ACADEMIC HANDBOOK
SESSION 2019/2020

Faculty of Electrical and Electronics Engineering Technology (FTKEE)
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UTeM VISION

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

UTeM MISSION

UTeM determined to lead and contribute to the wellbeing of the country and the world by:
- Promoting Knowledge Through Innovative Teaching & Learning, Research and Technical Scholarship -
  - Developing Professional Leaders with Impeccable Moral Values -
  - Generating Sustainable Development Through Smart Partnership with the Community and Industry -

UTeM MOTTO

Excellence Through Competency
UTeM GENERAL EDUCATIONAL GOALS

1. To conduct academic and professional programmes based on relevant needs of the industries.
2. To produce graduates with relevant knowledge, technical competency, soft skills, social responsibility and accountability.
3. To cultivate scientific method, critical thinking, creative and innovative problem solving and autonomy in decision making amongst graduates.
4. To foster development and innovation activities in collaboration with industries for the development of national wealth.
5. To equip graduates with leadership and teamwork skills as well as develop communication and life-long learning skills.
6. To develop technopreneurship and managerial skills amongst graduates.
7. To instill an appreciation of the arts and cultural values and awareness of healthy life styles amongst graduates.
It is my pleasure to welcome you as a student of this faculty. You are joining a multidisciplinary community of more than 165 staffs comprising of administrative and academicians. FTKEE has a growing curriculum committed to providing a quality education leading to variety of degrees including computer engineering technology, electronic engineering technology and electrical engineering technology.

Joining FTKEE, you will benefit immensely from an academically rich environment supported by advanced equipment technology and assisted by highly technical trainers and teaching engineers. In addition, you will be equipped with sound knowledge and skills relevant to the needs of multi-faceted industries which focused on the portion of the technological spectrum closest to various areas such as product design, product improvement, manufacturing, construction, system developments and engineering operational functions.

FTKEE aims to support the nation’s need for highly skilled workforces towards achieving the vision to be a high-income nation. It is a unique faculty where all the programs offered are application-oriented based on the current industrial needs and been taught by lecturers with industrial experiences. The faculty’s strong link with industries will also be beneficial to the students to be exposed to the actual industrial environment. The ready-to-practice engineering technologists are not only trained to be creative and innovative with high ethical values but with emphasis on the soft skills such as communication, team work and leadership as required by the industries.

This handbook is prepared to provide valuable information about our academic programs, which to assist you in the process of being a student at FTKEE. As a student you are responsible to consult regularly with your academic advisor particularly when it is time to register for your courses. Developing your creativity, skills and resourcefulness in such a fast changing discipline in this new millenium has many benefits in technological practices and many other future careers. At FTKEE, we are committed to creating a productive, efficient and friendly atmosphere within the faculty and welcome your partnership in this noble endeavor. We are pleased that you have chosen FTKEE and we are committed to the notion that you will continue to strive towards excellence throughout your tenure at FTKEE.

Ts. Dr. Rostam Affendi bin Hamzah,
Dean,
Faculty of Electrical & Electronic Engineering Technology.
FTKEE VISION

Our vision is to be one of the best engineering technology educational providers, well recognized locally, nationally and internationally for its achievements.

FTKEE MISSION

To provide quality programmes in engineering technology that will drive students toward achieving their educational objectives, professional goals and an engagement to life-long learning.

FTKEE MOTTO

Towards Engineering Technology Educational Excellence
FTKEE OBJECTIVES

1. To provide high quality and demanding engineering technology programme that meet current need of industry and society.
2. To produce highly skilled and competence workforce that is recognized by professional bodies nationally and internationally.
3. To implement modern and innovative approaches in our teaching and learning environment.
4. To establish network, good relationship and collaboration with universities and industries.
5. To participate in activities that supports the intellectual and economic development of business, industry, government and stakeholders.

FTKEE PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

1. To produce engineering technologists who are creative and innovative to practice in electrical / electronic / computer engineering technology fields.
2. To produce engineering technologists who are able to engage with continuous professional development and constantly adapt to evolving technologies.
3. To produce engineering technologists who are able to practice professional ethics and leadership to meet the needs of the society.
FTKEE ADMINISTRATION

TS. DR. ROSTAM AFFENDI BIN HAMZAH
DEAN

TS. DR. SYED NAJIB BIN SYED SALIM
DEPUTY DEAN (ACADEMIC)

IR. DR. MOHD FARRIZ BIN MD. BASAR
DEPUTY DEAN (RESEARCH & INDUSTRY NETWORK)

EN. MOHAMAD HANIFF BIN HARUN
DEPUTY DEAN (STUDENTS AFFAIR)

DR. MOHD BADRIL BIN NOR SHAH
HEAD OF ELECTRICAL ENGINEERING TECHNOLOGY

EN. AIMAN ZAKWAN BIN JIDIN
HEAD OF ELECTRONICS & COMPUTER ENGINEERING TECHNOLOGY

PUAN MARSITA BINTI MOHD TAIB
DEPUTY REGISTRAR
# PROGRAMME OFFERED

<table>
<thead>
<tr>
<th>No</th>
<th>Programme Name</th>
<th>Short Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bachelor of Electrical Engineering Technology (Industrial Power) with Honours</td>
<td>BEEI</td>
</tr>
<tr>
<td>2</td>
<td>Bachelor of Electrical Engineering Technology (Industrial Automation &amp; Robotics) with Honours</td>
<td>BEEEA</td>
</tr>
<tr>
<td>3</td>
<td>Bachelor of Electrical Engineering Technology with Honours</td>
<td>BEEY</td>
</tr>
<tr>
<td>4</td>
<td>Bachelor of Electronics Engineering Technology (Telecommunications) with Honours</td>
<td>BEET</td>
</tr>
<tr>
<td>5</td>
<td>Bachelor of Electronics Engineering Technology (Industrial Electronics) with Honours</td>
<td>BEEE</td>
</tr>
<tr>
<td>6</td>
<td>Bachelor of Computer Engineering Technology (Computer Systems) with Honours</td>
<td>BEEC</td>
</tr>
<tr>
<td>7</td>
<td>Bachelor of Electronic Engineering Technology with Honours</td>
<td>BEEZ</td>
</tr>
</tbody>
</table>
PROGRAMME DURATION

The Bachelor’s Degree duration is within minimum of 4 years and up to maximum of 6 years.

GRADING SYSTEM

A student’s achievement for each subject is based on the grades which are illustrated in Table 1.

<table>
<thead>
<tr>
<th>Marks</th>
<th>Grade</th>
<th>Points</th>
<th>Achievements</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 – 100</td>
<td>A</td>
<td>4.0</td>
<td>Distinction</td>
</tr>
<tr>
<td>75 – 79</td>
<td>A-</td>
<td>3.7</td>
<td>Distinction</td>
</tr>
<tr>
<td>70 – 74</td>
<td>B+</td>
<td>3.3</td>
<td>Merit</td>
</tr>
<tr>
<td>65 – 69</td>
<td>B</td>
<td>3.0</td>
<td>Merit</td>
</tr>
<tr>
<td>60 – 64</td>
<td>B-</td>
<td>2.7</td>
<td>Merit</td>
</tr>
<tr>
<td>55 – 59</td>
<td>C+</td>
<td>2.3</td>
<td>Pass</td>
</tr>
<tr>
<td>50 – 54</td>
<td>C</td>
<td>2.0</td>
<td>Pass</td>
</tr>
<tr>
<td>47 – 49</td>
<td>C-</td>
<td>1.7</td>
<td>Conditional Pass</td>
</tr>
<tr>
<td>44 – 46</td>
<td>D+</td>
<td>1.3</td>
<td>Conditional Pass</td>
</tr>
<tr>
<td>40 – 43</td>
<td>D</td>
<td>1.0</td>
<td>Conditional Pass</td>
</tr>
<tr>
<td>0 – 39</td>
<td>E</td>
<td>0.0</td>
<td>Fail</td>
</tr>
</tbody>
</table>
ACADEMIC CLASSIFICATION

A student’s achievement is evaluated based on Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA). A student’s academic status will be provided at the end of each semester based on CGPA as shown in Table 2.

<table>
<thead>
<tr>
<th>STATUS</th>
<th>CGPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good (KB)</td>
<td>CGPA ≥ 2.00</td>
</tr>
<tr>
<td>Conditional (KS)</td>
<td>1.70 ≤ CGPA &lt; 2.00</td>
</tr>
<tr>
<td>Fail (KG)</td>
<td>CGPA &lt; 1.70</td>
</tr>
</tbody>
</table>

(Note: KB = Kedudukan Baik, KS = Kedudukan Bersyarat, KG = Kedudukan Gagal)

ACADEMIC ADVISORY SYSTEM

Students are free to take subjects offered by the faculty at any semester based on their capability, as long as it complies with the rules and regulations set up by the faculty and university academic board. Students need to plan their own study carefully and the faculty shall appoint an academic advisor to guide them during their duration of study in the university.

Characteristics of the Semester System:
• Students are free to take any subjects offered in each semester based on their ability; and conditions of subject selection are determined by the faculty and university’s academics regulations.
• Students should plan their study and learning appropriately or as advised by their academic advisor.

The Importance of Academic Advisor:
• Students need to be guided in term of subjects taken under the semester system, where they are free to determine the number of subjects to be taken based on their capability or in case the student obtained a Conditional Position (KS) in the previous semester. They need to plan carefully to take subjects 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 whilst complying with 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 subjects taken, difficulty may be expected for him/her to discuss on the matter of study with the others. Thereby, the role of academic advisor is important.

Roles and Responsibilities of student and academic advisor in the Academic Advisory System are as follows:

<table>
<thead>
<tr>
<th>Academic Advisor</th>
<th>Student</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Conduct a meeting with students at least twice 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 meetings conducted by the academic advisor.</td>
</tr>
<tr>
<td>• Guide and make sure student's subjects registration is based on his/her current academic result.</td>
<td>• Regard the academic advisor as a mentor and seek advice on the academic matters from them.</td>
</tr>
<tr>
<td>• Supervise the student study progress and provide guidance in making a good study planning.</td>
<td>• Learn to have a good understanding of the academic system.</td>
</tr>
<tr>
<td>• Inspire students so that they will always be motivated in their study.</td>
<td>• Provide a copy of examination result to the academic advisor for each semester.</td>
</tr>
<tr>
<td>• Ensure the student's record and file is always updated – make sure no subject is missed to fulfill the requirement for the award of a Bachelor's Degree.</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 certain department/centre for further action if necessary.</td>
<td>• Keep records on all subjects that have already been taken during the period of study to prevent missed subject and fulfill the requirement for degree award.</td>
</tr>
</tbody>
</table>
**GPA & CGPA CALCULATION**

A student’s overall achievement is based on Grade Point Average (GPA) obtained for a particular semester and Cumulative Grade Point Average (CGPA) for the semesters that have been completed.

**Grade Point Average (GPA)**
GPA is the grade point average obtained in a particular semester. It is based on the following calculations:

\[
\text{Total Points, } JMN = k_1m_1 + k_2m_2 + \ldots + k_nm_n \\
\text{Total Calculated Credits, } JKK = k_1 + k_2 + \ldots + k_n \\
\text{GPA} = \frac{JMN}{JKK} = \frac{k_1m_1 + k_2m_2 + \ldots + k_nm_n}{k_1 + k_2 + \ldots + k_n}
\]

**Cumulative Grade Point Average (CGPA)**
CGPA is the cumulative grade point average obtained for the semesters that have been completed. It is based on the following calculations:

\[
\text{CGPA} = \frac{[JMN_1 + JMN_2 + \ldots + JMN_n]}{[JKK_1 + JKK_2 + \ldots + JKK_n]}
\]

Where:  
\( JMN_n = \text{Total points obtained in } n \text{ semester} \)  
\( JKK_n = \text{Total credits in } n \text{ semester} \)
AWARD

A Bachelor’s Degree shall be awarded if all the following conditions are fulfilled by the student:

1. Must get Good (KB) status in the final semester.
2. Pass all the subjects required as listed in the course curriculum.
3. Apply for the award of the degree, approved by the faculty and certified by senate.
4. Pass MUET according to the university directive.
5. Meet all the other university requirements.
# ELECTRICAL ENGINEERING TECHNOLOGY

## PROGRAMME LEARNING OUTCOMES (PLO)

<table>
<thead>
<tr>
<th>PLO</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLO1</td>
<td>Ability to apply knowledge of mathematics, science, engineering fundamentals and engineering specialization principles to defined and applied engineering procedures, processes, systems or methodologies in the field of electrical engineering technology (industrial automation &amp; robotics / industrial power).</td>
</tr>
<tr>
<td>PLO2</td>
<td>Ability to solve broadly-defined engineering problems systematically to reach substantiated conclusions, using tools and techniques appropriate to electrical engineering technology (industrial automation &amp; robotics / industrial power).</td>
</tr>
<tr>
<td>PLO3</td>
<td>Ability to design solutions for broadly-defined engineering technology problems, and to design systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, environmental and sustainability concerns.</td>
</tr>
<tr>
<td>PLO4</td>
<td>Ability to plan and conduct experimental investigations of broadly-defined problems, using data from relevant sources.</td>
</tr>
<tr>
<td>PLO5</td>
<td>Ability to select and apply appropriate techniques, resources and modern engineering tools, with an understanding of their limitations.</td>
</tr>
<tr>
<td>PLO6</td>
<td>Ability to demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities.</td>
</tr>
<tr>
<td>PLO7</td>
<td>Ability to demonstrate an understanding of the impact of engineering technology practices, taking into account the need for sustainable development.</td>
</tr>
<tr>
<td>PLO8</td>
<td>Ability to demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices.</td>
</tr>
<tr>
<td>PLO9</td>
<td>Ability to function effectively as individuals, and as members or leaders in diverse technical teams.</td>
</tr>
<tr>
<td>PLO10</td>
<td>Ability to communicate effectively with the engineering community and society at large.</td>
</tr>
<tr>
<td>PLO11</td>
<td>Ability to demonstrate an awareness of project management, business practices and entrepreneurship.</td>
</tr>
<tr>
<td>PLO12</td>
<td>Ability to recognise the need for professional development and to engage in independent and lifelong learning.</td>
</tr>
</tbody>
</table>
Bachelor of Electrical Engineering Technology (Industrial Power) with Honours (BEEI)

<table>
<thead>
<tr>
<th>SEMESTER 1</th>
<th>CODE</th>
<th>SUBJECT</th>
<th>CATEGORY</th>
<th>CREDIT</th>
<th>PRE-REQUISITE</th>
</tr>
</thead>
</table>
|            | BEEU 1013 | Matematik Teknikal  
**Technical Mathematics** | P        | 3      |               |
|            | BEEY 1303 | Sistem Pengukuran & Instrumentasi  
**Measurement & Instrumentation Systems** | K        | 3      |               |
|            | BEEA 1313 | Rekabentuk Terbantu Komputer  
**Computer Aided Design** | K        | 3      |               |
|            | BEEA 1304 | Elektronik & Sistem Digital  
**Digital Electronics & Systems** | K        | 4      |               |
|            | BEEI 1303 | Pengenalan Litar Elektrik  
**Electrical Circuit Fundamental** | K        | 3      |               |
|            | BLHW 1762 | Falsafah dan Isu Semasa  
(untuk pelajar tempatan)  
**Philosophy and Current Issue**  
(for local students) | W        | 2      |               |
|            | BLHL 1012 | Bahasa Melayu Komunikasi 1  
(untuk pelajar antarabangsa)  
**Malay Language for Communication**  
(for international students) |           |        |               |
|            | BKKX XXX1 | Kokurikulum I  
**Curriculum I** | W        | 1      |               |
|            |         | **TOTAL CREDITS THIS SEMESTER** |     | **19** |               |
| SEMESTER 2 | BEEU 1023 | Kalkulus untuk Teknologi  
**Calculus for Technology** | P        | 3      |               |
|            | BEEI 1311 | Bengkel Elektrik I  
**Electrical Workshop I** | K        | 1      |               |
|            | BEEI 1323 | Elektrik & Kemagnetan  
**Electrical & Magnetism** | K        | 3      |               |
|            | **BEEI 1333** | Litar Elektrik Lanjutan  
**Advanced Electrical Circuits** | K        | 3      | BEEI 1303 |
|            | BEEA 1343 | Pengaturcaraan Komputer  
**Computer Programming** | K        | 3      |               |
|            | BEEI 1453 | Prinsip Elektronik  
**Electronic Principle** | K        | 3      |               |
|            | BLHW 1442 | Bahasa Inggeris untuk Akademik  
**English for Academic Purposes** | W        | 2      |               |
|            |         | **TOTAL CREDITS THIS SEMESTER** |     | **18** |               |
### SEMESTER 3

<table>
<thead>
<tr>
<th>CODE</th>
<th>SUBJECT</th>
<th>CATEGORY</th>
<th>CREDIT</th>
<th>PRE-REQUISITE</th>
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</thead>
<tbody>
<tr>
<td>BEEU 2033</td>
<td>Kalkulus Lanjutan untuk Teknologi &lt;br&gt; Advanced Calculus for Technology</td>
<td>P</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BEEA 2061</td>
<td>Seminar Kejuruteraan I &lt;br&gt; Engineering Seminar I</td>
<td>P</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>BEEI 2342</strong></td>
<td>Bengkel Elektrik II &lt;br&gt; Electrical Workshop II</td>
<td>K</td>
<td>2</td>
<td>BEEI 1311</td>
</tr>
<tr>
<td>BEEI 2373</td>
<td>Mesin Elektrik &lt;br&gt; Electrical Machines</td>
<td>K</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BEEI 2364</td>
<td>Teknologi Elektrik &lt;br&gt; Electrical Technology</td>
<td>K</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>BEEA 2383</td>
<td>Pengenalan Sistem Kawalan &lt;br&gt; Control System Fundamental</td>
<td>K</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BKKX XXX1</td>
<td>Kokurikulum II &lt;br&gt; Cocurriculum II</td>
<td>W</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>BLHL 1XX2</td>
<td>Bahasa Ketiga &lt;br&gt; Third Language</td>
<td>W</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL CREDITS THIS SEMESTER**: 19

### SEMESTER 4

<table>
<thead>
<tr>
<th>CODE</th>
<th>SUBJECT</th>
<th>CATEGORY</th>
<th>CREDIT</th>
<th>PRE-REQUISITE</th>
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</thead>
<tbody>
<tr>
<td>BEEU 2043</td>
<td>Kaedah Statistik &lt;br&gt; Statistical Methods</td>
<td>P</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BEEA 2374</td>
<td>Sistem Terbenam &lt;br&gt; Embedded Systems</td>
<td>K</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>BEEI 2463</td>
<td>Termodinamik &amp; Pemindahan Haba &lt;br&gt; Thermodynamic &amp; Heat Transfer</td>
<td>K</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BEEI 2383</td>
<td>Teknologi Sistem Kuasa &lt;br&gt; Power System Technology</td>
<td>K</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BEEI 3413</td>
<td>Elektronik Kuasa &lt;br&gt; Power Electronics</td>
<td>K</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BLHW 2452</td>
<td>Penulisan Akademik &lt;br&gt; Academic Writing</td>
<td>W</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL CREDITS THIS SEMESTER**: 18
<table>
<thead>
<tr>
<th>SEMESTER 5</th>
<th>CODE</th>
<th>SUBJECT</th>
<th>CATEGORY</th>
<th>CREDIT</th>
<th>PRE-REQUISITE</th>
</tr>
</thead>
</table>
| **BEEI 3393** | Sistem Kuasa Lanjutan  
*Advanced Power System* | K | 3 | BEEI 2383 |
| BEEI 3423 | Penggerak & Pemacu  
*Actuators & Drives* | K | 3 | |
| BEEA 3414 | PLC & Automasi  
*PLC & Applications* | K | 4 | |
| BEEI 3474 | Penjanaan & Penghantaran Sistem Kuasa  
*Power System Generation & Transmission* | K | 4 | |
| **BLHW 2772** | Penghayatan Etika dan Peradaban  
*(untuk pelajar tempatan)*  
*Appreciation of Ethics and Civilisation*  
*(for local students)* | W | 2 | |
| **BLHW 1742** | Sejarah Malaysia  
*(untuk pelajar antarabangsa)*  
*(Malaysian Studies)*  
*(for international students)* | | | |
| **BLHX XXX2** | Elektif Umum  
*General Elective* | E | 2 | |
| **TOTAL CREDITS THIS SEMESTER** | | | | 18 |

<table>
<thead>
<tr>
<th>SEMESTER 6</th>
<th>CODE</th>
<th>SUBJECT</th>
<th>CATEGORY</th>
<th>CREDIT</th>
</tr>
</thead>
</table>
| BEEI 3061 | Seminar Kejuruteraan II  
*Engineering Seminar II* | P | 1 | |
| BEEU 4053 | Etika Kejuruteraan & KPPP  
*Engineering Ethics & OSHE* | P | 3 | |
| BEEU 3764 | Projek Sarjana Muda I  
*Bachelor Degree Project I* | K | 4 | |
| BEEI 4823 | Teknologi Voltan Tinggi  
*High Voltage Technology* | K | 3 | |
| BEEI 3403 | Sistem Pengagihan Kuasa  
*Power Distribution System* | K | 3 | |
| BEEI 4833 | Perlindungan Sistem Kuasa  
*Power Systems Protection* | K | 3 | |
| BLHW 3462 | Bahasa Inggeris untuk Interaksi Profesional  
*English for Professional Interaction* | W | 2 | |
| #BEEI 3100 | Kursus Persediaan Pensijilan Profesional  
*Professional Certificate Preparation Course* | | | |
| **TOTAL CREDITS THIS SEMESTER** | | | | 19 |
### Session 2019/2020

**Faculty of Electrical & Electronics Engineering Technology (FTKEE)**

#### Pre-requisite subject

For Elective I, II & III students may choose any TH subject from the list below:

<table>
<thead>
<tr>
<th>NO.</th>
<th>CODE</th>
<th>SUBJECT</th>
<th>CATEGORY</th>
<th>CREDIT</th>
<th>PRE-REQUISITE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BEEI 4803</td>
<td>Operasi &amp; Automasi Sistem Kuasa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Power Systems Operation &amp; Automation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>BEEI 4813</td>
<td>Kaedah Penambahbaikan Kualiti</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td><strong>Quality Improvement Tools</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>BEEY 3803</td>
<td>Sistem Tenaga Boleh Diperbaharui</td>
<td></td>
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<td><strong>Renewable Energy System</strong></td>
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**SEMESTER 7**

<table>
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</table>
| **BEEU 4774** | Projek Sarjana Muda II  
*Bachelor Degree Project II*                                      | K        | 4      | BEEU 3764     |
| BLHC 4032 | Pemikiran Kritis dan Kreatif (untuk pelajar tempatan)                   | W        | 2      |               |
|           | **Critical and Creative Thinking (for local students)**                 |          |        |               |
| BLHW 2752 | Kebudayaan Malaysia (untuk pelajar tempatan)                             | W        | 2      |               |
|           | **Malaysian Culture (for local students)**                              |          |        |               |
| BTMW 4012 | Keusahawanan Teknologi  
*Technology Entrepreneurship*                                       | W        | 2      |               |
| *BEEX XXXX| Elektif I  
*Elective I*                                                      | E        | 3      |               |
| *BEEX XXXX| Elektif II  
*Elective II*                                                      | E        | 3      |               |
| *BEEX XXXX| Elektif III  
*Elective III*                                                   | E        | 3      |               |

**TOTAL CREDITS THIS SEMESTER**  17

**SEMESTER 8**

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<tr>
<th>CODE</th>
<th>SUBJECT</th>
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</table>
| BEEU 4786| Latihan Industri  
*Industrial Training*                                                    | K        | 6      |
| BEEU 4796| Laporan Latihan Industri  
*Industrial Training Report*                                              | K        | 6      |

**TOTAL CREDITS THIS SEMESTER**  12

**TOTAL CREDITS**  140

**Pre-requisite subject**
For Elective I, II & III students may choose any THREE (3) subject from the list below:

<table>
<thead>
<tr>
<th>NO.</th>
<th>CODE</th>
<th>SUBJECT</th>
</tr>
</thead>
</table>
| 1   | BEEI 4803 | Operasi & Automasi Sistem Kuasa  
*Power Systems Operation & Automation* |
| 2   | BEEI 4813 | Kaedah Penambahbaikan Kualiti  
*Quality Improvement Tools*         |
| 3   | BEEY 3803 | Sistem Tenaga Boleh Diperbaharui  
*Renewable Energy System*           |
| 4   | BEEI 4863 | Kualiti Kuasa  
*Power Quality*                     |
| 5   | BEEY 4413 | Kecekapan Tenaga  
*Energy Efficiency*                  |
| 6   | BEEI 4843 | Keserasian Elektromagnet Sistem Kuasa  
*Power Systems Electromagnetic Compatibility* |
| 7   | BEEA 4813 | Kawalan Proses Industri  
*Industrial Process Control*         |
| 8   | BEEI 4853 | Ekonomi Sistem dan Pasaran Elektrik  
*Electricity Market and System Economics* |

For General elective, students may choose any ONE (1) subject from the list below:

<table>
<thead>
<tr>
<th>CODE</th>
<th>SUBJECT NAME</th>
</tr>
</thead>
</table>
| BLHW 1722 | Falsafah Sains dan Teknologi  
*Philosophy of Science and Technology*                                     |
| BLHC 4012 | Komunikasi Organisasi  
*Organizational Communication*                                                |
| BLHH 1032 | Psikologi Industri dan Organisasi  
*Industrial Psychology and Organization*                                      |
| BLHC 4022 | Kemahiran Perundingan  
*Negotiation Skills*                                                            |
| BLXX XXXX | Sosiologi Industri  
*Industrial Sociology*                                                           |
For Professional Certificate Preparation Course, student may choose any ONE (1) certificate from the list below:

<table>
<thead>
<tr>
<th>CODE</th>
<th>CERTIFICATE NAME</th>
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</thead>
<tbody>
<tr>
<td>BEEA 3100</td>
<td>Certified LabView Associate Developer (CLAD)</td>
</tr>
<tr>
<td>BEEE 3100</td>
<td>Programmable Logic Controller (PLC) Level 1 &amp; Level 2</td>
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<tr>
<td>BEEZ 3100</td>
<td>SMCT MT1 – Practical Mechatronics 1</td>
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</table>
## Bachelor of Electrical Engineering Technology (Industrial Automation & Robotic) with Honours (BEEA)

<table>
<thead>
<tr>
<th>SEMESTER 1</th>
<th>CODE</th>
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<tbody>
<tr>
<td>BEEU 1013</td>
<td>Matematik Teknikal</td>
<td>Technical Mathematics</td>
<td>P</td>
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<tr>
<td>BEEA 1304</td>
<td>Elektronik &amp; Sistem Digital</td>
<td>Digital Electronics &amp; Systems</td>
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<tr>
<td>BEEY 1303</td>
<td>Pengukuran dan Instrumentasi</td>
<td>Measurement and Instrumentation</td>
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<td>BEEA 1313</td>
<td>Rekabentuk Terbantu Komputer</td>
<td>Computer Aided Design</td>
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<td>Pengenalan Litar Elektrik</td>
<td>Electrical Circuit Fundamental</td>
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<td>BLHW 1762</td>
<td>Falsafah dan Isu Semasa (untuk pelajar tempatan)</td>
<td>Philosophy and Current Issue (for local students)</td>
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<tr>
<td>BLHL 1012</td>
<td>Bahasa Melayu Komunikasi 1 (untuk pelajar antarabangsa)</td>
<td>Malay Language for Communication (for international students)</td>
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<td>BKKX XXX1</td>
<td>Kokurikulum I</td>
<td>Cocurriculum I</td>
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**TOTAL CREDITS THIS SEMESTER** | **19**

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<tr>
<td>BEEI 1311</td>
<td>Bengkel Elektrik I</td>
<td>Electrical Workshop I</td>
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<tr>
<td>BEEI 1323</td>
<td>Elektrik &amp; Kemagnetan</td>
<td>Electrical &amp; Magnetism</td>
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<td>BEEI 1453</td>
<td>Prinsip Elektronik</td>
<td>Electronics Principle</td>
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<tr>
<td><strong>BEEI 1333</strong></td>
<td>Litar Elektrik Lanjutan</td>
<td>Advanced Electrical Circuits</td>
<td>K</td>
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<td>BEEI 1303</td>
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<tr>
<td>BEEA 1343</td>
<td>Pengaturcaraan Komputer</td>
<td>Computer Programming</td>
<td>K</td>
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<tr>
<td>BLHW 1442</td>
<td>Bahasa Inggeris untuk Akademik</td>
<td>English for Academic Purposes</td>
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**TOTAL CREDITS THIS SEMESTER** | **18**
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<td>Seminar Kejuruteraan I Engineering Seminar I</td>
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<td><strong>BEEI 2342</strong></td>
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<tr>
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<td>Statik &amp; Mekanik Static &amp; Mechanics</td>
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<tr>
<td>BEEI 2364</td>
<td>Teknologi Elektrik Electrical Technology</td>
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<tr>
<td>BEEI 2373</td>
<td>Mesin Elektrik Electrical Machine</td>
<td>K</td>
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<tr>
<td>BLHL 1XX2</td>
<td>Bahasa Ketiga Third Language</td>
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**TOTAL CREDITS THIS SEMESTER 19**

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<tr>
<td>BEEU 2043</td>
<td>Kaedah Statistik Statistical Methods</td>
<td>P</td>
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<tr>
<td>BEEA 2374</td>
<td>Sistem Terbenam Embedded Systems</td>
<td>K</td>
<td>4</td>
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<tr>
<td>BEEI 3413</td>
<td>Elektronik Kuasa Power Electronics</td>
<td>K</td>
<td>3</td>
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<tr>
<td>BMMH 2313</td>
<td>Mekanik Bendalir Fluids Mechanics</td>
<td>K</td>
<td>3</td>
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<tr>
<td>BEEA 2383</td>
<td>Pengenalan Sistem Kawalan Control System Fundamental</td>
<td>K</td>
<td>3</td>
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<tr>
<td>BLHW 2452</td>
<td>Penulisan Akademik Academik Writing</td>
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**TOTAL CREDITS THIS SEMESTER 18**
<table>
<thead>
<tr>
<th>CODE</th>
<th>SUBJECT</th>
<th>CATEGORY</th>
<th>CREDIT</th>
<th>PRE-REQUISITE</th>
</tr>
</thead>
</table>
| BEEI 2383 | Teknologi Sistem Kuasa  
*Power System Technology* | K        | 3      |               |
| BEEA 3463 | Data Komunikasi Industri  
*Industrial Data Communication* | K        | 3      |               |
| **BEEA 3393** | Kejuruteraan Sistem Kawalan  
*Control System Engineering* | K        | 3      | BEEA 2383     |
| BEEA 3464 | PLC & Automasi  
*PLC & Automation* | K        | 4      |               |
| BLHW 2772 | Penghayatan Etika dan Peradaban  
*(untuk pelajar tempatan)*  
*Appreciation of Ethics and Civilisation  
(for local students)* | W        | 2      |               |
| BLHW 1742 | Sejarah Malaysia  
*(untuk pelajar antarabangsa)*  
*(Malaysian Studies)*  
*(for international students)* |          |        |               |
| ***BLHX XXX2** | Elektif Umum  
*General Elective* | E        | 2      |               |

**TOTAL CREDITS THIS SEMESTER**  
17

<table>
<thead>
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<th>CODE</th>
<th>SUBJECT</th>
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<th>PRE-REQUISITE</th>
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</table>
| BEEI 3061 | Seminar Kejuruteraan II  
*Engineering Seminar II* | P        | 1      |               |
| BEEU 4053 | Etika Kejuruteraan & KKPP  
*Engineering Ethics & OSHE* | P        | 3      |               |
| BEEU 3764 | Proyek Sarjana Muda I  
*Bachelor Degree Project I* | K        | 4      |               |
| BEEA 3454 | Sistem Kawalan Peggerak  
*Motion Control System* | K        | 4      |               |
| BEEA 3443 | Pneumatik & Hidraulik  
*Pneumatic & Hydraulic* | K        | 3      |               |
| BEEA 3433 | Robotik Industri  
*Industrial Robotics* | K        | 3      |               |
| BLHW 3462 | Bahasa Inggeris untuk Interaksi Profesional  
*English for Professional Interaction* | W        | 2      |               |
| #BEEX 3100 | Kursus Persediaan Pensijilan Profesional  
*Professional Certificate Preparation Course* |          |        |               |

**TOTAL CREDITS THIS SEMESTER**  
20
<table>
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<tr>
<th>CODE</th>
<th>SUBJECT</th>
<th>CATEGORY</th>
<th>CREDIT</th>
<th>PRE-REQUISIT</th>
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</table>
| **BEEU 4774** | Projek Sarjana Muda II  
* Bachelor Degree Project II | K        | 4      | BEEU 3764    |
| BLHC 4032 | Pemikiran Kritis dan Kreatif  
* (untuk pelajar tempatan)  
* Critical and Creative Thinking  
* (for local students) | W        | 2      |              |
| BLHW 2752 | Kebudayaan Malaysia  
* (untuk pelajar tempatan)  
* Malaysian Culture  
* (for local students) | W        | 2      |              |
| BTMW 4012 | Keusahawanan Teknologi  
* Technology Entrepreneurship | W        | 2      |              |
| *BEEA 48X3 | Elektif I  
* Elective I | E        | 3      |              |
| *BEEA 48X3 | Elektif II  
* Elective II | E        | 3      |              |
| *BEEA 48X3 | Elektif II  
* Elective II | E        | 3      |              |
| **TOTAL CREDITS THIS SEMESTER** | | **17** | | |
| **SEMESTER 8** | | | | |
| BEEU 4786 | Latihan Industri  
* Industrial Training | K        | 6      |              |
| BEEU 4796 | Laporan Latihan Industri  
* Industrial Training Report | K        | 6      |              |
| **TOTAL CREDITS THIS SEMESTER** | | **12** | | |
| **TOTAL CREDITS** | | **140** | | |

** Pre-requisite subject
** Pre-requisite subject

For Elective I, II and III students may choose any THREE (3) subject from the list below:

<table>
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<tr>
<th>NO.</th>
<th>CODE</th>
<th>SUBJECT</th>
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<tbody>
<tr>
<td>1</td>
<td>BEEA 4803</td>
<td>Sistem Pembuatan Teranjal Flexible Manufacturing System</td>
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<tr>
<td>2</td>
<td>BEEA 4813</td>
<td>Kawalan Proses Industri Industrial Process Control</td>
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<td>3</td>
<td>BEEA 4823</td>
<td>Penglihatan Mesin Machine Vision</td>
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<td>4</td>
<td>BEEA 4833</td>
<td>Sistem Kawalan Teragih Distributed Control System</td>
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<td>5</td>
<td>BEEA 4843</td>
<td>Sistem Pembuatan Lanjutan Advanced Manufacturing System</td>
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<tr>
<td>6</td>
<td>BEEA 4853</td>
<td>Sistem Kawalan Lanjutan Advanced Control System</td>
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<td>7</td>
<td>BEEA 4863</td>
<td>Pembelajaran Mesin Machine Learning</td>
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<tr>
<td>8</td>
<td>BMMM 3523</td>
<td>Teknologi Penyelenggaraan &amp; Pengurusan Aset Maintenance Technology &amp; Asset Management</td>
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</tbody>
</table>

*** For General elective, students may choose any ONE (1) subject from the list below:

<table>
<thead>
<tr>
<th>CODE</th>
<th>SUBJECT NAME</th>
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</thead>
<tbody>
<tr>
<td>BLHC 4012</td>
<td>Komunikasi Organisasi Organizational Communication</td>
</tr>
<tr>
<td>BLHH 1032</td>
<td>Psikologi Industri dan Organisasi Industrial Psychology and Organization</td>
</tr>
<tr>
<td>BLHC 4022</td>
<td>Kemahiran Perundingan Negotiation Skills</td>
</tr>
</tbody>
</table>
# For Professional Certificate Preparation Course, student may choose any ONE (1) certificate from the list below:

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>BEEA 3100</td>
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<tr>
<td>BEEE 3100</td>
<td>Programmable Logic Controller (PLC) Level 1 &amp; Level 2</td>
</tr>
<tr>
<td>BEEZ 3100</td>
<td>SMCT MT1 – Practical Mechatronics 1</td>
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</table>
# Bachelor of Electrical Engineering Technology with Honours (BEEY)

<table>
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<tr>
<th>CODE</th>
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<th>CATEGORY</th>
<th>CREDIT</th>
<th>PRE-REQUISITE</th>
</tr>
</thead>
</table>
| BEEU 1013 | Matematik Teknikal  
*Technical Mathematics* | P        | 3      |               |
| BEEU 1023 | Kalkulus untuk Teknologi  
*Calculus for Technology* | P        | 3      |               |
| BEEY 1013 | Fizik Teknikal  
*Technical Physics* | P        | 3      |               |
| BEEY 1303 | Pengukuran dan Sistem Instrumentasi  
*Measurement and Instrumentation System* | K        | 3      |               |
| BEEY 1313 | Rekabentuk Terbantu Komputer  
*Computer Aided Design* | K        | 3      |               |
| BEEY 1323 | Elektronik & Sistem Digital  
*Digital Electronics & System* | K        | 3      |               |
| BKKX XXX1 | Kokurikulum I  
*Cocurriculum I* | W        | 1      |               |

**TOTAL CREDITS THIS SEMESTER** 18

<table>
<thead>
<tr>
<th>CODE</th>
<th>SUBJECT</th>
<th>CATEGORY</th>
<th>CREDIT</th>
<th>PRE-REQUISITE</th>
</tr>
</thead>
</table>
| BEEY 1303 | Pengenalan Litar Elektrik  
*Electrical Circuit Fundamental* | K        | 3      |                |
| BLHW 1702 | Falsafah dan Isu Semasa  
*(untuk pelajar tempatan)*  
*Philosophy and Current Issue (for local students)* | W        | 2      |               |
| BLHL 1012 | Bahasa Melayu Komunikasi 1  
*(untuk pelajar antarabangsa)*  
*Malay Language for Communication (for international students)* | W        | 2      |               |
| BKKX XXX1 | Kokurikulum 2  
*Cocurriculum 2* | W        | 1      |               |
| BLHW 1442 | Bahasa Inggeris untuk Akademik  
*English for Academic Purposes* | W        | 2      |               |

**TOTAL CREDITS THIS SEMESTER** 18
<table>
<thead>
<tr>
<th>CODE</th>
<th>Subject</th>
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<th>Credit</th>
<th>Pre-Requisite</th>
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<tr>
<td>BEEU 2033</td>
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<td>BEEY 2333</td>
<td>Pemasangan Elektrik I Electrical Installation I</td>
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<tr>
<td>BEEY 2343</td>
<td>Peranti Elektronik Electronic Devices</td>
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<td>Teknologi Elektrik Electrical Technology</td>
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<td>Kerjaya Teknologi Kejuruteraan Elektrik Electrical Engineering Technology Career</td>
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<td>Bahasa Ketiga Third Language</td>
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**TOTAL CREDITS THIS SEMESTER** 18

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<td>Pemasangan Elektrik II Electrical Installation II</td>
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<td>BEEA 2353</td>
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<td>Penulisan Akademik Academic Writing</td>
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<td>***BLHX XXX2</td>
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**TOTAL CREDITS THIS SEMESTER** 20
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<thead>
<tr>
<th>SEMESTER 5</th>
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</table>
|            | BEEI 2373 | Mesin Elektrik<br>
*Electrical Machines* | K        | 3      |               |
|            | BEEY 3383 | Peranti Elektronik Kuasa<br>
*Power Electronics Device* | K        | 3      |               |
|            | BEEI 2383 | Teknologi Sistem Kuasa<br>
*Power System Technology* | K        | 3      |               |
|            | BEEU 3803 | Projek Rekabentuk Bersepadu<br>
*Integrated Design Project* | K        | 3      |               |
|            | BLHW 2772 | Penghayatan Etika dan Peradaban<br>
*(untuk pelajar tempatan)*<br>
*Appreciation of Ethics and Civilisation (for local students)* | W        | 2      |               |
|            | BLHW 1742 | Sejarah Malaysia<br>
*(untuk pelajar antarabangsa)*<br>
*(Malaysian Studies)*<br>
*(for international students)* |               |        |               |
|            | *BEEY 38X3 | Elektif I<br>
*Elective I* | E        | 3      |               |
|            | *BEEY 3823 | Elektif II<br>
*Elective II* | E        | 3      |               |
|            |         | **TOTAL CREDITS THIS SEMESTER**                        |          | 20     |               |
| SEMESTER 6 | BEEU 3764 | Projek Sarjana Muda I<br>
*Bachelor Degree Project I* | K        | 4      |               |
|            | BEEY 4393 | Sistem Elektronik Kuasa<br>
*Power Electronics Systems* | K        | 3      |               |
|            | BEEY 3404 | Automasi Industri<br>
*Industrial Automation* | K        | 4      |               |
|            | BLHC 4032 | Pemikiran Kritis dan Kreatif<br>
*(untuk pelajar tempatan)*<br>
*Critical and Creative Thinking (for local students)* | W        | 2      |               |
|            | BLHW 2752 | Kebudayaan Malaysia<br>
*(untuk pelajar antarabangsa)*<br>
*Malaysian Culture (for international students)* |               |        |               |
|            | BLHW 3462 | Bahasa Inggeris untuk Interaksi Profesional<br>
*English for Professional Interaction* | W        | 2      |               |
|            | *BEEY 38X3 | Elektif III<br>
*Elective III* | E        | 3      |               |
<p>|            |         | <strong>TOTAL CREDITS THIS SEMESTER</strong>                        |          | 18     |               |</p>
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<td>**BEEU 4774</td>
<td>Projek Sarjana Muda II Bachelor Degree Project II</td>
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<tr>
<td></td>
<td>BEEY 4413</td>
<td>Kecekapan Tenaga Energy Efficiency</td>
<td>K</td>
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<td>BEEI 3403</td>
<td>Reka Bentuk Sistem Pengagihan Kuasa Power Distribution System Design</td>
<td>K</td>
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<td>BTMW 4012</td>
<td>Keusahawanan Teknologi Technology Entrepreneurship</td>
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<td>Elektif IV Elective IV</td>
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<th>SEMESTER 8</th>
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<tr>
<td></td>
<td>BEEU 4786</td>
<td>Latihan Industri Industrial Training</td>
<td>K</td>
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<td>BEEU 4796</td>
<td>Laporan Latihan Industri Industrial Training Report</td>
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** Pre-requisite subject

* For Elective I, students may choose any ONE (1) subject from the list below:

<table>
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<tr>
<th>CODE</th>
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<tbody>
<tr>
<td>BEEY 3803</td>
<td>Sistem Tenaga Diperbaharui Renewable Energy System</td>
</tr>
<tr>
<td>BEEY 3813</td>
<td>Pengenalan kepada Sistem Pengangkutan Elektrik Introduction To Electric Transportation System</td>
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</table>

* For Elective II, students must choose below subject:

<table>
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<tr>
<th>CODE</th>
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<tbody>
<tr>
<td>BEEY 3823</td>
<td>Teknologi Penyimpanan Tenaga Energy Storage Technology</td>
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</table>
* For Elective III, students may choose any ONE (1) subject from the list below:

<table>
<thead>
<tr>
<th>CODE</th>
<th>SUBJECT NAME</th>
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</thead>
</table>
| BEEY 3833 | Polisi Tenaga
            | Energy Policy                       |
| BEEY 3843 | Rekabentuk Sistem PV
            | PV System Design                    |
| BEEY 3853 | Aplikasi Elektronik Kuasa
            | Power Electronics Application      |
| BEEY 3863 | Pemacu Motor dan Sistem Tarikan
            | Motor Drive and Traction System    |

* For Elective IV, students may choose any ONE (1) subject from the list below:

<table>
<thead>
<tr>
<th>CODE</th>
<th>SUBJECT NAME</th>
</tr>
</thead>
</table>
| BEEY 4873 | Trend Teknologi dalam Industri
            | Technology Trend in Industry       |
| BEEI 4843 | Keserasian Elektromagnetik Sistem Kuasa
            | Power System Electromagnetic Compatibility |
| BEEY 4903 | Sistem Pemacu Moden
            | Modern Drive System                |
| BEEY 4913 | Kenderaan Elektrik Hibriz
            | Hybrid Electric Vehicle            |

*** For General elective, students may choose any ONE (1) subject from the list below:

<table>
<thead>
<tr>
<th>CODE</th>
<th>SUBJECT NAME</th>
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</table>
| BLHW 1722 | Falsafah Sains Dan Teknologi
            | Philosophy of Science and Technology |
| BLHC 4012 | Komunikasi Organisasi
            | Organizational Communication       |
| BLHH 1032 | Psikologi Industri dan Organisasi
            | Industrial Psychology and Organization |
| BLHC 4022 | Kemahiran Perundingan
            | Negotiation Skills                 |

# For Professional Certificate Preparation Course:

<table>
<thead>
<tr>
<th>CODE</th>
<th>CERTIFICATE NAME</th>
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<tbody>
<tr>
<td>BEEA 3100</td>
<td>NI Certified LabView Associate Developer (CLAD)</td>
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</table>
## ELECTRONICS & COMPUTER ENGINEERING TECHNOLOGY
### PROGRAMME OUTCOMES (PLO)

<table>
<thead>
<tr>
<th>PLO</th>
<th>Description</th>
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<tbody>
<tr>
<td>PLO1</td>
<td>Ability to apply knowledge of mathematics, science, engineering fundamentals and engineering specialisation principles to defined and applied engineering procedures, processes, systems or methodologies in the field of computer/industrial electronics/telecommunication engineering technology.</td>
</tr>
<tr>
<td>PLO2</td>
<td>Ability to solve broadly-defined engineering problems systematically to reach substantiated conclusions, using tools and techniques appropriate to computer/industrial electronics/telecommunication engineering technology.</td>
</tr>
<tr>
<td>PLO3</td>
<td>Ability to design solutions for broadly-defined engineering technology problems, and to design systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, environmental and sustainability concerns.</td>
</tr>
<tr>
<td>PLO4</td>
<td>Ability to plan and conduct experimental investigations of broadly-defined problems, using data from relevant sources.</td>
</tr>
<tr>
<td>PLO5</td>
<td>Ability to select and apply appropriate techniques, resources and modern engineering tools, with an understanding of their limitations.</td>
</tr>
<tr>
<td>PLO6</td>
<td>Ability to function effectively as individuals, and as members or leaders in diverse technical teams.</td>
</tr>
<tr>
<td>PLO7</td>
<td>Ability to communicate effectively with the engineering community and society at large.</td>
</tr>
<tr>
<td>PLO8</td>
<td>Ability to demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities.</td>
</tr>
<tr>
<td>PLO9</td>
<td>Ability to demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices.</td>
</tr>
<tr>
<td>PLO10</td>
<td>Ability to demonstrate an awareness of management, business practices and entrepreneurship.</td>
</tr>
<tr>
<td>PLO11</td>
<td>Ability to demonstrate an understanding of the impact of engineering practices, taking into account the need for sustainable development.</td>
</tr>
<tr>
<td>PLO12</td>
<td>Ability to recognise the need for professional development and to engage in independent and lifelong learning.</td>
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</table>
# Bachelor of Electronics Engineering Technology (Telecommunications) with Honours (BEET)

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
<th>Category</th>
<th>Credit</th>
<th>Pre-Requisite</th>
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</thead>
</table>
| BEEU 1013 | Matematik Teknikal  
Technical Mathematics                                                        | P        | 3      |               |
| BEEE 1013 | Fizik Teknikal  
Technical Physics                                                        | P        | 3      |               |
| BEEI 1303 | Pengenalan Litar Elektrik  
Electric Circuit Fundamental                                                   | K        | 3      |               |
| BEEE 1303 | Bengkel Kejuruteraan I  
Engineering Workshop I                                                        | K        | 3      |               |
| BLHW 1442 | Bahasa Inggeris untuk Akademik  
English for Academic Purposes                                              | W        | 2      |               |
| BLHW 2772 | Penghayatan Etika dan Peradaban  
(untuk pelajar tempatan)  
 Appreciation of Ethics and Civilisation  
(for local students)                                     | W        | 2      |               |
| BLHL 1012 | Bahasa Melayu Komunikasi 1  
(untuk pelajar antarabangsa)  
Malay Language for Communication 1  
(for international students)                                 | W        | 1      |               |
| BKKX XXX1 | Kokurikulum I  
Cocurriculum I                                                         | W        | 1      |               |
| **Total Credits This Semester** | **17** |        |        |               |

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<tr>
<th>Code</th>
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<th>Credit</th>
<th>Pre-Requisite</th>
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</table>
| BEEU 1023 | Kalkulus untuk Teknologi  
Calculus for Technology                                                       | P        | 3      |               |
| BEEC 1313 | Asas Pengaturcaraan  
Programming Fundamental                                                        | K        | 3      |               |
| BEEE 1313 | Bengkel Kejuruteraan II  
Engineering Workshop II                                                        | K        | 3      |               |
| **BEEI 1333** | Litar Elektrik Lanjutan  
Advanced Electric Circuit                                                      | K        | 3      | BEEI 1303    |
| BEEE 1323 | Pengenalan Elektronik  
Electronic Fundamentals                                                        | K        | 3      |               |
| BEEE 2373 | Teknologi Elektrik  
Electrical Technology                                                       | K        | 3      |               |
<table>
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<tr>
<td>BLHW 1702</td>
<td>Tamadun Islam dan Tamadun Asia (untuk pelajar tempatan) Islamic and Asian Civilization (for local students) Kebudayaan Malaysia (untuk pelajar antarabangsa) Malaysian Culture</td>
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<tr>
<td>BEEU 2033</td>
<td>Kalkulus Lanjutan untuk Teknologi</td>
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<td><strong>BEEE 2333</strong></td>
<td>Peranti Elektronik Analog</td>
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<td>BEEC 2404</td>
<td>Elektronik Digital</td>
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<td>BEEE 2364</td>
<td>Prinsip Kawalan</td>
<td>K</td>
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<tr>
<td>BEET 2313</td>
<td>Isyarat &amp; Sistem Berterusan</td>
<td>K</td>
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<td>BLHW 2452</td>
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<td>BEEU 2043</td>
<td>Kaedah Statistik</td>
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<td>Isyarat &amp; Sistem Diskrit</td>
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**TOTAL CREDITS THIS SEMESTER** 19

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<td><em>RF Technique &amp; Microwave</em></td>
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<td>BLHL 1XX2</td>
<td>Bahasa Ketiga</td>
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<td><em>Third Language</em></td>
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<tr>
<td><strong>BEEU 4774</strong></td>
<td>Projek Sarjana Muda II &lt;br&gt;Bachelor Degree Project II</td>
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<td>BEEU 3764</td>
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<tr>
<td>*BEET 48X3</td>
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<tr>
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<tr>
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**TOTAL CREDITS THIS SEMESTER**: 18

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<th>BEEU 4786</th>
<th>Latihan Industri &lt;br&gt;Industrial Training</th>
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<tr>
<td>BEEU 4796</td>
<td>Laporan Latihan Industri &lt;br&gt;Industrial Training Report</td>
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**TOTAL CREDITS THIS SEMESTER**: 12

**TOTAL CREDITS**: 144
For Elective I, II and III students may choose any THREE (3) subjects from the list below:

<table>
<thead>
<tr>
<th>NO.</th>
<th>CODE</th>
<th>SUBJECT</th>
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For General elective, students may choose any ONE (1) subject from the list below:

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For Professional Certificate Preparation Course:

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<td>• Introduction to Networks</td>
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<td>• Routing &amp; Switching Essentials</td>
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Bachelor of Electronics Engineering Technology (Industrial Electronics) with Honours (BEEE)

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<td>Kursus Persediaan Pensijilan Profesional &lt;i&gt;Professional Certificate Preparation Course&lt;/i&gt;</td>
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**TOTAL CREDITS THIS SEMESTER** 20
### Academic Handbook
Session 2019/2020
Faculty of Electrical & Electronics Engineering Technology (FTKEE)

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**SEMIESTER 7**

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**SEMESTER 8**

**TOTAL CREDITS THIS SEMESTER**

**TOTAL CREDITS**

142

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**Pre-requisite subject**

*For Elective I students may choose any ONE (1) subject from the list below:

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*For Elective II, students may choose any ONE (1) subject from the list below:

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| 1   | BEEE 4814| Robotik Perindustrian  
 *Industrial Robotic* |
| 2   | BEEE 4824| Pemacu & Kawalan Elektrik  
 *Electrical Drives & Control* |
| 3   | BEEC 4844| Pengujian Litar Bersepadu  
 *IC Testing* |

***For General elective, students may choose any ONE (1) subject from the list below:

<table>
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<tr>
<th>CODE</th>
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 *Philosophy of Science and Technology* |
| BLHC 4012  | Komunikasi Organisasi  
 *Organizational Communication* |
| BLHH 1032  | Psikologi Industri dan Organisasi  
 *Industrial Psychology and Organization* |
| BLHC 4022  | Kemahiran Perundingan  
 *Negotiation Skills* |

#For Professional Certificate Preparation Course, student may choose any ONE (1) certificate from the list below:

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**Pre-requisite subject**

*For Elective I, II & III, students may choose any THREE (3) subjects from the list below:

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| 1   | BEEC 4804 | Rekabentuk & Fabrikasi VLSI  
VLSI Design & Fabrication |
| 2   | BEEC 4814 | Pengantaramukaan Komputer  
Computer Interfacing |
| 3   | BEEC 4824 | Pemprosesan Imej & Video  
Image & Video Processing |
| 4   | BEEC 4834 | Sistem Masa Nyata  
Real Time Systems |
| 5   | BEEC 4844 | Pengujian Litar Bersepadu  
Integrated Circuit Testing |

***For General elective, students may choose any ONE (1) subject from the list below:

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*Philosophy of Science and Technology* |
| BLHC 4012 | Komunikasi Organisasi  
*Organizational Communication* |
| BLHH 1032 | Psikologi Industri dan Organisasi  
*Industrial Psychology and Organization* |
| BLHC 4022 | Kemahiran Perundingan  
*Negotiation Skills* |

#For Professional Certificate Preparation Course:

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| BEET 3100 | Cisco Certified Network Associate Routing & Switching:  
- Introduction to Networks  
- Routing & Switching Essentials |
# Bachelor of Electronic Engineering Technology with Honours (BEEZ)

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<td>BLHL 1XX2</td>
<td>Bahasa Ketiga</td>
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**TOTAL CREDITS THIS SEMESTER**  **19**

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<th>SEMESTER 8</th>
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<td>BEEU 4796</td>
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<td><em>Industrial Training</em></td>
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<td><strong>BEEU 4796</strong></td>
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<td><em>Industrial Training Report</em></td>
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**TOTAL CREDITS THIS SEMESTER**  **12**

**TOTAL CREDITS**  **142**

**Pre-requisite subject**
*For Elective I, students may choose any ONE (1) subjects from the list below:

<table>
<thead>
<tr>
<th>NO.</th>
<th>CODE</th>
<th>SUBJECT</th>
</tr>
</thead>
</table>
| 1   | BEET 3353| Sistem Telekomunikasi  
*Telecommunication System*                                                 |
| 2   | BEET 3413| Teknik RF & Gelombang Mikro  
*RF Technique & Microwave*                                                  |
| 3   | BEEZ 4803| Anatomi & Fisiologi  
*Anatomy & Physiology*                                                       |
| 4   | BEEZ 4813| Pengimejan Perubatan dan Pemprosesan Imej  
*Medical Imaging and Image Processing*                                       |
| 5   | BEEZ 4923| Fabrikasi Mikroelektronik  
*Microelectronic Fabrication*                                                |
| 6   | BEEZ 4903| Proses Semikonduktor  
*Semiconductor Process*                                                      |

*For Elective II & III, students may choose any TWO (2) subjects from the list below:

<table>
<thead>
<tr>
<th>NO.</th>
<th>CODE</th>
<th>SUBJECT</th>
</tr>
</thead>
</table>
| 1   | BEET 4813| Komunikasi Mudah Alih  
*Mobile Communication*                                                        |
| 2   | BEET 4833| Kejuruteraan Antena  
*Antenna Engineering*                                                          |
| 3   | BEEZ 4823| Peranti Perubatan dan Peranti Instrumentasi  
*Medical Devices and Instrumentation*                                          |
| 4   | BEEZ 4853| Etika, Akta, Piawai & Keselamatan Bioperubatan  
*Biomedical Ethics Acts, Standards & Safety*                                   |
| 5   | BEEZ 4873| Rekabentuk VLSI  
*VLSI Design*                                                                 |
| 6   | BEEZ 4883| Rekabentuk IC Digital  
*Digital IC Design*                                                             |
*For Elective IV, students may choose any ONE (1) subjects from the list below:

<table>
<thead>
<tr>
<th>NO.</th>
<th>CODE</th>
<th>SUBJECT</th>
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</table>
| 1   | BEET 4803 | Komunikasi Satelit  
Satellite Communication |
| 2   | BEEZ 4863 | Sistem Navigasi Radio  
Radio Navigation System |
| 3   | BEEZ 4843 | Penyelenggaraan Kejuruteraan Bioperubatan  
Biomedical Engineering Maintenance |
| 4   | BEEZ 4833 | Biomekanik  
Biomechanics |
| 5   | BEEZ 4913 | Seni Bina VLSI  
VLSI Architecture |
| 6   | BEEZ 4893 | Pengujian IC Digital  
Digital IC Testing |

***For General elective, students may choose any ONE (1) subject from the list below:

<table>
<thead>
<tr>
<th>CODE</th>
<th>SUBJECT NAME</th>
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</table>
| BLHW 1722 | Falsafah Sains Dan Teknologi  
Philosophy of Science and Technology |
| BLHC 4012 | Komunikasi Organisasi  
Organizational Communication |
| BLHH 1032 | Psikologi Industri dan Organisasi  
Industrial Psychology and Organization |
| BLHC 4022 | Kemahiran Perundingan  
Negotiation Skills |

#For Professional Certificate Preparation Course:

<table>
<thead>
<tr>
<th>CODE</th>
<th>CERTIFICATE NAME</th>
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<tbody>
<tr>
<td>BEET 3100</td>
<td>Cisco Certified Network Associate Routing &amp; Switching:</td>
</tr>
<tr>
<td></td>
<td>• Introduction to Networks</td>
</tr>
<tr>
<td></td>
<td>• Routing &amp; Switching Essentials</td>
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</tbody>
</table>
SUMMARY OF SUBJECTS
University Compulsory Subjects (W)

COCURRICULUM I & COCURRICULUM II /
KOKURIKULUM I & KOKURIKULUM II

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Apply skills in relevant fields.
2. Demonstrate teamwork abilities in related subjects.

SYNOPSIS
1. Cultural
   Choir, Gamelan, Cak Lempung, Nasyid, Seni Khat,
   Seni Lakon, Art, English Elocution, Bahasa Melayu
   Elocution, and Kompong.
2. Entrepreneurship
   Video, Film and Photography, Publishing &
   Journalism, Computer and Technopreneurship.
3. Society
   Fiqh Muamalat, Fiqh Amali, Tahsin Al-
   Quran & Yaasin and Peer Program.
4. Recreation
   Go-Kart, Adventure and Cycling.
5. Sports
   Swimming, Volley Ball, Golf, Kayaking, Takraw,
   Aerobic, Badminton, Football and Net ball.
6. Martial Arts
   Silat Gayong, Karate-Do and Taekwando.

BLHL 1XX2
THIRD LANGUAGE / BAHASA KETIGA

Bahasa Arab Tahap 1
Bahasa Arab Tahap 2
Bahasa Mandarin Tahap 1
Bahasa Mandarin Tahap 2
Bahasa Jepun Tahap 1
Bahasa Jepun Tahap 2
Bahasa Jerman Tahap 1
Bahasa Jerman Tahap 2
Bahasa Perancis Tahap 1
Bahasa Perancis Tahap 2

BLHW 1442
ENGLISH FOR ACADEMIC PURPOSES / BAHASA
INGGERIS UNTUK AKADEMIK

LEARNING OUTCOMES
By the end of the course, students should be able to:
1. Apply correct grammar rules according to context.
2. Demonstrate knowledge of various reading skills in
   the reading tasks given.

SYNOPSIS
This course aims to develop students’ reading skills and
grammar. A variety of academic reading texts and reading
skills are explored to facilitate students’ comprehension of
the texts. These reading skills are also necessary in
assisting students to master study skills. Grammar
elements are taught in context to develop students’
accuracy in the use of the language. This course also
includes elements of blended learning.
REFERENCES

LEARNING OUTCOMES
At the end of the course, students should be able to:
1. Prepare clear and detailed descriptions of a product related to fields of interest.
2. Express arguments systematically in a composition.

SYNOPSIS
This course aims to equip the students with the skills to communicate clear and detailed viewpoints in writing. The students are expected to have a stand on topics of their fields by providing advantages and disadvantages to support their arguments. From time to time, consultations with the students will be conducted throughout the completion of their assignments. This serves as the formative evaluation in the course. Grammar components are embedded in the course to support the required writing skills. Blended learning is incorporated in this course.

REFERENCES

PRE-REQUISITE
BLHW 1442
ENGLISH FOR ACADEMIC PURPOSES / BAHASA INGGERIS UNTUK AKADEMIK

LEARNING OUTCOMES
At the end of the course, students should be able to:
1. Listen and infer based on situations in context.
2. Respond to standard spoken language using communication strategies.
3. Display detailed descriptions by expanding and supporting points of view using relevant examples.

SYNOPSIS
This course which is designed based on a blended and student-centred learning approach aims to develop students' listening skills as well as communication skills and strategies. Among the elements covered are professional interactions that include group discussion.
and public speaking. Students are also required to express ideas with relevant examples in public speaking and online assessments. They are also exposed to the rudiments of grammar implicitly via the communicative activities.

REFERENCES

PRE-REQUISITE
BLHW 2452
ACADEMIC WRITING / PENULISAN AKADEMIK

LEARNING OUTCOMES
At the end of this course, students should be able to:
1. Discuss the role of civilizational value in the formation of community value systems.
2. Connecting elements of civilization with current community issues.

SYNOPSIS
This course provides knowledge on various civilizations. It introduces Islamic civilization as the basis for the Malay and Malaysian civilization. Additionally, issues related to the Chinese and Indian civilizations together with current and future issues of various world civilizations are also discussed.

REFERENCES
SYNOPSIS
This course focuses on the basic concepts of culture and ethnic relations in Malaysia. It exposes students to ethnic relations in the development of the Malaysian society. Besides, this course aims to give an understanding of the global challenges facing ethnic and cultural relations at the Malaysian level.

REFERENCES

BTMW 4012
TECHNOLOGY ENTREPRENEURSHIP / KEUSAHAWANAN TEKNOLOGI

LEARNING OUTCOMES
Upon completion of the subject, students should 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. (C1)
2. Explain the basic concepts of interdisciplinary competences in management, and create technology-based businesses. (C2)
3. Present a business plan project and develop an entrepreneurial profile. (C3, CS, ES)

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

REFERENCES

BLHC 4032
CRITICAL AND CREATIVE THINKING / PEMIKIRAN KRITIS DAN KREATIF

LEARNING OUTCOMES
At the end of the course, students should be able to:
1. Identify basic principles of critical and creative thinking skills
2. Analyze collected and traceable information to make decisions
3. Form a new concept or idea of a solution

SYNOPSIS
This course is designed to give students an introduction to the principles of critical and creative thinking, and problem-solving. Students will be exposed to the roles of the right brain and left brain, mental determination, elements of critical and creative thinking as well as problem solving. This subject is conducted in accordance with the concept of problem-based learning (PBL).

REFERENCES
Kajian Pengurusan Pembangunan Islam Universiti Sains Malaysia.


**BLHC 4012**
*ORGANIZATIONAL COMMUNICATION / KOMUNIKASI ORGANISASI*

**HASIL PEMBELAJARAN**
Pada akhir kursus ini, pelajar akan dapat:

1. Membincangkan prinsip-prinsip asas kemahiran komunikasi organisasi untuk tujuan interaksi dalam organisasi.
2. Memberikan maklum balas mengenai isu-isu yang berkaitan dengan pembangunan kemahiran komunikasi organisasi.

**SINOPSIS**
Kursus ini akan mendedahkan pelajar kepada idea-idea asas organisasi dalam komunikasi umum dan organisasi. Selain itu, pelajar juga akan dapat mengetahui teori-teori yang berkaitan dengan komunikasi organisasi dan memahami elemen-elemen penting dalam organisasi seperti kepimpinan, komunikasi rasmi dan komunikasi tidak rasmi. Selain itu, pelajar akan menyediari halangan, penyelesaian masalah dan membuat keputusan kemahiran dalam komunikasi organisasi. Akhirnya, pelajar akan mempunyai pemahaman iklim organisasi, hubungan teknologi dan organisasi dan komunikasi korporat dalam organisasi

**RUJUKAN**

**BLHH 1032**
*INDUSTRIAL PSYCHOLOGY AND ORGANIZATION / PSIKOLOGI INDUSTRI DAN ORGANISASI*

**HASIL PEMBELAJARAN**
Pada akhir kursus ini, pelajar akan dapat:

1. Menghubungkan proses persekitaran dan teori di tempat kerja dalam dunia organisasi dan perindustrian.
2. Mempamerkan ciri-ciri kepimpinan dalam aktiviti tugas kumpulan.
3. Memberi tindak balas terhadap peranan dan tanggungjawab sebagai seorang bakal pekerja di dalam organisasi.

**SINOPSIS**
Kursus ini memberi pendedahan kepada aspek psikologi dalam dunia pekerjaan dalam sektor industri serta permasalahan yang berhubung dengan tingkah laku dalam organisasi. Terdapat beberapa topik yang
dibincangkan termasuk isu-isu semasa dalam psikologi di tempat kerja, perancangan personel, tekanan di tempat kerja dan psikologi kejuruteraan.

**RUJUKAN**

**HASIL PEMBELAJARAN**
Pada akhir kursus ini, pelajar akan dapat:
1. Mengenalpasti konsep-konsep asas dalam proses perundingan menggunakan amalan komunikasi berkesan.
2. Membuat kesimpulan terhadap teknik-teknik perundingan yang terbaik berdasarkan pendekatan teori yang pelbagai.

**SINOPSIS**
Kursus ini akan membincangkan konsep asas perundingan, teknik berfikir secara kritis dan kreatif, teknik komunikasi berkesan dan teknik mendengar dan menyoal secara berkesan. Pelajar turut didedahkan dengan pengetahuan dan kemahiran yang diperlukan untuk menjalankan dan meguruskan proses perundingan pelbagai secara berkesan. Selain itu, kemahiran berfikir secara kritis dan kreatif, serta kemahiran komunikasi berkesan yang diperlukan bagi menjalankan proses perundingan juga akan dibincangkan.

**RUJUKAN**

**Programme Core Subjects (P)**

**TECHNICAL MATHEMATICS / MATEMATIK TEKNIKAL**

**LEARNING OUTCOMES**
Upon completion of this subject, student should be able to:
1. **Explain the concepts of matrices, trigonometry, complex number and three dimensional vector operations.**
2. **Use appropriate methods to solve matrices, trigonometry, complex numbers and three-dimensional vector operations.**
3. **Solve application problems using appropriate techniques.**
SYNOPSIS
This course has four components; matrices, trigonometry, complex numbers and three-dimensional vector operations. In matrices, it covers some fundamental concepts such as determinants, inverses of square matrices and techniques for solving systems of linear equations using matrices. In trigonometry, the use of trigonometric identities to solve trigonometric equations and its applications will be emphasized. In complex numbers, it covers some fundamental concepts of imaginary numbers and its representations on the complex plane, as well as the representations of the polar and exponential forms of the complex numbers. Three-dimensional coordinate system and vectors operations will also be introduced. This includes the concepts of the dot and the cross products of vectors.

REFERENCES

BEEU 1023
CALCULUS FOR TECHNOLOGY / KALKULUS UNTUK TEKNOLOGI

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Use appropriate methods to find the limits and continuity of a function.
2. Use appropriate methods to differentiate and integrate various functions.
3. Solve application problems using appropriate techniques.

SYNOPSIS
This course introduces the differential and integral calculus of a single variable, with applications. The topics covered are limits and continuity of a function, the derivative with all techniques and methods to differentiate, applications of differentiation such as approximation, related rates, maximum and minimum values, as well as optimization problems. Integration covers methods like substitution, integration by parts, integration by partial fraction decomposition and trigonometric substitution. While its applications cover the area of a bounded region or area between curves as well as the volume of a solid of a revolution.

REFERENCES

**REFERENCES**

topics include all the basic concepts of probability including events and probability, mutually exclusive events, independent events, multiplication rule, addition rule, conditional probability, discrete and continuous random variables. The inferential statistics covers topics like sampling, hypothesis testing, correlation, simple linear regression, chi-square independent test and ANOVA. Students will be exposed to a statistical software package.

REFERENCES

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Recognize the fundamental principles of Professional Ethics and various behaviour or conducts that need to be observed and controlled by a professional technologist.
2. Identify moral problems that related to engineering ethics and to solve the problem using various appropriate methods.
3. Explain the concepts in context of engineering ethics and to relate it with the actual phenomena.
4. Define the responsibilities of engineering technologists in the scope of their function in any organization either as an employee or as an employer and have a feeling of being a responsible and public safety and environmental conscious technologist.
5. Define the Occupational Health concept, understand the critical occupational safety health hazard that the workers exposed themselves in the factory working environment, how to prevent or at least minimize these hazards.

SYNOPSIS
This subject will discuss the concept and cases of engineering ethics; Introduction to professional ethics, engineering ethics as preventive ethics, framing the ethical problems, methods for moral problem solving, creative middle ways, organizing principles, utilitarian concept, minimalist views, respect for persons, reversibility, universal ability, responsible engineering technologists, reasonable care, good works, honesty, integrity, reliability, conflict of interest, engineering technologist as employees, engineering technologist as employers, engineers and environment, international engineering professionalism. At the end of the course, the student will be taught on the OSHA, critical safety and health hazards, first aids procedures and practice, its organization and how the OSHA manage to monitor the
safety and the health effectively, case study on the occupational safety and health.

REFERENCES

BEEI Course Core Subjects (K)

SEMESTER 1

BEEY 1303
MEASUREMENT & INSTRUMENTATION /
PENGUKURAN & INSTRUMENTASI

LEARNING OUTCOMES
At the end of the subject, students should be able to:
1. Apply the knowledge of principles, techniques, components and tools in measurement and instrumentation system.
2. Measure and operate the electrical parameter by using analogue and digital instruments.
3. Explain effectively the knowledge about the measurement and instrumentation tools, techniques and standard.

SYNOPSIS
This subject discuss about units and dimensions, standards, errors and calibration in measurement. It covers the measurement devices such as digital meter, analog meter, oscilloscope, function generator and any device related. This subject also covers on instrumentation elements for complete data acquisition system such as sensors & transducers, signal conditioning & processing, A/D and D/A conversion, interfacing standards and data presentation.

REFERENCES


BEEA 1304
DIGITAL ELECTRONICS & SYSTEMS /
ELEKTRONIK & SISTEM DIGITAL

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Apply the knowledge, basic features and configuration of combinational logic and sequential logic circuit in digital system.
2. Construct experiments and project on combinational, sequential, encoder, decoder and memory logic circuit by using simulation software and digital trainer kit.
3. Explain effectively as an individual and group member for conducted assignment and experiment.

SYNOPSIS
This subject discusses about number systems & codes, Boolean algebra, logic families and the characteristic of logic gates, combinational logic, analysis and design, MSI combinational logic circuit, flip-flops, counter and shift-
register, synchronous and asynchronous sequential circuit. Analysis and design of adder, decoder, encoder, multiplexer and de-multiplexer. PLD devices such as ROM, PAL, counter and register.

REFERENCES

SYNOPSIS
This course will be presented by means of lecture, tutorials, labs, lab test assignments and quiz fully in the CAD studio, without a final exam. The course concentrates on how to use Computer Aided Design (CAD) software to produce the basic engineering drawing, for example, geometric, orthographic, isometric, section cut and detail drawing. The students will be exposed to CAD interface, CAD coordinate system, basic drawing command tools, display controls, basic editing commands tools, text, dimensioning, isometric and template preparation in order to produce various types of engineering drawing. However, this course will focus on the electrical engineering drawing type. The 3D Solid Modelling Object Development drawing will also be covered.

REFERENCES
BEEI 1303
ELECTRIC CIRCUIT FUNDAMENTAL /
PENGENALAN LITAR ELEKTRIK

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:

1. Apply analytical method and theorem to DC and AC (steady state) circuits in electrical circuit.
2. Conduct experiment on DC and AC (steady state) circuit based on electrical circuit theorem.
3. Participate effectively for any assignment and experiment.

SYNOPSIS
This subject introduces the students to Ohm’s Law, Kircchoff’s Laws and use them to calculate current, voltage and power in DC / AC (steady state) circuits. Following this the students will learn the analytical methods namely mesh and nodal analysis. The use of theorems like Thevenin, Norton, Superposition and the Maximum Power Transfer will follow next. The applications of the above tools will cover both dc and ac circuits. This subject will be supported by laboratory works to impart to the students some basic practical skills.

REFERENCES

SEMESTER 2
BEEI 1323
ELECTRICAL & MAGNETISM /
ELEKTRIK & KEMAGNETAN

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:

1. Apply the concept and application of Electrical Field, Coulombs Law, Gauss Law, Lenz Law and Faradays Law in electrical charge phenomena.
2. Demonstrate electrical concepts, basic magnetic quantities and phenomena to simple devices (DC motor and transformer) in electrical engineering technology.
3. Present written and oral communications to document work and experiment results.

SYNOPSIS
This course will discuss mainly about the theory and analysis of some basic electromagnetic waves and fields. It deals with topics regarding vector calculus including transformation of coordinate systems. It is then followed by electrostatics and magnetostatics characteristics such as their static equations, field, potential and boundary conditions. After that, it is continued with Maxwell’s equations and wave propagation; Faraday’s law, uniform plane waves, and skin depth. Finally, the course will be ended with some transmission line topics: Matching, transient, and Smith chart.
REFERENCES

BEEI 1333
ADVANCED ELECTRICAL CIRCUIT /
LITAR ELEKTRIK LANJUTAN

LEARNING OUTCOMES
Upon completing this subject, the student should be able to:
1. Analyze first order and second order electrical circuit in transient and frequency response.
2. Conduct experiment on frequency response and electrical circuit measurement.
3. Present written and oral communications to document work and experiment results.

SYNOPSIS
These subject exposes students to the application of several tools in analyzing electrical circuits, such as the Laplace transform and two ports network. The students are required to use the tools to analyze transient and frequency response in electrical circuit.

REFERENCES

PRE-REQUISITE
BEEI 1303
ELECTRIC CIRCUIT FUNDAMENTAL / PENGENALAN LITAR ELEKTRIK

BEEI 1453
ELECTRONIC PRINCIPLE / PRINSIP ELEKTRONIK

LEARNING OUTCOMES
At the end of the subject, students should be able to:
1. Apply knowledge of semiconductor devices in electronic circuit.
3. Complete a mini project that involves utilization of semiconductor devices.

SYNOPSIS
This subject introduces students to semiconductor devices. There are four semiconductor devices involve which are diode, bipolar junction transistor (BJT), field effect transistor (FET) and operational amplifier. Students
will learn the types of these four devices, structure characteristic, configuration and application. In term of circuit analysis, student will learn how to calculate current and voltage in a circuit contain these semiconductor devices and draw output voltage waveform for diode application circuit. This subject will be supported by laboratory works and mini project to impart the students some basic practical skills.

REFERENCES

SYNOPSIS
Throughout the course, students will be introduced with basic principles of computers and software development methodology. The course also consists of basic programming principles such as syntax semantic, compiling, and linking. Programming techniques using C++ such as data type and operator, selection, repetition, function, array, file, and pointer are learnt towards the end of this course.

REFERENCES
3. Conform each workshop activities based on existing acts, regulations & standard.

SYNOPSIS
This course deals with knowledge and practical related experience on single-phase electrical installation. Students will have the opportunity to experience and be assessed on electrical installation activities involving diversity factor calculation, protective device sizing, cable sizing, single-line diagram, electrical wiring, verification, testing and troubleshooting as well as moral and ethical values. Students will also be emphasized on the safety and regulatory requirements on electrical installation. On top of that, students will also experience and be assessed on the ability to perform offsets on UPVC conduit and trunking which will lead towards a complete single-phase electrical installation system typically for domestic users.

REFERENCES

SEMESTER 3
BEEI 2342
ELECTRICAL WORKSHOP II / BENGKEL ELEKTRIK II

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Apply knowledge in three phase electrical installation and motor starter for industrial-based application.
2. Perform three phase electrical installation and motor starter for industrial-based application.
3. Conform each workshop activities based on existing acts, regulations & standard.

SYNOPSIS
This course deals with knowledge and practical related experience on three-phase electrical installation and AC motor starters. Students will have the opportunity to experience and be assessed on electrical installation and AC motor starter activities involving diversity factor calculation, protective device sizing, cable sizing, single-line diagram, main circuit, control circuit, electrical wiring, verification, testing and troubleshooting as well as moral and ethical values. Students will also be emphasized on the safety and regulatory requirements on electrical installation. On top of that, students will also experience and be assessed on the ability to perform offsets on galvanized iron conduit and trunking which will lead towards a complete three-phase electrical installation system typically for industrial users.

REFERENCES

PRE-REQUISITE
BEEI 1311
ELECTRICAL WORKSHOP I / BENGKEL ELEKTRIK I

REFERENCES

BEEI 2364
ELECTRICAL TECHNOLOGY / TEKNOLOGI ELEKTRIK

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Analyze basic electrical parameters for AC electrical system.
2. Conduct experiment on electrical parameters for AC electrical system.
3. Participate effectively in AC generation project-based activities.

SYNOPSIS
This subject 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. Magnetic circuit, construction and operation of transformer, generation of three phase voltage, balanced and unbalanced three phase load and also voltage, current, power and power factor calculation.

REFERENCES

BEEI 2373
ELECTRICAL MACHINES / MESIN ELEKTRIK

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Analyze the differences of physical and electrical construction and working principles of DC and AC electrical machines.
2. Conduct experiments to determine electrical and mechanical parameters and the performance of DC and AC electrical machines.
3. Conform to the safety and legal requirements for DC and AC electrical machines operation.

SYNOPSIS
This course deals with knowledge and practical related experience on electrical machines. Students will have the opportunity to experience and be assessed on laboratory activities involving determination of electrical and mechanical parameters and also the performance of DC and AC electrical machines covering both types; generators and motors. Students will also be emphasized on the safety and regulatory requirements on electrical machines. On top of that, students will also experience and be assessed on the ability to setup specific laboratory
connection which will lead towards a complete electrical machine training system to be used for laboratory activities.

REFERENCES

BEEA 2383
CONTROL SYSTEM FUNDAMENTAL /
PENGENALAN SISTEM KAWALAN

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Apply appropriate techniques in describing the characteristics of control systems in time domain.
2. Construct experiments to distinguish system performances of open loop and closed loop systems.

SYNOPSIS
This subject 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 and second order systems; Routh Hurwitz criteria for stability; steady-state error analysis; speed and position control system analysis using ScicosLab.

REFERENCES

SEMESTER 4

BEEI 2383
POWER SYSTEM TECHNOLOGY /
TEKNOLOGI SISTEM KUASA

LEARNING OUTCOMES
Upon completing this subject, the student should be able to:
1. Calculate the power system parameters using power system model, per unit (P.U) quantities and protection system requirements.
2. Conduct experiments on power system components using hardware or simulation software.
3. Present written and oral communications to document work and experiment results.
SYNOPSIS
This subject gives the overall components of power system to the students without going into detail. The power system components will be modelled for the analysis purposes. The topics include per-unit quantities, transmission line, transformer, synchronous generator, power flows, symmetrical components, power protection and power system stability.

REFERENCES

BEEA 2374
EMBEDDED SYSTEMS / SISTEM TERBENAM

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Analyze the operation of a microcontroller’s architecture, peripherals subsystem.
2. Construct hardware and software of microcontroller based system to solve related problem.
3. Demonstrate business practice and entrepreneurship in microcontroller project development.

SYNOPSIS
Basic concept of microcontroller and the differences between microcontroller and microprocessor. Microcontrollers memory map, compiler, programming language and software. Stack, subroutines, interrupt and reset. Application of programming with input and outputs such as switches and ‘Light Emitting Diodes’, DC motors, stepper motors and photosensors. Students will apply microcontroller with simple mechatronics system.

REFERENCES
2. Aminurrashid Noordin et. al (2011), Miniproject using MicroC (Mikroelektronika & Proteus Professional), Penerbit UTeM

BEEI 2463
THERMODYNAMIC & HEAT TRANSFER / THERMODINAMIK & PEMINDAHAN HABA

LEARNING OUTCOMES
Upon completing this subject, the student should be able to:
1. Analyze a heat transfer principle and process and energy equilibrium processes in thermodynamics for power system application.
2. Solve problems involving heat in mechanical system and properties in thermodynamics for power system application.
3. Practice the knowledge of heat transfer phenomena, thermodynamics laws, and properties professionally and ethically.

**SYNOPSIS**
This course introduces the basic concepts heat transfer and engineering thermodynamics. Concept of model heat transfer, one dimensional conduction, one dimensional convective heat transfer, heat transfer by natural convection, heat transfer in boiling and condensation, heat exchangers and evaporators will be covered in heat transfer. In Thermodynamics, topics covered include property of pure substances, energy, work, heat, and the 1st and 2nd Law of Thermodynamics.

**REFERENCES**

**BEEI 3413**
**POWER ELECTRONIC / ELEKTRONIK KUASA**

**LEARNING OUTCOMES**
Upon completion of this subject, student should be able to:
1. Analyze the basic topologies of converters and power supplies for device applications in industrial practices.
2. Conduct experiments on the characteristics and performance of rectifiers, converters choppers and inverters.
3. Work in a team to design rectifiers, choppers, switch-mode power supplies (SMPS) and inverters based on converter topologies.

**SYNOPSIS**
This course is about the basic principles of semiconductor devices, switching process and the application in rectifier circuit, one and three-phase inverter, switching losses, heat sink, the application of semiconductor devices as AC to DC, DC to AC and DC to DC converters, circuits as DC drives, AC drives, snubbers and harmonic effects, and also the introduction to computer simulation (PESIM).

**REFERENCES**

SEMMESTER 5

BEEI 3393
ADVANCED POWER SYSTEM / SISTEM KUASA LANJUTAN

LEARNING OUTCOMES
Upon completing this subject, the student should be able to:
1. Analyze power flow, faults and transient stability in power system operation and planning.
2. Perform analysis of power flow, faults and transient stability using simulation software.
3. Present technical investigation results among peers.

SYNOPSIS
This course deals with node equations of power system networks, development of bus admittance and bus impedance matrixes, utilization of bus admittance and bus impedance matrixes in power system analysis, i.e. symmetrical fault analysis, asymmetrical fault analysis, load flow study and transient stability analysis. Furthermore, application of power system analysis software is also useful to the students where they are able to model and investigate the impact on electrical power system.

REFERENCES

PRE-REQUISITE
BEEI 2383
POWER SYSTEM TECHNOLOGY / TEKNOLOGI SISTEM KUASA

BEEA 3414
PLC & APPLICATIONS / PLC & APLIKASI

LEARNING OUTCOMES
Upon completing this subject, the student should be able to:
1. Apply knowledge to solve basic industrial automation system problems using a PLC system.
2. Demonstrate PLC system experiments.
3. Communicate effectively for any assignments and experiments.

SYNOPSIS
This subject will expose students with knowledge and skills of PLC including its definition, main hard components, PLC programming languages, interfacing PLC with computers, integrates PLC hardware and software to design a simple automation system.

REFERENCES

BEEI 3474
POWER SYSTEM GENERATION & TRANSMISSION / PENJANAAN SISTEM KUASA & TRANSMISI

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Evaluate various options available for power generation methods and perform analysis on typical issues effecting different types of transmission lines.
2. Perform experiments related to power system generation and transmission.
3. Conform the power generation and transmission practice according to the related codes, regulations and standards.

SYNOPSIS
This course covers two main aspects of power system which are power system generation and power system transmission. The generation part introduces the students to the conventional and distributed generation methods. Meanwhile, the transmission part looks on the parameters involve as well as the steady-state operation. Delivery methods include lectures, tutorials and practical sessions.

REFERENCES

BEEI 3423
ACTUATORS & DRIVES / PENGGERAK & PEMACU

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Analyze the design of electrical and mechanical actuator and drives in motor drives, pneumatic and hydraulic applications.
2. Conduct the experiment on DC and AC motor drives, pneumatic/hydraulic and electro pneumatic/hydraulic systems.
3. Present assignment given on various actuators and drives for engineering technology application.

SYNOPSIS
This subject will introduce to the electrical, mechanical, pneumatic and hydraulic electrical actuator & drive system. This subject wills discussion on the definition, symbols, system, circuits, operation and component of the pneumatic, hydraulic and mechanical actuator system. Another part of this subject will covers on the electrical drive for DC and AC motor. It focuses on the fundamental of the electrical drive including element, block diagram, feedback, load characteristics and motor sizing. In addition, special discussion on the four quadrants operation with chopper fed dc driver for DC motor drive and three phase drive system.
REFERENCES

SEMESTER 6

BEEU 3764
BACHELOR DEGREE PROJECT I / PROJEK SARJANA MUDA I

LEARNING OUTCOMES
At the end of the subject, students should be able to:
1. Explain the problem, objectives and scope of project associated to the industrial or community needs.
2. Use related previous work and its relevant theory
3. Choose a proper methodology
4. Present the preliminary findings in the oral and written forms effectively

SYNOPSIS
The student needs to plan and implement the project individually that related to the respective engineering technology field. The student should implement a project, do the analysis and apply the theory to solve the problems related to topic. At the end, the student should write a problem based learning report that covers problem statement, literature review, methodology to overcome the problem. The student needs to achieve the objective of the project and presented it in the report.

REFERENCES

BEEI 4833
POWER SYSTEM PROTECTION / PERLINDUNGAN SISTEM KUASA

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Analyse the differences of function, design, and operation of protection schemes of power system operation.
2. Perform experiments to determine grading studies for radial and systems using IDMT overcurrent relays.
3. Conform to the safety and legal requirements for protection systems of power system operation.

SYNOPSIS
The general aim of this course is to enable students to identify and examine the main concept related to the function, design and operation of protection schemes for power transmission, distribution and (to a lesser extent) generation systems. Upon completion of the course, students should be able to understand the reasons why protection systems are required, the basic philosophies of protection, the components involved and how typical protection systems are designed and configured.

REFERENCES

BEEI 4823
HIGH VOLTAGE TECHNOLOGY /
TEKNOLOGI VOLTAN TINGGI

LEARNING OUTCOMES
Upon completing this subject, the student should be able to:
1. Conform the procedure of handling an experiment of HV AC, DC, impulse generation for testing.
2. Demonstrate high voltage measurement for AC, DC, impulse signal by organizing specific type and set up of voltage divider, cable and recorder.
3. Evaluate the conduction and breakdown criteria in gases, solids and liquids for power system operation.
4. Analyze the effect of overvoltage phenomenon in power system apparatus for insulation coordination.
5. Analyze the electrical properties in insulation system after testing and diagnostic according to standard requirement before operation.

SYNOPSIS
This subject is explaining about overview of high voltage technology and its standards. This subject also focuses on coordination of insulation in gases, solid and liquids and its coordination. It also describes on generation of HVAC, HVDC and impulse voltage and also the measurement methods of high voltage. The students are also exposed to diagnostic and testing techniques testing and explain about overvoltage phenomena in electrical power systems. Explain the procedure for design the lightning protection and its components.

REFERENCES
3. Dieter Kind & Kurt Feser, 1st publication, High Voltage Test Techniques

BEEI 3403
POWER SYSTEM DISTRIBUTION/
PENGAGIHAN SISTEM KUASA

LEARNING OUTCOMES
Upon completing this subject, the student should be able to
1. Design low voltage distribution system related to industrial and commercial-based requirements.
2. Perform testing on protection and metering equipment based on low voltage distribution design drawing.
3. Conform to the safety and legal requirements for designing and testing of low voltage distribution system.

SYNOPSIS
This course deals with knowledge and practical related experience on distribution system design within power
systems. Students will have the opportunity to experience and be assessed on distribution system design activities such as diversity factor calculation, protective device sizing, main switchboard, cable-busbar sizing, single-line diagram, verification, protective device testing and troubleshooting as well as moral and ethical values. Students will also be emphasized on the safety and regulatory requirements on distribution system design. On top of that, students will also experience and be assessed on the ability to perform manual and automatic control on power distribution systems via SCADA, which will lead towards an actual distribution system operation for power systems operation.

REFERENCES

SEMESTER 7

BEEU 4774
BACHELOR DEGREE PROJECT II / PROJEK SARJANA MUDA II

LEARNING OUTCOMES
After completing the course, students will be able to:
1. Execute project implementation systematically.
2. Interpret data in a meaningful form using relevant tools
3. Work independently and ethically.
4. Present the results in the oral and written forms effectively.

SYNOPSIS
This is the second part of the Bachelor Degree Project. Students are expected to continue the project done in Bachelor degree Project Part 1 till completion. At the end of the semester students are required to submit the Bachelor Degree Project report both orally and in writing for assessment.

REFERENCES

PRE-REQUISITE
BEEU 3764
BACHELOR DEGREE PROJECT I / PROJECT SARJANA MUDA I

BEEI 4803
POWER SYSTEMS OPERATION & AUTOMATION / OPERASI & AUTOMASI SISTEM KUASA

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Describe the power system operation criteria and standards appropriately
2. Recommend asset management strategies through Reliability Centered Maintenance (RCM) properly
3. Use the basic application of Supervisory Control and Data Acquisition (SCADA) and its component in Distribution Automation System (DAS)

4. Practice the knowledge of Distribution Automation System (DAS) professionally and ethically.

SYNOPSIS
This subject discuss about operation criteria and standards use in power system. It also covers the load and operation management, asset management strategies, RCM in power system especially in distribution level. This subject also covers the automation in power system which is focus in basic SCADA system, RTU and its components. Describe RTU, SCADA and master station protocol and communication. Explain about Distribution Management System (DMS) and Energy Management System (EMS).

REFERENCES

BEEY 3803
SISTEM TENAGA DIPERBAHARUI/ RENEWABLE ENERGY SYSTEM

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
3. Explain effectively as an individual and group member for conducted assignment and experiment.

SYNOPSIS
This subject is an introductory course for renewable energy system. The material encountered in the subject includes: introduction of energy usage, conventional energy sources, renewable energy sources (e.g PV, Wind, Biomass), basic energy storage, renewable energy case study, and engineering recommendations and generator protection requirements.

REFERENCES
BEEI 4813
QUALITY IMPROVEMENT TOOLS /
KAEDAH PENAMBAHBAIKAN KUALITI

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Apply the quality improvement tools, Acceptance Sampling Systems and techniques of Statistical Process Control to solve quality issues.
2. Construct the Control Charts for Variables and Attributes as well as other Statistical Process Control (SPC).
3. Practice the knowledge of quality improvement professionally and ethically.

SYNOPSIS
This subject focuses on the tools of quality. It begins with a brief discussion of Ishikawa’s basic tools of quality. Ishikawa’s seven basic tools include flow charts; check sheets, the histogram and control charts, scatter diagrams, cause and effect diagrams and Pareto charts. It is later followed by the new seven quality tools (N7) for quality are introduced and discussed, including the affinity diagram, the interrelationship digraph, tree diagrams, prioritization grids, matrix diagrams, process decision program charts, and activity network diagrams. It also covers various problem solving methods such as Statistical Process Control (SPC) and Acceptance Sampling. The tools are essential to improve processes and products quality.

REFERENCES

BEEI 4843
POWER SYSTEMS ELECTROMAGNETIC COMPATIBILITY / KESERASIAN ELEKTROMAGNET SISTEM KUASA

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Analyse the technical requirements of testing, shielding, grounding and bonding of EMC for power systems operation.
2. Perform experiments to determine suitable types of EMC mitigation approach for a different power systems scenario.
3. Conform to the safety and legal requirements for EMC for power systems operation.

SYNOPSIS
This subject will cover topic on introduction to industrial process control including basic terms and diagrams. It’s also emphasized on process variables, elements, and instruments for temperature, level and flow of process control. The right controllers for process control are discussed and control loops in process control are analyzed. Applications of automation technologies such
as SCADA and DCS for process control are also explained.

REFERENCES

BEEA 4813
INDUSTRIAL PROCESS CONTROL / KAWALAN PROSES INDUSTRI

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Analyze the control system characteristics and instrumentations for appropriate controller application in the process control industries.
2. Apply industrial process control elements and instruments for the process variables in the process control industries.
3. Prepare a design of process control plant.

SYNOPSIS
This subject will cover topic on introduction to industrial process control including basic terms and diagrams. It’s also emphasized on process variables, elements, and instruments for temperature, level and flow of process control. The right controllers for process control are discussed and control loops in process control are analyzed. Applications of automation technologies such as SCADA and DCS for process control are also explained.

REFERENCES

BEEY 4413
ENERGY EFFICIENCY / KECEKAPAN TENAGA

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Analyze the properties of electrical power management for improving energy efficiency in electrical system.
2. Demonstrate the functionality of important electrical parameters for controlling electrical energy efficiency through experiments in laboratory.
3. Create awareness among colleagues regarding the importance of energy sustainability.

SYNOPSIS
This course is an introductory course to electrical energy efficiency technologies, application and standard (eg: ISO, IEC and CEN). This subject provides students a comprehensive introduction to: standardization terminologies; ampacity calculation of the cables or lines for the solution of heat transfer, cable sizing and thermal consideration; power transformers losses, efficiency and load factor, cooling system, regulations, life cycle costing.
and design material; building automation control and management systems such as temperature control, lighting, drives and motors, technical alarm management, remote control, KNX / SCADA systems and Building Energy Performance; power quality phenomena and indicators in RMS voltage level, voltage fluctuations, voltage and current unbalance, and voltage and current distortion; tariff structure and cost rate charged to residential, commercial and industry.

REFERENCES
3. Marizan Sulaiman, Ekonomi dan Pengurusan Sistem Kuasa, Utusan Publications & Distributors

BEEI 4853
EKONOMI SISTEM DAN PASARAN ELEKTRIK / ELECTRICITY MARKET AND SYSTEM ECONOMICS

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Analyse suitable electricity generation and transmission system to be implemented based on economic factors in power systems.
2. Perform experiments on reliability assessment for power generation and power transfer in power systems.
3. Conform to the safety and legal requirements of different electricity industry regulations in power systems.

SYNOPSIS
This course deals with knowledge and practical related experience on electricity market and system economics within power systems. Student will have the opportunity to experience and be assessed on the economics, trading and pricing of electricity supply and how it is shaped by technical, commercial and regulatory considerations. Student will also be assessed on the understanding of system economics under the environment of multiple suppliers and users, deep appreciation of factors affecting security of supply and how it might be quantified and finally how to put engineering knowledge concerning electricity supply into context.

REFERENCES

BEEI 4863
POWER QUALITY/ KUALITI KUASA

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Evaluate different types of power quality and suggest suitable mitigation techniques for different case given.
2. Perform measurement and power quality monitoring by using power quality analyser.
3. Conform the power quality problems according to the related standards.

**SYNOPSIS**
This course covers all important aspects of power quality. The main topics are introduction to power quality, power quality characteristics, power quality measurement and monitoring tools, related standards, different types of power quality problem, mitigation techniques as well as relevant issues. Delivery methods include lectures, tutorials and practical sessions.

**REFERENCES**

**SEMESTER 8**

**BEEU 4786**
INDUSTRIAL TRAINING / LATIHAN INDUSTRI

**LEARNING OUTCOME**
At the end of the subject, students should be able to:
1. Show technical competencies and skills gained throughout their internship.
2. Prepare a report on the industrial field daily activities in the log book systematically.
3. Communicate effectively with staff, colleagues and other personnel.
4. Practice professional ethics in accordance with industry rules and regulations.

**SYNOPSIS**
All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

**REFERENCES**
1. UTeM Guideline Handbook for Industrial Training.

**BEEU 4796**
INDUSTRIAL TRAINING REPORT / LAPORAN LATIHAN INDUSTRI

**LEARNING OUTCOME**
At the end of the subject, students should be able to:
1. Produce industrial training report.
2. Present report orally on working experience.

**SYNOPSIS**
All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.
PRE-REQUISITE
Student required to pass Industrial Training BEEU 4786 in order to pass Industrial training report.

REFERENCES
1. UTeM Guideline Handbook for Industrial Training.

BEEA Course Core Subjects (K)

SEMESTER 1

BEEY 1303
MEASUREMENT & INSTRUMENTATION / PENGUKURAN & INSTRUMENTASI

LEARNING OUTCOMES
At the end of the subject, students should be able to:
1. Apply the knowledge of principles, techniques, components and tools in measurement and instrumentation system.
2. Measure and operate the electrical parameter by using analogue and digital instruments.
3. Explain effectively the knowledge about the measurement and instrumentation tools, techniques and standard.

SYNOPSIS
This subject discusses about units and dimensions, standards, errors and calibration in measurement. It covers the measurement devices such as digital meter, analog meter, oscilloscope, function generator and any device related. This subject also covers on instrumentation elements for complete data acquisition system such as sensors & transducers, signal conditioning & processing, A/D and D/A conversion, interfacing standards and data presentation.

REFERENCES

BEEA 1313
COMPUTER AIDED DESIGN / REKABENTUK TERBANTU KOMPUTER

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Use a standard Computer Aided Design software command tools for basic two-dimensional drafting and produce geometric, orthographic, isometric, section cut and detail drawing.
2. Construct detailed two-dimensional engineering drawings and basic three-dimensional solid modelling models using standard Computer Aided Design software.
3. Demonstrate an accurate engineering drawing based on given problem.
SYNOPSIS
This course will be presented by means of lecture, tutorials, labs, lab test assignments and quiz fully in the CAD studio, without a final exam. The course concentrates on how to use Computer Aided Design (CAD) software to produce the basic engineering drawing, for example, geometric, orthographic, isometric, section cut and detail drawing. The students will be exposed to CAD interface, CAD coordinate system, basic drawing command tools, display controls, basic editing commands tools, text, dimensioning, isometric and template preparation in order to produce various types of engineering drawing. However, this course will focus on the electrical engineering drawing type. The 3D Solid Modelling Object Development drawing will also be covered.

REFERENCES

BEEA 13
DIGITAL ELECTRONICS & SYSTEMS / ELEKTRONIK & SISTEM DIGITAL

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Apply the knowledge basic features and configuration of combinational logic and sequential logic circuit in digital system.
2. Construct experiments and project on combinational, sequential, encoder, decoder and memory logic circuit by using simulation software and digital trainer kit.
3. Explain effectively either individually or group members for conducted assignment and experiment.

SYNOPSIS
This subject discusses about number systems & codes, Boolean algebra, logic families and the characteristic of logic gates, combinational logic, analysis and design, MSI combinational logic circuit, flip-flops, counter and shift-register, synchronous and asynchronous sequential circuits. Analysis and design of adder, decoder, encoder, multiplexer, de-multiplexer. PLD devices such as ROM, PAL, counter and register.

REFERENCES


BEEI 1303
ELECTRICAL CIRCUIT FUNDAMENTAL / PENGENALAN LITAR ELEKTRIK

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Apply analytical method and theorem to DC and AC (steady state) circuits in electrical circuit.
2. Conduct experiment on DC and AC (steady state) circuit based on electrical circuit theorem.
3. Participate effectively for any assignment and experiment.

SYNOPSIS
This subject introduces the students to Ohm's Law, Kirchhoff's Laws and use them to calculate current, voltage and power in DC / AC (steady state) circuits. Following this the students will learn the analytical methods namely mesh and nodal analysis. The use of theorems like Thevenin, Norton, Superposition and the Maximum Power Transfer will follow next. The applications of the above tools will cover both dc and ac circuits. This subject will be supported by laboratory works to impart to the students some basic practical skills.

REFERENCES


SEMESTER 2

BEEI 1323
ELECTRICAL & MAGNETISM / ELEKTRIK & KEMAGNETAN

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Explain the concept and application of Electrical Field, Coulomb's Law, Lenz Law and Faraday's Law in electrical charge phenomena.
2. Demonstrate electrical concepts, basic magnetic quantities and phenomena to simple devices (DC motor and transformer) in electrical engineering technology.
3. Present written and oral communications to document work and experiment results.

SYNOPSIS
This course will begin with an introduction of static electrical charge including the related law such as coulomb’s law and gauss, Lenz law concept, conductors, dielectrics, and electric boundary conditions. The magnetism fundamental also will be covered in the
syllabus, which includes magnetic shell, magnetic flux, EMF and Faraday’s Law, magnetic field produce by more than one current carrying conductor.

REFERENCES

SYNOPSIS
These subject exposes students to the application of several tools in analyzing electrical circuits, such as the Laplace transform and two ports network. The students are required to use the tools to analyze transient and frequency response in electrical circuit.

REFERENCES

PRE-REQUISITE
BEEI 1303
ELECTRIC CIRCUIT FUNDAMENTAL / PENGENALAN LITAR ELEKTRIK

LEARNING OUTCOMES
Upon completing this subject, the student should be able to:
1. Analyze first order and second order electrical circuit in transient and frequency response.
2. Conduct experiment on frequency response and electrical circuit measurement.
3. Present written and oral communications to document work and experiment results.

BEEI 1453
ELECTRONIC PRINCIPLR / PRINSIP ELEKTRONIK

LEARNING OUTCOMES
At the end of the subject, students should be able to:
1. Apply knowledge of semiconductor devices in electronic circuit. (PLO1,C4).
3. Work in group effectively while performing group assignment. (PLO9,A3).

SYNOPSIS
This course is explained to students about the electronic principles and concepts. It involves the introduction to four semiconductor devices which are diode, bipolar junction transistor (BJT), field effect transistor (FET) and operational amplifier. Besides, students will be also learned about the types, structures, characteristics, configurations and applications of these devices. In terms of practical skills, students will conduct experiments and simulation works related to the application of electronic devices.

REFERENCES
4. Atul P. Godse, Uday A. Bakshi, Electronic devices.

BEEA 1343
COMPUTER PROGRAMMING / PENGATURCARAAN KOMPUTER

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Produce computer programming code based on principles, structures and techniques in C++.
2. Construct programming language code by applying suitable C++ programming techniques to solve a given problem.
3. Work in group effectively while performing group assignment.

SYNOPSIS
Throughout the course, students will be introduced with basic principles of computers and software development methodology. The course also consists of basic programming principles such as syntax semantic, compiling, and linking. Programming techniques using C++ such as data type and operator, selection, repetition, function, array, file, and pointer are learnt towards the end of this course.

REFERENCES

BEEI 1311
ELECTRICAL WORKSHOP I / BENGKEL ELEKTRIK I

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Apply knowledge in single phase electrical installation for domestic-based application.
2. Perform single phase electrical installation for domestic-based application.
3. Confirm each workshop activities based on existing acts, regulations & standard.

SYNOPSIS
This course deals with knowledge and practical related experience on single-phase electrical installation. Students will have the opportunity to experience and be assessed on electrical installation activities involving diversity factor calculation, protective device sizing, cable sizing, single-line diagram, electrical wiring, verification, testing and troubleshooting as well as moral and ethical values. Students will also be emphasized on the safety and regulatory requirements on electrical installation. On top of that, students will also experience and be assessed on the ability to perform offsets on UPVC conduit and trunking which will lead towards a complete single-phase electrical installation system typically for domestic users.

REFERENCES


SEMESTER 3
BEEI 2373
ELECTRICAL MACHINES / MESIN ELEKTRIK

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Analyze the differences of physical and electrical construction and working principles of DC and AC electrical machines.
2. Conduct experiments to determine electrical and mechanical parameters and the performance of DC and AC electrical machines.
3. Conform to the safety and legal requirements for DC and AC electrical machines operation.

SYNOPSIS
This course deals with knowledge and practical related experience on electrical machines. Students will have the opportunity to experience and be assessed on laboratory activities involving determination of electrical and mechanical parameters and also the performance of DC and AC electrical machines covering both types; generators and motors. Students will also be emphasized on the safety and regulatory requirements on electrical machines. On top of that, students will also experience and be assessed on the ability to setup specific laboratory activities.
connection which will lead towards a complete electrical machine training system to be used for laboratory activities.

REFERENCES

BEEI 2364
ELECTRICAL TECHNOLOGY / TEKNOLOGI ELEKTRIK

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Analyze single-phase, three-phase and magnetic circuit for alternating current (AC).
2. Conduct experiment on single-phase and three-phase system for alternating current (AC).
3. Participate effectively to fulfil experimentation task with peers.

SYNOPSIS
This subject 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. Magnetic circuit, construction and operation of transformer, generation of three phase voltage, balanced and unbalanced three phase load and also voltage, current, power and power factor calculation.

REFERENCES

BEEI 2342
ELECTRICAL WORKSHOP II / BENGKEL ELEKTRIK II

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Apply the knowledge in three phase electrical installation and motor starter for industrial-based application.
2. Perform three phase electrical installation and motor starter for industrial-based application.
3. Confirm each workshop activities based on existing acts, regulations & standard.
SYNOPSIS
This course deals with knowledge and practical related experience on three-phase electrical installation and AC motor starters. Students will have the opportunity to experience and be assessed on electrical installation and AC motor starter activities involving diversity factor calculation, protective device sizing, cable sizing, single-line diagram, main circuit, control circuit, electrical wiring, verification, testing and troubleshooting as well as moral and ethical values. Students will also be emphasized on the safety and regulatory requirements on electrical installation. On top of that, students will also experience and be assessed on the ability to perform offsets on galvanized iron conduit and trunking which will lead towards a complete three-phase electrical installation system typically for industrial users.

REFERENCES

PRE-REQUISITE
BEEI 1311
ELECTRICAL WORKSHOP 1/ BENKEL ELEKTRIK 1

BEEA 2363
STATIC & MECHANICS / STATIK & MEKANIK

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Explain the concepts and characteristics of static forces and mechanical systems.
2. Construct the statics and mechanics principles of materials through laboratory experiments.
3. Explain effectively either individually or in group for any assignment and experient in term of basic concept of force and material mechanics.

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 resultant and moment, equilibrium of particle, equilibrium of rigid body, structural analysis, centre of gravity and centroid.

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

REFERENCES

SEMIESTER 4

BEEA 2374
EMBEDDED SYSTEMS / SISTEM TERBENAM

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Analyze the operation of a microcontroller's architecture, peripherals subsystem.
2. Construct hardware and software of microcontroller based system to solve related problem.
3. Demonstrate business practice and entrepreneurship in microcontroller project development.

SYNOPSIS
Basic concept of microcontroller and the differences between microcontroller and microprocessor. Microcontrollers memory map, compiler, programming language and software. Stack, subroutines, interrupt and reset. Application of programming with input and outputs such as switches and 'Light Emitting Diodes', DC motors, stepper motors and photosensors. Students will apply microcontroller with simple mechatronics system.

REFERENCES
1. Zamani et. al (2013), Microcontroller Technology, Theory & Code Example, Penerbit UTeM.
2. Aminurrashid Noordin et. al (2011), Miniproject using MicroC (Mikroelektronika & Proteus Professional), Penerbit UTeM.

BEEA 2383
CONTROL SYSTEM FUNDAMENTAL / PENGENAALAN SISTEM KAWALAN

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Apply appropriate techniques in describing the characteristics of control systems in time domain.
2. Construct experiments to distinguish system performances of open loop and closed loop systems.

SYNOPSIS
This subject 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 and second order systems; Routh Hurwitz criteria for stability; steady-state error analysis; speed and position control system analysis using ScicosLab.
REFERENCES

BEEI 3413
POWER ELECTRONICS / ELEKTRONIK KUASA

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Analyze the basic topologies of converters and power supplies for device applications in industrial practices.
2. Conduct experiments on the characteristics and performance of rectifiers, converters choppers and inverters.
3. Work in a team to design rectifiers, choppers, switch-mode power supplies (SMPS) and inverters based on converter topologies.

SYNOPSIS
This course is about the basic principles of semiconductor devices, switching process and the application in rectifier circuit, one and three-phase inverter, switching losses, heat sink, the application of semiconductor devices as AC to DC, DC to AC and DC to DC converters, circuits as DC drives, AC drives, snubbers and harmonic effects, and also the introduction to computer simulation (PESIM).

REFERENCES

BMMH 2313
FLUID MECHANICS / MEKANIK BENDALIR

LEARNING OUTCOMES
Upon completing this subject, the student should be able to:
1. Apply fluid mechanics concept in solving fluid statics and fluid dynamics problem.
2. Measure related parameter by using appropriate techniques in fluid mechanics application.
3. Function effectively either as a member or leader in group for any assignment or experiment.

SYNOPSIS
Introduction to this subject is about the basic physical properties of fluid. Then it covers the definition of pressure...
and head. Next it followed by derivation of hydrostatic equation and its application in pressure measurement, static forces analysis on immersed surface and buoyancy analysis. For fluid dynamics, it started with introduction to fluid dynamics and fluid flow analysis. Then it is continued by 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. The last topic for this subject is dimensional analysis and its application.

REFERENCES

SEMESTER 5

BEEA 3464
PLC & AUTOMATION / PLC & AUTOMASI

LEARNING OUTCOMES
Upon completing this subject, the student should be able to:
1. Apply knowledge to solve basic industrial automation system problems using a PLC system.
2. Demonstrate PLC system experiments.
3. Communicate effectively for any assignments and experiments.

SYNOPSIS
This subject will expose students with knowledge and skills of PLC including its definition, main hard components, PLC programming languages, interfacing PLC with computers, integrates PLC hardware and software to design a simple automation system.

REFERENCES
LEARNING OUTCOMES
Upon completing this subject, the student should be able to:
1. Calculate the power system parameters using power system model, per unit (P.U) quantities and protection system requirements.
2. Conduct experiments on power system components using hardware or simulation software.
3. Present written and oral communications to document work and experiment results.

SYNOPSIS
This subject gives the overall components of power system to the students without going into detail. The power system components will be modelled for the analysis purposes. The topics include per-unit quantities, transmission line, transformer, synchronous generator, power flows, symmetrical components, power protection and power system stability.

REFERENCES

LEARNING OUTCOMES
Upon completing this subject, the student should be able to:
1. Apply the principle of a Local Area Network, ink layer data transmission techniques and protocols.
2. Construct the network operation and technology of LAN, wireless LAN, WAN and routing algorithm to the given assignment and experiments.
3. Demonstrate a good practice standard in conducted assignment and experiments.

SYNOPSIS
This subject will discuss about the control systems engineering; analysis in time and frequency domain responses; stability in time and frequency domain; design in time domain (root locus) and frequency domain (Bode plot).

REFERENCES

PRE-REQUISITE
BEEA 2383
CONTROL SYSTEM FUNDAMENTAL /
PENGENALAN SISTEM KAWALAN
BEEA 3463
INDUSTRIAL DATA COMMUNICATION /
DATA KOMUNIKASI INDUSTRI

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Explain and describe the concept of computer system network, communication model, network models, network components, network topology, network technology and applications
2. Design, install, configure and troubleshoot a wired and wireless network.
3. Demonstrate good practice safety standard, teamwork spirit and communication skills properly.

SYNOPSIS
Topics covered are: Introduction to Computer Network, Data Communications, Network Structure, Local Area Network, Wide Area Network, Interconnection, and Internetworking

REFERENCES

SEMESTER 6

BEEU 3764
BACHELOR DEGREE PROJECT I /
PROJEK SARJANA MUDA I

LEARNING OUTCOMES
At the end of the subject, students should be able to:
1. Explain the problem, objectives and scope of project associated to the industrial or community needs.
2. Use related previous work and its relevant theory.
3. Choose a proper methodology.
4. Present the preliminary findings in the oral and written forms effectively.

SYNOPSIS
The student needs to plan and implement the project individually that related to the respective engineering technology field. The student should implement a project, do the analysis and apply the theory to solve the problems related to topic. At the end, the student should write a problem based learning report that covers problem statement, literature review, methodology to overcome the problem. The student needs to achieve the objective of the project and presented it in the report.

REFERENCES
LEARNING OUTCOMES
Upon completing this subject, the students should be able to:

1. Identify the basic components and the system structure of motion control systems.
2. Apply software and hardware packages to set, measure, analyze and program basic motion control parameters as well as simulate and build basic motion control systems.
3. Demonstrate hands-on experience with personal computers, data acquisition and motion control systems.
4. Diagnose and resolve equipment problems by utilizing technical assessment skills that include planning, reliability, logical thinking, and ability to use drawings, schematics and documentation.

SYNOPSIS
This subject introduces students to basic principles of motion control which include components and system structure, mechanisms (gearbox, pulley, lead screw and rack/pinion), sensors and encoders (potentiometer, incremental encoder, resolver) and the basic principles of servo motor and stepper motor. Students will be involved in the application of software and hardware packages to set, measure, analyze and program basic motion control parameters as well as simulate and build basic motion control systems. Students are also required to diagnose and resolve equipment problems by utilizing technical assessment skills that include planning, reliability, logical thinking, and ability to use drawings, schematics and documentation.

REFERENCES
1. Industrial Automated Systems by Terry Bartelt Bird
3. Introduction to Mechatronics and measurement Systems, Alciatore, 2009, 3e, TMH
6. Incremental Motion Control, B. C. Kuo, SRL Publishing Company
7. National Instrument web site
8. Siemens web site

LEARNING OUTCOMES
Upon completing this subject, the students should be able to:

1. Apply the knowledge of basic application circuits of pneumatics/hydraulics and electro-pneumatics/electro-hydraulics systems commonly used in manufacturing industries.
2. Demonstrate the basic application circuits of pneumatics/hydraulics and electro-pneumatics/electro-hydraulics systems commonly used in manufacturing industries.
3. Function effectively as a team in laboratory works and in developing an electro-pneumatics system project.
SYNOPSIS
This subject introduces the students to industrial fluid power, which is consisting of hydraulic and pneumatic system. This course is taught by practical application approach (theory and practice) in the laboratory session. Lab equipment is provided that allows the students to design, build, and test most of the circuits discussed in class. Mini project or project oriented problem-based learning is incorporated in this subject.

REFERENCES

BEEA 3433
INDUSTRIAL ROBOTICS / ROBOTIC INDUSTRY

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Evaluate the forward, inverse & dynamic kinematic equation in robotic configuration in industrial robotics.
2. Construct specific robotic programming & simulation for actual robots used in industrial automation system.
3. Arrange the appropriate robotic technologies considering the impact to industrial environment.

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

SEMESTER 7

BEEU 4774
BACHELOR DEGREE PROJECT II / PROJEK SARJANA MUDA II

LEARNING OUTCOMES
After completing the course, students will be able to:
1. Execute project implementation systematically.
2. Interpret data in a meaningful form using relevant tools
3. Work independently and ethically.
4. Present the results in the oral and written forms effectively.

SYNOPSIS
This is the second part of the Bachelor Degree Project. Students are expected to continue the project done in Bachelor degree Project Part 1 till completion. At the end of the semester students are required to submit the Bachelor Degree Project report both orally and in writing for assessment.

REFERENCES

PRE-REQUISITE
BEEU 3764
BACHELOR DEGREE PROJECT I / PROJECT SARJANA MUDA I

BEEA 4803
FLEXIBLE MANUFACTURING SYSTEM /
SISTEM PEMBUATAN TERANJAL

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Analyze the manufacturing operations, manufacturing metrics and economics for discrete manufacturing systems as well as the quantitative analysis for Flexible Manufacturing Cells (FMC) and Flexible Manufacturing Systems (FMS).
2. Demonstrate an advanced manufacturing system's operation and an HMI/SCADA system commonly used in industry.
3. Function effectively as a team in laboratory works and in developing an HMI/SCADA system project.

SYNOPSIS
Introduction to industrial field topics such as production system, manufacturing system, manufacturing operation, production concept and mathematical models as well as manufacturing operation costs besides FMS, CIM, SCADA, HMI, CAD/CAM and TPM systems with the complete descriptions and relevant analysis where those systems are integrated in building modern automated systems in manufacturing industries.

REFERENCES


BEEA 4813
INDUSTRIAL PROCESS CONTROL / KAWALAN PROSES INDUSTRI

LEARNING OUTCOMES
Upon completing this subject, the student should be able to:
1. Analyse the control system characteristics and instrumentations for appropriate controller application in the process control industries
2. Apply industrial process control elements and instruments for the process variables in the process control industries
3. Prepare a design of process control plant.

SYNOPSIS
This subject will cover topic on introduction to industrial process control including basic terms and diagrams. It's also emphasized on process variables, elements, and instruments for temperature, level and flow of process control. The right controllers for process control are discussed and control loops in process control are analyzed. Applications of automation technologies such as SCADA and DCS for process control are also explained.

REFERENCES

BEEA 4823
MACHINE VISION / PENGLIHATAN MESIN

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Analyze the principle of machine learning and approaches to decision making for machine vision system.
2. Manipulate the image processing and tools on the digital images to extract their basic visual information.
3. Organise effectively in a team for a machine vision project related to industrial automation system.

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

BEEA 4833
DISTRIBUTED CONTROL SYSTEM /
SISTEM KAWALAN TERAGIH

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Analyze Distributed Control System (DCS) by knowledge of architecture (software and hardware), communication and engineering drawing.
2. Completes the experiment on DCS hardware and software using Distributed Control System (DCS).
3. Explain effectively either individually or in group for any assignment and experiment.

SYNOPSIS
Distributed Control System (DCS), designed to monitor and control distributed equipment across large, dynamic manufacturing and processing sites. If the system is performing both monitoring and control of a process or facility, it is referred to as a SCADA system, or Supervisory Control and Data Acquisition system. A DCS may be as simple as one PLC (Programmable Logic Controller) remotely connected to a computer located in a field office. Large system may be PLC based, but will most likely consist of specially designed cabinets containing all of the equipment necessary to provide I/O and communication.

REFERENCES
5. ABB DCS 800xA Manual.

BEEA 4843
ADVANCED MANUFACTURING SYSTEM /
SISTEM PEMBUATAN LANJUTAN

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Analyze the manufacturing operations, manufacturing metrics and economics for discrete manufacturing systems as well as the quantitative analysis for Flexible Manufacturing Cells (FMC) and Flexible Manufacturing Systems (FMS).
2. Demonstrate an advanced manufacturing system's operation and an HMI/SCADA system commonly used in industry.
3. Function effectively as a team in laboratory works and in developing an HMI/SCADA system project

SYNOPSIS
Introduction to industrial field topics such as production systems, manufacturing systems, manufacturing operations, manufacturing metrics and economics as well as manufacturing support systems besides FMS, CIM, CNC, HMI, SCADA, QC, CAD/CAM and TPM systems with the complete descriptions and relevant analysis where those systems are integrated in building modern automated systems in manufacturing industries.

REFERENCES
LEARNING OUTCOMES
Upon completing this subject, the student should be able to
1. Demonstrate ability to model engineering problem for machine learning implementation.
2. Display ability to compose appropriate machine learning toolbox.
3. Work individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS
This course will teach student the process in using machine learning for solving engineering problem. The main process that student will learn are: data collection, data pre-processing, data clustering, modeling engineering problem and choosing appropriate machine learning algorithms, applying and machine learning algorithm toolbox, and ethical aspect in applying machine learning algorithm and presenting the result.

REFERENCES
1. Andreas C. Muller, Introduction to Machine Learning with Phyton, O'Reilly Publisher, 2014.

SEMESTER 8

BEEU 4786
INDUSTRIAL TRAINING / LATIHAN INDUSTRI

LEARNING OUTCOME
At the end of the subject, students should be able to:
1. Show technical competencies and skills gained throughout their internship.
2. Prepare a report on the industrial field daily activities in the log book systematically.
3. Communicate effectively with staff, colleagues and other personnel.
4. Practice professional ethics in accordance with industry rules and regulations.

SYNOPSIS
All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

PRE-REQUISITE
Student required to pass Industrial Training BEEU 4786 in order to pass Industrial training report.

REFERENCES
1. UTeM Guideline Handbook for Industrial Training.

BEEU 4796
INDUSTRIAL TRAINING REPORT / LAPORAN LATIHAN INDUSTRI

LEARNING OUTCOME
At the end of the subject, students should be able to:
1. Produce industrial training report.
2. Present report orally on working experience.

SYNOPSIS
All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

REFERENCES
1. UTeM Guideline Handbook for Industrial Training.
BEEY Course Core Subjects (K)

BEEY1303
MEASUREMENT & INSTRUMENTATION SYSTEM / PENGUKURAN & SISTEM INSTRUMENTASI

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Apply the knowledge of principles, techniques, components and tools in measurement and instrumentation system.
2. Measure electrical parameter by using analogue and digital instruments.
3. Explain effectively the knowledge about the measurement and instrumentation tools, techniques and standard.

SYNOPSIS
This subject discusses about units and dimensions, standards, errors and calibration in measurement. It covers the measurement devices such as digital meter, analog meter, oscilloscope, function generator and any device related. This subject also covers on instrumentation elements for complete data acquisition system such as sensors & transducers, signal conditioning & processing, A/D and D/A conversion, interfacing standards and data presentation.

REFERENCES

BEEA 1313
COMPUTER AIDED DESIGN / REKABENTUK TERBANTU KOMPUTER

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Use a standard Computer Aided Design software command tools for basic two-dimensional drafting and produce geometric, orthographic, isometric, section cut and detail drawing.
2. Construct detailed two-dimensional engineering drawings and basic three-dimensional solid modelling models using standard Computer Aided Design software.
3. Demonstrate an accurate engineering drawing based on given problem.

SYNOPSIS
This course will be presented by means of lecture, tutorials, labs, lab test assignments and quiz fully in the CAD studio, without a final exam. The course concentrates on how to use Computer Aided Design (CAD) software to produce the basic engineering drawing,
for example, geometric, orthographic, isometric, section cut and detail drawing. The students will be exposed to CAD interface, CAD coordinate system, basic drawing command tools, display controls, basic editing commands tools, text, dimensioning, isometric and template preparation in order to produce various types of engineering drawing. However, this course will focus on the electrical engineering drawing type. The 3D Solid Modelling Object Development drawing will also be covered.

REFERENCES

SYNOPSIS
This subject introduces the students to Ohm’s Law, Kirchhoff’s Laws and use them to calculate current, voltage and power in DC / AC (steady state) circuits. Following this the students will learn the analytical methods namely mesh and nodal analysis. The use of theorems like Thevenin, Norton, Superposition and the Maximum Power Transfer will follow next. The applications of the above tools will cover both dc and ac circuits. This subject will be supported by laboratory works to impart to the students some basic practical skills.

REFERENCES

BEEI 1303
ELECTRICAL CIRCUIT FUNDAMENTAL /
PENGENALAN LITAR ELEKTRIK

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Apply analytical method and theorem to DC and AC (steady state) circuits in electrical circuit.
2. Conduct experiment on DC and AC (steady state) circuit based on electrical circuit theorem.
3. Participate effectively for any assignment and experiment.
LEARNING OUTCOMES
Upon completion of this subject, student should be able to:

1. Apply the knowledge, basic features and configuration of combinational logic and sequential logic circuit.
2. Construct digital system experiments and assignment.
3. Explain effectively either individually or in group for any assignment and experiment.

SYNOPSIS
This subject discusses about number systems & codes, Boolean algebra, logic families and the characteristic of logic gates, combinational logic, analysis and design, MSI combinational logic circuit, flip-flops, counter and shift-register, synchronous and asynchronous sequential circuits, analysis and design of adder, decoder, encoder, multiplexer, demultiplexer, counter and register. Simulations of digital logic systems are also included.

REFERENCES

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:

1. Explain the concept and application of Electrical Field, Coulombs Law, Lenz Law and Faradays Law in electrical charge phenomena.
2. Demonstrate electrical concepts, basic magnetic quantities and phenomena to simple devices (DC motor and transformer) in electrical engineering technology.
3. Present written and oral communications to document work and experiment results.

SYNOPSIS
This course will begin with an introduction of static electrical charge including the related law such as coulomb’s law and gauss, Lenz law concept, conductors, dielectrics, and electric boundary conditions. The magnetism fundamental also will be covered in the syllabus, which includes magnetic shell, magnetic flux, EMF and Faraday’s Law, magnetic field produced by direct current, solenoid magnetic field and force produce by more than one current carrying conductor.
REFERENCES

BEEI 1333
ADVANCED ELECTRICAL CIRCUIT / LITAR ELEKTRIK LANJUTAN

LEARNING OUTCOMES
Upon completing this subject, the student should be able to:
1. Analyze first order and second order electrical circuit in transient and frequency response.
2. Conduct experiment on frequency response and electrical circuit measurement.
3. Present written and oral communications to document work and experiment results.

SYNOPSIS
These subject exposes students to the application of several tools in analyzing electrical circuits, such as the Laplace transform and two ports network. The students are required to use the tools to analyze transient and frequency response in electrical circuit.

REFERENCES

PRE-REQUISITE
BEEI 1303
ELECTRICAL CIRCUIT FUNDAMENTAL/
PENGENALAN LITAR ELEKTRIK

BEEY 1313
ELECTRONICS WORKSHOP/
BENGKEL ELEKTRONIK

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Apply the knowledge of basic electronic components, circuit simulation, PCB fabrication, soldering, troubleshooting and test verification of an electronic circuitry design.
2. Measure an electrical parameter in troubleshooting and test verification using appropriate tools and equipment.
3. Explain effectively the knowledge about the Health and Safety Regulation.

SYNOPSIS
This subject aims to enable the student to acquire competency in the safe use of electronics laboratory test equipment and to acquire competency in construction and testing electronic assemblies. The practical element of the electronic production is considered to be of great importance. Student gains valuable experience in physical component identification and the use of supplier catalogues in the component identification and ordering procedure. The skills of PCB fabrication, circuit design and simulation, circuit assembly and soldering, debugging and troubleshooting are developed in this subject.

REFERENCES
3. Occupational safety and health (classification, labelling and safety datasheet of hazardous chemicals) regulations 2013, Department of Occupational safety and health Malaysia
4. Laboratory Safety Guidance, Occupational Safety and Health Administration U.S. Department of Labor, 2011

SEMESTER 3

BEEA 133
COMPUTER PROGRAMMING /
PENGATURCARAAN KOMPUTER

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Produce computer programming code based on principles, structures and techniques in C++.
2. Construct programming language code by applying suitable C++ programming techniques to solve a given problem.
3. Work in group effectively while performing group assignment.

SYNOPSIS
Throughout the course, students will be introduced with basic principles of computers and software development methodology. The course also consists of basic programming principles such as syntax semantic, compiling, and linking. Programming techniques using C++ such as data type and operator, selection, repetition, function, array, file, and pointer are learnt towards the end of this course.

REFERENCES

BEEY 2343
ELECTRONIC DEVICES / PERANTI ELEKTRONIK

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Apply knowledge of semiconductor devices in electronic circuit.
3. Explain effectively either individually or in group for any assignment and experiment

SYNOPSIS
This subject introduces students to semiconductor devices. There are four semiconductor devices involve which are diode, bipolar junction transistor (BJT), field effect transistor (FET) and operational amplifier. Students will learn the types of these four devices, structure characteristic, configuration and application. In term of circuit analysis, student will learn how to calculate current and voltage in a circuit contain these semiconductor devices and draw output voltage waveform for diode application circuit. This subject will be supported by laboratory works and assignment to impart the students some basic practical skills.

REFERENCES
1. Thomas L. Floyd, Electronic Devices, 10th, Pearson, 2017

BEEY 2333
ELECTRICAL INSTALLATION I /
PEMASANGAN ELEKTRIK I

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Design single phase electrical installation based on domestic application.
2. Perform single phase electrical installation based on domestic application.
3. Conform to single phase electrical installation based on existing acts, regulations and standards.

SYNOPSIS
This course outlines the principles, design and application of single phase electrical installation system. The course covers various matters of single phase electrical installation system such as electrical requirements by i.e Public Works Department, consultants and electrical utility companies. This would also involve relevant acts, regulations, standards and safety to be complied with the existing legal requirement by the Energy Commission of Malaysia and electrical utility companies. Students will carry out their learning activities on single phase electrical...
SYNOPSIS
In this subject, students will be equipped with general introduction to the field of electrical engineering technology. The students will be exposed to attributes of an electrical technologist. They will also be exposed with engineering seminars by the industrialists and / or by professional member of engineering bodies and also several sessions of industrial visits. The context of the subject will be related to exposure of electrical engineering technology practices in terms of engineering ethics, economy, finance and law. They also look into general contemporary issues and career path related to engineering technologists.

BEEY 2353
ELECTRICAL TECHNOLOGY / TEKNOLOGI ELEKTRIK

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Analyze single-phase, three-phase and magnetic circuit for alternating current (AC).
2. Conduct experiment on single-phase and three-phase system for alternating current (AC).
3. Participate effectively to fulfil experimentation task with peers.

SYNOPSIS
This subject 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. Furthermore, this subject also includes the topics of magnetic circuit, construction and operation of
transformer, generation of three phase voltage, balanced and unbalanced three phase load and also voltage, current, power and power factor calculation.

REFERENCES

SEMESTER 4

BEEA 2353
ANALOG ELECTRONICS / ELEKTRONIK ANALOG

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Analyze the operation of analog electronic circuit based on the component characteristics.
2. Conduct experiment on analog electrical circuit by using measurement equipment and simulation software.
3. Explain effectively in group for assignment.

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

REFERENCES
1. Modul Analog Electronics, UTeM

BEEA 2374
EMBEDDED SYSTEM / SISTEM TERBENAM

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Analyze the operation of a microcontroller’s architecture, peripherals subsystem.
2. Construct hardware and software of microcontroller based system to solve related problem.
3. Demonstrate business practice and entrepreneurship in microcontroller project development.

SYNOPSIS
This course exposes students to the basic concept of microcontroller and microprocessor. It starts with understanding microcontrollers architecture, compiler, programming language and software. All the interrupt
available including timers and counters are explained in details. Then, it continues with the analog digital converter and PWM signal. Students are exposed to the integration of DC motor, servo motor, stepper motor and to the application of programming including the input and output such as switches and ‘Light Emitting Diodes’, multiple sensors, serial and i2c devices. Students will apply microcontroller to simple mechatronic system.

REFERENCES

BEEA 2383
CONTROL SYSTEM FUNDAMENTAL /
PENGENALAN SISTEM KAWALAN

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Apply appropriate techniques in describing the characteristics of control systems in time domain.
2. Construct experiments to distinguish system performances of open loop and closed loop systems.

SYNOPSIS
This subject 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 and second order systems; Routh Hurwitz criteria for stability; steady-state error analysis; speed and position control system analysis using ScicosLab.

REFERENCES

BEEY 2373
ELECTRICAL INSTALLATION II /
PEMASANGAN ELEKTRIK II

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Design three phase electrical installation and motor starter circuit based on industrial application.
2. Perform three phase electrical installation and motor starter circuit based on industrial application.
3. Conform to three phase electrical installation and motor starter circuit based on existing acts, regulations and standards.

SYNOPSIS
This course outlines the principles, design and application of three phase electrical installation system and electrical motor control. The course covers various matters of three phase electrical installation system such electrical requirements by i.e. Public Works Department, consultants and electrical utility companies. This would also involve relevant acts, regulations, standards and safety to be complied with the existing legal requirement by the Energy Commission of Malaysia and electrical utility companies. Students will carry out their learning activities on three phase electrical installation and motor control involving planning (sizing of circuit breakers and cables), application designing (electrical drawing, single line diagram, main circuit and control circuit), commissioning (cable installation) and troubleshooting.

REFERENCES
1. Ir Md Nazri, Aminuddin Aman, Md hairul Nizam, Engineering Practice: Wiring System & Motor Starter.
3. Mohd Nazi, Teknologi Pemasangan Elektrik, DBP.

SEMESTER 5
BEEI 2383
POWER SYSTEM TECHNOLOGY / TEKNOLOGI SISTEM KUASA

LEARNING OUTCOMES
Upon completing this subject, the student should be able to:
1. Calculate the power system parameters using power system model, per unit (P.U) quantities and protection system requirements.
2. Conduct experiments on power system components using hardware or simulation software.
3. Present written and oral communications to document work and experiment results.

SYNOPSIS
This subject gives the overall information on components of power system to the students. The power system components will be modelled for analysis purposes. The topics covered are including per-unit quantities, transmission lines, transformer, synchronous generator, power flows, symmetrical components, power protection and power system stability.

REFERENCES

BEEI 2373
ELECTRICAL MACHINES / MESIN ELEKTRIK

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Analyze the differences of physical and electrical construction and working principles of DC and AC electrical machines.
2. Perform experiments to determine electrical and mechanical parameters and the performance of DC and AC electrical machines.
3. Conform to the safety and legal requirements for DC and AC electrical machines operation.

SYNOPSIS
This course deals with knowledge and practical related experience on electrical machines. Students will have the opportunity to experience and be assessed on laboratory activities involving determination of electrical and mechanical parameters and also the performance of DC and AC electrical machines covering both types; generators and motors. Students will also be emphasized on the safety and regulatory requirements on electrical machines. On top of that, students will also experience and be assessed on the ability to setup specific laboratory connection which will lead towards a complete electrical machine training system to be used for laboratory activities.

REFERENCES

BEEY 3383
POWER ELECTRONICS DEVICES / PERANTI ELEKTRONIK KUASA

LEARNING OUTCOMES
Upon completing this subject, the student should be able to:
1. Analyze the characteristics power electronic devices and performance of uncontrolled rectifier, DC-DC converter and single-phase inverter.
2. Design an uncontrolled rectifier, DC-DC converter and single-phase inverter for various engineering application.
3. Report the analysis on basic power electronics circuitry.

SYNOPSIS
This course covers the basic principles of power electronics devices such as MOSFET, IGBT and thyristor,
and its application in uncontrolled rectifier circuit, DC to DC converter and single-phase inverter. It covers aspects such as switching methods, analysis on switching losses, heat dissipation, snubbers and harmonic effects. Students are also introduced to the design aspect of various converter and inverter through computer simulation (PSIM, MATLAB or Pspice) as well as lab practical.

REFERENCES

BEEU 3803
INTEGRATED DESIGN PROJECT / PROJEK REKABENTUK BERSEPADU

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Design solution by synthesizing electrical engineering technology knowledge that will solve broadly defined engineering technology problem in accordance with relevant standards.
2. Utilize modern engineering technology and IT tools in facilitating solutions to broadly defined engineering technology problem with an understanding of the limitations.
3. Evaluate the impact of the design product, component or processes in term of safety, environmental and sustainability factors.
4. Demonstrate effectively teamwork skill in completing the IDP.
5. Apply project management and financial knowledge effectively in completing the IDP.

SYNOPSIS
Integrated Design Project is a course where students have to design an engineering technology project to solve broadly defined problem. Broadly defined problem is engineering problems which cannot be pursued without a coherent and detailed knowledge of defined aspects of a professional discipline with a strong emphasis on the application of developed technology. The design project activities include 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 engineering design, students are also required to integrate their knowledge of other engineering disciplines such as (but not limited to) structural analysis and design, including material 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 disciplines of electrical engineering knowledge.
REFERENCES
1. International Engineering Alliance, Graduates attributes and professional competencies, version 3, June 2013.

SYNOPSIS
This subject is an introductory course for renewable energy system. The material encountered in the subject includes: introduction of energy usage, conventional energy sources, renewable energy sources (e.g PV, Wind, Biomass), basic energy storage, renewable energy case study, and engineering recommendations and generator protection requirements.

REFERENCES
BEEY 3813
PENGENALAN KEPADA SISTEM PENGANGKUTAN ELEKTRIK / INTRODUCTION TO ELECTRIC TRANSPORTATION SYSTEM

LEARNING OUTCOMES
Upon completing this subject, the student should be able to:
1. Analyze the principle operation of various types of road, railway and elevation electric transportation systems.
2. Construct lab experiment load estimation and energy requirement of electrical transportation.
3. Demonstrate practical competence on basic electric vehicle system.

SYNOPSIS
This subject will discuss on principle operation of various types of electric transportation systems, covering on the aspects of overall system architecture, energy sources, power conversion as well as the control system. The energy sources aspect introduces student to various types of energy sources mainly the battery with their characteristics and performances. Then the power electronics interfacing for power conversion is discussed covering the AC/DC, DC/DC and DC/AC conversion modules. The control techniques used such as the speed control, acceleration characteristics etc with application on electric cars/train in general will also be covered. Practical lab sessions will expose student on the development and performance improvement of low power electric vehicle.

REFERENCES

BEEY 3823
TEKNOLOGI PENYIMPANAN TENAGA / ENERGY STORAGE TECHNOLOGY

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Discuss operation principle of various kinds of energy storage applied in electric vehicle system and renewable energy application.
2. Analyse various battery management system used in electrical transportation and renewable energy application.
3. Demonstrate understanding on energy storage design and performance characteristic evaluation.

SYNOPSIS
The course covers on the introduction of various kinds of energy storage devices used for the electric vehicle system and renewable energy application. Students learn on battery construction, cell characteristics, electric data, energy density, capacity retention and the cycle life. Focus is given on the battery management system where students analyze the performance of the energy storage devices applied in any particular application. The course work examines the developments and design process of energy storage and evaluate its performance.
REFERENCES

SEMESTER 6

BEEU 3764
BACHELOR DEGREE PROJECT I / PROJEK SARJANA MUDA I

LEARNING OUTCOMES
At the end of the subject, students should be able to:
1. Explain the problem, objectives and scope of project associated to the industrial or community needs.
2. Use related previous work and its relevant theory
3. Choose a proper methodology
4. Present the preliminary findings in the oral and written forms effectively

SYNOPSIS
The student needs to plan and implement the project individually that related to the respective engineering technology field. The student should implement a project, do the analysis and apply the theory to solve the problems related to topic. At the end, the student should write a problem based learning report that covers problem statement, literature review, methodology to overcome the problem. The student needs to achieve the objective of the project and presented it in the report.

REFERENCES

BEEY 4393
POWER ELECTRONICS SYSTEMS / SISTEM ELEKTRONIK KUASA

LEARNING OUTCOMES
Upon completing this subject, the students should be able to:
1. Analyze the principle operation, characteristics and performance parameters of three phase inverter and multilevel inverter.
2. Construct a design process appropriate switching technique to improve converters performances using simulation / IT tools.
3. Complete the assignment and experiment in group effectively for the given works related to basic power electronics systems.

SYNOPSIS
This subject will cover the principle operation of single-phase and three-phase controlled rectifier, three phase inverter and multilevel inverter. It also includes the design and analysis of various switching/modulation techniques and performance analysis of the converter circuits. The design and performance improvement of converters with selection of appropriate switching techniques will be verified via simulation tools (e.g. Pspice and MATLAB).
REFERENCES

BEEY 3404
INDUSTRIAL AUTOMATION / AUTOMASI INDUSTRI

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Apply knowledge to solve basic industrial automation system problems using a PLC system.
2. Demonstrate PLC system and accessories experiments.
3. Communicate effectively for any assignments and experiments.

SYNOPSIS
This subject will expose students with knowledge and skills of PLC including its definition, main and hard components, PLC programming languages, interfacing PLC with console and computers, data communication, integrates PLC to hardware components and to design a simple automation system.

REFERENCES

BEEY 3833
POLISI TENAGA / ENERGY POLICY

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Evaluate the success criteria and success of RE and sustainable energy development authority.
2. Analyze the Feed in Tariff (FiT) in Malaysia.
3. Develop the monitoring and reporting plan for the energy policy and energy education.
4. Explain the objectives and strategies of national renewable energy policies, act and action plan.

SYNOPSIS
The course reviews the objectives and strategies of renewable energy policies world-wide. It will examine policy drivers, including environmental impact, community
service obligations and industry development, as well as policy instruments and how they are applied, including taxation, legislation, tariffs, targets and incentives. The policies and strategies will be illustrated with international case studies of renewable energy programs.

REFERENCES

BEEY 3843
REKABENTUK SISTEM PV / PV SYSTEM DESIGN

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Perform the design and sizing of PV system that includes inverter, solar cable and protection components.
2. Integrate the design of the PV system’s Balance of System (BOS) that includes inverter, solar cable and protection components.
3. Explain the impact of PV system towards sustainable development.

SYNOPSIS
This subject introduces students on basic solar engineering and the design and operation principles of solar cells. The students will also learn the design and sizing of PV systems components that include inverter, solar cable and protection devices. System design will focus on grid-connected application, but the design principles of stand-alone PV system will be discussed. Finally, student will evaluate solar PV system’s performance using key performance indicator. The course will utilize actual system data available.

REFERENCES

BEEY 3853
APLIKASI ELEKTRONIK KUASA / POWER ELECTRONICS APPLICATION

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Apply the application of power electronics in renewable energy, industrial appliances, consumer goods, transportation and power system.
2. Execute the function and interaction between components and sub-system used in power electronic applications with their limitation.
3. Complete the assignment and experiment on basic power electronics application.

SYNOPSIS
This course covers on various power electronics application such as variable speed drive, renewable
energy generation and high voltage direct current (HVDC) system. Students are exposed on the integration and interaction of sub-systems within a larger and complex system. Various case studies are also introduced through lectures and lab demonstration.

REFERENCES

SEMESTER 7

BEEU 4774
BACHELOR DEGREE PROJECT II / PROJEK SARJANA MUDA II

LEARNING OUTCOMES
After completing the course, students will be able to:
1. Execute project implementation systematically.
2. Interpret data in a meaningful form using relevant tools.
3. Work independently and ethically.
4. Present the results in the oral and written forms effectively.

SYNOPSIS
This is the second part of the Bachelor Degree Project. Students are expected to continue the project done in Bachelor degree Project Part 1 till completion. At the end of the semester students are required to submit the Bachelor Degree Project report both orally and in writing for assessment.

REFERENCES

PRE-REQUISITE
BEEU 3764

BACHELOR DEGREE PROJECT I / PROJECT SARJANA MUDA I

BEEY 4413
ENERGY EFFICIENCY / KECEKAPAN TENAGA

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Analyze the properties of electrical power management for improving energy efficiency in electrical system.
2. Demonstrate the functionality of important electrical parameters for controlling electrical energy efficiency through experiments in laboratory.
3. Create awareness among colleagues regarding the importance of energy sustainability.

SYNOPSIS
This course is an introductory course to electrical energy efficiency technologies, application and standard (e.g., ISO, IEC and CEN). This subject provides students a comprehensive introduction to: standardization terminologies; ampacity calculation of the cables or lines for the solution of heat transfer, cable sizing and thermal consideration; power transformers losses, efficiency and load factor, cooling system, regulations, life cycle costing and design material; building automation control and management systems such as temperature control, lighting, drives and motors, technical alarm management, remote control, KNX / SCADA systems and Building Energy Performance; power quality phenomena and indicators in RMS voltage level, voltage fluctuations, voltage and current unbalance, and voltage and current...
distortion; tariff structure and cost rate charged to residential, commercial and industry.

REFERENCES
3. Marizan Sulaiman, Ekonomi dan Pengurusan Sistem Kuasa, Utusan Publications & Distributors

BEEI 3403
POWER DISTRIBUTION SYSTEM DESIGN /
REKA BENTUK SISTEM PENGAGIHAN KUASA

LEARNING OUTCOMES
Upon completing this subject, the student should be able to
1. Design low voltage distribution system based on problem statement or case study given
2. Perform testing on protection and metering equipment based on low voltage distribution design drawing.
3. Conform to the safety and legal requirements for designing and testing of low voltage distribution system.

SYNOPSIS
This course outlines the principles and design of electrical distribution system. There are various issues of distribution system that is covered; including regulations and standards related to electrical installation. Characteristic and specification for circuit breakers, cable size selection, and method of earthing and earthing arrangement are described in detail. Students will also exposed to the use of standard design procedures and type of testing and troubleshooting required for low voltage system.

REFERENCES

BEEY 4873
TREND TEKNOLOGI DALAM INDUSTRI/
TECHNOLOGY TREND IN INDUSTRY

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Assess the current renewable energy and electric transportation technologies and applications.
2. Demonstrate renewable energy and electric transportation system applications commonly used in industries.
3. Function effectively as a team in laboratory works/project/case studies in renewable energy and electric transportation industrial application.

SYNOPSIS
This course provides students an exposure to current trend and development in technologies related to
renewable energy and electric transportation in the industries. It may cover topics on the usage of high end equipment, technology development, technology application as well as services and maintenance. Lectures on various topics will be conducted by experienced lecturers in the respected fields and experts from the industry. For the course implementation, each topic will be covered for 3 to 5 weeks, with course works in parallel.

REFERENCES
References are based on the Selected Topics.

BEEI 4843
KESERASIAN ELEKTROMAGNETIK SISTEM KUASA/POWER SYSTEMS ELECTROMAGNETIC COMPATIBILITY

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Analyse the technical requirements of testing, shielding, grounding and bonding of EMC for power systems operation.
2. Perform experiments to determine suitable types of EMC mitigation approach for a different power systems scenario.
3. Conform to the safety and legal requirements for EMC for power systems operation.

SYNOPSIS
The general aim of this course is to enable students to identify and examine the main concepts related to the function and design of EMC mitigation for power transmission, distribution and (to a lesser extent) generation systems. Upon completion of the course, students should be able to understand the reasons why power systems EMC are required, the basic philosophies of EMC phenomena, shielding, grounding and bonding, the components involved and how typical EMC mitigation are designed and configured.

REFERENCES

BEEY 4903
SISTEM PEMACU MODEN / MODERN DRIVE SYSTEM

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Apply the principle of vector-controlled and DTC-controlled drive systems in AC machine.
2. Construct the experiment of three phase AC drive system.
3. Demonstrate practical competence on modern AC drive systems.

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

SEMESTER 8

BEEU 4786
INDUSTRIAL TRAINING / LATIHAN INDUSTRI

LEARNING OUTCOME
At the end of the subject, students should be able to:
1. Show technical competencies and skills gained throughout their internship.
2. Prepare a report on the industrial field daily activities in the log book systematically.
3. Communicate effectively with staff, colleagues and other personnel.
4. Practice professional ethics in accordance with industry rules and regulations.

SYNOPSIS
All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.
BEET Course Core Subjects (K)

SEMESTER 1

BEEE 1303
ENGINEERING WORKSHOP I / BENGKEL KEJURUTERAAN I

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Explain industrial OSHA and industrial practices in the lab activity.
2. Diagnose an electronic circuit using electronic testing equipment.
3. To build the electronic circuit according to IPC standard and project using the appropriate simulation tools.

SYNOPSIS

REFERENCES
1. Environmental, Safety and Health Engineering, Gayle Woodside, WILEY.
4. EMC and the Printed Circuit Board: Design, Theory and Layout Made Simple, Mark.I, WILEY.

5. Industrial Bioseparations: Principles and Practice, Daniel Forciniti, WILEY.

BEEI 1303
ELECTRIC CIRCUIT FUNDAMENTAL / PENGENALAN LITAR ELEKTRIK

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Apply analytical method and theorem to DC and AC (steady state) circuits in electrical circuit.
2. Conduct experiment on DC and AC (steady state) circuit based on electrical circuit theorem.
3. Participate effectively for any assignment and experiment.

SYNOPSIS
This subject introduces the students to Ohm’s Law, Kirchhoff’s Laws and use them to calculate current, voltage and power in DC / AC (steady state) circuits. Following this the students will learn the analytical methods namely mesh and nodal analysis. The use of theorems like Thevenin, Norton, Superposition and the Maximum Power Transfer will follow next. The applications of the above tools will cover both dc and ac circuits. This subject will be supported by laboratory works to impart to the students some basic practical skills.

REFERENCES

REFERENCES

SYNOPSIS
This subject will discuss on basic programming principles such as introduction to C programming consists of syntax, variables and basic data type, more fundamentals programming structure such as operator, rules / condition, looping, function, array and sequences. Furthermore, students will be exposed to topics like pointers, structures, file processing and bit manipulations. The subject is a compulsory to build a basic background in programming.

SYNOPSIS
This course will discuss:
Silicon Semiconductor Diodes: characteristics and measurement of forward & reverse biased, composite characteristics and load line analysis, clipping and simple rectifier (half & full) circuits, zener diodes characteristics, and simple shunt regulators. Bipolar Junction Transistor:
construction and operation of BJT, BJT characteristics and measurement technique, limits of operation, \( \beta_{dc} \) and \( \alpha_{dc} \), DC biasing – DC Load Lines. Amplification of signal. Transistor as a switch. Field Effect Transistor: construction and operation of FET, FET characteristics & diagram, Shockley’s equation, DC biasing – DC Load Lines-Graphical and mathematical approach.

REFERENCES

BEEE 2373
ELECTRICAL TECHNOLOGY / TEKNOLOGI ELEKTRIK

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply the principles of the electrical system.
2. Measure the application of the power system and electrical transmission in single phase and three-phase.
3. Work individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS
This subject will discuss on Alternating Voltage and Current, Phasor, Magnetic Circuit, Electromotive force, magnetic field strength, relation between B and H, Kirchhoff’s law magnetic hysteresis, Single Phase Circuit, series resonance, parallel resonance, power factor, transformer, phasor diagram, equivalent circuit voltage regulation and efficiency, O/C and S/C test, Voltage generation and excitation methods, Basic principles of power system, per unit system, electrical transmission.

REFERENCES

BEEE 1313
ENGINEERING WORKSHOP II / BENGKEL KEJURUTERAAN II

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Construct an electronic circuit using appropriate software.
2. Demonstrate the electrical wiring technique by using appropriate tools.
3. Fabricate Printed Circuit Board (PCB) using appropriate software and equipments.
SYNOPSIS
This subject will discuss on simulation tools that covers the software of MATLAB, PSpice and AutoCad. Domestic Wiring – theory on domestic wiring, wiring diagram and lab practical. PCB circuit design fabrication using the design software of Proteus, practical design of the printed circuit board using the Proteus.

REFERENCES
1. Environmental, Safety and Health Engineering, Gayle Woodside, WILEY.
4. EMC and the Printed Circuit Board: Design, Theory and Layout Made Simple, Mark.I, WILEY.
5. Industrial Bioseparations: Principles and Practice, Daniel Forciniti, WILEY.

BEEI 1333
ADVANCED ELECTRIC CIRCUIT / LITAR ELEKTRIK LANJUTAN

LEARNING OUTCOMES
Upon completing this subject, the student should be able to:
1. Analyze first order and second order electrical circuit in transient and frequency response.
2. Conduct experiment on frequency response and electrical circuit measurement.
3. Present written and oral communications to document work and experiment results.

SYNOPSIS
This subject exposes student to the application of several tools in analyzing electrical circuits, such as the Laplace transform and two ports network. The students are required to use the tools to analyze transient and frequency response in electrical circuit.

REFERENCES

PRE-REQUISITE
BEEI 1303
ELECTRIC CIRCUIT FUNDAMENTAL / PENGENALAN LITAR ELEKTRIK

SEMESTER 3
BEEE 2364
CONTROL PRINCIPLES / PRINSIP KAWALAN

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Demonstrate performance of a design control system.
2. Display respond of gain adjustment compensator in controlling broadly define system.
3. Work individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS
This subject will discuss on introduction to control system, frequency domain modelling, Laplace transform, transfer function, electric network transfer function, translational mechanical system, rotational mechanical system transfer function, time domain modelling, general state space representation, transfer function and state space conversion, time response, poles, zeros and system response, First and Second order systems, underdamped system, reduction of multiple subsystems, blocks diagrams, feedback systems, signal flow graphs, Mason’s rule, Routh- Hurwitz criterion and Gain Adjustment compensator design.

REFERENCES

BEEE 2333
ANALOGUE ELECTRONIC DEVICES /
PERANTI ELEKTRONIK ANALOG

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply the fundamental of small signal amplifiers using BJT and FETs and Op-amp circuits.
2. Measure response of single stage, multistage amplifiers and basic op-amp circuit.
3. Report the findings orally or in writing by performing assignments/experiments effectively.

SYNOPSIS
This subject will discuss on BJT Transistor modelling, CE, CC and CB configuration, BJT small signal analysis, Feedback configuration, FET small - signal analysis, Frequency response, Bode plot, Bandwidth, Special amplifier: cascade, Darlington, multistage, differential amplifier circuit, Operational amplifiers: inverting, non-inverting, summing and buffer.

REFERENCES
PRE-REQUISITE
BEEE 1323
ELECTRONIC FUNDAMENTALS / PENGENALAN ELEKTRONIK

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply analysis techniques for continuous signal and systems.
2. Display the waveform of continuous signals and systems by using modern tools.
3. Follow the instructions in a guided assignment independently by optimizing available resources.

SYNOPSIS

REFERENCES

BEEC 2404
DIGITAL ELECTRONIC / ELEKTRONIK DIGITAL

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Construct digital system using combinational and sequential logic circuits.
2. Assemble fully-function digital logic circuits.
3. Complete given tasks effectively as an individual or in groups.

SYNOPSIS
This subject will cover the topics of transistor-transistor logic. Logic functions, logic diagrams, Karnaugh maps, Boolean algebra, DeMorgan's Theorem. Numerical codes, arithmetic functions. Combinational circuits such as encoders, decoders, multiplexers, de-multiplexers, comparators. This subject also covers the introduction to memory, programmable logic devices and microcomputer systems. Student will learn the topics on latches and flip-
flops, flip-flops operating characteristics and applications. Registers and counters, shift registers, synchronous, asynchronous and modulo counters.

REFERENCES

SEMESTER 4

BEET 2333
COMMUNICATION PRINCIPLE / PRINSIP KOMUNIKASI

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply the basic principles of analogue modulation system and noise.
2. Manipulate the performance of analogue modulation techniques through experiments that commonly used in telecommunication system.

SYNOPSIS
This subject will discuss on Introduction to Telecommunication, Linear Modulation, Single Sideband (SSB) Communication Systems, Angle Modulation, Noise and Introduction to Digital Communication

The rationale of offering this subject is as the progression of communication system where students should have knowledge of communication principles and basic skills required by the industry.

REFERENCES

BEEE 2354
ELECTRONIC SYSTEMS / SISTEM ELEKTRONIK

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Analyze the characteristic and performance of the electronics devices.
2. Measure the performance of applied electronic circuits through lab sessions.
3. Report the findings orally or in writing by performing assignments/experiments.

SYNOPSIS
This subject will discuss about Electronic Devices: Application of electronic devices such as SCR, SCS, GTO, LASCR, DIAC, TRIAC, UJT and PUT. Filter: filter applications (basic filter concepts, filter response
characteristics, active LP filter, active HP filter, active BP filter, active BS filter and filter response measurement). Oscillator circuits: Feedback oscillator principles, oscillators with the RC feedback circuits, LC feedback circuits, crystal oscillator, Astable and Monostable using op-amp, the 555 timer and applications. Power amplifier circuits: Class A, class B and class AB. Power supply: Power supply circuit, IC voltage regulator and application. These topics are very important to students because it gives emphasis on the design of circuits used in electronic systems

REFERENCES

SYNOPSIS
This subject will explain the role and nature of the main application protocols and their relation to protocols and services provided to them by the lower layers of the network. This subject are technology focused and student thoroughly learn each technology (Routing, switching and WANs).

The rationale of offering this subject is as providing vast knowledge on networking topics, from fundamentals to advanced application and services, while providing hands-on experience and as well as preparation for Certified Cisco Network Associate (CCNA) exams.

REFERENCES
1. Cisco Networking Academy CCNA Exploration course material, cisco.netacad.net
BEET 2343
DISCRETE SIGNAL & SYSTEM /
ISYARAT & SISTEM DISKRIT

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply appropriate concepts and methods in demonstrating discrete signals and systems.
2. Display the sequence of discrete signals by using modern tools.

SYNOPSIS
The subject will cover various topics such as Introduction to Discrete-Time Signals and Systems: Fundamental Concept, Transformations of Discrete-Time Signals, Signal Characteristics, Common Signals, Discrete-Time Systems and Its Properties; Time-Domain Analysis of Discrete-Time Signals and Systems: Impulse response of a system, Convolution sum, Graphical method for evaluating the convolution sum, Properties of the convolution sum, Impulse response of LTID systems; Discrete-Time Fourier Series And Transform: Discrete-time Fourier series, Fourier transform for aperiodic functions, Existence of the DTFT, DTFT of periodic functions, Properties of the DTFT and the DTFS, etc; Discrete Fourier Transform: Continuous to discrete Fourier transform, Discrete Fourier transform, Spectrum analysis using the DFT, Properties of the DFT, Convolution using the DFT, etc.

REFERENCES

SEMESTER 5
BEET 3353
TELECOMMUNICATION SYSTEM /
SISTEM TELEKOMUNIKASI

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply the concept of telecommunication system.
2. Manipulate the concept of telecommunication system.
3. Report effectively in given tasks and assignment by managing different information from multiple resources for commercialization.

SYNOPSIS
This subject will discuss on Radio Spectrum, Broadcasting, PSTN/ISDN, Satellite System, Radar System, Optical Communication and Wireless Communication. The rationale of offering this subject is as providing fundamental knowledge on various types of telecommunication system and as foundation for higher level subjects.
REFERENCES

SYNOPSIS
This subject will discuss on Radio Frequency Amplifiers, Radio Frequency Oscillators, PLLs and Frequency Synthesizers, Transmitter Circuits and Receiver Circuits. The rationale of offering this subject is as the progression of communication system where students should have knowledge of communication electronics and basic skills required by the industry.

REFERENCES
1. Electronic communication a systems approach, Jeffery S. Beasley, 2014.

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Evaluate telecommunication electronics design and its related component.
2. Follow the procedure in measuring the signal of telecommunication electronics design and its related component.
3. Complete a given task using systematic planning in a group.

BEET 3373
DIGITAL SIGNAL PROCESSING / PEMPROSESAN ISYARAT DIGITAL

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply appropriate concepts and methods in demonstrating digital signals processing and systems.
2. Organize the implementation of digital signal processing in a system.
LEARNING OUTCOMES

Upon completion of this subject, students should be able to:

1. Evaluate the interfacing circuitry of basic microprocessor microcontroller based systems and its supporting components using assembly language/high level programming.
2. Manipulate the memory decoding circuit and microcontroller applications.
3. Perform effectively in given tasks and assignment by managing different information from multiple resources for commercialization.

SYNOPSIS

This subject will discuss on Introduction to DSP, discrete-time signals and systems, spectrum of representation of discrete-time signals, discrete Fourier transform, difference equations and discrete-time systems, z-transform and its applications, analysis and design of digital filters and random signals.

REFERENCES

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply the knowledge of electromagnetic laws and principles.
2. Construct experimental investigation of wave electromagnetic properties.
3. Display the ability to perform the task given independently by optimizing available resources.

SYNOPSIS
This subject will discuss on Vector analysis: Vector algebra, coordinate system and transformation, vector calculus; Electrostatics: Electrostatic fields, Gauss Law, Poisson’s equation, electric fields in material space, electrostatic boundary; Magnetostatics: Magnetostatic fields, Stokes Theorem, Biot-Savart Law, Gauss Law, magnetic forces, material and devices and magnetostatic boundary; Waves: Maxwell’s equations, Faraday’s Law, time-varying electromagnetic field, induced emf, displacement current. Electromagnetic wave propagation: free space, lossy and lossless dielectric, etc.

REFERENCES

SEMESTER 6

BEEE 4443
QUALITY MANAGEMENT / PENGURUSAN KUALITI

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Analyze any given problem and solution based on quality theories.
2. Work individually or in groups effectively to perform assignments/tasks given.
3. Study appropriate quality tools to improve the quality of management, process and product in organisation.

SYNOPSIS
This subject will discuss on the different of quality theories for many organisation, comparisme international quality standard for customer satisfaction. The designing of strategy planning, strategy process and ethic to enhance the quality improvement for process and, product with using quality tools. Six–sigma are using for management to improve the mangement strategy planning.
REFERENCES

BEET 3403
DIGITAL COMMUNICATION / KOMUNIKASI DIGITAL

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Evaluate the digital receiver system by taking into consideration the noise performance.
2. Measure the performance of equalization and multiplexing techniques based on Inter Symbol Interference.

SYNOPSIS
This subject will discuss on Review of Baseband Signalling, Bandpass Signalling, Baseband and Bandpass Detection, Equalization, Synchronization, Multiplexing and Multiple Access and Spread Spectrum. The rationale of offering this subject is as the progression of communication system where students should have knowledge of communication principles and basic skills required by the industry.

REFERENCES


PRE-REQUISITE
BEET 2333
COMMUNICATION PRINCIPLE / PRINSIP KOMUNIKASI

BEET 3393
TELECOMMUNICATION SWITCHING SYSTEM / SISTEM PENSUSIAN TELEKOMUNIKASI

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Evaluate the principle of telecommunication switching system, signalling and unified communication system.
2. Manipulate the application of telecommunication switching system, signalling and unified communication system.

SYNOPSIS
This subject will discuss on Introduction & Evolution of Switching System, Public Switched Telephone Network (PSTN), Telecommunication Traffic, Switching Network, Time Division Switching, Telecommunication Signalling and Network. The rationale of offering this subject is as telecommunication switching system is one of the important elements in telecommunication system, students will be analysing the functionality as well as evaluating the network performance as required by the industry.

REFERENCES

References

Synopsis
The student needs to plan and implement the project individually that related to the respective engineering technology field. The student should implement a project, do the analysis and apply the theory to solve the problems related to topic. At the end, the student should write a problem based learning report that covers problem statement, literature review, methodology to overcome the problem. The student needs to achieve the objective of the project and presented it in the report.

References

BEEU 3764
BACHELOR DEGREE PROJECT I /
PROJEK SARJANA MUDA I

Learning Outcomes
Upon completion of this subject, students should be able to:
1. Explain the problem, objectives and scope of project associated to the industrial or community needs.
2. Use related previous work and its relevant theory
3. Choose a proper methodology
4. Present the preliminary findings in the oral and written forms effectively.

Synopsis
This subject will discuss on Introduction to RF and Microwave Engineering; Transmission Lines; Microwave Network Analysis; Impedance Matching and Tuning; Power Dividers and Couplers; Microwave Filter and Microwave Amplifier.
REFERENCES

SEMESTER 7

BEEU 4774
BACHELOR DEGREE PROJECT II / PROJEK SARJANA MUDA II

LEARNING OUTCOMES
After completing the course, students will be able to:
1. Execute project implementation systematically.
2. Interpret data in a meaningful form using relevant tools.
3. Work independently and ethically.
4. Present the results in the oral and written forms effectively.

SYNOPSIS
This is the second part of the Bachelor Degree Project. Students are expected to continue the project done in Bachelor degree Project Part 1 till completion. At the end of the semester students are required to submit the Bachelor Degree Project report both orally and in writing for assessment.

REFERENCES

PRE-REQUISITE
BEEU 3764
BACHELOR DEGREE PROJECT I /
PROJECT SARJANA MUDA I

BEET 4803
SATELLITE COMMUNICATION / KOMUNIKASI SATELIT

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Evaluate the mechanic orbit, satellite link and noise in satellite communication system.
2. Measure the performance of satellite link and satellite subsystem in telecommunication.
3. Revise sustainable technologies and relate to the given assignment.

SYNOPSIS
This subject will discuss on introduction to satellite communication - frequency allocations, applications, future trends satellite communication; Orbital mechanics and launchers- Orbital Mechanics, Look angle determination; Satellite subsystem - telemetry, tracking, command and monitoring, power systems, communication subsystems, satellite antenna; Satellite Link Design - design of downlink, uplink design, design of satellite links for specific C/N; and Earth station technology.
REFERENCES


BEET 4813
MOBILE COMMUNICATION / KOMUNIKASI MUDAH ALIH

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Evaluate the concepts, theories and strategies in solving of mobile communication system.
2. Measure the performance of radio wave propagation model.
3. Revise sustainable technologies and relate to the given assignment.

SYNOPSIS

REFERENCES

BEET 4823
OPTICAL COMMUNICATIONS & OPTOELECTRONIC / KOMUNIKASI OPTIK & OPTO ELEKTRONIK

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Evaluate the basic properties of light in semiconductor and various components of optical communication system.
2. Measure the characteristics of laser diode, LED, photo detector and performance of optical network.
3. Revise sustainable technologies and relate to the given assignment.

SYNOPSIS
The rationale of offering this subject is as the progression of communication system where the existing transmission media has been replaced to fibre optics due to its advantages. Therefore, students should have basic knowledge of optical communication and basic skills required by the industry.

REFERENCES

BEET 4833
ANTENNA ENGINEERING / KEJURUTERAAN ANTENA

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Evaluate the antenna parameters and structures.
2. Measure the performance of antenna structures and network.
3. Revise sustainable technologies and relate to the given assignment.

SYNOPSIS
This course will discuss on Introduction and Fundamentals of Antenna, Antenna Solution using Maxwell Equation, Types of Antenna, Matching and Feeding Networks, Antenna Measurement and Introduction to Radio-wave Propagation.

REFERENCES
SEMESTER 8

BEEU 4786
INDUSTRIAL TRAINING / LATIHAN INDUSTRI

LEARNING OUTCOME
At the end of the subject, students should be able to:
1. Show technical competencies and skills gained throughout their internship.
2. Prepare a report on the industrial field daily activities in the log book systematically.
3. Communicate effectively with staff, colleagues and other personnel.
4. Practice professional ethics in accordance with industry rules and regulations.

SYNOPSIS
All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

PRE-REQUISITE
Student required to pass Industrial Training BEEU 4786 in order to pass Industrial training report.

REFERENCES
1. UTeM Guideline Handbook for Industrial Training.

BEEU 4796
INDUSTRIAL TRAINING REPORT /
LAPORAN LATIHAN INDUSTRI

LEARNING OUTCOME
At the end of the subject, students should be able to:
1. Produce industrial training report.
2. Present report orally on working experience.

SYNOPSIS
All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

PRE-REQUISITE
Student required to pass Industrial Training BEEU 4786 in order to pass Industrial training report.

REFERENCES
1. UTeM Guideline Handbook for Industrial Training.


BEEE Course Core Subjects (K)

SEMESTER 1

BEEE 1303
ENGINEERING WORKSHOP I / BENGKEL KEJURUTERAAN I

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Explain industrial OSHA and industrial practices in the lab activity.
2. Diagnose an electronic circuit using electronic testing equipment.
3. To build the electronic circuit according to IPC standard and project using the appropriate simulation tools.

SYNOPSIS
This subject will discuss on introduction to Industrial Safety and Health + Lab Safety, Equipment- theory, testing and circuit diagnostic & Report writing, Component – introduction, theory, assembly and soldering, Simulation tools - MULTISIM – introduction and application, Problem Based Learning (PBL).

REFERENCES
1. Environmental, Safety and Health Engineering, Gayle Woodside, WILEY.
4. EMC and the Printed Circuit Board: Design, Theory and Layout Made Simple, Mark.I, WILEY.
5. Industrial Bioseparations: Principles and Practice, Daniel Forciniti, WILEY.

BEEI 1303
ELECTRICAL CIRCUIT FUNDAMENTAL / PENGENALAN LITAR ELEKTRIK

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Apply analytical method and theorem to DC and AC (steady state) circuits in electrical circuit.
2. Conduct experiment on DC and AC (steady state) circuit based on electrical circuit theorem.
3. Participate effectively for any assignment and experiment.

SYNOPSIS
This subject introduces the students to Ohm’s Law, Kircchoff’s Laws and use them to calculate current, voltage and power in DC / AC (steady state) circuits. Following this the students will learn the analytical methods namely mesh and nodal analysis. The use of theorems like Thevenin, Norton, Superposition and the Maximum Power Transfer will follow next. The applications of the above tools will cover both dc and ac circuits. This subject will be supported by laboratory works to impart to the students some basic practical skills.

REFERENCES

SEMESTER 2

BEEE 1313
ENGINEERING WORKSHOP II / BENGKEL KEJURUTERAAN II

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Construct an electronic circuit using appropriate software.
2. Demonstrate the electrical wiring technique by using appropriate tools.
3. Fabricate Printed Circuit Board (PCB) using appropriate software and equipments.

SYNOPSIS
This subject will discuss on simulation tools that covers the software of MATLAB, PSpice and AutoCad. Domestic Wiring – theory on domestic wiring, wiring diagram and lab practical. PCB circuit design fabrication using the design software of Proteus, practical design of the printed circuit board using the Proteus.

REFERENCES
1. Environmental, Safety and Health Engineering, Gayle Woodside, WILEY.

BEEI 1333
ADVANCED ELECTRIC CIRCUIT / LITAR LANJUTAN ELEKTRIK

LEARNING OUTCOMES
Upon completing this subject, the student should be able to:
1. Analyze first order and second order electrical circuit in transient and frequency response.
2. Conduct experiment on frequency response and electrical circuit measurement.
3. Present written and oral communications to document work and experiment results.

SYNOPSIS
This subject exposes student to the application of several tools in analyzing electrical circuits, such as the Laplace transform and two ports network. The students are required to use the tools to analyze transient and frequency response in electrical circuit.

REFERENCES

PRE-REQUISITE
BEEI 1303
ELECTRICAL CIRCUIT FUNDAMENTAL / PENGENALAN LITAR ELEKTRIK

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply the semiconductors theory in electronic applications.
2. Construct electronics circuit of diode, BJT and FET.
3. Report the findings orally or in writing by performing assignments/experiments effectively.

SYNOPSIS
This course will discuss:
2. Silicon Semiconductor Diodes: characteristics and measurement of forward & reverse biased, composite characteristics and load line analysis, clipping and simple rectifier (half & full) circuits, zener diodes characteristics, and simple shunt regulators.

REFERENCES

BEEC 1313
PROGRAMMING FUNDAMENTAL / ASAS PENGATURCARAAN

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Explain the fundamental of programming principles and algorithms of C programming language.
2. Apply C Programming Language to solve given problems.
3. Manipulate C programming structure using programming fundamentals and principles.
SYNOPSIS
This subject will discuss on basic programming principles such as introduction to C programming consists of syntax, variables and basic data type, more fundamentals programming structure such as operator, rules / condition, looping, function, array and sequences. Furthermore, students will be exposed to topics like pointers, structures, file processing and bit manipulations. The subject is a compulsory to build a basic background in programming.

REFERENCES

SYNOPSIS
This subject will focus on the principles of the object-oriented programming approach. It will discuss more in detail on topics such as classes and objects, interfaces and inheritance, basic syntax of object-oriented programming languages, collections and exception handling. In this course, students shall apply and construct the object oriented programming basic structures (such as polymorphism, encapsulation and abstraction). The subject is a compulsory to strengthen programming skills in students.

REFERENCES

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply programming principles and algorithms understanding in object oriented programming language.
2. Build a reliable program using object oriented programming to solve complex problems.
3. Construct maintainable object oriented application composed of several classes.

PRE-REQUISITE
BEEC 1313
PROGRAMMING FUNDAMENTAL / ASAS PENGATURCARAAN
**LEARNING OUTCOMES**

Upon completion of this subject, students should be able to:

1. Apply the fundamental of small signal amplifiers using BJT and FETs and Op-amp circuits.
2. Measure response of single stage, multistage amplifiers and basic op-amp circuit.
3. Report the findings orally or in writing by performing assignments/experiments effectively.

**SYNOPSIS**

This course will discuss on BJT Transistor modelling, CE, CC and CB configuration, BJT small signal analysis, Feedback configuration, FET small-signal analysis, Frequency response, Bode plot, Bandwidth, Special amplifier: cascade, cascode, Darlington, multistage, differential amplifier circuit, Operational amplifiers: inverting, non-inverting, summing and buffer

**REFERENCES**


**PRE-REQUISITE**

BEEE 1323

BEEE 2343
ENGINEERING DRAWING / LUKISAN KEJURUTERAAN

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply mechanical engineering design drawing using Computer Aided Design (CAD).
2. Draw Geometric, orthographic, isometric, sectional, assembly, part and detailed drawings by using CAD based on the given problem.
3. Work individually or in groups effectively to perform assignments/tasks give.

SYNOPSIS
This subject will discuss on draft techniques manually and using computer software (AUTOCAD), basic hardware of draft drawing, technique and applications in producing various technical drawing, AUTOCAD software, interfacing AUTOCAD, editing command, coordinate systems, template and layers 3D modeling. It will help students to read the engineering drawing as well in the AUTOCAD drawing. This subject will introduce students to basic information, skills, and concepts related to drafting and design with the usage of AutoCAD tools and commands

REFERENCES


SEMESTER 4

BEET 2333
COMMUNICATION PRINCIPLE / PRINSIP KOMUNIKASI

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply the basic principles of analogue modulation system and noise.
2. Manipulate the performance of analogue modulation techniques through experiments that commonly used in telecommunication system.

SYNOPSIS
This subject will discuss on Introduction to Telecommunication, Linear Modulation, Single Sideband (SSB) Communication Systems, Angle Modulation, Noise and Introduction to Digital Communication
The rationale of offering this subject is as the progression of communication system where students should have knowledge of communication principles and basic skills required by the industry.
REFERENCES

BEEE 234
ELECTRONIC SYSTEMS / SISTEM ELEKTRONIK

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Analyze the characteristic and performance of the electronics devices.
2. Measure the performance of applied electronic circuits through lab sessions.
3. Report the findings orally or in writing by performing assignments/experiments.

SYNOPSIS
This subject will discuss about Electronic Devices: Application of electronic devices such as SCR, SCS, GTO, LASCR, DIAC, TRIAC, UJT and PUT. Filter: filter applications (basic filter concepts, filter response characteristics, active LP filter, active HP filter, active BP filter, active BS filter and filter response measurement). Oscillator circuits: Feedback oscillator principles, oscillators with the RC feedback circuits, LC feedback circuits, crystal oscillator, Astable and Monostable using op-amp, the 555 timer and applications. Power amplifier circuits: Class A, class B and class AB. Power supply: Power supply circuit, IC voltage regulator and application. These topics are very important to students because it gives emphasis on the design of circuits used in electronic systems.

REFERENCES

BEEE 2364
CONTROL PRINCIPLES / PRINSIP KAWALAN

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Demonstrate performance of a design control system.
2. Display respond of gain adjustment compensator in controlling broadly define system.
3. Work individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS
This subject will discuss on introduction to control system, frequency domain modelling, Laplace transform, transfer function, electric network transfer function, translational mechanical system, rotational mechanical system transfer function, time domain modelling, general state space
representation, transfer function and state space conversion, time response, poles, zeros and system response, First and Second order systems, underdamped system, reduction of multiple subsystems, blocks diagrams, feedback systems, signal flow graphs, Mason’s rule, Routh-Hurwitz criterion and Gain Adjustment compensator design.

REFERENCES

BEEE 2373
ELECTRICAL TECHNOLOGY / TEKNOLOGI ELEKTRIK

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply the principles of the electrical system.
2. Measure the application of the power system and electrical transmission in single phase and three-phase.
3. Work individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS
This subject will discuss on Alternating Voltage and Current, Phasor, Magnetic Circuit, Electromotive force, magnetic field strength, relation between B and H, Kirchhoff’s law magnetic hysteresis, Single Phase Circuit, series resonance, parallel resonance, power factor, transformer, phasor diagram, equivalent circuit voltage regulation and efficiency, O/C and S/C test, Voltage generation and excitation methods, Basic principles of power system, per unit system, electrical transmission.

REFERENCES

SEMESTER 5
BEEE 3384
INDUSTRIAL CONTROL / KAWALAN INDUSTRI

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Design industrial control system using appropriate industrial based approach.
2. Solve the PLC wiring system and programming language for a specific problem based application.
3. Work individually or in groups effectively to perform assignments/tasks given.
SYNOPSIS
This subject will provide the students both solid theoretical concepts related to industrial control system and a practical to the Programmable logic controller (PLC) which is generally used in the industrial control. Extensive practical-oriented and hands on session will be given using OMRON PLC Training Kit equipment. The graphical programming tools, GRAFCET will be introduced in the course. The topics as listed below:
1. Introduction to Industrial Control
2. Discrete control elements and Relay Ladder diagram
3. Programmable logic controller (PLC)
4. Discrete sensors and actuators
5. GRAFCET

This subject is the authentic problem based purposely to expose the students with real engineering problems in the industries

REFERENCES

BEEC 3444
MICROPROCESSOR & MICROCONTROLLER TECHNOLOGY /
TEKNOLOGI MIKROPEMPROSES & MIKROPENGAWAL

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Demonstrate a working knowledge of microprocessor and microcontroller architecture and peripheral subsystem.
2. Manipulate the hardware-software functionalities and technologies to solve given task using appropriate techniques and tools.
3. Propose sustainable solutions to given problems.

SYNOPSIS
This subject will provide the students both theoretical & practical applications to the microprocessors/microcontrollers-based system. Practical sessions will be given using MC68K microprocessor and PIC microcontroller involving program development software, chip programming and debugging. Topics covered are microcomputer system & peripheral design, software and hardware integration; interrupt control system, analog interfacing, subsystems on microprocessor, etc.

REFERENCES

BEEE 3404
DATA ACQUISITION & SENSORS /
PEROLEHAN DATA & PENDERIA

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Select an appropriate process measurement of a control system
2. Measure process control response based on instrumentation approach.
3. Report the findings orally or in writing by performing assignments/experiments.

SYNOPSIS
This subject will discuss on introduction on Data Acquisition and Sensor, Data Acquisition Hardware, Analog and Digital Signals, Signal Conditioning, Serial Data Communications, Distributed & Standalone Loggers/Controllers, IEEE 488 Standard, Ethernet & LAN Systems, The Universal Serial Bus (USB), Specific Techniques, The PCMCIA Card Sensor and application, Labview, Interfacing Software and Hardware, controlling automation system using Labview.

This subject prepares students with knowledge and skills to use data acquisition hardware and software as well as sensors.

REFERENCES
LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Design a pneumatic system using suitable pneumatic component for a specific problem based application.
2. Apply several design techniques in discrete pneumatic system.
3. Work individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS
This subject will discuss on compressed air: theory, production, purification and distribution; pneumatic components, actuators, directional control valves, pneumatic control configurations, electro-pneumatic components, electro-pneumatic control configuration, sequential and cascade design methods of pneumatic and electro-pneumatic systems. The test on this technology will be held in this course to ensure the competency level is up to industrial standard. The test will be conducted with cooperation of SMC (Pneumatics) Sdn Bhd. The certificate is recognized by HRDC schemes

REFERENCES
very important to students because it gives emphasis on the design of circuits used in embedded systems.

REFERENCES

BEEE 3804
POWER ELECTRONIC / ELEKTRONIK KUASA

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Explain the operational of power semiconductors witches and power electronics converter.
2. Measure power electronic circuitry in laboratory experiments.
3. Report the findings of related given task on power electronic environment effectively as individual or in groups.

SYNOPSIS
This subject will discuss about power electronics fundamentals, protection devices and circuit, diode rectifiers, AC to DC converters (controlled rectifiers), DC to DC converters (dc choppers), switch-mode power supply and DC to AC converters (inverter).

REFERENCES

BEEU 3764
BACHELOR DEGREE PROJECT I / PROJEK SARJANA MUDA I

LEARNING OUTCOMES
At the end of the subject, students should be able to:
1. Explain the problem, objectives and scope of project associated to the industrial or community needs.
2. Use related previous work and its relevant theory
3. Choose a proper methodology
4. Present the preliminary findings in the oral and written forms effectively

SYNOPSIS
The student needs to plan and implement the project individually that related to the respective engineering technology field. The student should implement a project, do the analysis and apply the theory to solve the problems related to topic. At the end, the student should write a problem based learning report that covers problem statement, literature review, methodology to overcome the problem. The student needs to achieve the objective of the project and presented it in the report.

REFERENCES

BEEE 3804
POWER ELECTRONIC / ELEKTRONIK KUASA

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Explain the operational of power semiconductors witches and power electronics converter.
2. Measure power electronic circuitry in laboratory experiments.
3. Report the findings of related given task on power electronic environment effectively as individual or in groups.

SYNOPSIS
This subject will discuss about power electronics fundamentals, protection devices and circuit, diode rectifiers, AC to DC converters (controlled rectifiers), DC to DC converters (dc choppers), switch-mode power supply and DC to AC converters (inverter).

REFERENCES


BEEC 4814
COMPUTER INTERFACING /
PENGANTARAMUKAAN KOMPUTER

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Evaluate the components and structure of a computer user interface development framework.
2. Construct user interfaces by using appropriate computer user interface development framework.
3. Propose sustainable solutions to given problems.

SYNOPSIS
This subject covers abstractions and implementation techniques for the design of application using computer interfacing. Topics include: microcontroller, features of different I/O peripheral devices and their interfaces, Java programming language and interfacing, sensors and actuators, data analysis and controls and various software and hardware tool which significant for computer interfacing. This subject is taken to expose student to Java programming language and interfacing computer with other peripherals. Eclipse IDE will be used as the compiler and editor to demonstrate programming and in laboratories session in this subject.

REFERENCES

BEEE 3814
SEMICONDUCTOR INDUSTRIAL PROCESS /
PROSES PERINDUSTRIAN SEMIKONDUKTOR

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Explain the basic semiconductor manufacturing process and its materials for front end, back end and testing process.
2. Display the understanding towards process flow, hazards, Personal Protective Equipment (PPE), attire and available technology in semiconductor process.
3. Describe semiconductor technology individually or in a group.

SYNOPSIS
This course on semiconductor fabrication focuses on the concept and the basics of semiconductor materials, process technology and the fabrication processes of

REFERENCES

SEMESTER 7

BEEE 4434
INDUSTRIAL AUTOMATION / AUTOMASI PERINDUSTRIAN

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Evaluate manufacturing operation towards the improvement of its productivity.
2. Display competence in applying appropriate automation techniques to meet process targets.
3. Work individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS
This subject will discuss on major manufacturing processes, materials, technologies of electronics packaging, surface mount assembly and printed board fabrications. Also cover automation and control technologies, material handling, manufacturing support systems, quality control in manufacturing systems. This subject will prepare the students with knowledge and practical aspects regarding manufacturing line and respected areas.

REFERENCES
BEEE 4443
QUALITY MANAGEMENT / PENGURUSAN KUALITI

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Analyze any given problem and solution based on quality theories.
2. Work individually or in groups effectively to perform assignments/tasks given.
3. Study appropriate quality tools to improve the quality of management, process and product in organisation.

SYNOPSIS
This subject will discuss on the different of quality theories for many organisation, comparism international quality standard for customer satisfaction. The designing of strategy planning, strategy process and ethic to enhance the quality improvement for process and product with using quality tools. Six -sigma are using for management to improve the management strategy planning.

REFERENCES

BEEU 4774
BACHELOR DEGREE PROJECT II / PROJEK SARJANA MUDA II

LEARNING OUTCOMES
After completing the course, students will be able to:
1. Execute project implementation systematically.
2. Interpret data in a meaningful form using relevant tools
3. Work independently and ethically.
4. Present the results in the oral and written forms effectively.

SYNOPSIS
This is the second part of the Bachelor Degree Project. Students are expected to continue the project done in Bachelor degree Project Part 1 till completion. At the end of the semester students are required to submit the Bachelor Degree Project report both orally and in writing for assessment.

REFERENCES

PRE-REQUISITE
BEEU 3764
BACHELOR DEGREE PROJECT I / PROJECT SARJANA MUDA I
LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Determine the manipulator coordinate transformation by integrating kinematics parameters of industrial manipulator.
2. Manipulate the robot parameters based on several techniques.
3. Describe the robot technology for sustainable development.

SYNOPSIS
This subject will discuss on mechanics and control of mechanical manipulator, coordinate mapping and transformation, forward kinematics, inverse manipulator kinematics, manipulator dynamics, trajectory generation, linear and nonlinear robot control system. As practical engineers, the knowledge and practical aspects regarding an industrial robotics is a must. Most of the plants nowadays are equipped with their own robots.

REFERENCES

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Explain the basic operation and control technique for AC and DC motor electrical drive.
2. Measure the speed controlling system of AC and DC motors in laboratory experiments.
3. Report the findings of related given tasks on electrical drive environment effectively as individual or in groups.

SYNOPSIS
This subject will discuss on elements of electric drive systems, electromechanical modelling, basic speed control of dc motors, switching amplifier field current controllers, armature voltage controllers, troubleshooting of dc drives, modelling of permanent magnet brushless dc motor, braking of dc motors, limitation of electric drives, control of ac motor, braking of ac motors and stepper motor.

REFERENCES
BEEC 4844
IC TESTING / PENGUJIAN LITAR BERSEPADU

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Evaluate the performance and effectiveness of the IC testing techniques.
2. Perform different techniques of IC testing effectively.
3. Propose sustainable solutions to given problems.

SYNOPSIS
This course will introduce to the testing techniques and methodology of the integrated circuit. Students will be exposed to different topics such as types of defects and faults in the wafer fabrication, faults detection using various methods, different type of tests, test pattern generation and also design for testability technique. By using the aide of the software, students will learn how to perform an IC testing by using several methods such as SCAN and BIST techniques. Towards the end of this course, the introduction to the board level testing using boundary scan technique will also be covered.

REFERENCES
4. Lavagno L., Scheffer L., Martin G., EDA for IC system design, verification, and testing, CRC Press, 2006

SEMESTER 8

BEEU 4786
INDUSTRIAL TRAINING / LATIHAN INDUSTRI

LEARNING OUTCOME
At the end of the subject, students should be able to:
1. Show technical competencies and skills gained throughout their internship.
2. Prepare a report on the industrial field daily activities in the log book systematically.
3. Communicate effectively with staff, colleagues and other personnel.
4. Practice professional ethics in accordance with industry rules and regulations.

SYNOPSIS
All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

REFERENCES
1. UTeM Guideline Handbook for Industrial Training.
LEARNING OUTCOME
At the end of the subject, students should be able to:
1. Produce industrial training report
2. Present report orally on working experience

SYNOPSIS
All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

PRE-REQUISITE
Student required to pass Industrial Training BEEU 4786 in order to pass Industrial training report.

REFERENCES
1. UTeM Guideline Handbook for Industrial Training.

BEEC Course Core Subjects (K)

SEMESTER 1

BEEC 1303
BASIC ELECTRONICS /
ELEKTRONIK ASAS

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Explain basic functions of discrete electronic components, as well as the fundamental of digital electronics.
2. Solve basic electronic circuit's problems using simple and non-complex techniques.
3. Measure the relevant parameter of electronic circuits such as current, voltage and voltage gain.

SYNOPSIS
This course discusses the concept of basic electronic components quantity such as charge, current, voltage, energy and power. It will cover topics on concepts, functions and applications of electronic components such as resistors, inductors, capacitors, diodes, BJT and FET transistors, switch and relays, and also operational amplifiers. Introduction to the digital systems and the display technologies will also be given.

REFERENCES
LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Follow lab manual on basics of electronics components and circuit simulation software.
2. Assemble the alternatives that exist in the selection of hardware, software and computer engineering facilities when implementing a given task.
3. Complete given tasks effectively as an individual or in groups.

SYNOPSIS
The first part is dedicated to general practice of engineering. Students will experience mechanical, electrical, electronic and manufacturing practices. The topics covered in first part are electronics circuit design and analysis using electronics computer aided design software, printed circuit board design and fabrication and soldering technique for electronic circuits. The second part is dedicated for practice of computer engineering. The topics that will cover in second part are three major areas in computer engineering discipline namely computer networking, operating system and computer organization.

REFERENCES
3. EMC and the Printed Circuit Board: Design, Theory and Layout Made Simple, Mark.I, WILEY.
REFERENCES

SEMESTER 2

BEEI 1303
ELECTRICAL CIRCUIT FUNDAMENTAL / PENGENALAN LITAR ELEKTRIK

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Apply analytical method and theorem to DC and AC (steady state) circuits in electrical circuit.
2. Conduct experiment on DC and AC (steady state) circuit based on electrical circuit theorem.
3. Participate effectively for any assignment and experiment.

SYNOPSIS
This subject introduces the students to Ohm’s Law, Kirchoff’s Laws and use them to calculate current, voltage and power in DC / AC (steady state) circuits. Following this the students will learn the analytical methods namely mesh and nodal analysis. The use of theorems like Thevenin, Norton, Superposition and the Maximum Power Transfer will follow next. The applications of the above tools will cover both dc and ac circuits. This subject will be supported by laboratory works to impart to the students some basic practical skills.

REFERENCES

BEEC 1333
COMPUTER ENGINEERING WORKSHOP II / BENGKEL KEJURUTERAAN KOMPUTER II

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Manipulate prior knowledge of engineering and safety measure to conduct projects.
2. Demonstrate appropriate techniques for solving related industry problem and suggest possible solution.
3. Complete given tasks effectively as an individual or in groups.

SYNOPSIS
This subject will be provided students need to prepare and submit a technical report based on the acquired knowledge and exposure gained during computer engineering practice. In addition, students will also involve
in industrial visit and hearing industrial talk as part of the industrial exposure.

REFERENCES
3. EMC and the Printed Circuit Board: Design, Theory and Layout Made Simple, Mark.I, WILEY.
4. Turbo Cad Deluxe V.15 2D & 3D Precision Design by IMSI 2008

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Analyze the internal structure and the function of a computer system.
2. Construct assembly language program to accomplish tasks for a given instruction set.
3. Complete given tasks effectively as an individual or in groups.

SYNOPSIS
This course aims primarily to give the students a general understanding of how computer systems work, both internally (ALU, control unit, registers, etc.) and externally (I/O interfaces, networking, etc.). Such understanding will enable the graduates to make intelligent decisions when confronted with computer-related problems at their workplace. The knowledge and skills gained in this course will also enable the graduates to further their studies in the field of computer architecture, organization, and design. This course will provide student with full understanding of the inner-workings of digital computer systems and tradeoffs present at the interface of hardware-software. Students will get an understanding of the design process of a complex hardware system and hands-on experience with computer-aided design tools.

REFERENCES

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply programming principles and algorithms understanding in object oriented programming language.
2. Build a reliable program using object oriented programming to solve complex problems.
3. Construct maintainable object oriented application composed of several classes.

SYNOPSIS
This subject will focus on the principles of the object-oriented programming approach. It will discuss more in detail on topics such as classes and objects, interfaces and inheritance, basic syntax of object-oriented programming languages, collections and exception handling. In this course, students shall apply and construct the object oriented programming basic structures (such as polymorphism, encapsulation and abstraction). The subject is a compulsory to strengthen programming skills in students.

REFERENCES

PRE-REQUISITE
BEEC 1313
PROGRAMMING FUNDAMENTAL/
ASAS PENGATURCARAAN

SEMESTER 3
BEEC 2363
DATA STRUCTURE & ALGORITHM /
STRUKTUR DATA & ALGORITMA

LEARNING OUTCOMES
Upon completing this course, the student should be able to:
1. Apply the concept of data structures and algorithm analysis to optimize the memory and runtime efficiency.
2. Construct an application system using appropriate data structures and algorithms to maximize the performance of the system.
3. Complete given tasks effectively as an individual or in groups.

SYNOPSIS
This subject will expose the students to the fundamental knowledge of data structures and algorithm analysis. The topics that will be covered in the course include the introduction to data structures and algorithm analysis, fundamental of C++ programming language, object-oriented development, Array, List, Stack, Queue, Trees, Sorting and Searching algorithms. Apart from the theory, students are asked to apply the data structures and algorithms through a small application that is developed in a team. Microsoft Visual Studio C++ will be used as editor for C++ programming languages in this course.

REFERENCES


LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply the basic principles of analogue modulation system and noise.
2. Manipulate the performance of analog modulation techniques through experiments that commonly used in telecommunication system.

SYNOPSIS
This subject will discuss on Introduction to Telecommunication, Linear Modulation, Single Sideband (SSB) Communication Systems, Angle Modulation, Noise and Introduction to Digital Communication
The rationale of offering this subject is as the progression of communication system where students should have knowledge of communication principles and basic skills required by the industry.

REFERENCES

BEET 2423
SIGNAL & SYSTEMS /
ISYARAT & SISTEM

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Explain the basic concepts and properties of signal and systems.
2. Use appropriate analysis techniques in solving signal and system problems.
3. Conduct experimental works to analyse the performance of signal and system applications.

SYNOPSIS
Functions, Convolution, Transforms with Complex and Repeated Poles.

REFERENCES

BEEE 2373
ELECTRICAL TECHNOLOGY /
TEKNOLOGI ELEKTRIK

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply the principles of the electrical system.
2. Measure the application of the power system and electrical transmission in single phase and three-phase.
3. Work individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS
This subject will discuss on Alternating Voltage and Current, Phasor, Magnetic Circuit, Electromotive force, magnetic field strength, relation between B and H, Kirchhoff’s law magnetic hysteresis, Single Phase Circuit, series resonance, parallel resonance, power factor, transformer, phasor diagram, equivalent circuit voltage regulation and efficiency, O/C and S/C test, Voltage generation and excitation methods, Basic principles of power system, per unit system, electrical transmission.

REFERENCES

SEMESTER 4
BEEC 1343
DATABASE MANAGEMENT SYSTEM /
SISTEM PENGURUSAN PANGKALAN DATA

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Explain the concept of database, data modeling (relationship) and SQL statements.
2. Classify database application based on the current problem requirement.
3. Build database application to complete tasks and assignment as individual or in group.
SYNOPSIS
This subject will discuss on introduction to database and file management system. It assists the students to form an understanding of data modeling, file management and database system functionality in information system. The students will be introduced to the process of designing, developing and executing database applications. This course focuses on practical skills to create, control and execute statement for database relationship. MySQL Workbench software will be used to design and model the databases for this course.

REFERENCES

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Explain the fundamentals of computer network technology and its components
2. Analyze the OSI and TCP/IP models, protocols, and the functions of each layer.
3. Manipulate different types of network devices in developing a sustainable network design.

SYNOPSIS

Computer Network and System is a program targeted for dynamic digital and communication careers. It is strongly emphasis on technical aspect and enables employers to meet the needs of Computer Networks and System graduates including some of the best platform for many companies specializing in computer networking and system. This unique curriculum balances theory with extensive hands-on experiments.

REFERENCES
BEEC 2393
INTERNET TECHNOLOGY & MULTIMEDIA /
TEKNOLOGI INTERNET & MULTIMEDIA

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply the concepts, the infrastructure and the protocols of the Internet technology & multimedia.
2. Manipulate the software functionalities, technologies and protocols to design and implement a fully functional internet application.
3. Select the best Internet application and technology for commercialization.

SYNOPSIS
This subject provides an introductory knowledge of technologies related to Internet applications and services. The students are introduced to Internet protocols and their functionalities as well as hardware required to develop and implement Internet applications and services. The course is extended by an introduction to concept of Human-Computer Interaction (HCI) and its relationship in system development. The topics include the basic understanding of cognitive psychology, user interface design, and interaction design. This course is highly in demand since in the past few years there has been an explosion in the number of people using the Internet as well as multimedia.

REFERENCES

BEEC 2404
DIGITAL ELECTRONIC /
ELEKTRONIK DIGITAL

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Construct digital system using combinational and sequential logic circuits.
2. Assemble fully-function digital logic circuits.
3. Complete given tasks effectively as an individual or in groups.

SYNOPSIS
This subject covers the topics of transistor - transistor logic. Logic functions, logic diagrams, Karnaugh maps, Boolean algebra, DeMorgan's Theorem. Numerical codes, arithmetic functions. Combinational circuits such as encoders, decoders, multiplexers, de-multiplexers, comparators. This subject also covers the introduction to memory, programmable logic devices and microcomputer systems. Student will learn the topics on latches and flip-flops, flip- flops operating characteristics and applications. Registers and counters, shift registers, synchronous, asynchronous and modulo counters.
REFERENCES

SEMESTER 5
BEEC 3453 OPERATING SYSTEMS / SISTEM PENGOPERASIAN

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Explain the major components of an operating system, its responsibilities and aspects.
2. Analyze the structure and the functionality of the operating system.
3. Manipulate operating system theories to solve basic functional kernel problems.

SYNOPSIS
This subject introduces the internal operation of modern operating systems. In particular, the topics that will be covered in the course are Fundamental of Operating Systems, Process & threads Management, Concurrency Control, Memory Management, I/O Systems, File Systems, Protection and Security. Linux will be used as operating system for this course.

REFERENCES

BEEC 3413 DISCRETE MATHEMATICS / MATEMATIK DISKRIT

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Explain the fundamental concept of discrete mathematics.
2. Solve problems in computer engineering by referring to discrete mathematic theory.
3. Develop a program based on engineering technology problems using discrete mathematics principles.

SYNOPSIS
This subject will discuss on Functions, Relations and Sets: Functions, Relations, Discrete versus continuous functions and relations, Sets, Cardinality and countability; Basic Logics: Propositional logic, Logical connectives, Truth tables, Use of logic to illustrate connectives, Normal forms (conjunctive and disjunctive), Predicate logic, Universal and existential quantification, Limitations of predicate logic, Boolean algebra, Applications of logic to computer engineering; Proof Techniques: Notions of
implication, converse, inverse, negation, and
contradiction, The structure of formal proofs, Direct
proofs, Proof by counterexample, contraposition, etc;
Basics of Counting: Permutations and combinations,
Counting arguments rule of products, rule of sums, The
pigeonhole principle, Generating functions, Applications to
computer engineering; Graphs and Trees: Trees,
Undirected graphs, Directed graphs, Spanning trees,
Shortest path, Euler and Hamiltonian cycles, Traversal
strategies; Recursion: Recursive mathematical definitions,
Developing recursive equations, etc.

REFERENCES
Computability, Jones & Bartlett Publishers
Structures (Encyclopaedia of Mathematical
Sciences), Springer.
with Contemporary Applications. Chapman and
Hall/CRC.
4. Hein, James L., “Discrete structures, logic, and
computability”, Jones and Bartlett Pub, 2010.

3. Demonstrate proficiency in the computer system
problem solving skills.

SYNOPSIS
This subject covers topics on the engineering of computer
software and hardware systems: techniques for
controlling complexity; strong modularity using client-
server design, virtual memory, and threads; networks;
atomicity and coordination of parallel activities;
recovery and reliability; privacy, security, and encryption;
and impact of computer systems on society.

Knowledge, understanding, analysis and design abilities
are developed principally through lectures and tutorials.
Practical and design skills are developed through
laboratory work involving problem solving assignments
and practical exercises.

REFERENCES
1. Dhillon, B. S. Computer system reliability: safety and
2. Umakishore Ramachandran and William D. Leahy.
Computer systems: an integrated approach to
architecture and operating systems. Boston, MA:
Addison-Wesley, 1st ed, 2011.
3. Michael J. Flynn, Wayne Luk. Computer system
design: system-on-chip. Hoboken, NJ: Wiley, 1st ed,
2011.
BEEC 3433
COMPUTER NETWORK & SECURITY / RANGKAIAN & KESELAMATAN KOMPUTER

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Analyze the appropriate security system mechanism for computer software and computer network.
2. Integrate the suitable components in providing service and security mechanism in the computer and network system.
3. Present the assignment or technical report based on computer and network security issues.

SYNOPSIS
This subject will be discussed on how to control failures of confidentiality, integrity and availability in applications, databases, operating systems and networks alike. Beside that students should be able to implement the cyber law to protect their rights. Students also will learn on how to plan the recovery solution if any disaster happens to the computing environment.

REFERENCES

PRE-REQUISITE
BEEC 2383
COMPUTER NETWORK & SYSTEM / SISTEM & RANGKAIAN KOMPUTER

BEEC 3444
MICROPROCESSOR & MICROCONTROLLER TECHNOLOGY / TEKNOLOGI MIKROPEMPROSES & MIKROPENGAWAL

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Demonstrate a working knowledge of microprocessor and microcontroller architecture and peripheral subsystem.
2. Manipulate the hardware-software functionalities and technologies to solve given task using appropriate techniques and tools.
3. Propose sustainable solutions to given problems.

SYNOPSIS
This subject will provide the students both solid theoretical and practical applications to the microprocessors / microcontrollers based system. Extensive practical-oriented sessions will be given using MC68K microprocessor and PIC microcontroller involving program development software, chip programming and debugging. Topics covered are microcomputer system & peripheral design, software and hardware integration; interrupt control system, analog interfacing, etc.
REFERENCES

SEMESTER 6

BEEU 3764
BACHELOR DEGREE PROJECT I / PROJEK SARJANA MUDA 1

LEARNING OUTCOMES
At the end of the subject, students should be able to:
1. Explain the problem, objectives and scope of project associated to the industrial or community needs.
2. Use related previous work and its relevant theory
3. Choose a proper methodology
4. Present the preliminary findings in the oral and written forms effectively.

SYNOPSIS
The student needs to plan and implement the project individually that related to the respective engineering technology field. The student should implement a project, do the analysis and apply the theory to solve the problems related to topic. At the end, the student should write a problem based learning report that covers problem statement, literature review, methodology to overcome the problem. The student needs to achieve the objective of the project and presented it in the report.

REFERENCES

BEEC 3463
SOFTWARE ENGINEERING / KEJURUTERAAN PERISIAN

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Explain the basic concept, element and uses of software engineering.
2. Evaluate various solutions for a given software engineering problems.
3. Construct UML diagrams in the process of analysis and design.

SYNOPSIS
This subject will discuss on Introduction to software development, software engineering and database system; Software lifecycle model, CASE tools, requirement definition and management, requirement analysis, requirement specification document. Software design and modelling; design process, design quality and metrics, design strategy, software testing, database management and query language. Software Project management including estimation and quality management. Unified
Modelling Language (UML) is used to design and model in the software development process. For this purpose, Poseidon will be used as the software tools.

REFERENCES

SYNOPSIS
This subject will discuss on Introduction to DSP, discrete-time signals and systems, spectrum of representation of discrete-time signals, discrete Fourier transform, difference equations and discrete-time systems, z-transform and its applications, analysis and design of digital filters and application of digital signal processing.

REFERENCES

PRE-REQUISITE
BEET 2423
SIGNAL & SYSTEMS / ISYARAT & SISTEM

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply appropriate concepts and methods in demonstrating digital signals processing and systems.
2. Organize the implementation of digital signal processing in a system.

BEET 3373
DIGITAL SIGNAL PROCESSING /
PEMPROSESAN ISYARAT DIGITAL

SEMESTER 7

BEEU 4774
BACHELOR DEGREE PROJECT II /
PROJEK SARJANA MUDA II

LEARNING OUTCOMES
After completing the course, students will be able to:
1. Execute project implementation systematically.
2. Interpret data in a meaningful form using relevant tools.
3. Work independently and ethically.
4. Present the results in the oral and written forms effectively.

SYNOPSIS
This is the second part of the Bachelor Degree Project. Students are expected to continue the project done in Bachelor degree Project Part 1 till completion. At the end of the semester students are required to submit the Bachelor Degree Project report both orally and in writing for assessment.

REFERENCES

PRE-REQUISITE
BEEU 3764
BACHELOR DEGREE PROJECT I / PROJECT SARJANA MUDA I

BEEE 4443
QUALITY MANAGEMENT / PENGURUSAN KUALITI

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Analyze any given problem and solution based on quality theories.
2. Work individually or in groups effectively to perform assignments/tasks given.
3. Study appropriate quality tools to improve the quality of management, process and product in organisation.

SYNOPSIS
This subject will discuss on the different of quality theories for many organisation, comparism international quality standard for customer satisfaction. The designing of strategy planning, strategy process and ethic to enhance the quality improvement for process and, product with using quality tools. Six –sigma are using for management to improve the management strategy planning.

REFERENCES

BEEC 4473
EMBEDDED SYSTEM /
SISTEM TERBENAM

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Explain the basic components of an embedded system.
2. Analyze the principles of embedded systems and its communication protocols in order to solve given problems.
3. Manipulate the hardware-software functionalities, technologies and protocols to solve real-life problems.

SYNOPSIS
Topics covered in this course are overview of Embedded System, characteristics & application areas, introduction
to assembler-level software and high level language programming for Embedded Systems, introduction to Embedded System hardware, application-level embedded system design concepts in computer engineering. Student of this subject develop practical and theoretical skills for the modern software industry to build innovative system using embedded technology. Students will develop essential skills required to create clever system which drives intelligent robots and more.

REFERENCES

SEMESTER 8
BEEU 4786
INDUSTRIAL TRAINING / LATIHAN INDUSTRI

LEARNING OUTCOME
At the end of the subject, students should be able to:
1. Show technical competencies and skills gained throughout their internship.
2. Prepare a report on the industrial field daily activities in the log book systematically.
3. Communicate effectively with staff, colleagues and other personnel.
4. Practice professional ethics in accordance with industry rules and regulations.

SYNOPSIS
All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

REFERENCES
1. UTeM Guideline Handbook for Industrial Training.
LEARNING OUTCOME
At the end of the subject, students should be able to:
1. Produce industrial training report.
2. Present report orally on working experience.

SYNOPSIS
All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

PRE-REQUISITE
Student required to pass Industrial Training BEEU 4786 in order to pass Industrial training report.

REFERENCES
1. UTeM Guideline Handbook for Industrial Training.

LEARNING OUTCOME
At the end of the subject, students should be able to:
1. Evaluate solutions to problems in designing IC and its subcomponents by using adequate techniques.
2. Construct logic gates or subsystems circuits by using appropriate tools and techniques in VLSI.
3. Propose sustainable solutions to given problems.

SYNOPSIS
This subject will discuss on Electronic properties of materials: Solid-state materials, Electronics and holes Doping, acceptors and donors, p- and n-type material, Conductivity and resistivity, Drift and diffusion currents, mobility and diffusion; Function of the basic inverter structure: Connectivity, layout, and basic functionality of a CMOS inverter, The CMOS inverter voltage transfer characteristic (VTC), Analysis of the CMOS VTC for switching threshold, VOH, VOL, VIH, VIL, and noise margins, Effect of changing the inverter configuration on the CMOS VTC, Connectivity and basic functionality of a Bipolar ECL inverter, Connectivity and basic functionality of a Bipolar TTL inverter; Combinational logic structures: Basic CMOS gate design, Layout techniques for combinational logic structures, Transistor sizing for complex CMOS logic devices, Transmission gates, Architectural building blocks (multiplexers, decoders, adders, counters, multipliers); Sequential logic structures, etc.

REFERENCES
BEEC 4814
COMPUTER INTERFACING /
PENGANTARAMUKAAN KOMPUTER

LEARNING OUTCOME
At the end of the subject, students should be able to:
1. Evaluate the components and structure of a computer user interface development framework.
2. Construct user interfaces by using appropriate computer user interface development framework.
3. Propose sustainable solutions to given problems.

SYNOPSIS
This subject covers abstractions and implementation techniques for the design of application using computer interfacing. Topics include: microcontroller, features of different I/O peripheral devices and their interfaces, Java programming language and interfacing, sensors and actuators, data analysis and controls and various software and hardware tool which significant for computer interfacing. This subject is taken to expose student to Java programming language and interfacing computer with other peripherals. Eclipse IDE will be used as the compiler and editor to demonstrate programming and in laboratories session in this subject.

REFERENCES

BEEC 4824
IMAGE & VIDEO PROCESSING /
PEMPROSESAN IMEJ & VIDEO

LEARNING OUTCOME
At the end of the subject, students should be able to:
1. Evaluate appropriate methods, theories and techniques for image processing.
2. Manipulate images using various image processing techniques.
3. Propose sustainable solutions to given problems.

SYNOPSIS
This subject will discuss on Introduction to Image Processing, Two-dimensional signals and systems, Sampling in two dimensions, Two-dimensional discrete transforms, Introduction to 2-D filter design, Multi-resolution image processing, Image Estimation and Restoration, Morphological image processing, Edge detection, Fundamentals of image compression, Video processing and compression.

After learning this subject, students should be able to use point operations, perform basic image filtering, implement multi-resolution and image classification techniques, video filters, and basic algorithms for image and video compression.
REFERENCES

BEEC 4834
REAL TIME SYSTEMS / SISTEM MASA NYATA

LEARNING OUTCOME
At the end of the subject, students should be able to:
1. Evaluate solutions to problems related to the real-time system by using knowledge and principles of its basic reference model.
2. Adapt real-time operating system, scheduling techniques and resources to solve the given experimental problem.
3. Propose sustainable solutions to given problems.

SYNOPSIS
The topics that will be covered in the course are Introduction to Real-Time Systems, A Reference Model of Real-Time Systems, Scheduling Approaches, Clock-Driven Scheduling, Priority-Driven Scheduling for Periodic, Aperiodic and Sporadic Tasks, Resources and Resource Access Control, Model of Multiprocessor and Distributed Systems, Design of Real-Time Communication Protocol and Design of Real-Time Operating System. LynxOS will be used as real-time operating system for real-time application development and simulation for this course.

REFERENCES

BEEC 4884 IC TESTING / PENGUJIAN LITAR BERSEPADU

LEARNING OUTCOME
At the end of the subject, students should be able to:
1. Evaluate the performance and effectiveness of the IC testing techniques.
2. Perform different techniques of IC testing effectively.
3. Propose sustainable solutions to given problems.

SYNOPSIS
This course will introduce to the testing techniques and methodology of the integrated circuit. Students will be exposed to different topics such as types of defects and faults in the wafer fabrication, faults detection using various methods, different type of tests, test pattern generation and also design for testability technique. By using the aide of the software, students will learn how to
perform an IC testing by using several methods such as SCAN and BIST techniques. Towards the end of this course, the introduction to the board level testing using boundary scan technique will also be covered.

REFERENCES
4. Lavagno L., Scheffer L., Martin G., EDA for IC system design, verification, and testing, CRC Press, 2006

BEEZ Course Core Subjects (K)

SEMESTER 1

BEEE 1303
ENGINEERING WORKSHOP I /
BENGKEL KEJURUTERAAN I

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Explain industrial OSHA and industrial practices in the lab activity.
2. Diagnose an electronic circuit using electronic testing equipment.
3. To build the electronic circuit according to IPC standard and project using the appropriate simulation tools.

SYNOPSIS

REFERENCES
2. L. Nemerow, Franklin J. Agardy, Joseph A. Salvato, 2009, WILEY

BEEI 1303
ELECTRIC CIRCUIT FUNDAMENTAL /
PENGENALAN LITAR ELEKTRIK

LEARNING OUTCOMES
Upon completion of this subject, student should be able to:
1. Apply analytical method and theorem to DC and AC (steady state) circuits in electrical circuit.
2. Conduct experiment on DC and AC (steady state) circuit based on electrical circuit theorem.
3. Participate effectively for any assignment and experiment.

SYNOPSIS
This subject introduces the students to Ohm’s Law, Kirchoff’s Laws and use them to calculate current, voltage and power in DC / AC (steady state) circuits. Following this the students will learn the analytical methods namely mesh and nodal analysis. The use of theorems like Thevenin, Norton, Superposition and the Maximum Power Transfer will follow next. The applications of the above tools will cover both dc and ac circuits. This subject will be supported by laboratory works to impart to the students some basic practical skills.

REFERENCES

BEEC 1313
PROGRAMMING FUNDAMENTAL / ASAS PENGATURCARAAN

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Explain the fundamental of programming principles and algorithms of C programming language.
2. Apply C Programming Language to solve given problems.
3. Manipulate C programming structure using programming fundamentals and principles.

SYNOPSIS
Topics covered: basic programming principles such as introduction to C programming consists of syntax, variables and basic data type, more fundamentals programming structure such as operator, rules / condition, looping, function, array and sequences. The subject is compulsory to build a basic background in programming.

REFERENCES
SEMESTER 2

BEEE 1323
ELECTRONIC FUNDAMENTALS / PENGENALAN ELEKTRONIK

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply the semiconductors theory in electronic applications.
2. Construct electronics circuit of diode, BJT and FET.
3. Report the findings orally or in writing by performing assignments/experiments effectively.

SYNOPSIS
This course will discuss:
Bohr Atomic Model: valency, period table of elements, trivalent, tetravalent and pentavalent elements, movement electrons in solid: conductor, insulator and semiconductor, bands theory: energy band, conduction band and forbidden band. Doping, p and n materials, pn junction. Silicon Semiconductor Diodes: characteristics and measurement of forward & reverse biased, composite characteristics and load line analysis, clipping and simple rectifier (half & full) circuits, Zener diodes characteristics, and simple shunt regulators. Bipolar Junction Transistor: construction and operation of BJT, BJT characteristics and measurement technique, limits of operation, $\beta_{dc}$ and $\alpha_{dc}$, DC biasing – DC Load Lines. Amplification of signal. Transistor as a switch. Field Effect Transistor: construction and operation of FET, FET characteristics & diagram, Shockley’s equation, DC biasing – DC Load Lines-Graphical and mathematical approach.

REFERENCES

BEEE 2343
ENGINEERING DRAWING / LUKISAN KEJURUTERAAN

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply mechanical engineering design drawing using Computer Aided Design (CAD).
2. Draw Geometric, orthographic, isometric, sectional, assembly, part and detailed drawings by using CAD based on the given problem.
3. Work individually or in groups effectively to perform assignments/tasks give.

SYNOPSIS
This subject will discuss on draft techniques manually and using computer software (AUTOCAD), basic hardware of draft drawing, technique and applications in producing various technical drawing, AUTOCAD software, interfacing AUTOCAD, editing command, coordinate systems, template and layers 3D modeling. It will help students to read the engineering drawing as well in the AUTOCAD drawing. This subject will introduce students to basic information, skills, and concepts related to drafting and design with the usage of AutoCAD tools and commands.
REFERENCES

BEEE 1313
ENGINEERING WORKSHOP II / BENGKEL KEJURUTERAAN II

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Construct an electronic circuit using appropriate software.
2. Demonstrate the electrical wiring technique by using appropriate tools.
3. Fabricate Printed Circuit Board (PCB) using appropriate software and equipment.

SYNOPSIS
Simulation tools that cover the software of MATLAB, PSpice and AutoCad. Domestic Wiring – theory on domestic wiring, wiring diagram and lab practical. Printed Circuit Board (PCB) circuit design, practical design and fabrication using the design software of Proteus.

REFERENCES
1. Introduction to PSpice Using OrCAD for Circuits and Electronics 2015, by Muhammad H. Rashid

BEEZ 1203
AC CIRCUIT ANALYSIS / ANALISA LITAR AC

LEARNING OUTCOMES
Upon completing this subject, the student should be able to:
1. Apply the principles of the electrical system.
2. Conduct experiment on electrical circuit in single phase and three phase measurement.
3. Present written and oral communications to document work and experiment results.

SYNOPSIS
This subject exposes students to the application of several tools in analyzing AC electrical circuits, such as the Laplace transform and two ports network. Kirchhoff’s law magnetic hysteresis, single phase circuit, series and parallel resonance, power factor, transformer, phasor diagram, equivalent circuit voltage regulation and efficiency, open circuit and short circuit test, voltage generation and excitation method. The students are required to use the tools to analyze transient and frequency response in electrical circuit.
REFERENCES

SEMESTER 3
BEEE 2333
ANALOGUE ELECTRONIC DEVICES /
PERANTI ELEKTRONIK ANALOG

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply the fundamental of small signal amplifiers using BJT and FETs and Op-amp circuits.
2. Measure response of single stage, multistage amplifiers and basic op-amp circuit.
3. Report the findings orally or in writing by performing assignments/experiments effectively.

SYNOPSIS
This subject will discuss on BJT Transistor modeling, CE, CC and CB configuration, BJT small signal analysis, Feedback configuration, FET small-signal analysis, Frequency response, Bode plot, bandwidth, Special amplifier: cascade, cascode, Darlington, multistage, differential amplifier circuit, Operational amplifiers: inverting, non-inverting, summing and buffer.

REFERENCES

PRE-REQUISITE
BEEE 1323
ELECTRONIC FUNDAMENTALS /
PENGENALAN ELEKTRONIK

BEET 2423
SIGNAL & SYSTEMS / ISYARAT & SISTEM

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Explain the basic concepts and properties of signal and systems.
2. Use appropriate analysis techniques in solving signal and system problems.
3. Conduct experimental works to analyse the performance of signal and system applications.

SYNOPSIS
The course will cover various topics such as Introduction to Signals and Systems: Fundamental Concept, Transformations of Signals, Signal Characteristics, Common Signals, Systems and Its Properties,

**REFERENCES**
1. Alan V. Oppenheim, Alan S. Willsky and S. Hamid Nawab, Signals and Systems, 2nd Ed. 2015

**SYNOPSIS**
This subject will cover the topics of transistor- transistor logic. Logic functions, logic diagrams, Karnaugh maps, Boolean algebra, DeMorgan's Theorem. Numerical codes, arithmetic functions. Combinational circuits such as encoders, decoders, multiplexers, de-multiplexers, comparators. This subject also covers the introduction to memory, programmable logic devices and microcomputer systems. Student will learn the topics on latches and flip-flops, flip- flops operating characteristics and applications. Registers and counters, shift registers, synchronous, asynchronous and modulo counters.

**REFERENCES**

**BEEC 2404**
DIGITAL ELECTRONIC / ELEKTRONIK DIGITAL

**LEARNING OUTCOMES**
Upon completion of this subject, students should be able to:
1. Construct digital system using combinational and sequential logic circuits.
2. Assemble fully-function digital logic circuits.
LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Describe the principle, various terms and standards in measurement.
2. Select the appropriate technique or measurement tool to perform electrical signal measurement.
3. Report the findings orally or in writing by performing assignments/experiments effectively.

SYNOPSIS
This subject discusses about units and dimensions, standards, errors, static characteristics, 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

SEMESTER 4

BEET 2333
COMMUNICATION PRINCIPLE / PRINSIP KOMUNIKASI

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply the basic principles of analogue modulation system and noise
2. Manipulate the performance of analogue modulation techniques through experiments that commonly used in telecommunication system.

SYNOPSIS
This subject will discuss on Introduction to Telecommunication, Linear Modulation, Single Sideband (SSB) Communication Systems, Angle Modulation, Noise and Introduction to Digital Communication. The rationale of offering this subject is as the progression of communication system where students should have knowledge of communication principles and basic skills required by the industry.

REFERENCES
BEEE 2364
CONTROL PRINCIPLES / PRINSIP KAWALAN

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Demonstrate performance of a design control system.
2. Display respond of gain adjustment compensator in controlling broadly define system.
3. Work individually or in groups effectively to perform assignments/tasks given.

SYNOPSIS
This subject will discuss on introduction to control system, frequency domain modelling, Laplace transform, transfer function, electric network transfer function, translational mechanical system, rotational mechanical system transfer function, time domain modelling, general state space representation, transfer function and state space conversion, time response, poles, zeros and system response, First and Second order systems, underdamped system, reduction of multiple subsystems, blocks diagrams, feedback systems, signal flow graphs, Mason’s rule, Routh- Hurwitz criterion and Gain Adjustment compensator design.

REFERENCES

BEEE 2354
ELECTRONIC SYSTEMS / SISTEM ELEKTRONIK

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Analyze the characteristic and performance of the electronics devices.
2. Measure the performance of applied electronic circuits through lab sessions.
3. Report the findings orally or in writing by performing assignments/experiments.

SYNOPSIS
This subject will discuss about Electronic Devices: Application of electronic devices such as SCR, SCS, GTO, LASCR, DIAC, TRIAC, UJT and PUT. Filter: filter applications (basic filter concepts, filter response characteristics, active LP filter, active HP filter, active BP filter, active BS filter and filter response measurement). Oscillator circuits: Feedback oscillator principles, oscillators with the RC feedback circuits, LC feedback circuits, crystal oscillator, Astable and Monostable using op-amp, the 555 timer and applications. Power amplifier circuits: Class A, class B and class AB. Power supply: Power supply circuit, IC voltage regulator and application. These topics are very important to students because it gives emphasis on the design of circuits used in electronic systems.

REFERENCES

BEEZ 2404
MICROCONTROLLER TECHNOLOGY /
TEKNOLOGI MIKROPENGAWAL

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Demonstrate a working knowledge of microcontroller architecture and peripheral subsystem.
2. Manipulate the hardware-software functionalities and technologies to solve given task using appropriate techniques and tools.
3. Propose sustainable solutions to given problems.

SYNOPSIS
This subject will provide the students both solid theoretical and practical applications to the microcontrollers based system. Extensive practical-oriented sessions will be given using PIC microcontroller involving program development software, chip programming and debugging. Topics covered are microcomputer system & peripheral design, software and hardware integration; interrupt control system, analog interfacing, subsystems on microcontroller, applications, peripheral devices and system control design.

REFERENCES


SEMESTER 5

BEET 3383
ELECTROMAGNETIC / ELEKTROMAGNETIK

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply the knowledge of electromagnetic laws and principles.
2. Construct experimental investigation of wave electromagnetic properties.
3. Display the ability to perform the task given independently by optimizing available resources.

SYNOPSIS
This subject will discussed on Vector analysis: Vector algebra, coordinate system and transformation, vector calculus; Electrostatics: Electrostatic fields, Gauss Law, Poisson’s equation, electric fields in material space, electrostatic boundary; Magnetostatics: Magnetostatic fields, Stokes Theorem, Biot-Savart Law, Gauss Law, magnetic forces, material and devices and magnetostatic boundary; Waves: Maxwell’s equations, Faraday’s Law, time-varying electromagnetic field, induced emf, displacement current. Electromagnetic wave propagation: free space, lossy and lossless dielectric, good conductors, power and Pyonting vector, incident, reflected and refracted wave.
REFERENCES

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply appropriate concepts and methods in demonstrating digital signals processing and systems.
2. Organize the implementation of digital signal processing in a system.

SYNOPSIS
Topics covered: Introduction to discrete-time signals and system, properties, difference equations, infinite impulse response (IIR), finite impulse response (FIR), z-transform and its applications, analysis, design and application of digital filters and random signals.

REFERENCES
balances theory with extensive hands-on experiments. Fundamental of IOT, Application of IOT.

REFERENCES

BEEU 3803
INTEGRATED DESIGN PROJECT / PROJEK REKABENTUK BERSEPADU

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Design solution by synthesizing mechanical engineering technology knowledge that will solve broadly defined engineering technology problem in accordance with relevant standards.
2. Utilize modern engineering technology and IT tools in facilitating solutions to broadly defined engineering technology problem with an understanding of the limitations.
3. Evaluate the impact of the design product, component or processes in term of safety, environmental and sustainability factors.
4. Demonstrate effectively teamwork skill in completing the IDP.
5. Apply project management and financial knowledge effectively in completing the IDP.

SYNOPSIS
Integrated Design Project is a course where students have to design an engineering technology project to solve broadly defined problem. Broadly defined problem is engineering problems which cannot be pursued without a coherent and detailed knowledge of defined aspects of a professional discipline with a strong emphasis on the application of developed technology. The design project activities include 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 engineering design, students are also required to integrate their knowledge of other engineering disciplines such as (but not limited to) structural analysis and design, including material 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 disciplines of mechanical engineering knowledge.

REFERENCES
1. International Engineering Alliance, Graduates attributes and professional competencies, version 3, June 2013.

BEET 3353
TELECOMMUNICATION SYSTEM /
SISTEM TELEKOMUNIKASI

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Apply the concept of telecommunication system.
2. Manipulate the concept of telecommunication system.
3. Report effectively in given tasks and assignment by managing different information from multiple resources for commercialization.

SYNOPSIS
This subject will discuss on Radio Spectrum, Broadcasting, PSTN/ISDN, Satellite System, Radar System, Optical Communication and Wireless Communication. The rationale of offering this subject is as providing fundamental knowledge on various types of telecommunication system and as foundation for higher level subjects. IP core.

REFERENCES


BEET 3413
RF TECHNIQUE AND MICROWAVE /
TEKNIK RF & GELOMBANG MIKRO

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Evaluate transmission line circuits of RF system.
2. Construct the design of transmission line circuits for RF system.
3. Report current sustainable technologies and relate to the given assignment.

SYNOPSIS
This subject will discuss on Introduction to RF and Microwave Engineering; Transmission Lines; Microwave Network Analysis; Impedance Matching and Tuning;
Power Dividers and Couplers; Microwave Filter and Microwave Amplifier.

REFERENCES

BEEZ 4803
ANATOMY AND PHYSIOLOGY / ANATOMI AND FISIOLOGI

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Perceive terminologies to describe anatomical parts and physiological of biological functions.
2. Dismantling and re-assemble parts and functions of the human body with no errors
3. Report the findings orally and in writing by performing assignments effectively

SYNOPSIS
This course has been designed to introduce the student to human anatomy and physiology. Due to the close interrelationship between structure and function in biological systems, each functional physiology topic will include a brief overview of anatomic structure. The physical and chemical laws that are the basis of the physiological processes and also applications to current biomedical research and clinically relevant situations are discussed.

REFERENCES

BEEZ 4813
MEDICAL IMAGING AND IMAGE PROCESSING / PENGIMEJAN PERUBATAN DAN PEMPROSESAN IMEJ

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Perceive basic understanding of medical imaging and fundamental image processing techniques.
2. Manipulates imaging concepts and image processing techniques to acquire and process biomedical images.
3. Report the findings orally and in writing by performing assignments effectively
SYNOPSIS
The aim of the course is to show how to extract, model, and analyze information from medical data and applications to help diagnosis, treatment and monitoring of diseases through computer science. Medical image computing is a highly interdisciplinary field involving not only medicine and computer science but also mathematics, biology, statistics, probability, psychology and other fields. The course includes topics in an introduction to the physics and engineering of tomographic imaging devices, medical image analysis: image segmentation, registration, statistical modeling and applications of computational tools for medicine. It will also include selected topics relating to medical image formation. It will be application oriented.

REFERENCES

BEEZ 4923
MICROELECTRONIC FABRICATION / FABRIKASI MIKROELEKTRONIK

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Explain the fundamental physical properties of semiconductors and the operation of fundamental semiconductor devices.
2. Analyze the behavior of semiconductor devices.
3. Propose sustainable solutions to given problems.

SYNOPSIS
This course introduces the basic concepts of the operation of the semiconductor devices that comprise today’s integrated circuits. Topics to be discussed include semiconductor materials, basic device physics, p-n junctions, metal-semiconductor junctions and transistors, both bipolar and metal-oxide-semiconductor (MOS).

REFERENCES
LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Explain the basic semiconductor manufacturing process and its materials for front end, back end and testing process.
2. Display the understanding towards process flow, hazards, Personal Protective Equipment (PPE), attire and available technology in semiconductor process.
3. Describe semiconductor technology individually or in a group.

SYNOPSIS
Semiconductor manufacturing process towards front end and back end of lines will be taught to give understanding on the important materials and component for high quality product.

REFERENCES

SEMESTER 6
BEEE 3404
DATA ACQUISITION & SENSORS / PEROLEHAN DATA & PENDERIA

LEARNING OUTCOMES
Upon completing this course, the student should be able to:
1. Classify the concept of data acquisition system and sensor.
2. Construct data monitoring system by using appropriate data acquisition tools.
3. Report the findings orally or in writing by performing assignments/experiments effectively.

SYNOPSIS
This subject will discuss on introduction on Data Acquisition and Sensor, Data Acquisition Hardware, Analog and Digital Signals, Signal Conditioning, Serial Data Communications, Distributed & Standalone Loggers/Controllers, IEEE 488 Standard, Ethernet & LAN Systems, Universal Serial Bus (USB), Specific Techniques, LabView, Interfacing Software and Hardware, controlling automation system using LabView, bluetooth technology.

This subject prepares students with knowledge and skills to use data acquisition hardware and software as well as sensors.
REFERENCES
4. Nikolai V. Kirianaki and Sergey Y. Yurish, Data Acquisition for Smart Sensors, Wiley, 2002

BEEU 3764
BACHELOR DEGREE PROJECT I / PROJEK SARJANA MUDA 1

LEARNING OUTCOMES
At the end of the subject, students should be able to:
1. Explain the problem, objectives and scope of project associated to the industrial or community needs.
2. Use related previous work and its relevant theory
3. Choose a proper methodology
4. Present the preliminary findings in the oral and written forms effectively.

SYNOPSIS
The student needs to plan and implement the project individually that related to the respective engineering technology field. The student should implement a project, do the analysis and apply the theory to solve the problems related to topic. At the end, the student should write a problem based learning report that covers problem statement, literature review, methodology to overcome the problem. The student needs to achieve the objective of the project and presented it in the report.

REFERENCES

BEET 4833
ANTENNA ENGINEERING / KEJURUTERAAN ANTENA

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Evaluate the antenna parameters and structures.
2. Measure the performance of antenna structures and network.
3. Revise sustainable technologies and relate to the given assignment.

SYNOPSIS
This course will discuss on Introduction and Fundamentals of Antenna, Antenna Solution using Maxwell Equation, Types of Antenna, Matching and Feeding Networks, Antenna Measurement and Introduction to Radio-wave Propagation.

REFERENCES
BEET 4813
MOBILE COMMUNICATION / KOMUNIKASI MUDAH ALIH

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Evaluate the concepts, theories and strategies in solving of mobile communication system.
2. Measure the performance of radio wave propagation model.
3. Revise sustainable technologies and relate to the given assignment.

SYNOPSIS
This subject will discuss on Introduction and Basic Concept of Mobile Communication System, Radio Wave propagation in Mobile Communication Systems, High Spectrum Efficiency Modulation Systems, Zone Techniques for Configuration and Channel Assignment, Techniques to Improve Transmission Quality and Error Control Techniques. Mobile communications technology has seen a thriving development in recent years. Driven by technological advancements as well as application demands, various classes of communication networks emerged. This is why this subject should be included in the program.

REFERENCES

BEEZ 4823
MEDICAL DEVICES AND INSTRUMENTATION / PERANTI PERUBATAN DAN INSTRUMENTASI PERUBATAN

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Perceive the concepts and operations of the medical instruments.
2. Dismantling and re-assembling various components of the medical devices with efficiency and no errors.
3. Report the findings orally and in writing by performing assignments effectively

SYNOPSIS
Description designs and applications of electronic medical instruments for ECG, EEG, EMG, pressure, flow, volume, bio impedance, temperature, concentration, cell count and so on. Including the introduction to clinical analysers and therapeutic device. Origins, physiology and acquisition of biological signals, the use of electrodes and sensors and the processing of analogue and digital biological signals are discussed. Topic on electrical safety of the devices and patients are also included.
REFERENCES

BEEZ 4853
BIOMEDICAL ETHICS, ACTS, STANDARDS & SAFETY / ETIKA, AKTA, PIAWAI & KESELAMATAN
BIOPERUBATAN

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Evaluate problems and scenarios and give recommendation based of learned concepts and ideas.
2. Manipulate learned concepts to solve given ethical, regulations and safety issues.
3. Report systematic planning in solving problems orally and in writing by performing assignments effectively.

SYNOPSIS
This course exposes students to the acts, regulations and laws concerning the design, application and use of biomedical devices. It also emphasizes on the biomedical engineering ethics principles and case studies.

REFERENCES
3. Medical Device Regulation 2012
4. Medical Act 2012 (Act 737)
5. Medical Device Authority Act 2012 (Act 738)
6. Electrical equipment in medical practice (TC62)
7. IEC 60601 - Medical Electrical Equipment
8. IEC 61010 - Safety requirements for electrical equipment for measurement, control and laboratory
9. IEC TR 61852 Medical electrical equipment - Digital imaging and communications in medicine (DICOM) - Radiotherapy objects
10. IEC 62353 Medical electrical equipment - Recurrent test and test after repair of medical electrical equipment

BEEZ 4873
VLSI DESIGN / REKABENTUK VLSI

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Evaluate solutions to problems in designing IC and its subcomponents by using adequate techniques.
2. Construct logic gates or subsystems circuits by using appropriate tools and techniques in VLSI.
3. Propose sustainable solutions to given problems.

SYNOPSIS
Topics covered: Electronic properties of materials: Solid-state materials, Electronics and holes Doping, acceptors and donors, p- and n-type material, Conductivity and resistivity, Drift and diffusion currents, mobility and diffusion; Function of the basic inverter structure: Connectivity, layout, and basic functionality of a CMOS inverter, The CMOS inverter voltage transfer characteristic (VTC), Analysis of the CMOS VTC for switching threshold, VOH, VOL, VIH, VIL, and noise margins, Effect of changing the inverter configuration on the CMOS VTC, Connectivity and basic functionality of a Bipolar ECL inverter, Connectivity and basic functionality of a Bipolar TTL inverter; Combinational logic structures: Basic CMOS gate design, Layout techniques for combinational logic structures, Transistor sizing for complex CMOS logic devices, Transmission gates, Architectural building blocks (multiplexers, decoders, adders, counters, multipliers); Sequential logic structures: Storage mechanisms in CMOS logic, Dynamic latch circuits, Static latch and flip-flop circuits, Sequential circuit design.

REFERENCES
5. IEC 62353 Medical electrical equipment - Recurrent test and test after repair of medical electrical equipment

BEEZ 4883
DIGITAL IC DESIGN / REKABENTUK IC DIGITAL

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Evaluate suitable digital system design to solve engineering problem.
2. Design complete digital system on FPGA by using the HDL.
3. Propose sustainable solutions to given problems.

SYNOPSIS
This course provides exposure to digital hardware IC design, which consists of the design entry, simulation and verification of the digital circuits. Students will learn how to design from simple logic gates and combinational logic to more complex circuits by using the Hardware Description Language (HDL). The transformation process from design entry to the physical design will be explained. Moreover, an introduction to the digital circuit timing analysis will also be covered towards the end of this course. Sequential logic structures: Storage mechanisms in CMOS logic, Dynamic latch circuits, Static latch and flip-flop circuits, sequential circuit design.

REFERENCES

REFERENCES

PRE-REQUISITE
BEEU 3764
BACHELOR DEGREE PROJECT I / PROJECT SARJANA MUDA I

BEEU 4774
BACHELOR DEGREE PROJECT II / PROJEK SARJANA MUDA II

LEARNING OUTCOMES
After completing the course, students will be able to:
1. Execute project implementation systematically.
2. Interpret data in a meaningful form using relevant tools
3. Work independently and ethically.
4. Present the results in the oral and written forms effectively.

SYNOPSIS
This is the second part of the Bachelor Degree Project. Students are expected to continue the project done in Bachelor degree Project Part 1 till completion. At the end of the semester students are required to submit the Bachelor Degree Project report both orally and in writing for assessment.

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Analyze any given problem and solution based on quality theories.
2. Work individually or in groups effectively to perform assignments/tasks given.
3. Study appropriate quality tools to improve the quality of management, process and product in organisation.

SYNOPSIS
This subject will discuss on the different of quality theories for many organisation, comparisme international quality standard for customer satisfaction. The designing of strategy planning, strategy process and ethic to enhance the quality improvement for process and, product with using quality tools. Six —sigma are using for management to improve the mangement strategy planning.
REFERENCES
3. Stephen R. Covey’s book, The 7 Habits of Highly Effective People

BEEE 3424
EMBEDDED SYSTEMS APPLICATION /
APLIKASI SISTEM TERBENAM

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Analyse suitable microcontrollers to be used in a given scenario and constraints.
2. Construct embedded systems using programmable or reconfigurable devices.
3. Report the findings orally or in writing by performing assignments/experiments.

SYNOPSIS
This subject will discuss about embedded System, characteristics & application areas, introduction to digital hardware technologies, introduction to computer systems & architectures, introduction to assembler-level software and high level language programming for Embedded Systems, introduction to Interfacing Computer Systems to External Hardware, application-level embedded system design concepts in industrial electronics. These topics are very important to students because it gives emphasis on the design of circuits used in embedded systems.

REFERENCES

BEET 4803
SATELLITE COMMUNICATION / KOMUNIKASI SATELIT

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Evaluate the mechanic orbit, satellite link and noise in satellite communication system.
2. Measure the performance of satellite link and satellite subsystem in telecommunication.
3. Revise sustainable technologies and relate to the given assignment.

SYNOPSIS
This subject will discuss on introduction to satellite communication - frequency allocations, applications, future trends satellite communication; Orbital mechanics and launchers- Orbital Mechanics, Look angle determination; Satellite subsystem - telemetry, tracking, command and monitoring, power systems, communication subsystems, satellite antenna; Satellite Link Design - design of downlink, uplink design, design of satellite links for specific C/N ; and Earth station technology.
REFERENCES


BEEZ 4863
RADIO NAVIGATION / SISTEM NAVIGASI RADIO

LEARNING OUTCOMES

Upon completion of this subject, students should be able to:

1. Apply knowledge of the technical specification of various radio navigation systems.
2. Evaluate the selection of a radio navigation system for a given application
3. Report and explain clearly their given assignment

SYNOPSIS


REFERENCES

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Evaluate and determine fault based learned concepts.
3. Report the findings orally and in writing by performing assignments effectively

SYNOPSIS
This course is designed to focus on the ability and skills of the students in identifying and troubleshooting faults in electronic circuits and devices. It also encompasses the ability to select and use suitable equipment for troubleshooting and elementary calibration of devices.

This course will also include:

i. Project management for procurement, equipping, installing, commissioning, decommissioning, testing and handing over of biomedical equipment

ii. A maintenance strategy includes procedures for inspection, as well as preventive and corrective maintenance. Performance inspections ensure that equipment is operating correctly, safety inspections ensure the equipment is safe for both patients and operators, and preventive maintenance (PM) aims to extend the life of the equipment and reduce failure rates.

iii. Troubleshooting the electronic circuit and calibration the medical equipment quality assurance program and building facility for medical equipment.

iv. Students will be taught to develop flow charts and event-tree analysis in fault finding. Students will also be exposed to the principles of innovative problem-solving techniques (TRIZ).

REFERENCES
BEEZ 4833
BIOMECHANICS / BIOMEKANIK

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Perceive concepts of mechanical properties and dynamics of the human structure.
2. Assembles procedures in measuring and modelling the human mechanics.
3. Report the findings orally and in writing by performing assignments effectively.

SYNOPSIS
The course provides an overview of musculoskeletal anatomy, the mechanical properties and structural behavior of biological tissues, and biodynamics. Specific course topics will include structure and function relationships in tissues and organs; application of stress and strain analysis to biological tissues; analysis of forces in human function and movement; energy and power in human activity; introduction to modeling viscoelasticity. More specifically, it is expected that the student will: (a) acquire knowledge and experience necessary to structurally, functionally, and mechanically analyse the performer and performance of physical activities; (b) make appropriate recommendations about modifying performance; (c) demonstrate how bones, joints, and muscles serve as components of human levers, acting in accordance with the laws of mechanics; (d) demonstrate the application of knowledge of joint structure, joint stability factors and those factors influencing joint range of motion to the selection of developmental exercises for muscle strengthening, treatment and prevention of sport/athletic injuries; (e) demonstrate the basic principles of mechanics as they apply to the analysis of human movement; and (f) be able to approach training, rehabilitation, and/or coaching from an analytical point of view.

REFERENCES

BEEZ 4913
VLSI ARCHITECTURE / SENI BINA VLSI

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Select the suitable hardware implementation strategy for IC architectures.
2. Construct digital systems by using adequate implementation techniques.
3. Propose sustainable solutions to given problems.

SYNOPSIS
This course will expose to VLSI architecture and hardware implementation techniques for advanced applications. It will cover techniques such as pipelining and parallel processing which are applied in various VLSI applications such as microprocessors, memory hierarchies, digital signal processing and arithmetic.
operations. Besides, the concept of low-power design of digital systems will also be introduced.

REFERENCES

BEEZ 4893
DIGITAL IC TESTING / PENGUJIAN IC DIGITAL

LEARNING OUTCOMES
Upon completion of this subject, students should be able to:
1. Evaluate the performance and effectiveness of the IC testing techniques.
2. Perform different techniques of IC testing effectively.
3. Propose sustainable solutions to given problems.

SYNOPSIS
This course will introduce to the testing techniques and methodology of the integrated circuit. Students will be exposed to different topics such as types of defects and faults in the wafer fabrication, faults detection using various methods, different type of tests, test pattern generation and also design for testability technique. By using the aide of the software, students will learn how to perform an IC testing by using several methods such as SCAN and BIST techniques. Towards the end of this course, the introduction to the board level testing using boundary scan technique will also be covered.

REFERENCES

SEMESTER 8
BEEU 4786
INDUSTRIAL TRAINING / LATIHAN INDUSTRI

LEARNING OUTCOME
At the end of the subject, students should be able to:
1. Show technical competencies and skills gained throughout their internship.
2. Prepare a report on the industrial field daily activities in the log book systematically.
3. Communicate effectively with staff, colleagues and other personnel.
4. Practice professional ethics in accordance with industry rules and regulations.

SYNOPSIS
All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.

REFERENCES
1. UTeM Guideline Handbook for Industrial Training.

PRE-REQUISITE
Student required to pass Industrial Training BEEU 4786 in order to pass Industrial training report.

REFERENCES
1. UTeM Guideline Handbook for Industrial Training.

BEEU 4796
INDUSTRIAL TRAINING REPORT /
LAPORAN LATIHAN INDUSTRI

LEARNING OUTCOME
At the end of the subject, students should be able to:
1. Produce industrial training report.
2. Present report orally on working experience.

SYNOPSIS
All students are required to undergo industrial training as part of their curriculum to complete four (4) years course for the Bachelor of Engineering Technology. The duration of training is 24 weeks and it will be taken place at the end of the course (semester 8). The students are expected to gain knowledge and enhance their technical skills within industrial environment relevant to their field of study.
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## DEPARTMENT OF ELECTRICAL ENGINEERING TECHNOLOGY

### INDUSTRIAL POWER (BEEI)

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BPA - ACADEMIC ADMINISTRATION DEPARTMENT
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LEGEND
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SCL - STUDENT CENTRED LEARNING
HT - HIGH TENSION
LV - LIGHT VOLTAGE
LOGISTIC 1

LEGEND:
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- LV = LIGHT VOLTAGE
- BC = BILIK COMRACK
- BP = BILIK PENGAJAR

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