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

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.

EXCELLENCE THROUGH COMPETENCY
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.
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, the Faculty 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 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 Malaysia’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 structured and beautiful UTeM’s main campus at Durian Tunggal in April 2005.

In order to uphold the academic pillar that being decreed 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
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.

TOWARDS ACADEMIC EXCELLENCE

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.
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.

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.

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.

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 certificate 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

<table>
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<tr>
<th>FOR SPM HOLDERS</th>
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| **General Requirements** | 1. Citizen of Malaysia; and  
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:  
- Mathematics  
- Additional Mathematics  
- Physics  

And either one (1) of the following subjects:  
- Additional Science/ Applied Science  
- Science  
- Chemistry  
- Biology  
- Engineering Technology  
- Principle of Electrical and Electronic  
- Application of Electrical and Electronic  
- Engineering Technology or Mechanical or Electrical & Electronics Engineering Studies  
- Electrical Automation and Diesel  
- Computerize Machine  
- Engineering Drawing  
- Visual Arts or Invention and  
2. Pass at least **(Gred E)** in English Language and  
3. The applicant must not a colour blind or physically disabled which impair to complete practical assignments. |
### 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 and **Diploma or other qualification recognised as equivalent** by the Government of Malaysia and approved by the University’s Senate or Pass in **Sijil Tinggi Persekolahan Malaysia (STPM)** year 2016 or previous **STPM** with at least:
- **C Grade (NGMP 2.00)** in General Studies; and
- **C Grade (NGMP 2.00)** in two (2) other subjects or Pass in **Matriculation 2016 or previous examination** with at least a **CGPA of 2.50** and Obtained at least Band 2 in the Malaysian University English Test (MUET). |
<table>
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<th>Programme Specific Requirements</th>
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<tr>
<td><strong>FOR DIPLOMA/EQUIVALENT HOLDERS</strong></td>
</tr>
<tr>
<td>Pass in <strong>Diploma</strong> with at least a <strong>CGPA of 3.00</strong> in a related field from a recognised institution and approved by the University’s Senate; and</td>
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<tr>
<td>Credit exemption is subject to the discretion and approval by the Faculty and</td>
</tr>
<tr>
<td>Pass/ completed studies at Diploma level before the commencement of academic session or</td>
</tr>
<tr>
<td>Pass in <strong>Sijil Tinggi Persekolahan Malaysia (STPM) year 2016 or previous STPM</strong> with at least C Grades (NGMP 2.00) in all of the following subjects:</td>
</tr>
<tr>
<td>- General Studies</td>
</tr>
<tr>
<td>- Physics /Biology</td>
</tr>
<tr>
<td>- Mathematics T/Further Mathematics T/ Mathematics S</td>
</tr>
<tr>
<td>- Chemistry</td>
</tr>
<tr>
<td>The applicant who did not take Physics at STPM level must has pass in Sijil Pelajaran Malaysia (SPM)/ equivalent with at least <strong>4B</strong> in Physics, or</td>
</tr>
<tr>
<td>Pass in <strong>MOE Matriculation/ UM Foundation/ UiTM Foundation year 2014 or previous STPM</strong> with at least <strong>C Grades</strong> (NGMP 2.00) in <strong>all</strong> of the following subjects:</td>
</tr>
<tr>
<td>- Physics / Engineering Physics/Biology</td>
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<tr>
<td>- Mathematics T/Further Mathematics</td>
</tr>
<tr>
<td>- Chemistry / Engineering Chemistry</td>
</tr>
<tr>
<td>The applicant who did not take Physics at STPM level must has pass in Sijil Pelajaran Malaysia (SPM)/ equivalent with at least <strong>4B</strong> in Physics and</td>
</tr>
<tr>
<td>The applicant must not be colour blind or physically disabled which impairs to complete practical assignments.</td>
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## FOR MATRICULATION HOLDERS

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

  and

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

The applicant must not be colour blind and not physically disabled which impairs to complete practical assignments. |
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

<table>
<thead>
<tr>
<th>Grade (Achievement)</th>
<th>Relations between Marks Percentage and Grade Point</th>
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<tbody>
<tr>
<td></td>
<td>Marks Percentages</td>
</tr>
<tr>
<td>A (Excellent)</td>
<td>80 – 100</td>
</tr>
<tr>
<td>A- (Excellent)</td>
<td>75 – 79</td>
</tr>
<tr>
<td>B+ (Honours)</td>
<td>70 – 74</td>
</tr>
<tr>
<td>B (Honours)</td>
<td>65 – 69</td>
</tr>
<tr>
<td>B- (Pass)</td>
<td>60 – 64</td>
</tr>
<tr>
<td>C+ (Pass)</td>
<td>55 – 59</td>
</tr>
<tr>
<td>C (Pass)</td>
<td>50 – 54</td>
</tr>
<tr>
<td>C- (Conditional Pass)</td>
<td>47 - 49</td>
</tr>
<tr>
<td>D+ (Conditional Pass)</td>
<td>44 – 46</td>
</tr>
<tr>
<td>D (Conditional Pass)</td>
<td>40 – 43</td>
</tr>
<tr>
<td>E (Fail)</td>
<td>0 - 39</td>
</tr>
<tr>
<td>PROGRAMME</td>
<td>GRADUATION REQUIREMENT</td>
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<td>---------------------------------</td>
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</tbody>
</table>
| 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:  
  i. Students must obtain Kedudukan Baik (KB) in the last semester.  
  ii. Passed all courses required for curriculum requirements:  
      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.  
  iii. Has applied for the award, recommended by the Faculty and approved by the Senate.  
  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:  
  i. Students must obtain Kedudukan Baik (KB) in the last semester.  
  ii. Passed all courses required for curriculum requirements:  
      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.  
  iii. Has applied for the award, recommended by the Faculty and approved by the Senate.  
  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:  
  i. Students must obtain Kedudukan Baik (KB) in the last semester.  
  ii. Passed all courses required for curriculum requirements:  
      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.  
  iii. Has applied for the award, recommended by the Faculty and approved by the Senate.  
  iv. Other requirements set by the university.                                                                                       |
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.

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
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:

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

### 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

<table>
<thead>
<tr>
<th>EXTERNAL EXAMINER</th>
<th>QUALIFICATIONS</th>
<th>POSITION</th>
<th>APPOINTMENT PERIOD</th>
</tr>
</thead>
</table>
| Professor Dr. Hj. Mohd Nasir Taib (Department of Control, Instrumentasi & Automation) | 1. Doctor of Philosophy (Ph.D) in Control & Instrumentation, UMIST, United Kingdom  
2. Master of Science in Control System with Distinction, University of Sheffield, United Kingdom  
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 (Department of Electrical Engineering) | 1. Doctor of Philosophy (Ph.D), Universiti Teknologi Malaysia  
2. M.Sc. In Control Systems, University of Sheffield, Australia  
3. B. Eng. (Hons), Electrical Engineering, Universiti Teknologi Malaysia | Senior Director Centre for Quality and Risk Management (QRiM), UTM | 2 February 2017 to 30 April 2019 |
| Assoc. Prof. Ts. Dr. Mohd Ruslim Mohamed (Department of Electrical & Electronics Engineering) | 1. Doctor of Philosophy (Ph.D) in Electrical Engineering, Universiti Malaysia Pahang  
2. M.Sc. In Electrical Engineering, Universiti Teknologi Tun Hussien Onn  
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 |
<table>
<thead>
<tr>
<th>VISITING PROFESSOR</th>
<th>QUALIFICATIONS</th>
<th>POSITION</th>
<th>APPOINTMENT PERIOD</th>
</tr>
</thead>
</table>
| Professor Dr. Rini Akmeliawati (Department of Mechatronics) | 1. Doctor of Philosophy (Ph.D), in Electrical and Electronic Engineering, University of Melbourne, Australia  
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 (Department of Electrical Engineering) | 1. Doctor of Philosophy (Ph.D), in High Voltage Engineering, University of Manchester, United Kingdom  
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 |

<table>
<thead>
<tr>
<th>INDUSTRIAL ADVISORY PANEL</th>
<th>POSITION</th>
<th>DEPARTMENT</th>
<th>APPOINTMENT PERIOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ir. Shamsul bin Zakaria (Department of Diploma Engineering)</td>
<td>Senior Engineer 1 - Electrica, Edra Power Holding Sdn. Bhd</td>
<td>DIPLOMA</td>
<td>1 August 2017 to 31 July 2019</td>
</tr>
<tr>
<td>Ir. Riduan Bin Mohd Shariff (Department of Diploma Engineering)</td>
<td>Subject Matter Expert-Electrical, PETRONAS Penapisan Sdn Bhd</td>
<td>DIPLOMA</td>
<td>1 August 2017 to 31 July 2019</td>
</tr>
<tr>
<td>INDUSTRIAL ADVISORY PANEL</td>
<td>POSITION</td>
<td>DEPARTMENT</td>
<td>APPOINTMENT PERIOD</td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------</td>
<td>------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Ir. Azril Hisham bin Abu Hassan (Department of Power Electronic and Drives)</td>
<td>Head of Operational Excellence DNV.GL Oil &amp; Gas</td>
<td>BEKG</td>
<td>11 Oct 2017 to 10 Oct 2019</td>
</tr>
<tr>
<td>Ir. Ammar bin Alamshah (Department of Industrial Power Engineering)</td>
<td>Managing Director, Rokhiza Engineering Services</td>
<td>BEKG</td>
<td>11 Oct 2017 to 10 Oct 2019</td>
</tr>
<tr>
<td>Ir. Faizal bin Abdullah</td>
<td>Senior Engineer, Exxonmobil Exploration &amp; Production Malaysia</td>
<td>BEKG</td>
<td>11 Oct 2017 to 10 Oct 2019</td>
</tr>
<tr>
<td>Ir. Mohd Redzuan bin Mohd Rafiee</td>
<td>Manager Project, PBJV Sdn Bhd.</td>
<td>BEKG</td>
<td>11 Oct 2017 to 10 Oct 2019</td>
</tr>
</tbody>
</table>
DIPLOMA PROGRAMME
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.

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

<table>
<thead>
<tr>
<th>NO</th>
<th>PROGRAMME OUTCOMES (PO)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Upon graduation, graduates should be able to :-</td>
</tr>
<tr>
<td>1.</td>
<td>Apply fundamental knowledge of mathematics, sciences and engineering in field of electrical engineering. (K)</td>
</tr>
<tr>
<td>2.</td>
<td>Identify, analyse and solve well-defined electrical engineering problems including troubleshooting based on provided information. (CTPS)</td>
</tr>
<tr>
<td>3.</td>
<td>Conduct investigation and assist in the design of solution for well defined electrical engineering problems (CTPS)</td>
</tr>
<tr>
<td>4.</td>
<td>Apply appropriate techniques, resources and engineering tools to well defined electrical engineering problem/practices. (S)</td>
</tr>
<tr>
<td>5.</td>
<td>Demonstrate an awareness and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities. (SSR)</td>
</tr>
<tr>
<td>6.</td>
<td>Demonstrate the understanding for impact of engineering practises/solutions by considering need for sustainable development. (K)</td>
</tr>
<tr>
<td>7.</td>
<td>Demonstrate an understanding of professional ethics, responsibilities and norm of engineering practices. (EM)</td>
</tr>
<tr>
<td>8.</td>
<td>Communicate and deliver ideas through technical writing and oral presentation effectively with engineering community and society at large. (CS)</td>
</tr>
<tr>
<td>NO</td>
<td>PROGRAMME OUTCOMES (PO)</td>
</tr>
<tr>
<td>----</td>
<td>-------------------------</td>
</tr>
<tr>
<td></td>
<td>Upon graduation, graduates should be able to :-</td>
</tr>
<tr>
<td>9.</td>
<td>Work as a team effectively and exhibit good leadership skills toward achieving goal. (TS,LS)</td>
</tr>
<tr>
<td>10.</td>
<td>Recognise the need for professional development and to engage in independent and lifelong learning. (LL)</td>
</tr>
<tr>
<td>11.</td>
<td>Demonstrate an awareness of management, business practices and entrepreneurship in the related field. (ES)</td>
</tr>
</tbody>
</table>
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:

<table>
<thead>
<tr>
<th>Components</th>
<th>Credit Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compulsory University Course (W)</td>
<td>16</td>
<td>17.2%</td>
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<tr>
<td>Core Course (P)</td>
<td></td>
<td></td>
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<tr>
<td>Engineering</td>
<td>60</td>
<td>76.3%</td>
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<tr>
<td>Science &amp; Mathematics</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Elective (E)</td>
<td>6</td>
<td>6.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>93</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

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.
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.

<table>
<thead>
<tr>
<th>TYPE OF COURSE</th>
<th>SEMESTER KHAS PERMULAAN</th>
<th>SEMESTER 1</th>
<th>SEMESTER 2</th>
<th>SEMESTER 3</th>
<th>SEMESTER 4</th>
<th>SEMESTER BREAK</th>
<th>SEMESTER 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>CORE PROGRAM (P)</td>
<td></td>
<td>DEKA 1212 ALGEBRA</td>
<td>DEKA 1222 CALCULUS</td>
<td>DEKA 2332 DIFFERENTIAL EQUATION</td>
<td>DEKA 2342 ENGINEERING MATHEMATICS</td>
<td>DEKU 2363 INDUSTRIAL TRAINING</td>
<td>DEK 3643 AUTOMATION</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DEKA 1213 PHYSICS</td>
<td>DITG 1113 COMPUTER PROGRAMMING</td>
<td>DEKM 3753 ELECTRICAL MACHINES</td>
<td>DEKE 3443 POWER ELECTRONICS</td>
<td>DEKU 2362 INDUSTRIAL TRAINING REPORT</td>
<td>DEKP 3463 DIPLOMA PROJECT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DITG 1112 COMPUTER SKILLS</td>
<td>DMG 1323 INTRODUCTION TO MECHANICAL SYSTEM</td>
<td>DEKE 2443 ANALOGUE ELECTRONICS II</td>
<td>DEKC 3813 CONTROL SYSTEM ENGINEERING</td>
<td></td>
<td>DEKP 3763 POWER SYSTEM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DEKP 1213 ELECTRICAL CIRCUIT I</td>
<td>DEKP 1223 ELECTRICAL CIRCUIT II</td>
<td>DEKP 2241 ELECTRIC WORKSHOP II</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>DEKP 1212 ELECTRICAL WORKSHOP I</td>
<td>DEKE 2333 ANALOGUE ELECTRONICS I</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>DEKE 2333 DIGITAL ELECTRONICS</td>
<td></td>
<td></td>
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<tr>
<td>CREDIT HOUR SEMESTER</td>
<td></td>
<td>14</td>
<td>15</td>
<td>14</td>
<td>14</td>
<td>5</td>
<td>9</td>
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<td>ELECTIVE (E)</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>UNIVERSITY REQUIREMENT (W)</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>DLHW 1012 FOUNDATION ENGLISH</td>
<td>DLHW 2422 ENGLISH FOR EFFECTIVE COMMUNICATION</td>
<td>DLHW 3432 ENGLISH FOR MARKABILITY</td>
<td>DTKKX 2XX1 CO-CURRICULUM II</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>DLHW 1032 MALAYSIA STUDIES</td>
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<td></td>
<td>DLHW 1742 LEADERSHIP</td>
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<td></td>
<td>DLHW 1722 PHILOSOPHY OF SCIENCE &amp; TECHNOLOGY</td>
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<td></td>
<td></td>
<td>DKKX 1XX1 CO-CURRICULUM I</td>
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<tr>
<td>CREDIT HOUR SEMESTER</td>
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<td>6</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
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<tr>
<td>TOTAL CREDIT</td>
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<td>6</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>16</td>
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</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>SEMESTER</th>
<th>CODE</th>
<th>COURSE</th>
<th>CATEGORY</th>
<th>CREDIT HOUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>KHAS</td>
<td>DLHW 1012</td>
<td>FOUNDATION ENGLISH</td>
<td>W</td>
<td>2</td>
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<tr>
<td>Permulaan</td>
<td>DLHW 1742</td>
<td>LEADERSHIP</td>
<td>W</td>
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<tr>
<td></td>
<td>DLHW 1722</td>
<td>PHILOSOPHY OF SCIENCE &amp; TECHNOLOGY</td>
<td>W</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
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<tr>
<td></td>
<td>DEKA 1212</td>
<td>ALGEBRA</td>
<td>P</td>
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</tr>
<tr>
<td></td>
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<td>COMPUTER SKILLS</td>
<td>P</td>
<td>2</td>
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<tr>
<td></td>
<td>DEKA 1213</td>
<td>PHYSICS</td>
<td>P</td>
<td>3</td>
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<td></td>
<td>DEKP 1213</td>
<td>ELECTRICAL CIRCUIT I</td>
<td>P</td>
<td>3</td>
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<td>DEKP 1121</td>
<td>ELECTRICAL WORKSHOP I</td>
<td>P</td>
<td>1</td>
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<td></td>
<td>DEKE 2333</td>
<td>DIGITAL ELECTRONICS</td>
<td>P</td>
<td>3</td>
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<td>DLHW 1032</td>
<td>MALAYSIA STUDIES</td>
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<td>CO-CURRICULUM I</td>
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<tr>
<td></td>
<td>DEKA 1222</td>
<td>CALCULUS</td>
<td>P</td>
<td>2</td>
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<td>ELECTRICAL CIRCUIT II</td>
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<td>3</td>
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<td></td>
<td>DMCG 1323</td>
<td>INTRODUCTION TO MECHANICAL SYSTEM</td>
<td>P</td>
<td>3</td>
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<td>DITG 1113</td>
<td>COMPUTER PROGRAMMING</td>
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<td>3</td>
</tr>
<tr>
<td></td>
<td>DEKE 2433</td>
<td>ANALOGUE ELECTRONICS I</td>
<td>P</td>
<td>3</td>
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<td>DLHW 2422</td>
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<td>3</td>
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<td>P</td>
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<td>DEKC 3453</td>
<td>MICROPROCESSOR</td>
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<td>CO-CURRICULUM II</td>
<td>W</td>
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<td>DEKA 2342</td>
<td>ENGINEERING MATHEMATICS</td>
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</tr>
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<td></td>
<td>DEKE 3443</td>
<td>POWER ELECTRONICS</td>
<td>P</td>
<td>3</td>
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<td>DEKC 3813</td>
<td>CONTROL SYSTEM ENGINEERING</td>
<td>P</td>
<td>3</td>
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<td>DEKC 3433</td>
<td>COMMUNICATION ENGINEERING</td>
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<td>DEKP 3353</td>
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<tr>
<td>SEMESTER</td>
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</tr>
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<td>---------</td>
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<td>SEMESTER KHAS</td>
<td>DEKU 2363</td>
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**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

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

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

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)

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
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 statistical analysis (PO1).
3. Demonstrate experiment on DC/AC meter and bridge (PO3).
4. Explain the principle of Data Acquisition System in instrumentation (PO1).
5. Design signal conditioning element based 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 DC bridges. It also introduces the principle of data acquisition system used in instrumentation.

References
2. UA Bakshi, AV Bakshi and KA Bakshi, Electronic Measurements and Instrumentation, Technical Publications Pune, 2009
5. BC Nakra and KK Chaudry, Instrumentation, Measurement and 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, superheterodyne 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

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
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

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

DEKE 2433
ANALOGUE ELECTRONICS I

Learning Outcomes
Upon completion this course, the students should be able to:
1. Interpret 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

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-scare simulation software for circuit designing as well as hardware experiments during laboratory will be implemented.

References

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

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

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).

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

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 resistance 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

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 adequately (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

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

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

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 the students the most recent development on the sustainable electrical systems development. This includes context, drivers and the up-to-date 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

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
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 curriculum 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

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, PO2).
3. Produce program codes by applying suitable programming structure and techniques (PO1, PO2, 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

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

**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**

**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**

**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

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

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

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 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 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:

<table>
<thead>
<tr>
<th>NO</th>
<th>PROGRAMME OUTCOMES (PO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>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)</td>
</tr>
<tr>
<td>2.</td>
<td>Ability to identify, formulate, research literature and analyse complex electrical/mechatronics engineering problems reaching substantiated conclusion. (K,S,A)</td>
</tr>
<tr>
<td>3.</td>
<td>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)</td>
</tr>
<tr>
<td>4.</td>
<td>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)</td>
</tr>
<tr>
<td>5.</td>
<td>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)</td>
</tr>
<tr>
<td>6.</td>
<td>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)</td>
</tr>
<tr>
<td>NO</td>
<td>PROGRAMME OUTCOMES (PO)</td>
</tr>
<tr>
<td>----</td>
<td>-------------------------</td>
</tr>
<tr>
<td>7.</td>
<td>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)</td>
</tr>
<tr>
<td>8.</td>
<td>Ability to apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. (K,A)</td>
</tr>
<tr>
<td>9.</td>
<td>Communicate effectively on complex engineering activities with the engineering community and with society at large through presentation or technical writing. (S,A)</td>
</tr>
<tr>
<td>10.</td>
<td>Ability to function effectively either as a member or a leader in a team and in multi-disciplinary environment. (S,A)</td>
</tr>
<tr>
<td>11.</td>
<td>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)</td>
</tr>
<tr>
<td>12.</td>
<td>Ability to demonstrate knowledge and understanding of engineering economics, management principles and entrepreneurship skills as applied in the electrical engineering profession. (K,A)</td>
</tr>
</tbody>
</table>
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.

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:

<table>
<thead>
<tr>
<th>Components</th>
<th>Credit Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>University Requirements (W)</td>
<td>14</td>
<td>10.37%</td>
</tr>
<tr>
<td>Core (P) Common</td>
<td>38</td>
<td>28.15%</td>
</tr>
<tr>
<td>Program</td>
<td>65</td>
<td>48.15%</td>
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<tr>
<td>Industrial Practical</td>
<td>5</td>
<td>3.70%</td>
</tr>
<tr>
<td>Electives (E) University</td>
<td>4</td>
<td>2.96%</td>
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<tr>
<td>Program</td>
<td>9</td>
<td>6.67%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>135</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

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.
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

<table>
<thead>
<tr>
<th>TYPE COURSE</th>
<th>SEMESTER 1</th>
<th>SEMESTER 2</th>
<th>SEMESTER 3</th>
<th>SEMESTER 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMMON CORE &amp; PROGRAM CORE</td>
<td>BMFG 1313 ENGINEERING MATHEMATICS I</td>
<td>BMCG 1013 DIFFERENTIAL EQUATIONS</td>
<td>BEKG 2443 ENGINEERING MATHEMATICS II</td>
<td>BENG 2143 ENGINEERING STATISTICS</td>
</tr>
<tr>
<td></td>
<td>BITG 1233 COMPUTER PROGRAMMING</td>
<td>BENG 1413 DIGITAL ELECTRONICS</td>
<td>BMCG 1523 ENGINEERING GRAPHICS AND CAD</td>
<td>BMCG 2432 INTRODUCTION TO MECHANICAL ENGINEERING</td>
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<tr>
<td></td>
<td>BEKG 1123 PRINCIPLES OF ELECTRIC AND ELECTRONICS</td>
<td>BEKG 1233 PRINCIPLES OF INSTRUMENTATION AND MEASUREMENT</td>
<td>BEKU 2333 ELECTRIC CIRCUIT II</td>
<td>BEKG 2433 ELECTRICAL SYSTEMS</td>
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<td>BMFG 1213 ENGINEERING MATERIALS</td>
<td>BEKU 1123 ELECTRIC CIRCUIT I</td>
<td>BEKE 2333 ANALOGUE ELECTRONICS</td>
<td>BEK 2453 ELECTROMAGNETIC THEORY</td>
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<td></td>
<td>BEKB 1131 ENGINEERING PRACTICE I</td>
<td>BEKB 1231 ENGINEERING PRACTICE II</td>
<td>BEK 2433 SIGNAL &amp; SYSTEMS</td>
<td>BEK 2453 COMMUNICATION SYSTEMS</td>
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<td>16</td>
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<td>ELECTIVE (E)</td>
<td>BLHL 1XX2 ELECTIVE I (UNIVERSITY)</td>
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<td>CREDIT HOUR SEMESTER</td>
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<td>UNIVERSITY REQUIREMENTS (W)</td>
<td>BKKX XXX1 CO-CURRICULUM I</td>
<td>BKKX XXX1 CO-CURRICULUM II</td>
<td>BLHW 2452 ACADEMIC WRITING</td>
<td>#BLHW 2712 ETHNIC RELATIONS</td>
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<td>#BLHW 1702 TITAS</td>
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<td>** BKKX XXX1 CO-CURRICULUM (SUUKSIS)</td>
<td>*BLHW 2752 MALAYSIAN CULTURE</td>
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<td>*BLHW 1742 MALAYSIAN STUDIES</td>
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<td>BLHW 1442 ENGLISH FOR ACADEMIC PURPOSE</td>
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<td>CREDIT HOUR SEMESTER</td>
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<td>TYPE COURSE</td>
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<td>-------------</td>
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</tr>
<tr>
<td><strong>COMMON CORE &amp; PROGRAM CORE (P)</strong></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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<td>BEKE 3533 ELECTRICAL MACHINE</td>
<td>BEKE 4753 ELECTRICAL DRIVES</td>
<td>BEKU 3695 INDUSTRIAL TRAINNING</td>
<td>BEKU 4861 ENGINEERING SEMINAR</td>
<td>BENG 4322 ENGINEER AND SOCIETY</td>
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<tr>
<td>BEKC 3523 CONTROL SYSTEMS ENGINEERING</td>
<td>BEKC 3663 INSTRUMENTATION AND CONTROL</td>
<td>BEKU 4792 FINAL YEAR PROJECT I</td>
<td>BEKP 4843 RENEWABLE ENERGY</td>
<td>BEKP 4853 ENERGY UTILLIZATION AND CONSERVATION</td>
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<tr>
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**Subjected to the courses offer by the faculty in the current semester**
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.

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* COMPULSORY FOR INTERNATIONAL STUDENTS ONLY
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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

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
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
5. Thomas L. Floyd, Digital Fundamentals, Prentice Hall, 10th Ed.

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. Construct 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. Demonstrate 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

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 practical aspects of the above mentioned fields.

References
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. (PO7)
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. (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

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

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

References

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

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 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

BEKC 3663
INSTRUMENTATION AND CONTROL

Learning Outcomes
Upon completion of this course, the student should be able to:
4. Apply and analyze the appropriate 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

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
2. Kenji Sugawara; Artificial Intelligence; Morikita; 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

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 contains 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

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

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, Introduction to Power Electronics, Prentice Hall. (Text Book)

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 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

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

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

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

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 accelerometer meter. It also introduces oscilloscope and sensors for instrumentation application.
References

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 emphasizing 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

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

References

BEKM 4863
INDUSTRIAL ROBOTICS

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

References

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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**


**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. Identify 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**


**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**  
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**  

**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-date 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**

5. MS 1837: 2010 'Installation of Grid-Connected Photovoltaic (PV) System (First Revision).

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**

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

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, 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

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)

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. (PO2)
2. Conduct investigation using research based knowledge and methods. (PO4)
3. Apply ethical principles in project implementation (PO8)
4. Present the results in written and in oral format effectively. (PO9)
5. Identify basic entrepreneurship skills in project management. (PO12)
6. Apply reasoning informed by contextual knowledge. (PO6)
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

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

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

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

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

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


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
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

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

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.

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

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

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.
3. Membincangkan secara mudah tentang sesuatu topik semasa.
4. Membina ayat dan bertutur dalam bahasa Melayu dengan grammatis.

Synopsis

References
**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 (P07)
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**

**BLHL 1XX2**

**JAPANESE**

**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 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**
2. Minna no Nihongo 1, Translation & Grammatical Notes, 3A Corporation, Tokyo, 2002.

**BLHL 1XX2**

**MANDARIN**

**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 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

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 ketamadunan, 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

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 countries in 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

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

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 in Malaysian 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

BTMW 4012
ENTREPRENEURSHIP 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

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)
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.

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:

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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.
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

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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

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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

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
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

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

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**


**References**


**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**


**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

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

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 automation 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
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
5. Kenji Sugawara; Artificial Intelligence; Morikita; 1997.

BEKC 4883
ADVANCED MANUFACTURING SYSTEM

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
2. Kenji Sugawara; Artificial Intelligence; Morikita; 1997.
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

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

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

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

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 emphasized, 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
5. DP Kothari, IJ Nagrath, Modern Power System Analysis, 3rd Ed, 2005

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**

**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 mechanical 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 switches, solid-state switches, solenoids, D.C. motors, A.C. motors, stepper motors. Mathematical models, mechatanical 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

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

BEKM 3543
ELECTROMECHANICAL SYSTEM

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Defined and desirable 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

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
3. Course Files of BEKC 4753 and BMCG 3643, FKE, UTeM.

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
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, repeatability and reliability of the robot performances by using statistical method.

References

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. (P01)
2. Apply knowledge in physics and mathematics to the solution of complex dynamics problem. (P01)
3. Apply knowledge in mathematics to the solution of complex trajectory generation motion. (P01)
4. Apply knowledge in control engineering to the solution of robotics control problem.(P01)

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
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 understanding 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

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

References

BEKP 2333
CIRCUITS ANALYSIS

Learning Outcomes
Upon completion of this course, the student should be able to:
2. Apply Mesh and Nodal methods for dc and ac circuits’ analysis.

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

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(P05)
3. Construct RLC circuits using electrical components with appropriate tools(P05)
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
7. File Subjek BEKU 2333 (Litar Elektrik 2).

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 curriculum 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 (PO2)
2. Conduct investigation using research based knowledge and methods (PO4)
3. Apply ethical principles in project implementation (PO8)
4. Present the results in written and in oral format effectively (PO9)
5. Identify basic entrepreneurship skills in project management (PO12)
6. Apply reasoning informed by contextual knowledge (PO6)
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)
4. 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

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

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 global issues 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**


**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**


**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

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

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
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

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
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

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

Reference
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

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)

References

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

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 allows students to critically evaluate business in terms of technical feasibility, investment potential, and risks.

References

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

1. Memberikan respon terhadap perbualan biasa dan situasi-situasi lain.
3. Membincangkan secara mudah tentang sesuatu topik semasa.
4. Membina ayat dan bertutur dalam bahasa Melayu dengan gramatis.

Synopsis

References

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 (P07)
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 students is based on information from oral texts and face-to-face or group activities.

References:
5. Abdul Rahim (2010). *Pembelajaran bahasa Arab bagi golongan yang bukan Arab*, (Bil. 1). Saudi Arabia: Kuliah Bahasa Arab UIM.

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:

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:
2. Minna no Nihongo shokyu 1, (Beginners 1) Translation & Grammatical Notes, 3A Network 2012.

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:
**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 countries in 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 Malaysia’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**

**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. (PO6)
2. Menghubungkait respons tentang isu dan cabaran etnik budaya di Malaysia. (PO11)
3. Merumus isu-isu perpaduan dan cadangan untuk memperkasakannya di Malaysia. (PO11)

**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 menggupas 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**

**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 in Malaysian 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.
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.

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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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- **2nd & 3rd Floor**: Lecturer rooms

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- **1st Floor**: Lecturers’ rooms, Discussion Room 1 & 2
- **2nd Floor**: Lecturers’ rooms, Discussion room 4 & 5
- **3rd Floor**: Lecturers’ rooms

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- **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)

<table>
<thead>
<tr>
<th>NO</th>
<th>LABORATORY / WORKSHOP NAME</th>
<th>ROOM NO.</th>
<th>EQUIPMENTS</th>
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<tr>
<td>1</td>
<td>Power system Laboratory 1</td>
<td>ME1 (E/G-2)</td>
<td>TERCO Transmission System Training Set, TERCO Power Utilization System Training Set</td>
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<td>Power system Laboratory 2</td>
<td>ME2 (E/G-7)</td>
<td>TERCO Generation System Training Set</td>
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<td>Energy Efficiency Laboratory</td>
<td>ME3 (E/1-19)</td>
<td>Various tools &amp; equipment of energy efficiency studies</td>
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<td>Protection system Laboratory</td>
<td>ME4 (F/G-27)</td>
<td>LABVOLT Protection System Training Set, PC</td>
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<td>Electrical &amp; Electronic Laboratory 1</td>
<td>ME5 (F/2-4)</td>
<td>PCs, Function Generators, Oscilloscopes, Digital Lab Trainers, Multimeters</td>
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<td>Electrical &amp; Electronic Laboratory 2</td>
<td>ME6 (F/2-15)</td>
<td>PCs, Function Generators, Oscilloscopes, Digital Lab Trainers, Multimeters</td>
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<td>Electrical Technology Laboratory 1</td>
<td>ME7 (D/2-11)</td>
<td>LABVOLT meters, loads, tools &amp; equipments for electrical technology studies</td>
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<td>8</td>
<td>Control, Instrumentation &amp; Automation(CIA) Simulation Laboratory</td>
<td>ME12 (E/1-14)</td>
<td>PC c/w Matlab &amp; Multisim, Micro-Box</td>
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<td>PLC &amp; Process Control Laboratory</td>
<td>ME13 (E/3-13)</td>
<td>OMRON PLC Training Set, Test Panel DOL Motor Starter, Test Panel STAR-DELTA Motor Starter and various equipments of automation</td>
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<td>Microprocessor Laboratory</td>
<td>ME14 (F/3-8)</td>
<td>PCs, Oscilloscopes, Multitester, Mechatronics project kit, PIC Training Kit</td>
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<td>Instrumentation and DSP Laboratory</td>
<td>ME15 (F/3-5)</td>
<td>LORENZO CBT Modul, Multimeters, function generators, digital lab trainer, analog oscilloscope, magnaprobe, Galvanometer, Decade resistor, Decade Inductor</td>
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<td>BE25 (F/G-4)</td>
<td>Wiring bays, tools and equipments for domestic &amp; motor control/starter wiring</td>
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<td>BE26 (D/1-10B)</td>
<td>CIM System, AGV, CNC machine, OMRON machine vision, robot arm training set</td>
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<td>Hitachi bench drill, welding set, grinder, break cutter, pallet jack, spanner Canada</td>
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<td>Electronics Components</td>
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<td>Mechatronic System Laboratory</td>
<td>ME29 (F/3-2)</td>
<td>PCB machine</td>
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### RESEARCH LABORATORIES (POSTGRADUATE)

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<th>RESEARCH FIELD</th>
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| 1  | Robotics & Industrial Automation Research Laboratory | ME27 (F/G – 6) | • Assistive/ rehabilitatio robotics  
• Mobile robot navigation  
• Artificial Intelligence |
| 2  | Motion Control Research Laboratory | ME16 (E/2–16) | • Precision Motion Control  
• Control Theory  
• Precision Actuator Design  
• Robotics, Biped Robot |
| 3  | Underwater Technology Research Laboratory | ME9 (F/G–22) | • Remotely Operated Vehicle  
• Surface Vessel System  
• Underwater Sensory Technology |
| 4  | Power Electronics and Drives Research Laboratory | MP2 (E/1 -3) | • Direct Torque Control of Induction/PM machines.  
• Multilevel/Multiphase Inverters  
• Power Converters for Battery Management Sys. & PV Applications |
| 5  | Electrical Machine Design Research Laboratory | D / G - 11 | • Permanent magnet machine: Designs and Applications  
• Switched Reluctance and Bearingless motor.  
• Condition Monitoring of Electric Machines. |
| 6  | Electric Vehicle Drives Research Laboratory | BPS2 (E/1-4) | • Sensorles PMSM Drives  
• Electric Vehicle Drives using Dual-motor  
• Control  
• Five-Leg Inverter for Dual-machine Drives |
| 7  | Solar PV System and Smart Grid Research Laboratory | D / G - 11 | • Solar PV System Design & Evaluation  
• Cost and Benefits of PV System Integration  
• Smart Grid Application |
| 8  | Energy and Power System Research Laboratory | MP3 (E/3-2) | • Optimization of electricity system  
• Energy Efficiency  
• Power System Planning and Operation |
| 9  | High Voltage Research Laboratory | ME10 (F/G-18) | • Breakdown in gases  
• Surface discharge  
• Atmospheric discharges & insulation |
| 10 | Advanced Digital Signal Processing Research Laboratory | ME24 (F/G-30) | • Neural feedback  
• Brain computer interface  
• Computer vision, graphics & visualization |
| 11 | Rehabilitation Eng. & Assistive Technology Research Laboratory | F/2-9 | • Biomedical engineering  
• Biomechanics  
• Computational and information |
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.

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**Total credit 93**

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## 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.

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|            | 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      |       |             |     |       |
|            |          |                                             |          |        |       |             |     | 17    |

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The Faculty would like to extend our gratitude and appreciation to all who have contributed to the success of Academic Handbook 2018/2019 completion:

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And all of the parties involved.

AUGUST 2018