopsis**

The main purpose of this course is to instill the recognition of the need for and the ability to engage in life-long learning among students. Through presentation by invited speakers from the industry and academia, students will be exposed to topics such as professional engineering bodies and knowledge of in contemporary issues in related engineering fields. Presentation by successful alumni describing how their careers developed after obtaining their undergraduate degrees will also be included.

## BEKU 4894
## FINAL YEAR PROJECT II

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Identify, formulate, research literature and analyze problem (P02)
2. Conduct investigation using research based knowledge and methods (P04)
3. Apply ethical principles in project implementation (P08)
4. Present the results in written and in oral format effectively (P09)
5. Identify basic entrepreneurship skills in project management (PO12)
6. Apply reasoning informed by contextual knowledge (P06)

7. Engage in independent and lifelong learning (PO11)

**Synopsis**
This course is the second part of Final Year Project I, in second semester. Students will continue their project from FINAL YEAR PROJECT I during the second semester, and they should accomplish the projects completely either in hardware, software or both of them. Students needs to write-up a good final report (in thesis format), as a part of the course's assessment. .

**References**
Depend on each student project's references.

## SERVICE COURSES (FKEKK)

### BENG 1413
### DIGITAL ELECTRONICS

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Describe the basic concept of digital circuits that form complex electronic systems.(PO1)
2. Solve the calculation and conversion of number systems used by complex electronic systems.(PO2)
3. Design basic digital circuits based on combinational and sequential components.(PO3)
1. Work effectively as individual or in group to complete the given tasks.(PO10)

**Synopsis**
This course comprises of several topics such as number systems and codes, logic gates and Boolean algebra, combinational logic circuits, MSI logic circuits and flip flops, and integrated circuit logic families.

**References**

1. Thomas L. Floyd. Digital Fundamentals. 10th Edition, Prentice Hall, 2008.
2. Ronald J. Tocci, N. Widmer, G. Moss. Digital Systems, Principles and Applications. 11th Edition, Prentice Hall, 2010.
3. Roger l. Tokheim. Digital Electronics, Principles and Applications. McGraw-Hill, 2008.


### BENG 2142
### STATISTIC

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Identify clearly the concept of probability for a range of discrete and continuous random phenomena.
2. Apply the concept of sampling distribution, estimation and hypothesis testing to draw valid conclusion in solving engineering problems.
3. Analyze and interpret data by using simple linear and multiple linear regression techniques to forecast and produce statistical information.
4. Develop some experience in the implementation of statistics by using SPSS and Minitab.

**Synopsis**
Topics covered are: Data description and Numerical Measures, Probability, Random variables and Probability Distributions, Sampling Distributions, Estimation, Hypothesis Testing, Simple Linear Regression.

**References**

1. Sh. Sara, Hanissah, Fauziah, Nortazi, Farah Shahnaz, Introduction To Statistics & Probability A Study Guide, 2008.
2. Prem S.Mann, Introductory Statistics Using Technology, 5thEdition, John Wiley, 2007.
3. Douglas C. Montgomery, George C.Runger, Applied Statistics and Probability for Engineers,5th Edition, John Wiley, 2010.
4. Richard Johnson, John Freund, Irwin Miller,Miller And Freund's Probability and Statistics for Engineers, 8th Edition, Pearson – Prentice Hall, 2010.
5. Jay L. Devore, Probability and Statistics for Engineering and the Sciences, 7th Edition, Thomsons – Duxbury, 2008.


### BENG 4322
### ENGINEER AND SOCIETY

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Relate the effect and impact of technology on society, culture and environment.
2. Demonstrate as a responsible professional, abiding to the code of professional ethics.

3. Demonstrate effectively the assignment given in a group or individual.
4. Response critically and handle social, cultural and globalissues as well as environment, occupational health & safety issues.

**Synopsis**
Role of engineer in Nation Building, evaluation of engineering, National development Role of engineers in society, laws related to public safety, health & welfare, future engineers, professionalism and codes of ethics, definition of professionalism, understanding engineering as a profession, ethical theories, IEM and BEM code of ethics. Ethical problem solving techniques analysis of issues in ethical problems, line drawing, flow charting, learn to handle conflicting problems, application in bribery and accepting gifts situation. Ethics practice in Occupational Safety and Health at work. Rights and responsibilities of engineers. Quality from engineering perspective. Carrier guidance and project management.

**References**

1. Charles B. Fleddermann, Engineering Ethics, 3rd Ed, Prentice Hall, 2008.
2. Mike W Martin, Roland Schinzinger, Ethics in Engineering, 4th Ed, McGraw-Hill, 2005.
3. John Canning, Workplace Safety for Occupational Health and Safety (Safety at Work Series V4), 2007.
4. Safe Work in 21st Centuries (Educational and Training for the Next Decade Occupational Health and Safety Personnel) National Academy Press, 2006.
5. Arazi Idrus, Shaharin A. Sulaiman, Mohd Faris Khamidi, Engineers in Society, Mc Graw Hill Education 2010.


## SERVICE COURSES (FTMK)

### BITG 1233
### COMPUTER PROGRAMMING

**Learning Outcomes**
In the end of the course, student will be able to:
1. Describe the fundamental principles of problem solving, programming techniques and structures in program development.(PO1)
2. Give solution to given problem based on the principles of problem solving and programming techniques.(PO3)
3. Construct computer program codes by applying suitable programming structures and techniques. (PO5)

**Synopsis**
This course covers the introductory topics in programming using C++ language. It includes the introduction to computers and programming, the fundamentals of programming, problem solving and software development. Data types and operators, selection, repetition, function, array, file, structured data and pointer are among the topics covered in the course.

**References**

1. Gaddis, T., (2011), “Starting Out with C++ Brief Version: From Control Structures Through Objects 7th. Edition”, Pearson Education.
2. Abdullah, N. et. al, (2014), "Lab Module Computer Programming BITG 1113", FTMK, UTeM.
3. Friedman, Koffman (2011), “Problem Solving, Abstraction and Design using C++”, 6th Edition, Pearson Education.
4. Etter, D.M., Ingber, J.A., (2012), "Engineering Problem Solving with C++", 3rd Edition, Pearson Education.
5. Hanly, J.R, (2002), “Essential C++ for Engineers and Scientists”, 2nd Addison Wesley.


## SERVICE COURSES (FKM)

### BMCG 1013
### DIFFERENTIAL EQUATIONS

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Solve second order linear differential equations with constant coefficients by using method of Undetermined Coefficient and method of Variation of Parameters. (PO1)
2. Solve linear differential equations with constant coefficients by the Laplace Transform method.(PO1)
3. Find the Fourier series of a periodic function. (PO1)
4. Solve partial differential equations using the separation of variable method.(PO1)
5. Develop some experience in the implementation of differential equations using appropriate method in solving engineering problems. (PO1)

**Synopsis**

Introduction of ordinary and partial differential equations, second order linear differential equation with constant coefficients, Laplace Transform, Fourier series and Partial Differential Equations. The syllabuses are developed based on these three different stages which is exposing the learner's on the fundamental concept of differential equation, various techniques to solve different type of differential equation and lastly, apply the knowledge in electronic and computer engineering problem.

**References**


1. Werner Kohler & Lee Johnson, Elementary Differential Equations with Boundary Value Problems. Pearson Education Inc., 2009.
2. Dennis G. Zill & Micheal R. Cullen. Differential Equations with Boundary-Value Problems. Sixth Edition. Thomson Learning, Inc., 2008.
3. R. Kent Nagle, Edward B. Staff& Arthur David Snider. Fundamentals of Differential Equations and Boundary Value Problems. Fifth Edition. Pearson Education Inc., 2008.


## BMCG 1123
## STATICS & MECHANICS OF MATERIAL

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. State the basic concept of force and material mechanics.(PO1)
2. Analyze the force on a mechanical system. (PO1)
3. Understand and elaborate the forces on a mechanical system. (PO1)

**Synopsis**

Statics

Introduction to basic concepts in statics and mechanics as a study of physical sciences, system of units, scalars and vectors, free body diagram, forces system resultants and moments, equilibrium of a particle, equilibrium of a rigid body, structural analysis, center of gravity and centroid.

Material Mechanics

Introduction to various type of structures, type of supports, concepts and definition of stress, strains, torsion, shear force and bending moment, theory on axial loading, torsion, pure bending and beam deflection, and combination of loads.

**References**


1. Hibbeler R. C., 2004, Static and Mechanics of Materials, SI Edition, Pearson Prentice Hall, New York.
2. Morrow H.W. and Kokernak R.P., 2007, Statics and Strength of Materials, Pearson Prentice Hall, New York.
3. Limbrunner G. F. and Spiegel L., 2009, Applied Statics and Strength of materials, Pearson Prentice Hall, New York.
4. Riley W. F., Sturges L.D. and Morris D. H., 2002, Static and Mechanics of Materials: An integrated Approach, 2nd Edition, John Wiley & Sons, New York


## BMCG 1253
## DYNAMICS & MECHANISM

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Describe and apply the concept of position; velocity and acceleration in determine the motion of particle and rigid body.(PO1)
2. Describe the Newton's 2nd Law of Motion and the type of motion in rigid bodies.(PO1)
3. Apply Equation of Motion in solving the particle and rigid body problems.(PO1)
4. Analyze the motion of the rigid body using absolute and relative velocity and acceleration in plane motion.(PO1)
5. Identify and solve problems related to types of transmission system.(PO1)
6. Solve related problems in balancing system of rotating body using Newton's Second Law Method and Newton's Third Law Method.(PO1)
7. Identify and analyze the effect of gyroscope couple to the real world applications.(PO1)
8. Formulate and calculate natural frequency in free vibration system using one of these methods ( Energy Conservation Method, Equivalent Method and Newton's Law Method).(PO1)

**Synopsis**

This course consist of two parts, Dynamics and Mechanics of Machines. A Dynamics topic introduces the basis principle of mechanics of particles and rigid bodies, kinetics for systems of particles, kinematics of rigid bodies. For Mechanics of Machine, the course will cover of Friction-based power transmission system, balancing system including gyroscope and vibration. It will introduce to students the principles and simple applications.

**References**

1. Beer, F. P., Vector Mechanics for Engineers, Dynamics SI Units, 10th Edition, McGraw-Hill, (2012)
2. Hibbeler, R. C., Engineering Mechanics, Dynamics, 13th Edition, Prentice Hall. (2012)
3. Fadilah, et. all, Dynamics and Mechanism: Part 1, Penerbit UTeM, 2013
4. Roslan Abdul Rahman, Che Abas Che Ismail dan Mohd Yunus Abdullah, Mekanik Mesin, Penerbit UTM, Johor.(2013).
5. Fadilah, et. all, Dynamics and Mechanism: Part 2, Penerbit UTeM, 2013.

**BMCG 1523**
**ENGINEERING GRAPHICS AND CAD**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Acquire and apply fundamental knowledge of mechanical engineering drawing format and types.(PO1)
2. Produce mechanical engineering drawings by using standard manual drafting tools and Computer Aided Design (CAD) software based on given problem. (PO1, PO5, PO9)
3. Communicate effectively through the applications of mechanical engineering drawing.(PO5, PO9)
4. Recognize the need to undertake lifelong learning in mechanical engineering drawing applications.

**Synopsis**
The course concentrates on manual drafting and Computer Aided Drafting (CAD) software. For manual drafting, students will be exposed to the basic drafting tools, techniques and the application in producing various types of engineering drawing. For computer aided design, CAD engineering drawing software is exercised to produce engineering drawing. The students will be exposed to CAD interface, editing commands, coordinate system, template preparation and layer in order to produce various types of engineering drawing.

**References**
1. Er. R. K. Dhawan, 2010, Engineering Graphics (In First Angle Projection), 1st Ed., S. Chand Technical, India.
2. Mohd Rizal Alkahari et. al., 2009, Modul Lukisan Berbantu Komputer, Penerbit Universiti Teknikal Malaysia Melaka, Melaka.
3. Giesecke, F.E., Mitchell, A., Spencer, H.C., Hill, I.L., Dygdon, J.T., and Novak, J.E., 2008, Technical Drawing, 13th Ed., Prentice Hall, New York.
4. Jensen C. H., 2002, Interpreting Engineering Drawings: 6th Edition, Delmar Thomson Learning, New York.
5. Mohd Ramzan Zainal, Badri Abd Ghani and Yahya Samian, 2000, Lukisan Kejuruteraan Asas, Penerbit Universiti Teknologi Malaysia, Skudai.

**BMCG 2372**
**FLUID MECHANICS**

**Learning Outcomes**
Upon completion of this course, the student should be able to:
1. Define fluid and the general trends of its properties.(PO1)
2. Apply fluid mechanics equations in solving fluid statics and dynamics problems. (PO1, PO2)
3. Analyze stability of an object submersed in a fluid. (PO1, PO2)
4. Analyze the behaviour of the fluids in a control volume. (PO1, PO2)
5. Develop meaningful and systematic way to perform an experiment by means of dimensional analysis. (PO1, PO2)

**Synopsis**
This course introduces students the basic physical properties of fluid and the definition of pressure and head. Then, the derivation of hydrostatic equation and its application in pressure measurement, static forces analysis on immersed surface and buoyancy analysis are presented. For fluid dynamics, the introduction to fluid dynamics and fluid flow analysis followed by the derivation of flow equations, the application of energy equation and Bernoulli equation in the calculation of flow velocity, discharge, and head lost in piping systems are discussed. In the final chapter, the knowledge of dimensional analysis and its application are instilled.

**References**
1. Yuan, C.S., *Fluid Mechanics I*, Pearson Prentice Hall, Malaysia, (2006).
2. Cengel, Y.A. and Cimbala, J.M., *Fluid Mechanics: Fundamentals and Applications*, International Edition, McGraw-Hill, Singapore, (2006).
3. Munson, B. R., Young D. F. and Okiishi, T. H., *Fundamentals of Fluid Mechanics*, 5th Edition, John Wiley & Sons, Inc, Asia, (2006).

4. Som, S. K. and Biswas, G., *Introduction to Fluid Mechanics and Fluid Machines*, 2nd Edition, Tata McGraw-Hill, New Delhi, (2004).
5. Douglas, J. F., Gasiorek J. M. and Swaffield, J. A., *Fluid Mechanics*, 4th Edition, Prentice Hall, Spain, (2001).
6. Streeter, V. L. and Wylie, E. B., *Fluid Mechanics*, First SI Metric Ed., McGraw-Hill, Singapore, (1983).

## BMCG 3643
## HYDRAULIC & PNEUMATIC SYSTEMS

**Learning Outcome**

1. Describe fundamental principles that govern the behavior of fluid power systems. (PO1)
2. Explain the common hydraulic and pneumatic components, their use, symbols and their applications in industry.(PO1)
3. Analyze mathematical models of hydraulic and pneumatic circuits in order to study performance of the system.(PO3)
4. Design the hydraulic and pneumatic circuit manually or using related computer software. (PO3)

**Synopsis**

This course covers the introduction of the hydraulic and pneumatic systems, types of pump, compressor and their working principles, types of valve, actuator and their usage, performance of the fluid power system, others fluid power system ancillaries and sensors, fluid power circuit design and analysis with manual control and electrical control, fluid power symbols, the usage of computer software to design and simulate the fluid power circuit, the usage of programmable logic controller in fluid power circuit design and the application of fluid power in robotic and mobile hydraulic.

**References**

1. Ilango S. 2007. Introduction to Hydraulics and Pneumatics. Prentice Hall-India. New Delhi.
2. Esposito A. 2003. *Fluid Power with Applications* .6th Ed. Prentice Hall. New Jersey.
3. Johnson, J.L. 2002. *Introduction to Fluid Power.* Delmar. New York.
4. Majumdar SR. 2002. *Oil Hydarulic System Principles and Maintenance.* Tata-McGraw Hill. New York.
5. Hehn A.H. 2000. *Fluid Power Handbook.*Vol 1. Gulf Publishing Company. Texas.

## BMCG 3653
## THERMODYNAMICS & HEAT TRANSFER

**Learning Outcomes**

After completion of the course, the students should be able to:

1. Define basic terms of thermodynamics and identify systems, properties and processes.(P01)
2. Use property tables and draw property diagrams of pure substances to define the state of the system. (P01)
3. Apply the concept of First Law of Thermodynamics in Closed Systems and Control Volumes. (P01)
4. Analyze the concept of Second Law of Thermodynamics to determine the performance of heat engine, refrigerators and heat pumps. (P02)
5. Describe different modes of heat transfer: conduction, convection and radiation, and calculate the thermal conductivity, heat transfer coefficients, heat transfer through plates, cylinders and spheres. (P01)
6. Apply the concept of heat transfer for cooling of electronics and hydraulic systems(P02)

**Synopsis**

Basic concepts and definitions of engineering thermodynamics. The properties of pure substances (relationship of P-v, T-v, P-T and T-s diagrams) and ideal gas. The first Law of Thermodynamics. Energy, work and heat. The Second Law of Thermodynamics. Enthalpy and entropy. Different modes of Heat Transfer, definition of Conduction, Convection and Radiation, thermal conductivity, Fourier's Law of Conduction, heat transfer coefficients. Newtons's law of cooling, Steffan-Boltzman constant, emissivity of Black Bodies, heat transfer through plates, cylinders and spheres.

**Reference**

1. Cengel, Y.A, 1997, Introduction to Thermodynamics & Heat Transfer, International Edition, McGraw Hill.
2. Cengel, Y.A. and Turner, R.H. (2001). *Fundamentals of thermal-fluid science.* McGraw- Hill International Edition.
3. Munson, B.R., Young, D.F. and Okiishi, T.H. (2002). *Fundamentals of Fluid Mechanics.* John Wiley and Sons, Inc.

## SERVICE COURSES (FKP)

### BMFG 1113
### ENGINEERING MATHEMATICS

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Identify the multivariable functions together with its domain and range (PO1)
2. Solve double and triple integrals of functions using various techniques (PO1).
3. Apply the techniques of integration to calculate the properties of solid such as volume, mass and moment of inertia (PO1).
4. Analyze the properties of vector and curve space.
5. Solving some application problems in science and engineering using appropriate mathematical technique (PO1).

**Synopsis**

This course consists of three chapters: Functions of Several Variables, Multiple Integrals and Vector-valued Functions. The syllabus is developed by introducing the concepts of the functions with severable variables, integration and also vector-valued function, followed by learning various techniques in solving the problems and its application in physical and engineering fields.

**References**


1. Anton H, & Bivens I, Davis S, Calculus Multivariable, 8th edition, John Wiley, 2010.
2. Edwin Kreyszig, Advanced Engineering Mathematics, 9th edition, John Wiley, 2009.
3. Donald Trim, Calculus for Engineers, 4th edition, Prentice Hall, 2008.
4. Stroud K. A, Engineering Mathematics, 5th Edition, Palgrave Macmillan 2007.
5. Glyn James, Modern Engineering Mathematics, 4th edition, Prentice Hall, 2007.


### BMFG 1213
### ENGINEERING MATERIALS

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Explain the basic concepts of engineering materials in terms of interatomic bonding and crystal structure.(PO1)
2. Analyze the properties of engineering materials based on its structure.(PO1, PO2)
3. Apply the basic understanding of engineering materials properties to determine their processing method. (PO1, PO2)

**Synopsis**

This course introduces basic concepts of engineering materials that covers introduction to engineering materials, interatomic bonding, crystalline structure and imperfections and diffusion in solid. Explanation on different types of engineering material (i.e. metal, ceramic, polymer, composites and semiconductor), its mechanical properties, basic applications and processing are also included. Introduction to the binary phase diagrams (composition and microstructure correlation) is also given.

**References**


1. Askeland D. R., 2010, The Science and Engineering of Materials, 6th Edition, CL-Engineering.
2. Budinski K. G. and Budinski M.G., 2009, Engineering Materials: Properties and Selection, 9th Edition, Prentice Hall.
3. Smith W. F., 2009, Foundation of Materials Science and Engineering, 5th Edition, McGraw Hill.
4. Shackleford J. F., 2008, Introduction to Materials Science for Engineers, 7th Edition, Prentice Hall.
5. Callister W.D., 2008, Fundamentals of Materials Science and Engineering, 3rd Edition, John Wiley & Sons.


## SERVICE COURSES (FPTT)

### BTMG 4102
### PROJECT MANAGEMENT

**Learning Outcomes**

In the end of the course, student will be able to:

1. Develop a comprehensive & viable Project Proposal and deliver a presentation of the proposal, based on core engineering perspectives, thereby meeting the required industry needs.(P10)
2. Explain the core concepts and principles, functions, and process in project management including the importance of project management in the implementation and execution of high-technology programs/projects.(P10, P11)
3. Determine important skills required and the necessary implementation methodology/ formulation in project management.(P11)

**Synopsis**
The purpose of this course is to provide students with the contemporary skills that enable them to deploy it effectively into project management. This course covers the principles, concepts, strategies, methods and techniques of project management. At the end of the course, students should be able to understand the principles, and to obtain the knowledge in managing a project.

**References**

1. Pinto, K. Jeffrey. (2012). Project Management, Achieving Competitive Advantage. Pennsylvania State University, Prentice Hall.
2. Gray, C.F and Larson, E.W, (2010). Project Management; A Managerial Perspective. McGrawHill.
3. Meredith, J., Mantel, S. and Mantel, S. Jr. (2005). Project Management: A Managerial Approach. New York, John Wiley & Sons Inc.
4. Russell, D. A (2003). Managing High Technology Programms and Projects, John Wiley & Sons Inc.


**BTMW 4012**
**TECHNOPRENEURSHIP**

**Learning Outcomes**
In the end of the course, student will be able to:

1. Recognize the importance of entrepreneurship, the role of entrepreneurship in today's society, and the technical knowledge of the entrepreneurial process.(PO11)
2. Explain the basic concepts of interdisciplinary competences in management, and create technology-based businesses. (PO12)
3. Present a business plan project and develop an entrepreneurial profile.(PO9, PO11)

**Synopsis**
The course provides students with technological knowledge about entrepreneurship as well as the skills to turn such knowledge into practice. The teaching and learning (T&L) activities include case study and field work with the aim to inculcate entrepreneurship values and entrepreneurship acculturation with a view to successfully launch and subsequently manage their enterprises. Students will be exposed with the support systems available or government agencies in starting new ventures, including the tactics commonly employed by entrepreneurs starting a business. The course allows students to critically evaluate business in terms of technical feasibility, investment potential, and risks.

**References**

1. Barringer, B.R, and Ireland, R.D. (2012). Entrepreneurship 4th Edition. Pearson.
2. Scarborough, N.M. (2011). Essentials of Entrepreneurship and Small Business Management 6th.Edition. Pearson.
3. UiTM Entrepreneurship Study Group. Revised Edition (2010). Fundamentals of Entrepreneurship. Pearson


**SERVICE COURSES**
**(PBPI & CO-CURRICULUM UNIT)**
**BLHC 4032**
**CRITICAL AND CREATIVE THINKING**

**Learning Outcomes**
In the end of the course, student will be able to:
1. Identify the basic principles of critical and creative thinking skills to solve everyday problems (PO6)
2. Provide feedback on issues related to the development of critical and creative thinking skills (PO6)
3. Solve problems of case studies on current issues related to their field of study (PO7)
4. Analyze future market requirements and propose a solution based products.(PO7)

**Synopsis**
This course is designed to expose students to the principles foundation in critical and creative thinking. Students will apply the methods of critical thinking and creative problem-solving through a student-centered approach including approaches of problems based learning (PBL). Students will be guided in the final project where the analysis of future market requirements will be implemented and proposed solutions are based on the product market requirements from multiple perspectives and thinking outside the box.

**References**

1. Aziz Yahya, Aida Nasirah Abdullah, Hazmilah Hasan, Raja Roslan Raja Abd Rahman. (2011) Critical and Creative Thinking Module 2. Melaka. Penerbit UTeM.
2. Buzan, T. (2009). Mind maps for business : revolutionise your business thinking and practice, New York : Pearson BBC Active.
3. Claxton, G., Lucas, B. (2007). The Creative Thinking Plan, London: BBC Books.

4. Fisher, A. (2011) Critical Thinking: An Introduction. London: Cambridge UniversityPress.

**BLHL 1XXX**
**THIRD LANGUAGE**
**BLHL 1012**
**MALAY COMMUNICATION I**

**Learning Outcome**
Upon completion of this course, the student should be able to:
1. Memberikan respon terhadap perbualan biasa dan situasi-situasi lain.
2. Mengaitkan bunyi-bunyi atau ucapan dalam Bahasa Melayu dari segi nahu, fonologi dan kemahiran lisan tentang diri sendiri, keluarga, rakan-rakan and aktiviti harian.
3. Membincangkan secara mudah tentang sesuatu topik semasa.
4. Membina ayat dan bertutur dalam bahasa Melayu dengan gramatis.

**Synopsis**
Kursus ini memperkenalkan susuk tatabahasa bahasa Melayu. Pelajar didedahkan dengan aspek-aspek nahu, klausa, terminologi, binaan ayat, penjodoh bilangan dan unsur sastera. Diharapkan pelajar dapat menguasai pertuturan atau berkomunikasi dengan baik dan mudah berdasarkan kemampuan pelajar asing.

**References**
1. Amy Buttner. (2013). *Aktivitas, permainan dan strategi penilaian untuk kelas bahasa asing.* PT Indeks, Jakarta, Indonesia.
2. Yong ChynChye, Rohaidah Mashudi dan Maarof Abd Rahman. (2012). *Bahasa Kebangsaan untuk pelajar luar negara (Malay Language for International Students).* Kuala Lumpur: Pearson Malaysia Sdn Bhd.
3. Zarina Othman, Roosfa Hashim dan Rusdi Abdullah (Peny.). (2012). *Modul Komunikasi Melayu Antarabangsa.* Bangi, Selangor: Penerbit Universiti Kebangsaan Malaysia.

**BLHL 1112**
**ARABIC I**

**Learning Outcomes**
In the end of the course, student will be able to:
1. Use the basic Arabic grammar correctly and apply the information from the text (PO7)
2. Construct sentences and apply selected vocabulary in a report.(P09)
3. Demonstrate communication skills. (P07)

**Synopsis**
Basic Arabic is a course which adopts the communicative approach and introduces the phonology, grammar, vocabulary and writing system. Students will be exposed to basic reading materials in the language and discuss topics in groups besides the exercises and practical conversations. Interaction among studentsis based oninformation fromoraltextsandface-to-face or group activities.

**References**:
1. Hasan, A. T. (2009). Mausuah An-Nahwu Wassorp Wali'raf. Shah Alam: UPENA, UiTM.
2. Yaakob, A. B. (2010). Mausuah An-Nahwu Wassorp Wali'raf. Beirut, Lubnan : Darul Ilmi Lilmalayin.
3. Abdul Masih, G. M. (2009). Mu'jam Kawaid Al-Lugatul Arobiah Fi Jadawal Walauhat. Lubnan: Maktabah Lubnan.
4. Yaakob, M., Mohd Salleh, A. H. & Mahpol, S. (2009). Al-ibtikar, (Bil. 1). Sepang, Selangor: Penerbitan Salafi.
5. Abdul Rahim (2010). Pembelajaran bahasa Arab bagi golongan yang bukan Arab, (Bil. 1). Saudi Arabia: Kuliah Bahasa Arab UIM.

**BLHL 1212**
**MANDARIN I**

**Learning Outcomes**
In the end of the course, student will be able to:
1. Demonstrate the ability to converse in Mandarin with correct and accurate pronunciation and intonation.(P07)
2. Use the rules of Chinese writing and the theory of word and sentence formation. (P09)
3. Interpret the information in the simple text.(P07)

**Synopsis**
This course is designed for students who do not have prior knowledge in Mandarin. It provides students with the foundation of knowledge to enable them to understand and respond in the oral and written forms. This course encompasses the listening, speaking, reading and writing components. This course aims to help students to obtain enough exposure of the Mandarin phonetics (Han Yu Pin

Yin). The basic grammar introduced is related to the language used daily by the Chinese. Particular care is also taken to ensure the development of verbal communication and written skills in mandarin.

**References**:


1. Ang Lay Hoon, Ooi Bee Lee (2012). Basic Chinese For Everyone. Selangor: Pelanduk Publications.
2. James Wu, Bai Lu (2011). Chinese Grammar Step by Step. Singapore: Cengage Learning Asia Pte Ltd.
3. Soh Wei Nee, Chia Teh Heng, Liau lay San, Mok Soon Sim (2009). Conversational Mandarin Chinese for non-native speakers. Selangor: Xueer publisher.
4. Alison, Laurence Mattews (2006). The First 100 Chinese Characters. Hong Kong: Tuttle Publishing.
5. Hong You He (2000). A guide to han yu pin yin. Singapore: Greenleaf Publications.


## BLHL 1312
## JAPANESE I

**Learning Outcomes**

In the end of the course, student will be able to:

1. Use grammar and classify the features of Japanese phonology correctly.(P07)
2. Demonstrate correct pronunciation.(P07)
3. Construct sentences and demonstrate writing skills.(P09)

**Synopsis**

This course is designed for students who do not have any background in Japanese. It provides students with the knowledge to enable them to understand and communicate in the oral and written forms. This course encompasses the listening, speaking, reading and writing components. The grammar introduced is related to the language used daily by the Japanese. In addition, two types of Japanese language writing systems; Hiragana and Katakana are also introduced. Students are also exposed to elementary reading materials.

**References**:


1. Minna no Nihongo shokyu 1, (Beginners 1) Sentence Pattern Workbook 3A Network, 2012.
2. Minna no Nihongo shokyu 1, (Beginerners 1) Translation & Grammatical Notes, 3A Network 2012.
3. The Association For Overseas Technical Scholarship (AOTS),2009 , Shin Nihongo no Kiso 1-English Translation, Asian Edition.
4. Shin Nihongo No Kiso 1 English Translation Asian Edition,2009 Association for Japanese-Language Teaching.


## BLHW 1702
## TAMADUN ISLAM DAN TAMADUN ASIA (TITAS)

**Learning Outcomes**

In the end of the course, student will be able to:

1. Menjelaskan konsep asas ketamadunan (P06)
2. Menghubungkait sejarah dengan kemajuan tamadun bangsa di dunia (P011)
3. Menganalisis isu dan cabaran peradaban dunia (P011)

**Synopsis**

Mata pelajaran ini membincangkan tentang konsep ilmu, konsep falsafah, sains dan teknologi yang berunsurkan kreativiti dan inovasi menurut sarjana Islam dan barat. Selain itu, mata pelajaran ini juga menekankan tentang metodologi dalam sains Islam, konsep dan pencapaian tamadun Islam dalam bidang matematik, astronomi, fizik, kimia, perubatan, konsep penciptaan alam dan kosmologi dalam Islam, pencapaian dalam bidang telekomunikasi terkini dan isu-isu sains semasa. Pendekatan sarjana Islam silam menjadi contoh kepada generasi masa kini menjadi manusia yang kreatif dan mempunyai pemikiran kritis dalam pelbagai bidang seperti penciptaan dan kejuruteraan.

**References**:


1. Abdul Rahman Abdullah. (2010). *Wacana falsafah sains sejarah dan pemikiran.* Pulau Pinang*:* Pusat Kajian Pengurusan Pembangunan Islam Universiti Sains Malaysia.
2. Abdul Rahman Haji Abdullah. (2010*). Wacana falsafah sains: Sejarah dan pemikiran*. Pulau Pinang: Pusat Kajian Pengurusan Pembangunan Islam (ISDEV), Universiti Sains Malaysia.
3. Azizan Baharuddin & Maisarah Hasbullah. (2010).*Pendidikan sejarah dan falsafah sains di Institusi Pengajian Tinggi Awam*. Kuala Lumpur: Dewan Bahasa dan Pustaka.
4. Azizan Baharuddin. (2009). *Pemantapan pengajian sejarah, falsafah dan dasar sains*. Kuala Lumpur: Dewan Bahasa dan Pustaka.

## BLHW 1742
## MALAYSIAN STUDIES

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Explain the political and economic structure of Malaysia.(PO11)
2. Respond to the uniqueness of the Malaysian's historical and cultural heritage.(PO7)
3. Compare the Malaysian experience and achievement with their home countriesin various aspects.(PO9)

**Synopsis**

By going through this course, students will be exposed to a wealth of information on Malaysia. They will gain information on Malaysian's historical background, political system and socio-economic structure. Additionally, this course highlights the Malaysian government's development plans and major policies in economic, industrial and socio-cultural aspects. It also gives emphasis on the attitude and commitment of the Malaysian government towards the regional and international issues as reflected in its foreign policy.

**References**


1. Abdul Rahman Embong. (2010). *Malaysian studies:Llooking back moving forward: Selected speeches, public statements and other writings*. Kuala Lumpur: Persatuan Sains Sosial Malaysia
2. Abdul Razak Baginda. (2009). *Malaysia at 50 and Beyond*. Kuala Lumpur: Malaysian Strategic Research Centre.
3. Ambri Buang. (2009). *Dasar-dasar utama kerajaan Malaysia*. Kuala Lumpur: Institusi Tadbiran Awam Malaysia.


## BLHW 2712
## ETHNIC RELATIONS

**Learning Outcomes**

In the end of the course, student will be able to:

1. Menganalisis peranan hubungan etnik dan kepentingannya dalam proses pembangunan Malaysia.(P06)
2. Menghubungkait respons tentang isu dan cabaran etnik budaya di Malaysia.(P011)
3. Merumus isu-isu perpaduan dan cadangan untuk memperkasakannya di Malaysia.(P011)

**Synopsis**

Mata pelajaran ini membincangkan konsep-konsep asas budaya, peranan etnik dan pengaruhnya terhadap sosiopolitik dan sosioekonomi negara khususnya dalam merealisasikan agenda perpaduan. Mata pelajaran ini juga memberi pendedahan tentang isu-isu dan cabaran dalam konteks perpaduan di Malaysia. Selain itu, mata pelajaran ini turut mengupas perkembangan globalisasi dan kesannya ke atas jati diri dan proses pembangunan di peringkat Malaysia. Selain itu mata pelajaran ini akan merumuskan isu-isu perpaduan dan cadangan penambahbaikannya di Malaysia.

**References**


1. Abd. Manaf Ahmad. (2009). *Kontrak Sosial*. Kuala Lumpur: Utusan Publication & Distribution.
2. Shamsul Amri Baharuddin. (2012). *Modul Hubungan Etnik*. Selangor: Institut Kajian Etnik Universiti Kebangsaan Malaysia.
3. Wan Hashim. (2011). *Hubungan etnik di Malaysia*. Kuala Lumpur : Institut Terjemahan Negara Malaysia.
4. Wan Norhasniah Haji Wan Husin. (2012) *Peradaban dan perkauman di Malaysia: Hubungan etnik Melayu-Cina*. Kuala Lumpur : Penerbit Universiti Malaya.


## BLHW 2752
## MALAYSIAN CULTURE

**Learning Outcomes**

Upon completion of this course, the student should be able to:

1. Discuss issues related to Malaysian culture. (PO11)
2. Present issues related to Malaysian culture. (PO7)
3. Reflect the scenario of cultural diversity in Malaysia. (PO11)
4. Describe an element inMalaysian culture(PO6)

**Synopsis**

This course exposes international students to the socio-cultural background of Malaysia which includes ethnic composition, religions, traditions and values. Other elements like music, arts, cuisine, costume, ethnic games, celebrations and national festivals are also highlighted. Student Centered Learning (SCL) methods such as group discussion and presentation will be used in order to assist international students in developing their understanding and appreciation of Malaysian culture.

**References**
1. Heidi Munan. (2010). *Cultural Shock. A Guide to Customs and Etiquette*. Kuala Lumpur: The New Straits Times Press.
2. Heidi Munan. (2010). *Malaysian Culture Group*. Kuala Lumpur: Book Group.
3. Guan Yeoh Seng. (2011). *Media, Culture and Society in Malaysia*. Kuala Lumpur: Routledge.

**BLHW 3403**
**ENGLISH FOR PROFESSIONAL COMMUNICATION**

**Learning Outcomes**
In the end of the course, student will be able to:
1. Demonstrate job seeking skills.(PO11)
2. Produce a recommendation report. (PO9)
3. Demonstrate effective communication skills. (PO9)

**Synopsis**
This course is designed to develop students' written and oral communication skills, as well as to enhance their level of English literacy which will be beneficial to their professional careers. Students are taught to write application letter and resume that meet the requirements of the workplace. They are also taught to produce a recommendation report. Students also acquire effective presentation skills as well as gain experience in mock interviews and meetings prior to seeking employment. Grammar is taught implicitly. The Student-Centred Learning approach is employed in the teaching and learning process.

**References**
1. Azar, B. S. & Hagen, S. A. (2006). Basic English grammar. New York: Pearson Education.
2. Casher, C. C. & Weldon, J. (2010). Presentation excellence: 25 tricks, tips and techniques for professional speakers and trainers. USA: CLB Publishing House.
3. Chin, F. C. J., Soo, K. S. E. & R. Manjuladevi. (2010). English for professional communication: Science and engineering. Singapore: Cenggage Learning Asia Pte Ltd.
4. Sharimllah D. R., S. Indra Devi & Nurlisa Loke Abdullah. (2011). *Grammar for Technical Writing*. Malaysia: Pearson.

**BKXX XXX1**
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*Please refer to the Pusat Bahasa & Pembangunan Insan (PBPI) handbook for further information on the offered courses.*

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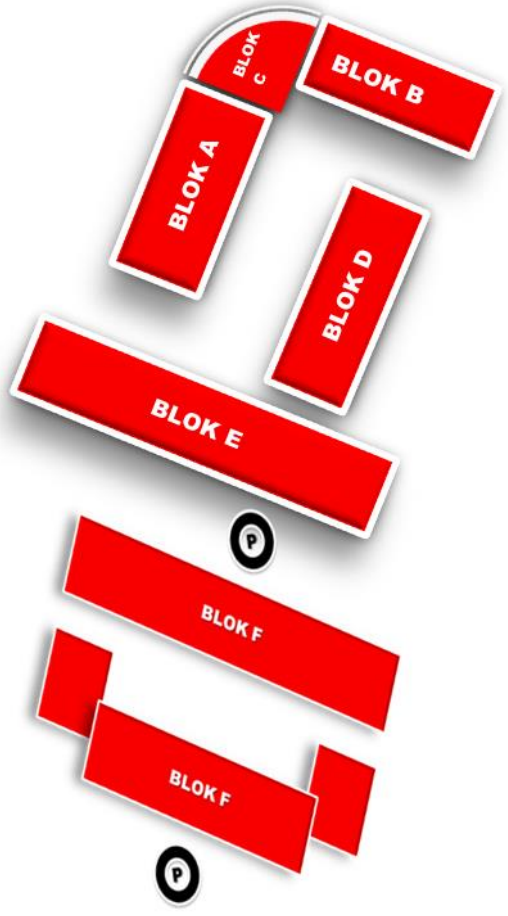
# FACILITIES & INFRASTRUCTURE

## FKE'S BUILDING MAP




**BLOCK A**

| | |
|---|---|
| Ground Floor | Lecturers' rooms, Lecture Room 2 |
| 1st Floor | Ladies prayer room, Lecturer rooms, Seminar room |
| 2nd & 3rd Floor | Lecturer rooms |

**BLOCK B**

| | |
|---|---|
| Ground Floor | Lecturers' rooms, Lecture Room 1 |
| 1st Floor | Lecturers' rooms ,Discussion Room 1 & 2 |
| 2nd Floor | Lecturers' rooms, Discussion room 4 & 5 |
| 3rd Floor | Lecturers' rooms |

**BLOCK C**

| | |
|---|---|
| Ground Floor | Faculty lobby, Lecturers' rooms |
| 1st Floor | Faculty administration office, Dean, Deputy Dean/Head of Department |
| 2nd Floor | FKE meeting room, ISO files room, waiting room. |
| 3rd Floor | Lecturers' rooms. |

**BLOCK D**

| | |
|---|---|
| Ground Floor | Power electronic and drive lab. |
| 1st Floor | Robotic and industry automation research lab, Mechatronic and CIA lab. |
| 2nd Floor | Electrical Technology lab 1, Post graduate room 1 |

**BLOCK E**

| | |
|---|---|
| Ground Floor | Power systems Labs 1 & 2, Pneumatic and hydraulic Lab, Power electronic lab , Lecture Rooms 3 & 8, Students prayer room (male) |
| 1st Floor | Power electronic and drive lab research room , Post graduate room 2, Final year project room , Lecture Rooms 4,9 & 10, , Students prayer room (female), CIA simulation lab , Energy Efficiency lab. |
| 2nd Floor | Power electronic applications lab , Power electronic simulation lab , Lecture rooms 5 ,10 & 12 Mechatronic system lab, Control system lab. |
| 3rd Floor | Energy and power system lab, Lecture Rooms 6 ,13 & 14, Briefing room 7 , PLC & Process control lab , Robotic and automation lab. |

**BLOCK F**

| | |
|---|---|
| Ground Floor | Power industry workshop, Engineering practices workshop, Electrical machine labs 1 & 2 , High voltage lab, Generation and transmission lab, Protection system lab , Machine drive lab. |
| 2nd Floor | Electrical & Electronic Labs 1 & 2 , Lecture Room 15 & 16 |
| 3rd Floor | Microprocessor Lab , Instrumentation and DSP Lab ,Motion Control Research Lab. |

## TEACHING AND LEARNING LABORATORIES (UNDERGRADUATE)

| NO | LABORATORY / WORKSHOP NAME | ROOM NO. | EQUIPMENTS |
|---|---|---|---|
| 1 | Power system Laboratory 1 | ME1 (E/G-2) | TERCO Transmission System Training Set, TERCO Power Utilization System Training Set |
| 2 | Power system Laboratory 2 | ME2 (E/G-7) | TERCO Generation System Training Set |
| 3 | Energy Efficiency Laboratory | ME3 (E/1-19) | Various tools & equipment of energy efficiency studies |
| 4 | Protection system Laborator | ME4 (F/G-27) | LABVOLT Protection System Training Set, PC |
| 5 | Electrical & Electronic Laboratory 1 | ME5 (F/2–4) | PCs, Function Generators, Oscilloscopes, Digital Lab Trainers, Multimeters |
| 6 | Electrical & Electronic Laboratory 2 | ME6 (F/2–15) | PCs, Function Generators, Oscilloscopes, Digital Lab Trainers, Multimeters |
| 7 | Electrical Technology Laboratory 1 | ME7 (D/2–11) | LABVOLT meters, loads, tools & equipments for electrical technology studies |
| 8 | Control, Instrumentation & Automation(CIA) Simulation Laboratory | ME12 (E/1–14) | PC c/w Matlab & Multisim, Micro-Box |
| 9 | PLC & Process Control Laboratory | ME13 (E/3–13) | OMRON PLC Training Set, Test Panel DOL Motor Starter, Test Panel STAR-DELTA Motor Starter and various equipments of automation |
| 10 | Microprocessor Laboratory | ME14 (F/3–8) | PCs, Oscilloscopes, Multitester, Mechatronics project kit, PIC Training Kit |
| 11 | Instrumentation and DSP Laboratory | ME15 (F/3–5) | LORENZO CBT Modul, Multimeters, function generators, digital lab trainer, analog oscilloscope, magnaprobe, Galvanometer, Decade resistor, Decade Inductor |

**Power System Lab 2**

**Electrical Technology Lab**

| | | | |
|---|---|---|---|
| 12 | Control System Laboratory | ME11 (E/2-21) | Modular Servo System,Mathlab software, Digital Oscilloscope. |
| 13 | Robotic and Automation Laboratory | ME17 (E/ 3-18) | Rhino robot trainer, Scara robot trainer, etc, |
| 14 | Pneumatic and Hydraulic Laboratory | ME18 (E/G-15) | BOSCH REXROTH Pneumatic & Hydraulic System Training Set |
| 15 | Power Electronic Laboratory | ME19 (E/G–20) | PCs, oscilloscope digital Tektronix and various equipments for power electronics studies, Power Electronics training system model labvolt |
| 16 | Power Electronic Simulation Laboratory | ME20 (E/2–7) | PCs & LabView software |
| 17 | Power Electronic Applications Laboratory | ME21 (E/2–2) | PCs, ERACS & PSCAD software |
| 18 | Electrical Machine Laboratory 1 | ME22 (F/G–14) | LORENZO electrical machines |
| 19 | Electrical Machine Laboratory 2 | ME23 (F/G-11) | Dissectible machine |
| 20 | Power Electronic workshop | BE25 (F/G–4) | Wiring bays, tools and equipments for domestic & motor control/starter wiring |
| 21 | Mechatronic and CIA Workshop | BE26 (D/1-10B) | CIM System, AGV, CNC machine, OMRON machine vision, robot arm training set |
| 22 | Engineering Workshop/ CERIA Lab | ME27 (F/G-6) | Hitachi bench drill, welding set, grander, break cutter, pallet jack, spanner Canady |
| 23 | Components Store | D/G-11 | Electronics Components |
| 24 | Mechatronic System Laboratory | ME29 (F/3-2) | PCB machine |


# RESEARCH LABORATORIES (POSTGRADUATE)

| NO | LABORATORY NAME | ROOM NO. | RESEARCH FIELD |
|---|---|---|---|
| 1 | Robotics & Industrial Automation Research Laboratory | ME27 (F/G – 6) | ▪ Assistive/ rehabilitatio robotics<br>▪ Mobile robot navigation<br>▪ Artificial Intelligence |
| 2 | Motion Control Research Laboratory | ME16 (E/2–16) | ▪ Precision Motion Control<br>▪ Control Theory<br>▪ Precision Actuator Design<br>▪ Robotics, Biped Robot |
| 3 | Underwater Technology Research Laboratory | ME9 (F/G–22) | ▪ Remotely Operated Vehicle<br>▪ Surface Vessel System<br>▪ Underwater Sensory Technology |
| 4 | Power Electronics and Drives Research Laboratory | MP2 (E/1 -3) | ▪ Direct Torque Control of Induction/PM machines.<br>▪ Multilevel/Multiphase Inverters.<br>▪ Power Converters for Battery Management Sys. & PV Applications |
| 5 | Electrical Machine Design Research Laboratory | D / G - 11 | ▪ Permanent magnet machine: Designs and Applications<br>▪ Switched Reluctance and Bearingless motor.<br>▪ Condition Monitoring of Electric Machines. |
| 6 | Electric Vehicle Drives Research Laboratory | BPS2 (E/1-4) | ▪ Sensorles PMSM Drives<br>▪ Electric Vehicle Drives using Dual-motor<br>▪ Control<br>▪ Five-Leg Inverter for Dual-machine Drives |
| 7 | Solar PV System and Smart Grid Research Laboratory | D / G - 11 | ▪ Solar PV System Design & Evaluation<br>▪ Cost and Benefits of PV System Integration<br>▪ Smart Grid Application |
| 8 | Energy and Power System Research Laboratory | MP3 (E/3-2) | ▪ Optimization of electricity system<br>▪ Energy Efficiency<br>▪ Power System Planning and Operation |
| 9 | High Voltage Research Laboratory | ME10 (F/G-18) | ▪ Breakdown in gases<br>▪ Surface discharge<br>▪ Atmospheric discharges &insulation |
| 10 | Advanced Digital Signal Processing Research Laboratory | ME24 (F/G-30) | ▪ Neural feedback<br>▪ Brain computer interface<br>▪ Computer vision, graphics & visualization |
| 11 | Rehabilitation Eng. & Assistive Technology Research Laboratory | F/2-9 | ▪ Biomedical engineering<br>▪ Biomechanics<br>▪ Computational and information |

**CERIA Workshop**

**Machine Drive Lab**

# APPENDIX A: STUDENT AUDIT FORM - DEK PROGRAM

**INSTRUCTIONS TO STUDENTS (COMPULSARY FOR EACH SEMESTER)**

1. Students are required to keep record of their obtained grades for a given course for graduation purpose.
2. Refer to SMP system to fill in your grades, GPA & CGPA.

| CATEGORY | COURSE STATUS | STATUS HW | CREDIT HOURS | | TO BE FILLED IN BY STUDENTS IN EACH SEMESTER | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | KHAS 0 | 1 | 2 | 3 | 4 | KHAS 1 | 5 |
| E | - | - | 6 | 6 | | | | | | | |
| P | - | - | 68 | 71 | | | | | | | |
| | LI | HW | 3 | | | | | | | | |
| W | - | - | 14 | 16 | | | | | | | |
| | KK | - | 2 | | | | | | | | |
| | | **Total credit** | 93 | | | | | | | | |

**LIST OF COURSE GRADES**

| SEMESTER | CODE | COURSE | CATEGORY | CREDIT | TO BE FILLED IN BY STUDENTS | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | GRADE | STATUS (UM) | GPA | CGPA |
| **SEMESTER KHAS PERMULAAN** | DLHW 1012 | FOUNDATION ENGLISH | W | 2 | | | | |
| | DLHW 1702 | LEADERSHIP | W | 2 | | | | |
| | DLHW 1722 | PHILOSOPHY OF SCIENCE & TECHNOLOGY | W | 2 | | | | |
| | | | **TOTAL** | **6** | | | | |
| **SEMESTER 1** | DEKA 1212 | ALGEBRA | P | 2 | | | | |
| | DITG 1112 | COMPUTER SKILLS | P | 2 | | | | |
| | DEKA 1213 | PHYSICS | P | 3 | | | | |
| | DEKP 1213 | ELECTRICAL CIRCUIT I | P | 3 | | | | |
| | DEKP 1121 | ELECTRICAL WORKSHOP I | P | 1 | | | | |
| | DEKE 2333 | DIGITAL ELECTRONICS | P | 3 | | | | |
| | DLHW 1032 | MALAYSIA STUDIES | W | 2 | | | | |
| | DKKX 1XX1 | CO-CURRICULUM I | W | 1 | | | | |
| | | | **TOTAL** | **17** | | | | |
| **SEMESTER 2** | DEKA 1222 | CALCULUS | P | 2 | | | | |
| | DEKP 1223 | ELECTRICAL CIRCUIT II | P | 3 | | | | |
| | DMCG 1323 | INTRODUCTION TO MECHANICAL SYSTEM | P | 3 | | | | |
| | DITG 1113 | COMPUTER PROGRAMMING | P | 3 | | | | |
| | DEKE 2433 | ANALOGUE ELECTRONICS I | P | 3 | | | | |
| | DEKP 2241 | ELECTRICAL WORKSHOP II | P | 1 | | | | |
| | DLHW 2422 | ENGLISH FOR EFFECTIVE COMMUNICATION | W | 2 | | | | |
| | | | **TOTAL** | **17** | | | | |

| | | | | | TO BE FILLED IN BY STUDENTS | | | |
|---|---|---|---|---|---|---|---|---|
| **SEMESTER** | **CODE** | **COURSE** | **CATEGORY** | **CREDIT** | **GRADE** | **STATUS (UM)** | **GPA** | **CGPA** |
| **SEMESTER 3** | DEKA 2332 | DIFFERENTIAL EQUATIONS | P | 2 | | | | |
| | DEKE 2443 | ANALOGUE ELECTRONICS II | P | 3 | | | | |
| | DEKC 2333 | INSTRUMENTATION & MEASUREMENT | P | 3 | | | | |
| | DEKM 3753 | ELECTRICAL MACHINES | P | 3 | | | | |
| | DEKC 3453 | MICROPROCESSOR | P | 3 | | | | |
| | DLHW 3432 | ENGLISH FOR MARKETABILITY | W | 2 | | | | |
| | DKKX 2XX1 | CO-CURRICULUM II | W | 1 | | | | |
| | | | **TOTAL** | **17** | | | | |
| **SEMESTER 4** | DEKA 2342 | ENGINEERING MATHEMATICS | P | 2 | | | | |
| | DEKE 3443 | POWER ELECTRONICS | P | 3 | | | | |
| | DEKC 3813 | CONTROL SYSTEM ENGINEERING | P | 3 | | | | |
| | DEKC 3433 | COMMUNICATION ENGINEERING | P | 3 | | | | |
| | DEKP 3353 | ENGINEERING PRACTICE | P | 3 | | | | |
| | DTMW 1012 | FUNDAMENTAL OF ENTREPRENEURIAL ACCULTURATION | W | 2 | | | | |
| | | | **TOTAL** | **16** | | | | |
| **SPECIAL SEMESTER II** | DEKU 2363 | INDUSTRIAL TRAINING | P (HW) | 3 | | | | |
| | DEKU 2362 | INDUSTRIAL TRAINING REPORT | P | 2 | | | | |
| | | | **TOTAL** | **5** | | | | |
| **SEMESTER 5** | DEKP 3763 | POWER SYSTEM | P | 3 | | | | |
| | DEKC 3643 | AUTOMATION | P | 3 | | | | |
| | DEKP 3463 | DIPLOMA PROJECT | P | 3 | | | | |
| | **CHOOSE ONLY TWO (2) COURSES** | | | | | | | |
| | DEKM 3553 | INDUSTRIAL ROBOTIC | E | 3 | | | | |
| | DEKP 3563 | RENEWABLE ENERGY AND APPLICATIONS | E | 3 | | | | |
| | DEKP 3553 | BUILDING MAINTENANCE AND MANAGEMENT | E | 3 | | | | |
| | | | **TOTAL** | **15** | | | | |
| | | | **MINIMUM TOTAL CREDIT** | **93** | | | | |

# APPENDIX B: STUDENT AUDIT FORM - BEKG PROGRAM

## INSTRUCTIONS TO STUDENTS (COMPULSARY FOR EACH SEMESTER)

1. Students are required to keep record of their obtained grades for a given course for graduation purpose.
2. Refer to SMP system to fill in your grades, GPA & CGPA.

| CATEGORY | COURSE STATUS | STATUS HW | CREDIT HOURS | | TO BE FILLED IN BY STUDENT IN EACH SEMESTER | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 2 | 3 | 4 | 5 | 6 | KHAS | 7 | 8 |
| E | - | - | 13 | 13 | | | | | | | | | |
| P | - | - | 96 | 108 | | | | | | | | | |
| | - | HW | 1 | | | | | | | | | | |
| | PSM | - | 6 | | | | | | | | | | |
| | LI | HW | 5 | | | | | | | | | | |
| W | - | - | 12 | 14 | | | | | | | | | |
| | KK | - | 2 | | | | | | | | | | |
| | | **TOTAL CREDIT** | **135** | | | | | | | | | | |

## LIST OF COURSE GRADES

# COMPULSORY FOR LOCAL STUDENTS ONLY
* COMPULSORY FOR INTERNATIONAL STUDENTS ONLY

| SEMESTER | CODE | COURSE | CATEGORY | CREDIT | TO BE FILLED IN BY STUDENTS | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | GRADE | STATUS (UM) | GPA | CGPA |
| SEMESTER 1 | BLHL 1XX2 | ELECTIVE I (UNIVERSITY) | W | 2 | | | | |
| | BKKX XXX1 | CO-CURRICULUM I | W | 1 | | | | |
| | BMFG 1313 | ENGINEERING MATHEMATICS I | P | 3 | | | | |
| | BITG 1233 | COMPUTER PROGRAMMING | P | 3 | | | | |
| | BEKG 1123 | PRINCIPLES OF ELECTRIC AND ELECTRONICS | P | 3 | | | | |
| | BMFG 1213 | ENGINEERING MATERIALS | P | 3 | | | | |
| | BEKB 1131 | ENGINEERING PRACTICE I | P | 1 | | | | |
| | | | **TOTAL** | **16** | | | | |
| SEMESTER 2 | #BLHW 1702<br>*BLHW 1742 | TITAS<br>MALAYSIAN STUDIES | W | 2 | | | | |
| | BLHW 1442 | ENGLISH FOR ACADEMIC PURPOSE | W | 2 | | | | |
| | BKKX XXX1 | CO-CURRICULUM II | W | 1 | | | | |
| | BMCG 1013 | DIFFERENTIAL EQUATIONS | P | 3 | | | | |
| | BENG 1413 | DIGITAL ELECTRONICS | P | 3 | | | | |
| | BEKG 1233 | PRINCIPLES OF INSTRUMENTATION AND MEASUREMENT | P | 3 | | | | |
| | BEKU 1123 | ELECTRIC CIRCUIT I | P | 3 | | | | |
| | BEKB 1231 | ENGINEERING PRACTICE II | P | 1 | | | | |
| | | | **TOTAL** | **18** | | | | |

| | | | | | TO BE FILLED IN BY STUDENTS | | | |
|---|---|---|---|---|---|---|---|---|
| **SEMESTER** | **CODE** | **COURSE** | **CATEGORY** | **CREDIT** | **GRADE** | **STATUS (UM)** | **GPA** | **CGPA** |
| **SEMESTER 3** | BLHW 2452 | ACADEMIC WRITING | W | 2 | | | | |
| | BEKG 2443 | ENGINEERING MATHEMATICS II | P | 3 | | | | |
| | BMCG 1523 | ENGINEERING GRAPHIC AND CAD | P | 3 | | | | |
| | BEKU 2333 | ELECTRIC CIRCUIT II | P | 3 | | | | |
| | BEKE 2333 | ANALOGUE ELECTRONICS | P | 3 | | | | |
| | BEKC 2433 | SIGNAL & SYSTEMS | P | 3 | | | | |
| | BEKB 2331 | ELECTRICAL ENGINEERING LAB I | P | 1 | | | | |
| | | | **TOTAL** | **18** | | | | |
| **SEMESTER 4** | #BLHW 2712<br>*BLHW 2752 | ETHNIC RELATIONS<br>MALAYSIAN CULTURE | W | 2 | | | | |
| | BENG 2143 | ENGINEERING STATISTICS | P | 3 | | | | |
| | BEKG 2433 | ELECTRICAL SYSTEMS | P | 3 | | | | |
| | BMCG 2432 | INTRODUCTION TO MECHANICAL ENGINEERING | P | 3 | | | | |
| | BEKC 2453 | COMMUNICATION SYSTEMS | P | 3 | | | | |
| | BEKP 2453 | ELECTROMAGNETIC THEORY | P | 2 | | | | |
| | BEKB 2431 | ELECTRICAL ENGINEERING LAB II | P | 1 | | | | |
| | | | **TOTAL** | **17** | | | | |
| **SEMESTER 5** | BLHW 3462 | ENGLISH FOR PROFESSIONAL INTERACTION | W | 2 | | | | |
| | BEKE 3533 | ELECTRICAL MACHINE | P | 3 | | | | |
| | BEKC 3523 | CONTROL SYSTEMS ENGINEERING | P | 3 | | | | |
| | BEKC 3543 | MICROPROCESSOR | P | 3 | | | | |
| | BEKE 3543 | POWER ELECTRONICS | P | 3 | | | | |
| | BEKP 4773 | POWER SYSTEMS ANALYSIS | P | 3 | | | | |
| | | | **TOTAL** | **17** | | | | |
| **SEMESTER 6** | BEKX XXX3 | ELECTIVE I (PROGRAM) | P | 3 | | | | |
| | BEKE 4753 | ELECTRICAL DRIVES | P | 3 | | | | |
| | BEKC 3663 | INSTRUMENTATION AND CONTROL | P | 3 | | | | |
| | BEKP 4883 | HIGH VOLTAGE ENGINEERING | P | 3 | | | | |
| | BEKB 3673 | INTEGRATED DESIGN PROJECT | P | 3 | | | | |
| | BEKB 3551 | ELECTRICAL ENGINEERING LABORATORY III | P | 1 | | | | |
| | | | **TOTAL** | **16** | | | | |
| **SPECIAL SEMESTER I** | BEKU 3695 | INDUSTRIAL TRAINING | P | 5 | | | | |
| | | | **TOTAL** | **5** | | | | |

| | | | | | TO BE FILLED IN BY STUDENTS | | | |
|---|---|---|---|---|---|---|---|---|
| **SEMESTER** | **CODE** | **COURSE** | **CATEGORY** | **CREDIT** | **GRADE** | **STATUS (UM)** | **GPA** | **CGPA** |
| **SEMESTER 7** | BMFG 4623 | ENGINEERING ECONOMY AND MANAGEMENT | P | 3 | | | | |
| | BEKU 4861 | ENGINEERING SEMINAR | P | 1 | | | | |
| | BEKU 4792 | FINAL YEAR PROJECT I | P | 2 | | | | |
| | BEKP 4843 | RENEWABLE ENERGY | P | 3 | | | | |
| | BXXX XXX2 | ELECTIVE II (UNIVERSITY) | E | 2 | | | | |
| | BEKX XXX3 | ELECTIVE II (PROGRAM) | E | 3 | | | | |
| | | | **TOTAL** | **14** | | | | |
| **SEMESTER 8** | BTMW 4012 | ENTERPRENEURSHIP TECHNOLOGY | W | 2 | | | | |
| | BENG 4322 | ENGINEER AND SOCIETY | P | 2 | | | | |
| | BEKU 4894 | FINAL YEAR PROJECT II | P | 4 | | | | |
| | BEKP 4853 | ENERGY UTILLIZATION AND CONSERVATION | P | 3 | | | | |
| | BEKX XXX3 | ELECTIVE III (PROGRAM) | E | 3 | | | | |
| | | | **TOTAL** | **14** | | | | |
| | | | **MINIMUM TOTAL CREDIT** | **135** | | | | |

# APPENDIX C: STUDENT AUDIT FORM - BEKM PROGRAM

## INSTRUCTIONS TO STUDENTS (COMPULSARY FOR EACH SEMESTER)

1. Students are required to keep record of their obtained grades for a given course for graduation purpose.
2. Refer to SMP system to fill in your grades, GPA & CGPA.

| CATEGORY | COURSE STATUS | STATUS HW | CREDIT HOURS | | TO BE FILLED IN BY STUDENT IN EACH SEMESTER | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 2 | 3 | 4 | 5 | 6 | KHAS 1 | 7 | 8 |
| E | - | - | 10 | 10 | | | | | | | | | |
| P | - | - | 99 | 111 | | | | | | | | | |
| | - | HW | 1 | | | | | | | | | | |
| | PSM | - | 6 | | | | | | | | | | |
| | LI | HW | 5 | | | | | | | | | | |
| W | - | - | 12 | 14 | | | | | | | | | |
| | KK | - | 2 | | | | | | | | | | |
| | | **TOTAL CREDIT** | **135** | | | | | | | | | | |

## LIST OF COURSE GRADES

# COMPULSORY FOR LOCAL STUDENTS ONLY
* COMPULSORY FOR INTERNATIONAL STUDENTS ONLY

| SEMESTER | CODE | COURSE | CATEGORY | CREDIT | TO BE FILLED IN BY STUDENTS | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | GRADE | STATUS (UM) | GPA | CGPA |
| **SEMESTER 1** | BLHW 1442 | ENGLISH FOR ACADEMIC PURPOSE | W | 2 | | | | |
| | BKKX XXX1 | CO-CURRICULUM I | W | 1 | | | | |
| | BMFG 1313 | ENGINEERING MATHEMATICS I | P | 3 | | | | |
| | BEKG 1123 | PRINCIPLES OF ELECTRIC AND ELECTRONICS | P | 3 | | | | |
| | BMFG 1213 | ENGINEERING MATERIALS | P | 3 | | | | |
| | BMCG 1123 | STATICS & MECHANICS OF MATERIAL | P | 3 | | | | |
| | BEKB 1131 | ENGINEERING PRACTICE I | P | 1 | | | | |
| | | | **TOTAL** | **15** | | | | |
| **SEMESTER 2** | BKKX XXX1 | CO-CURRICULUM II | W | 1 | | | | |
| | BMCG 1013 | DIFFERENTIAL EQUATIONS | P | 3 | | | | |
| | BENG 1413 | DIGITAL ELECTRONICS | P | 3 | | | | |
| | BMCG 1523 | ENGINEERING GRAPHICS AND CAD | P | 3 | | | | |
| | BEKU 1123 | ELECTRIC CIRCUIT I | P | 3 | | | | |
| | BMCG 1253 | DYNAMICS & MECHANISM | P | 3 | | | | |
| | BEKB 1231 | ENGINEERING PRACTICE II | P | 1 | | | | |
| | | | **TOTAL** | **17** | | | | |

| | | | | | TO BE FILLED IN BY STUDENTS | | | |
|---|---|---|---|---|---|---|---|---|
| **SEMESTER** | **CODE** | **COURSE** | **CATEGORY** | **CREDIT** | **GRADE** | **STATUS (UM)** | **GPA** | **CGPA** |
| **SEMESTER 3** | BEKG 2443 | ENGINEERING MATHEMATICS II | P | 3 | | | | |
| | BITG 1233 | COMPUTER PROGRAMMING | P | 3 | | | | |
| | BEKU 2333 | ELECTRIC CIRCUIT II | P | 3 | | | | |
| | BEKG 1233 | PRINCIPLES OF INSTRUMENTATION AND MEASUREMENT | P | 3 | | | | |
| | BEKM 2342 | INTRODUCTION TO MECHATRONIC | P | 2 | | | | |
| | BMCG 2372 | FLUID MECHANICS | P | 2 | | | | |
| | BEKU 1231 | ELECTRICAL & ELECTRONICS ENGINEERING LABORATORY | P | 1 | | | | |
| | | | **TOTAL** | **17** | | | | |
| **SEMESTER 4** | BLHW 2452 | ACADEMIC WRITING | W | 2 | | | | |
| | BENG 2143 | ENGINEERING STATISTICS | P | 3 | | | | |
| | BEKC 2433 | SIGNAL & SYSTEMS | P | 3 | | | | |
| | BEKE 2422 | ANALOGUE ELECTRONICS APPLICATIONS | P | 2 | | | | |
| | BEKC 3533 | INTRODUCTION TO CONTROL SYSTEM | P | 3 | | | | |
| | BEKC 3543 | MICROPROCESSOR | P | 3 | | | | |
| | BEKM 2321 | MECHANICAL ENGINEERING LABORATORY | P | 1 | | | | |
| | | | **TOTAL** | **17** | | | | |
| **SEMESTER 5** | BLHW 3462 | ENGLISH FOR PROFESSIONAL INTERACTION | W | 2 | | | | |
| | BMFG 4623 | ENGINEERING ECONOMY AND MANAGEMENT | P | 3 | | | | |
| | BEKG 2433 | ELECTRICAL SYSTEMS | P | 3 | | | | |
| | BEKM 3453 | MICROCONTROLLER TECHNOLOGY | P | 3 | | | | |
| | BEKM 3543 | ELECTROMECHANICAL SYSTEMS | P | 3 | | | | |
| | BEKC 3643 | CONTROL SYSTEM ENGINEERING | P | 3 | | | | |
| | BEKC 2421 | CONTROL SYSTEMS LABORATORY | P | 1 | | | | |
| | | | **TOTAL** | **18** | | | | |
| **SEMESTER 6** | #BLHW 1702<br>*BLHL 1012 | TITAS<br>MALAY COMMUNICATION I | W | 2 | | | | |
| | BEKM 3653 | INTEGRATED DESIGN PROJECT | P | 3 | | | | |
| | BEKC 4753 | PLC & AUTOMATION | P | 3 | | | | |
| | BMCG 3643 | HYDRAULIC & PNEUMATIC SYSTEMS | P | 3 | | | | |
| | BMCG 3653 | THERMODYNAMICS & HEAT TRANSFER | P | 3 | | | | |
| | BEKM 3641 | MECHATRONICS ENGINEERING LABORATORY I | P | 1 | | | | |
| | | | **TOTAL** | **15** | | | | |
| **SPECIAL SEMESTER** | BEKU 3695 | INDUSTRIAL TRAINING | P | 5 | | | | |
| | | | **TOTAL** | **5** | | | | |

| | | | | | TO BE FILLED IN BY STUDENTS | | | |
|---|---|---|---|---|---|---|---|---|
| **SEMESTER** | **CODE** | **COURSE** | **CATEGORY** | **CREDIT** | **GRADE** | **STATUS (UM)** | **GPA** | **CGPA** |
| **SEMESTER 7** | BEKU 4861 | ENGINEERING SEMINAR | P | 1 | | | | |
| | BEKU 4792 | FINAL YEAR PROJECT I | P | 2 | | | | |
| | BEKM 4763 | ROBOTICS | P | 3 | | | | |
| | BEKC 2453 | COMMUNICATION SYSTEMS | P | 3 | | | | |
| | BEKM 4751 | MECHATRONICS ENGINEERING LABORATORY II | P | 1 | | | | |
| | BXXX XXX2 | ELECTIVE I (UNIVERSITY) | E | 2 | | | | |
| | BEKM 4783 | MACHINE VISION | E | 3 | | | | |
| | BEKC 4873 | ARTIFICIAL INTELLIGENCE | | | | | | |
| | | | **TOTAL** | **15** | | | | |
| **SEMESTER 8** | BTMW 4012 | TECHNOPRENEURSHIP | W | 2 | | | | |
| | #BLHC 2712<br>*BLHW 2752 | ETHNIC RELATIONS<br>MALAYSIAN CULTURE | W | 2 | | | | |
| | BENG 4322 | ENGINEER AND SOCIETY | P | 2 | | | | |
| | BEKU 4894 | FINAL YEAR PROJECT II | P | 4 | | | | |
| | BXXX XXX2 | ELECTIVE II (UNIVERSITY) | E | 2 | | | | |
| | BEKC 4683 | DIGITAL CONTROL SYSTEMS | E | 3 | | | | |
| | BEKC 4883 | ADVANCED MANUFACTURING SYSTEMS | | | | | | |
| | BEKM 4823 | DATA COMMUNICATIONS & COMPUTER NETWORKING | | | | | | |
| | | | **TOTAL** | **15** | | | | |
| | | | **MINIMUM TOTAL CREDIT** | **135** | | | | |

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