UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ACADEMIC HANDBOOK
SESSION 2019/2020

Faculty of Electrical and Electronics Engineering Technology (FTKEE)

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Aras Bawah, Perpustakaan Laman Hikmah,
Universiti Teknikal Malaysia Melaka
Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia.
Tel: +606 270 1241 Fax: +606 270 1038

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UTeM ADMINISTRATION

SENIOR MANAGEMENT

PROF. DATUK WIRA DR. RAHA ABDUL RAHIM
Vice Chancellor

PROF. DATUK Ts. DR. MOHD RAZALI BIN MUHAMAD
Deputy Vice Chancellor, Academic & International

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Deputy Vice Chancellor, Research & Innovation

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Bursar

MR. MOHD ISA BIN MOHD DOM

Chief Information Officer

DATUK AZHAR BIN MOHAMED

Legal Advisor

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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.

WELCOME TO FTKEE

Assalammualaikum dan Salam Sejahtera,

Welcome to the
Faculty of Electrical and Electronics Engineering Technology (FTKEE)!

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 achieveing 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 COORDINATOR

ELECTRICAL ENGINEERING TECHNOLOGY (INDUSTRIAL POWER)

BEEI

TS. DR. MUHAMMAD SHARIL BIN YAHAYA

ELECTRICAL ENGINEERING TECHNOLOGY (INDUSTRIAL AUTOMATION & ROBOTIC)

BEEA

TS. DR. SAHAZATI BINTI MD ROZALI

ELECTRICAL ENGINEERING TECHNOLOGY (RENEWABLE ENERGY)

BEEY

PUAN HALYANI BINTI MOHD YASSIM

ELECTRONICS ENGINEERING TECHNOLOGY (TELECOMMUNICATIONS)

BEET

TS. ZAHARIAH BINTI MANAP

ELECTRONICS ENGINEERING TECHNOLOGY (INDUSTRIAL ELECTRONICS)

BEEE

IR. TS. MOHD. SYAHRIN AMRI BIN MOHD. NOH

ELECTRONICS ENGINEERING TECHNOLOGY

BEEZ

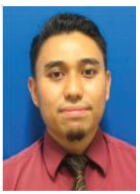
PUAN IZADORA BINTI MUSTAFFA

COMPUTER ENGINEERING TECHNOLOGY (COMPUTER SYSTEMS)

BEEC

TS. SHAMSUL FAKHAR BIN ABD GANI

MATHEMATICS



EN. ADAM BIN SAMSUDIN

PROGRAMME OFFERED

No	Programme Name	Short Code
1	Bachelor of Electrical Engineering Technology (Industrial Power) with Honours	BEEI
2	Bachelor of Electrical Engineering Technology (Industrial Automation & Robotics) with Honours	BEEA
3	Bachelor of Electrical Engineering Technology with Honours	BEEY
4	Bachelor of Electronics Engineering Technology (Telecommunications) with Honours	BEET
5	Bachelor of Electronics Engineering Technology (Industrial Electronics) with Honours	BEEE
6	Bachelor of Computer Engineering Technology (Computer Systems) with Honours	BEEC
7	Bachelor of Electronic Engineering Technology with Honours	BEEZ

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 1: Marks, Grades and Points Awarded

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

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 2: Academic Status Classification

STATUS	CGPA
Good (KB)	CGPA ≥ 2.00
Conditional (KS)	1.70 ≤ CGPA < 2.00
Fail (KG)	CGPA < 1.70

(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:

Academic Advisor	Student
• Conduct a meeting with students at least twice every semester.	• Always be open-minded when meeting with the academic advisor.
• Make sure to student understand the academic system in UTeM.	• Attend meetings conducted by the academic advisor.
• Guide and make sure student's subjects registration is based on his/her current academic result.	• Regard the academic advisor as a mentor and seek advice on the academic matters from them.
• Supervise the student study progress and provide guidance in making a good study planning.	• Learn to have a good understanding of the academic system.
• Inspire students so that they will always be motivated in their study.	• Provide a copy of examination result to the academic advisor for each semester.
• 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.	• Get the certification of registration form, copy of certificates and reference letter from the academic advisor.
• Refer the student to certain department/centre for further action if necessary.	• 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.

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:

Total Points, $JMN = k_1m_1 + k_2m_2 + ...k_nm_n$

Total Calculated Credits, $JKK = k_1 + k_2 + ...k_n$

$GPA = JMN / JKK$

$= [k_1m_1 + k_2m_2 + ...k_nm_n] / [k_1 + k_2 + ...k_n]$

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:

$CGPA = [JMN_1 + JMN_2 + ...JMN_n] / [JKK_1 + JKK_2 + ...JKK_n]$

Where: JMN_n = Total points obtained in n semester

JKK_n = Total credits in n 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.

CURRICULUM STRUCTURE

ELECTRICAL ENGINEERING TECHNOLOGY
PROGRAMME LEARNING OUTCOMES (PLO)

PLO1	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 & robotics / industrial power).
PLO2	Ability to solve broadly-defined engineering problems systematically to reach substantiated conclusions, using tools and techniques appropriate to electrical engineering technology (industrial automation & robotics / industrial power).
PLO3	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.
PLO4	Ability to plan and conduct experimental investigations of broadly-defined problems, using data from relevant sources.
PLO5	Ability to select and apply appropriate techniques, resources and modern engineering tools, with an understanding of their limitations.
PLO6	Ability to demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities.
PLO7	Ability to demonstrate an understanding of the impact of engineering technology practices, taking into account the need for sustainable development.
PLO8	Ability to demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices.
PLO9	Ability to function effectively as individuals, and as members or leaders in diverse technical teams.
PLO10	Ability to communicate effectively with the engineering community and society at large.
PLO11	Ability to demonstrate an awareness of project management, business practices and entrepreneurship.
PLO12	Ability to recognise the need for professional development and to engage in independent and lifelong learning.

Bachelor of Electrical Engineering Technology (Industrial Power) with Honours (BEEI)

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	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 *Cocurriculum 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**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BEEU 2033	Kalkulus Lanjutan untuk Teknologi *Advanced Calculus for Technology*	P	3	
	BEEA 2061	Seminar Kejuruteraan I *Engineering Seminar I*	P	1	
	**BEEI 2342	Bengkel Elektrik II *Electrical Workshop II*	K	2	BEEI 1311
	BEEI 2373	Mesin Elektrik *Electrical Machines*	K	3	
	BEEI 2364	Teknologi Elektrik *Electrical Technology*	K	4	
	BEEA 2383	Pengenalan Sistem Kawalan *Control System Fundamental*	K	3	
	BKKX XXX1	Kokurikulum II *Cocurriculum II*	W	1	
	BLHL 1XX2	Bahasa Ketiga *Third Language*	W	2	
TOTAL CREDITS THIS SEMESTER				**19**	
SEMESTER 4	BEEU 2043	Kaedah Statistik *Statistical Methods*	P	3	
	BEEA 2374	Sistem Terbenam *Embedded Systems*	K	4	
	BEEI 2463	Termodinamik & Pemindahan Haba *Thermodynamic & Heat Transfer*	K	3	
	BEEI 2383	Teknologi Sistem Kuasa *Power System Technology*	K	3	
	BEEI 3413	Elektronik Kuasa *Power Electronics*	K	3	
	BLHW 2452	Penulisan Akademik *Academic Writing*	W	2	
TOTAL CREDITS THIS SEMESTER				**18**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	**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 Genaration & 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**	
SEMESTER 6	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**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 7	**BEEU 4774	Projek Sarjana Muda II *Bachelor Degree Project II*	K	4	BEEU 3764
	BLHC 4032 BLHW 2752	Pemikiran Kritis dan Kreatif **(untuk pelajar tempatan)** *Critical and Creative Thinking* ***(for local students)*** Kebudayaan Malaysia **(untuk pelajar tempatan)** *Malaysian Culture* ***(for local students)***	W	2	
	BTMW 4012	Keusahawanan Teknologi *Technology Enterpreneurship*	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	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:

NO.	CODE	SUBJECT
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:

CODE	SUBJECT NAME
BLHW 1722	Falsafah Sains dan Teknologi *Philosophy of Science and Technology*
BLHC 4012	Komunikasi Organisasi *Organizational Communication*
BLHH 1032	Psikologi Industri dan Organisasi *Industrial Psycology 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:

CODE	CERTIFICATE NAME
BEEA 3100	Certified LabView Associate Developer (CLAD)
BEEE 3100	Programmable Logic Controller (PLC) Level 1 & Level 2
BEEZ 3100	SMCT MT1 – Practical Mechatronics 1

Bachelor of Electrical Engineering Technology (Industrial Automation & Robotic) with Honours (BEEA)

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BEEU 1013	Matematik Teknikal *Technical Mathematics*	P	3	
	BEEA 1304	Elektronik & Sistem Digital *Digital Electronics & Systems*	K	4	
	BEEY 1303	Pengukuran dan Instrumentasi *Measurement and Instrumentation*	K	3	
	BEEA 1313	Rekabentuk Terbantu Komputer *Computer Aided Design*	K	3	
	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 *Cocurriculum 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 1453	Prinsip Elektronik *Electronics Principle*	K	3	
	**BEEI 1333	Litar Elektrik Lanjutan *Advanced Electrical Circuits*	K	3	BEEI 1303
	BEEA 1343	Pengaturcaraan Komputer *Computer Programming*	K	3	
	BLHW 1442	Bahasa Inggeris untuk Akademik *English for Academic Purposes*	W	2	
TOTAL CREDITS THIS SEMESTER				**18**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE- REQUISITE
SEMESTER 3	BEEU 2033	Kalkulus Lanjutan untuk Teknologi *Advanced Calculus for Technology*	P	3	
	BEEA 2061	Seminar Kejuruteraan I *Engineering Seminar I*	P	1	
	**BEEI 2342	Bengkel Elektrik II *Electrical Workshop II*	K	2	BEEI 1311
	BEEA 2363	Statik & Mekanik *Static & Mechanics*	K	3	
	BEEI 2364	Teknologi Elektrik *Electrical Technology*	K	4	
	BEEI 2373	Mesin Elektrik *Electrical Machine*	K	3	
	BLHL 1XX2	Bahasa Ketiga *Third Language*	W	2	
	BKKX XXX1	Kokurikulum II *Cocurriculum II*	W	1	
TOTAL CREDITS THIS SEMESTER				**19**	
SEMESTER 4	BEEU 2043	Kaedah Statistik *Statistical Methods*	P	3	
	BEEA 2374	Sistem Terbenam *Embedded Systems*	K	4	
	BEEI 3413	Elektronik Kuasa *Power Electronics*	K	3	
	BMMH 2313	Mekanik Bendalir *Fluids Mechanics*	K	3	
	BEEA 2383	Pengenalan Sistem Kawalan *Control System Fundamental*	K	3	
	BLHW 2452	Penulisan Akademik *Academik Writing*	W	2	
TOTAL CREDITS THIS SEMESTER				**18**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	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**	
SEMESTER 6	BEEI 3061	Seminar Kejuruteraan II *Engineering Seminar II*	P	1	
	BEEU 4053	Etika Kejuruteraan & KKPP *Engineering Ethics & OSHE*	P	3	
	BEEU 3764	Projek 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**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISIT
SEMESTER 7	**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)***			
	BTMW 4012	Keusahawanan Teknologi *Technology Enterpreneurship*	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:

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

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

CODE	SUBJECT NAME
BLHC 4012	Komunikasi Organisasi *Organizational Communication*
BLHH 1032	Psikologi Industri dan Organisasi *Industrial Psycology and Organization*
BLHC 4022	Kemahiran Perundingan *Negotiation Skills*

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

CODE	CERTIFICATE NAME
BEEA 3100	Certified LabView Associate Developer (CLAD)
BEEE 3100	Programmable Logic Controller (PLC) Level 1 & Level 2
BEEZ 3100	SMCT MT1 – Practical Mechatronics 1

Bachelor of Electrical Engineering Technology with Honours (BEEY)

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BEEU 1013	Matematik Teknikal *Technical Mathematics*	P	3	
	BEEE 1013	Fizik Teknikal *Technical Physics*	P	3	
	BEEY 1303	Pengukuran dan Sistem Instrumentasi *Measurement and Instrumentation System*	K	3	
	BEEA 1313	Rekabentuk Terbantu Komputer *Computer Aided Design*	K	3	
	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 *Cocurriculum I*	W	1	
TOTAL CREDITS THIS SEMESTER				**18**	
SEMESTER 2	BEEU 1023	Kalkulus untuk Teknologi *Calculus for Technology*	P	3	
	BEEY 1313	Bengkel Elektronik *Electronics Workshop*	K	3	
	BEEI 1323	Elektrik & Kemagnetan *Electrics & Magnetism*	K	3	
	BEEY 1323	Elektronik & Sistem Digital *Digital Electronics & System*	K	3	
	**BEEI 1333	Litar Elektrik Lanjutan *Advanced Electrical Circuit*	K	3	BEEI 1303
	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**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BEEU 2033	Kalkulus Lanjutan untuk Teknologi *Advanced Calculus for Technology*	P	3	
	BEEY 2333	Pemasangan Elektrik I *Electrical Installation I*	K	3	
	BEEY 2343	Peranti Elektronik *Electronic Devices*	K	3	
	BEEY 2353	Teknologi Elektrik *Electrical Technology*	K	3	
	BEEA 1343	Pengaturcaraan Komputer *Computer Programming*	K	3	
	BEEY 2361	Kerjaya Teknologi Kejuruteraan Elektrik *Electrical Engineering Technology Career*	K	1	
	BLHL 1XX2	Bahasa Ketiga *Third Language*	W	2	
TOTAL CREDITS THIS SEMESTER				**18**	
SEMESTER 4	BEEU 2043	Kaedah Statistik *Statistical Methods*	P	3	
	BEEA 2374	Sistem Terbenam *Embedded Systems*	K	4	
	BEEY 2373	Pemasangan Elektrik II *Electrical Installation II*	K	3	
	BEEA 2383	Pengenalan Sistem Kawalan *Control System Fundamental*	K	3	
	BEEA 2353	Elektronik Analog *Analog Electronics*	K	3	
	BLHW 2452	Penulisan Akademik *Academic Writing*	W	2	
	***BLHX XXX2	Elektif Umum *General Elective*	E	2	
	#BEEA 3100	Kursus Persediaan Pensijilan Profesional *Professional Certificate Preparation Course*			
TOTAL CREDITS THIS SEMESTER				**20**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BEEI 2373	Mesin Elektrik *Electrical Machines*	K	3	
	BEEY 3383	Peranti Elektronik Kuasa *Power Electronics Device*	K	3	
	BEEI 2383	Teknologi Sistem Kuasa *Power System Technology*	K	3	
	BEEU 3803	Projek Rekabentuk Bersepadu *Integrated Design Project*	K	3	
	BLHW 2772 BLHW 1742	Penghayatan Etika dan Peradaban **(untuk pelajar tempatan)** *Appreciation of Ethics and Civilisation* ***(for local students)*** Sejarah Malaysia **(untuk pelajar antarabangsa)** *(Malaysian Studies)* ***(for international students)***	W	2	
	*BEEY 38X3	Elektif I *Elective I*	E	3	
	*BEEY 3823	Elektif II *Elective II*	E	3	
TOTAL CREDITS THIS SEMESTER				**20**	
SEMESTER 6	BEEU 3764	Projek Sarjana Muda I *Bachelor Degree Project I*	K	4	
	BEEY 4393	Sistem Elektronik Kuasa *Power Electronics Systems*	K	3	
	BEEY 3404	Automasi Industri *Industrial Automation*	K	4	
	BLHC 4032 BLHW 2752	Pemikiran Kritis dan Kreatif **(untuk pejar tempatan)** *Critical and Creative Thinking* ***(for local students)*** Kebudayaan Malaysia **(untuk pelajar antarabangsa**) *Malaysian Culture* ***(for international students)***	W	2	
	BLHW 3462	Bahasa Inggeris untuk Interaksi Profesional *English for Professional Interaction*	W	2	
	*BEEY 38X3	Elektif III *Elective III*	E	3	
TOTAL CREDITS THIS SEMESTER				**18**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 7	BEEU 4053	Etika Kejuruteraan & KKPP *Engineering Ethics & OSHE*	P	3	
	**BEEU 4774	Projek Sarjana Muda II *Bachelor Degree Project II*	K	4	BEEU 3764
	BEEY 4413	Kecekapan Tenaga *Energy Efficiency*	K	3	
	BEEI 3403	Reka Bentuk Sistem Pengagihan Kuasa *Power Distribution System Design*	K	3	
	BTMW 4012	Keusahawanan Teknologi *Technology Enterpreneurship*	W	2	
	*BEEX 4XX3	Elektif IV *Elective IV*	E	3	
TOTAL CREDITS THIS SEMESTER				**18**	
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				**142**	

** Pre-requisite subject

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

CODE	SUBJECT NAME
BEEY 3803	Sistem Tenaga Diperbaharui *Renewable Energy System*
BEEY 3813	Pengenalan kepada Sistem Pengangkutan Elektrik *Introduction To Electric Transportation System*

* For Elective II, students must choose below subject:

CODE	SUBJECT NAME
BEEY 3823	Teknologi Penyimpanan Tenaga *Energy Storage Technology*

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

CODE	SUBJECT NAME
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:

CODE	SUBJECT NAME
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 Hibrid *Hybrid Electric Vehicle*

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

CODE	SUBJECT NAME
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:

CODE	CERTIFICATE NAME
BEEA 3100	NI Certified LabView Associate Developer (CLAD)

ELECTRONICS & COMPUTER ENGINEERING TECHNOLOGY
PROGRAMME OUTCOMES (PLO)

PLO1	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.
PLO2	Ability to solve broadly-defined engineering problems systematically to reach substantiated conclusions, using tools and techniques appropriate to computer/industrial electronics/ telecommunication engineering technology.
PLO3	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.
PLO4	Ability to plan and conduct experimental investigations of broadly-defined problems, using data from relevant sources.
PLO5	Ability to select and apply appropriate techniques, resources and modern engineering tools, with an understanding of their limitations.
PLO6	Ability to function effectively as individuals, and as members or leaders in diverse technical teams.
PLO7	Ability to communicate effectively with the engineering community and society at large.
PLO8	Ability to demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities.
PLO9	Ability to demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices.
PLO10	Ability to demonstrate an awareness of management, business practices and entrepreneurship.
PLO11	Ability to demonstrate an understanding of the impact of engineering practices, taking into account the need for sustainable development.
PLO12	Ability to recognise the need for professional development and to engage in independent and lifelong learning.

Bachelor of Electronics Engineering Technology (Telecommunications) with Honours (BEET)

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	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)***			
	BKKX XXX1	Kokurikulum I *Cocurriculum I*	W	1	
		TOTAL CREDITS THIS SEMESTER		**17**	
SEMESTER 2	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	

	BLHW 1702	Tamadun Islam dan Tamadun Asia **(untuk pelajar tempatan)** *Islamic and Asian Civilization* ***(for local students)***	W	2	
	BLHW 2752	Kebudayaan Malaysia **(untuk pelajar antarabangsa**) *Malaysian Culture*			
TOTAL CREDITS THIS SEMESTER				**20**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BEEU 2033	Kalkulus Lanjutan untuk Teknologi *Advanced Calculus for Technology*	P	3	
	**BEEE 2333	Peranti Elektronik Analog *Analogue Electronic Devices*	K	3	BEEE 1323
	BEEC 2404	Elektronik Digital *Digital Electronic*	K	4	
	BEEE 2364	Prinsip Kawalan *Control Principles*	K	4	
	BEET 2313	Isyarat & Sistem Berterusan *Continuous Signal & System*	K	3	
	BLHW 2452	Penulisan Akademik *Academic Writing*	W	2	
TOTAL CREDITS THIS SEMESTER				**19**	
SEMESTER 4	BEEU 2043	Kaedah Statistik *Statistical Methods*	P	3	
	BEEE 2354	Sistem Elektronik *Electronic Systems*	K	4	
	BEET 2324	Komunikasi & Rangkaian Data *Data Communication & Networking*	K	4	
	BEET 2333	Prinsip Komunikasi *Communication Principle*	K	3	
	BEET 2343	Isyarat & Sistem Diskrit *Discrete Signal & System*	K	3	
	BLHC 4032	Pemikiran Kritis dan Kreatif **(untuk pejar tempatan)** *Critical and Creative Thinking* ***(for local students)***	W	2	
	BLHW 1742	Sejarah Malaysia **(untuk pelajar antarabangsa)** *Malaysian Studies* ***(for international students)***			
	BKKX XXX1	Kokurikulum II *Cocurriculum II*	W	1	
TOTAL CREDITS THIS SEMESTER				**20**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BEET 3353	Sistem Telekomunikasi *Telecommunication System*	K	3	
	BEEC 3483	Asas Mikropemproses & Mikropengawal *Fundamental of Microprocessor & Microcontroller*	K	3	
	BEET 3363	Elektronik Telekomunikasi *Telecommunication Electronic*	K	3	
	BEET 3373	Pemprosesan Isyarat Digital *Digital Signal Processing*	K	3	
	BEET 3383	Elektromagnetik *Electromagnetic*	K	3	
	BTMW 4012	Keusahawanan Teknologi *Technology Enterpreneurship*	W	2	
	BLHW 3462	Bahasa Inggeris untuk Interaksi Profesional *English for Professional Interaction*	W	2	
	#BEET 3100	Kursus Persediaan Pensijilan Profesional *Professional Certificate Preparation Course*			
TOTAL CREDITS THIS SEMESTER				**19**	
SEMESTER 6	**BEET 3403	Komunikasi Digital *Digital Communication*	K	3	BEET 2333
	BEEE 4443	Pengurusan Kualiti *Quality Management*	K	3	
	BEET 3393	Sistem Pensuisan Telekomunikasi *Telecommunication Switching System*	K	3	
	BEEU 3764	Projek Sarjana Muda I *Bachelor Degree Project I*	K	4	
	BEET 3414	Teknik FR & Gelombang Mikro *RF Technique & Microwave*	K	4	
	BLHL 1XX2	Bahasa Ketiga *Third Language*	W	2	
TOTAL CREDITS THIS SEMESTER				**19**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 7	BEEU 4053	Etika Kejuruteraan & KKPP *Engineering Ethics & OSHE*	P	3	
	**BEEU 4774	Projek Sarjana Muda II *Bachelor Degree Project II*	K	4	BEEU 3764
	*BEET 48X3	Elektif I *Elective I*	E	3	
	*BEET 48X3	Elektif II *Elective II*	E	3	
	*BEET 48X3	Elektif III *Elective III*	E	3	
	***BLHX XXX2	Elektif Umum *General Elective*	E	2	
TOTAL CREDITS THIS SEMESTER				**18**	
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				**144**	

** Pre-requisite subject

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

NO.	CODE	SUBJECT
1	BEET 4803	Komunikasi Satelit *Satellite Communication*
2	BEET 4813	Komunikasi Mudah Alih *Mobile Communication*
3	BEET 4823	Komunikasi Optik & Opto Elektronik *Optical Communications & Optoelectronic*
4	BEET 4833	Kejuruteraan Antena *Antenna Engineering*

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

CODE	SUBJECT NAME
BLHW 1722	Falsafah Sains Dan Teknologi *Philosophy of Science and Technology*
BLHC 4012	Komunikasi Organisasi *Organizational Communication*
BLHH 1032	Psikologi Industri dan Organisasi *Industrial Psycology and Organization*
BLHC 4022	Kemahiran Perundingan *Negotiation Skills*

\# For Professional Certificate Preparation Course:

CODE	CERTIFICATE NAME
BEET 3100	Cisco Certified Network Associate Routing & Switching: • Introduction to Networks • Routing & Switching Essentials

Bachelor of Electronics Engineering Technology (Industrial Electronics) with Honours (BEEE)

	CODE	SUBJECT	CATEGORY	CREDIT	PRE- REQUISITE
SEMESTER 1	BEEU 1013	Matematik Teknikal *Technical Mathematics*	P	3	
	BEEE 1013	Fizik Teknikal *Technical Physics*	P	3	
	BEEE 1303	Bengkel Kejuruteraan I *Engineering Workshop I*	K	3	
	BEEI 1303	Pengenalan Litar Elektrik *Electrical Circuit Fundamental*	K	3	
	BLHW 1442	Bahasa Inggeris untuk Akademik *English for Academic Purposes*	W	2	
	BKKX XXX1	Kokurikulum I *Cocurriculum I*	W	1	
TOTAL CREDITS THIS SEMESTER				**15**	
SEMESTER 2	BEEU 1023	Kalkulus untuk Teknologi *Calculus for Technology*	P	3	
	BEEE 1313	Bengkel Kejuruteraan II *Engineering Workshop II*	K	3	
	**BEEI 1333	Litar Elektrik Lanjutan *Advanced Electrical Circuit*	K	3	BEEI 1303
	BEEE 1323	Pengenalan Elektronik *Electronic Fundamentals*	K	3	
	BEEC 1313	Asas Pengaturcaraan *Programming Fundamental*	K	3	
	BKKX XXX1	Kokurikulum II *Cocurriculum II*	W	1	
	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)***			
TOTAL CREDITS THIS SEMESTER				**18**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE- REQUISITE
SEMESTER 3	BEEU 2033	Kalkulus Lanjutan untuk Teknologi *Advanced Calculus for Technology*	P	3	
	**BEEC 1353	Pengaturcaraan Lanjutan *Advanced Programming*	K	3	BEEC 1313
	**BEEE 2333	Peranti Elektronik Analog *Analogue Electronic Devices*	K	3	BEEE 1323
	BEEC 2404	Elektronik Digital *Digital Electronic*	K	4	
	BEEE 2343	Lukisan Kejuruteraan *Engineering Drawing*	K	3	
	BLHW 2452	Penulisan Akademik *Academic Writing*	W	2	
	BLHC 4032	Pemikiran Kritis dan Kreatif **(untuk pejar tempatan)** *Critical and Creative Thinking* ***(for local students)***	W	2	
	BLHW 1742	Sejarah Malaysia **(untuk pelajar antarabangsa)** *Malaysian Studies* ***(for international students)***			
TOTAL CREDITS THIS SEMESTER				**20**	
SEMESTER 4	BEEU 2043	Kaedah Statistik *Statistical Methods*	P	3	
	BEET 2333	Prinsip Komunikasi *Communication Principle*	K	3	
	BEEE 2354	Sistem Elektronik *Electronic Systems*	K	4	
	BEEE 2364	Prinsip Kawalan *Control Principles*	K	4	
	BEEE 2373	Teknologi Elektrik *Electrical Technology*	K	3	

	BLHW 1762	Falsafah dan Isu Semasa **(untuk pelajar tempatan)** *Philosophy and Current Issue* ***(for local students)***	W	2	
	BLHW 2752	Kebudayaan Malaysia **(untuk pelajar antarabangsa**) *Malaysian Culture* ***(for international students)***			
TOTAL CREDITS THIS SEMESTER				**19**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BEEE 3384	Kawalan Industri *Industrial Control*	K	4	
	BEEC 3444	Teknologi Mikropemproses & Mikropengawal *Microprocessor & Microcontroller Technology*	K	4	
	BEEE 3394	Proses Instrumentasi *Process Instrumentation*	K	4	
	BEEE 3404	Perolehan Data & Penderia *Data Acquisition & Sensors*	K	4	
	BLHW 3462	Bahasa Inggeris untuk Interaksi Profesional *English for Professional Interaction*	W	2	
	***BLHX XXX2	Elektif Umum *General Elective*	E	2	
TOTAL CREDITS THIS SEMESTER				**20**	
SEMESTER 6	BEEE 3414	Pneumatik Perindustrian *Industrial Pneumatics*	K	4	
	BEEE 3424	Aplikasi Sistem Terbenam *Embedded Systems Application*	K	4	
	BEEU 3764	Projek Sarjana Muda I *Bachelor Degree Project I*	K	4	
	BTMW 4012	Keusahawanan Teknologi *Technology Entrepreneurship*	W	2	
	BLHL 1XX2	Bahasa Ketiga *Third Language*	W	2	
	*BEEX XXX4	Elektif I *Elective I*	E	4	
	#BEEX 3100	Kursus Persediaan Pensijilan Profesional *Professional Certificate Preparation Course*			
TOTAL CREDITS THIS SEMESTER				**20**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 7	BEEU 4053	Etika Kejuruteraan & KKPP *Engineering Ethics & OSHE*	P	3	
	BEEE 4434	Automasi Perindustrian *Industrial Automation*	K	4	
	BEEE 4443	Pengurusan Kualiti *Quality Management*	K	3	
	**BEEU 4774	Projek Sarjana Muda II *Bachelor Degree Project II*	K	4	BEEU 3764
	*BEEX XXX4	Elektif II *Elective II*	E	4	
TOTAL CREDITS THIS SEMESTER				**18**	
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				**142**	

**Pre-requisite subject

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

NO.	CODE	SUBJECT
1	BEEE 3804	Elektronik Kuasa *Power Electronic*
2	BEEC 4814	Pengantaramukaan Komputer *Computer Interfacing*
3	BEEE 3814	Proses Perindustrian Semikonduktor *Semiconductor Industrial Process*

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

NO.	CODE	SUBJECT
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:

CODE	SUBJECT NAME
BLHW 1722	Falsafah Sains Dan Teknologi *Philosophy of Science and Technology*
BLHC 4012	Komunikasi Organisasi *Organizational Communication*
BLHH 1032	Psikologi Industri dan Organisasi *Industrial Psycology and Organization*
BLHC 4022	Kemahiran Perundingan *Negotiation Skills*

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

CODE	CERTIFICATE NAME
BEEA 3100	Certified LabView Associate Developer (CLAD)
BEEE 3100	Programmable Logic Controller (PLC) Level 1 & Level 2
BEEZ 3100	SMCT MT1 – Practical Mechatronics 1

Bachelor of Computer Engineering Technology (Computer Systems) with Honours (BEEC)

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 1	BEEU 1013	Matematik Teknikal *Technical Mathematic*	P	3	
	BEEE 1013	Fizik Teknikal *Technical Physics*	P	3	
	BEEC 1303	Asas Elektronik *Basic Electronic*	K	3	
	BEEC 1323	Bengkel Kejuruteraan Komputer I *Computer Engineering Workshop I*	K	3	
	BEEC 1313	Asas Pengaturcaraan *Programming Fundamental*	K	3	
	BLHW 1442	Bahasa Inggeris untuk Akademik *English for Academic Purposes*	W	2	
TOTAL CREDITS THIS SEMESTER				**17**	
SEMESTER 2	BEEU 1023	Kalkulus untuk Teknologi *Calculus for Technology*	P	3	
	BEEI 1303	Pengenalan Litar Elektrik *Electrical Circuit Fundamental*	K	3	
	BEEC 1333	Bengkel Kejuruteraan Komputer II *Computer Engineering Workshop II*	K	3	
	BEEC 2373	Organisasi & Senibina Komputer *Computer Organization & Architecture*	K	3	
	**BEEC 1353	Pengaturcaraan Lanjutan *Advanced Programming*	K	3	BEEC 1313
	BLHW 1762	Falsafah dan Isu Semasa **(untuk pelajar tempatan)** *Philosophy and Current Issue* ***(for local students)***	W	2	
	BLHW 2752	Kebudayaan Malaysia **(untuk pelajar antarabangsa**) *Malaysian Culture* ***(for international students)***			
	BKKX XXX1	Ko-kurikulum I *Co-curriculum I*	W	1	
	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)***			
TOTAL CREDITS THIS SEMESTER				**20**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 3	BEEU 2033	Kalkulus Lanjutan untuk Teknologi *Advanced Calculus for Technology*	P	3	
	BEEC 2363	Struktur Data & Algoritma *Data Structure & Algorithm*	K	3	
	BEET 2333	Prinsip Komunikasi *Communication Principle*	K	3	
	BEET 2423	Isyarat & Sistem *Signal & Systems*	K	3	
	BEEE 2373	Teknologi Elektrik *Electrical Technology*	K	3	
	BLHW 2452	Penulisan Akademik *Academic Writing*	W	2	
	BKKX XXX1	Ko-kurikulum II *Co-curriculum II*	W	1	
TOTAL CREDITS THIS SEMESTER				**18**	
SEMESTER 4	BEEU 2043	Kaedah Statistik *Statistical Methods*	P	3	
	BEEC 1343	Sistem Pengurusan Pangkalan Data *Database Management System*	K	3	
	BEEC 2383	Sistem & Rangkaian Komputer *Computer Network & System*	K	3	
	BEEC 2393	Teknologi Internet & Multimedia *Internet Technology & Multimedia*	K	3	
	BEEC 2404	Elektronik Digital *Digital Electronic*	K	4	
	BLHL 1XX2	Bahasa Ketiga *Third Language*	W	2	
	BLHC 4032 BLHW 1742	Pemikiran Kritis dan Kreatif **(untuk pejar tempatan)** *Critical and Creative Thinking* ***(for local students)*** Sejarah Malaysia **(untuk pelajar antarabangsa)** *Malaysian Studies* ***(for international students)***	W	2	
TOTAL CREDITS THIS SEMESTER				**20**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BEEC 3453	Sistem Pengoperasian *Operating Systems*	K	3	
	BEEC 3413	Matematik Diskrit *Discrete Mathematics*	K	3	
	**BEET 3373	Pemprosesan Isyarat Digital *Digital Signal Processing*	K	3	BEET 2423
	**BEEC 3433	Rangkaian & Keselamatan Komputer *Computer Network & Security*	K	3	BEEC 2383
	BEEC 3444	Teknologi Mikropemproses & Mikropengawal *Microprocessor & Microcontroller Technology*	K	4	
	BLHW 3462	Bahasa Inggeris untuk Interaksi Profesional *English for Professional Interaction*	W	2	
	***BLHX XXX2	Elektif Umum *General Elective*	E	2	
	#BEET 3100	Kursus Persediaan Pensijilan Profesional *Professional Certificate Preparation Course*			
TOTAL CREDITS THIS SEMESTER				**20**	
SEMESTER 6	BEEU 3764	Projek Sarjana Muda I *Bachelor Degree Project I*	K	4	
	BEEC 3463	Kejuruteraan Perisian *Software Engineering*	K	3	
	BEEC 3423	Kejuruteraan Sistem Komputer *Computer System Engineering*	K	3	
	BTMW 4012	Keusahawanan Teknologi *Technology Entrepreneurship*	W	2	
	*BEEC 48X4	Elektif I *Elective I*	E	4	
	*BEEC 48X4	Elektif II *Elective II*	E	4	
TOTAL CREDITS THIS SEMESTER				**20**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 7	BEEU 4053	Etika Kejuruteraan & KKPP *Engineering Ethics & OSHE*	P	3	
	**BEEU 4774	Projek Sarjana Muda II *Bachelor Degree Project II*	K	4	BEEU 3764
	BEEE 4443	Pengurusan Kualiti *Quality Management*	K	3	
	BEEC 4473	Sistem Terbenam *Embedded System*	K	3	
	*BEEC 48X4	Elektif III *Elective III*	E	4	
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 REDITS				**144**	

**Pre-requisite subject

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

NO.	CODE	SUBJECT
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:

CODE	SUBJECT NAME
BLHW 1722	Falsafah Sains Dan Teknologi *Philosophy of Science and Technology*
BLHC 4012	Komunikasi Organisasi *Organizational Communication*
BLHH 1032	Psikologi Industri dan Organisasi *Industrial Psycology and Organization*
BLHC 4022	Kemahiran Perundingan *Negotiation Skills*

#For Professional Certificate Preparation Course:

CODE	CERTIFICATE NAME
BEET 3100	Cisco Certified Network Associate Routing & Switching: • Introduction to Networks • Routing & Switching Essentials

Bachelor of Electronic Engineering Technology with Honours (BEEZ)

	CODE	SUBJECT	CATEGORY	CREDIT	PRE- REQUISITE
SEMESTER 1	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	
	BEEC 1313	Asas Pengaturcaraan *Programming Fundamental*	K	3	
	BLHW 1442	Bahasa Inggeris untuk Akademik *English for Academic Purposes*	W	2	
TOTAL CREDITS THIS SEMESTER				**17**	
SEMESTER 2	BEEU 1023	Kalkulus untuk Teknologi *Calculus for Technology*	P	3	
	BEEZ 1203	Analisa Litar AC *AC Circuit Analysis*	K	3	
	BEEE 1313	Bengkel Kejuruteraan II *Engineering Workshop II*	K	3	
	BEEE 2343	Lukisan Kejuruteraan *Engineering Drawing*	K	3	
	BEEE 1323	Pengenalan Elektronik *Electronic Fundamentals*	K	3	
	BKKX XXX1	Kokurikulum I *Cocurriculum I*	W	1	
	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)***			
TOTAL CREDITS THIS SEMESTER				**18**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE- REQUISITE
SEMESTER 3	BEEU 2033	Kalkulus Lanjutan untuk Teknologi *Advanced Calculus for Technology*	P	3	
	**BEEE 2333	Peranti Elektronik Analog *Analogue Electronic Devices*	K	3	BEEE 1323
	BEEC 2404	Elektronik Digital *Digital Electronic*	K	4	
	BEET 2423	Isyarat & Sistem *Signal & Systems*	K	3	
	BEEZ 1213	Instrumentasi & Pengukuran *Instrumentation & Measurement*	K	3	
	BLHW 2452	Penulisan Akademik *Academic Writing*	W	2	
	BKKX XXX1	Kokurikulum II *Cocurriculum II*	W	1	
TOTAL CREDITS THIS SEMESTER				**19**	
SEMESTER 4	BEEU 2043	Kaedah Statistik *Statistical Methods*	P	3	
	BEET 2333	Prinsip Komunikasi *Communication Principle*	K	3	
	BEEE 2354	Sistem Elektronik *Electronic Systems*	K	4	
	BEEE 2364	Prinsip Kawalan *Control Principles*	K	4	
	BEEZ 2404	Teknologi Mikropengawal *Microcontroller Technology*	K	4	
	BLHC 4032	Pemikiran Kritis dan Kreatif **(untuk pejar tempatan)** *Critical and Creative Thinking* ***(for local students)***	W	2	
	BLHW 1742	Sejarah Malaysia **(untuk pelajar antarabangsa)** *Malaysian Studies* ***(for international students)***			
TOTAL CREDITS THIS SEMESTER				**20**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 5	BEET 3383	Elektromagnetik *Electromagnetic*	K	3	
	BEEU 3803	Projek Rekabentuk Bersepadu *Integrated Design Project*	K	3	
	BEEC 2383	Sistem & Rangkaian Komputer *Computer Network & System*	K	3	
	**BEET 3373	Pemprosesan Isyarat Digital *Digital Signal Processing*	K	3	BEET 2423
	BLHW 1762 BLHW 2752	Falsafah dan Isu Semasa **(untuk pelajar tempatan)** *Philosophy and Current Issue* ***(for local students)*** Kebudayaan Malaysia **(untuk pelajar antarabangsa**) *Malaysian Culture* ***(for international students)***	W	2	
	*BEEX XXXX	Elektif I *Elective I*	E	3	
	***BLHX XXX2	Elektif Umum *General Elective*	E	2	
TOTAL CREDITS THIS SEMESTER				**18**	
SEMESTER 6	BEEE 3404	Perolehan Data & Penderia *Data Acquisition & Sensors*	K	4	
	BEEU 3764	Projek Sarjana Muda I *Bachelor Degree Project I*	K	4	
	BLHW 3462	Bahasa Inggeris untuk Interaksi Profesional *English for Professional Interaction*	W	2	
	BTMW 4012	Keusahawanan Teknologi *Technology Entrepreneurship*	W	2	
	*BEEX XXXX	Elektif II *Elective II*	E	3	
	*BEEX XXXX	Elektif III *Elective III*	E	3	
	#BEET 3100	Kursus Persediaan Pensijilan Profesional *Professional Certificate Preparation Course*			
TOTAL CREDITS THIS SEMESTER				**18**	

	CODE	SUBJECT	CATEGORY	CREDIT	PRE-REQUISITE
SEMESTER 7	BEEU 4053	Etika Kejuruteraan & KKPP *Engineering Ethics & OSHE*	P	3	
	BEEE 3424	Aplikasi Sistem Terbenam *Embedded Systems Application*	K	4	
	BEEE 4443	Pengurusan Kualiti *Quality Management*	K	3	
	**BEEU 4774	Projek Sarjana Muda II *Bachelor Degree Project II*	K	4	BEEU 3764
	BLHL 1XX2	Bahasa Ketiga *Third Language*	W	2	
	*BEEX XXXX	Elektif IV *Elective IV*	E	3	
TOTAL CREDITS THIS SEMESTER				**19**	
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				**142**	

**Pre-requisite subject

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

NO.	CODE	SUBJECT
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:

NO.	CODE	SUBJECT
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:

NO.	CODE	SUBJECT
1	BEET 4803	Komunikasi Satelit *Satellite Communication*
2	BEEZ 4863	Sistem Navigasi Radio *Radio Navigation System*
3	BEEZ 4843	Penyelenggaran 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:

CODE	SUBJECT NAME
BLHW 1722	Falsafah Sains Dan Teknologi *Philosophy of Science and Technology*
BLHC 4012	Komunikasi Organisasi *Organizational Communication*
BLHH 1032	Psikologi Industri dan Organisasi *Industrial Psycology and Organization*
BLHC 4022	Kemahiran Perundingan *Negotiation Skills*

#For Professional Certificate Preparation Course:

CODE	CERTIFICATE NAME
BEET 3100	Cisco Certified Network Associate Routing & Switching: • Introduction to Networks • Routing & Switching Essentials

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 Kompang.
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

1. De Chazal, E., & Rogers, L. (2013). *Oxford EAP: A course in English for Academic Purposes*. Oxford: Oxford University Press.
2. McDonald, A. & Hancock, M. (2010). *English result*. Oxford: Oxford University Press.
3. Paterson, K. & Wedge, R. (2013). *Oxford grammar for EAP*. Oxford: Oxford University Press.

BLHW 2452
ACADEMIC WRITING / PENULISAN AKADEMIK

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.
3. Prepare short reviews of technical materials.

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

1. Chazal, E.d. & Rogers, L. (2012). Oxford EAP: A course in English for Academic Purposes. New York: Oxford University Press.
2. Hancock, M. & McDonald, A. (2010). English Result Upper-intermediate. New York: Oxford University Press.
3. Paterson, K. & Wedge, R. (2013). Oxford Grammar for EAP. UK: Oxford University Press.

PRE-REQUISITE

BLHW 1442
ENGLISH FOR ACADEMIC PURPOSES / BAHASA INGGERIS UNTUK AKADEMIK

BLHW 3462
ENGLISH FOR PROFESSIONAL INTERACTION / BAHASA INGGERIS UNTUK INTERAKSI PROFESIONAL

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

1. Fry, R. (2016). 101 smart questions to ask on your interview. U.K.: New Page Books.
2. Cooper, S. (2016). 100 tricks to appear smart in meetings: How to get by without even trying. Andrews McMeel Publishing.
3. Hood, J.H. (2013). *How to book of meetings: A complete guide for every business*. South Australia: Magill.
4. Carmine, G. (2014). *Talk like TED: The 9 public-speaking secret of the world's top minds*. New York: St Martins Press.
5. Jason, S.W. (2013). *Workplace communication for the 21st century: Tools and strategies that impact the bottom line*. California: Praeger.

PRE-REQUISITE

BLHW 2452
ACADEMIC WRITING / PENULISAN AKADEMIK

BLHW 1702
ISLAMIC & ASIAN CIVILIZATIONS /
TAMADUN ISLAM DAN TAMADUN ASIA

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

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

BLHW 2712
ETHNIC RELATIONS / HUBUNGAN ETNIK

LEARNING OUTCOMES

At the end of this course, students should be able to:

1. Evaluate the importance of national identity and volunteerism towards creating responsible citizens.
2. Generate social relationships and interactions between ethnics.

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

1. Shamsul Amri Baharuddin. (2007). Modul Hubungan Etnik. UPENA, KPTM.
2. Abdul Aziz Bari. (2008). Perlembagaan Malaysia. Shah Alam: Arah Publication Sdn. Bhd.
3. Mohd Taib Hj Dora. (2005). Liberalisasi Komuniti. Melaka: Penerbit Universiti Teknikal Malaysia Melaka.

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

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

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

1. Aziz Yahya, Aida Nasirah Abdullah, Hazmilah Hasan, Raja Roslan Raja Abd Rahman. (2011) Critical and Creative Thinking Module 2. Melaka. Penerbit UTeM.
2. Buzan, T. & Buzan, B. (2006). The Mind Map Book, Essex: BBC Active, Pearson Education.
3. Claxton, G. & Lucas, B. (2007). The Creative Thinking Plan, London: BBC Books.
4. Reichenbach, W. (2000). Introduction to Critical Thinking, McGraw-Hill College.

General Elective Subjects (E)

BLHW 1722
PHILOSOPHY OF SCIENCE AND TECHNOLOGY / FALSAFAH SAINS DAN TEKNOLOGI

HASIL PEMBELAJARAN

Pada akhir kursus ini, pelajar akan dapat:

1. Menghuraikan konsep ilmu, falsafah sains dan teknologi dalam perspektif Islam secara kritis dan kreatif.
2. Menunjukkan perkaitan antara konsep falsafah sains dan teknologi dari perspektif Islam dan barat.
3. Mengaplikasikan pemahaman tentang konsep ilmu falsafah sains dan teknologi dalam kehidupan masyarakat masa kini.

SINOPSIS

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

RUJUKAN

1. Abdul Rahman Abdullah (2010). *Wacana Falsafah Sains Sejarah dan Pemikiran.* Pulau Pinang: Pusat

Kajian Pengurusan Pembangunan Islam Universiti Sains Malaysia.
2. Azizan Baharuddin & Maisarah Hasbullah (2010). *Pendidikan Sejarah dan Falsafah Sains di Institusi Pengajian Tinggi Awam*. Kuala Lumpur: Dewan Bahasa dan Pustaka.
3. Azizan Baharuddin (2009). *Pemantapan Pengajian Sejarah, Falsafah dan Dasar Sains*. Kuala Lumpur: Dewan Bahasa dan Pustaka.

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.
3. Menyelesaikan masalah komunikasi organisasi berdasarkan konteks persekitaran organisasi sebenar.

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 menyedari 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

1. Miller, K. (2012). *Organizational Communication*. (4rd. ed). Belmont: Thomson Wadsworth Publishing Company.
2. Dennis K. Mumby (2018). *Organizational Communication: A Critical Approach*. (2nd ed). SAGE Publications, Incorporated

BLHH 1032
INDUSTRIAL PSYCOLOGY AND ORGANIZATION / PSIKOLOGI INDUSTRI DAN ORGANISASI

HASIL PEMBELAJARAN

Pada akhir kursus ini, pelajar akan dapat:

1. Menghubung kait proses persekitaran dan teori di tempat kerja dalam dunia organisasi dan perindustrian.
2. Mempamerkan ciri-ciri kepimpinan dalam aktiviti tugasan 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

1. Azlina Abu Bakar (2013). *Psikologi Industri dan Pengurusan Sumber Manusia*. Terengganu: Penerbit Universiti Malaysia Terengganu.
2. Schultz & Schultz, Duane (2010). *Psychology and Work Today*. New York: Prentice Hall.
3. Yukl, G. (2010). *Leadership in Organizations*

BLHC 4022
NEGOTIATION SKILLS / KEMAHIRAN PERUNDINGAN

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.
3. Menyelesaikan isu-isu perundingan berdasarkan teknik-teknik kemahiran perundingan yang berkesan berasaskan pelbagai situasi.

SINOPSIS

Kursus ini akan membincangkan konsep asas perundingan, teknik berfikiran 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. Selian itu, kemahiran berfikir secara kritis dan kreatif, serta kemahiran komunikasi berkesan yang diperlukan bagi menjalankan proses perundingan juga akan dibincangkan.

RUJUKAN

1. Lemiwki, R., Barry, B. & Saunders, D. (2016). Essentials of negotiation. USA: McGraw Hill Education.
2. Fisher, R & Ury. (2011). Getting to YES: Negotiating agreement without giving in. 3rd Edition. Penguin Books.
3. Covey, S. (2013) The Third Alternative: Solving Life's Most Difficult Problems. New York: Free Press.

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

1. Bittinger, M. L. (2013). Algebra and Trigonometry: graphs and models (5th ed.). Pearson Addison.
2. Larson, R. (2012). Algebra and Trigonometry (9th ed.). Brooks Cole.
3. Williams, G. (2011). Linear algebra with applications (7th ed.). Jones and Bartlett.
4. Swokowski, E. W. & Cole, J. A. (2012). Algebra and trigonometry with analytic geometry (13th ed.). Thomson Brooks/Cole.
5. Roger, B. & Kuttler, K. (2014). Linear Algebra with applications. World Scientific Publications.

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

1. James, S. (2016). *Calculus* (8th ed.). Cengage Learning.
2. Abd Wahid Md Raji, et al. (2009). *Calculus for science and engineering*. Batu Pahat: UTHM.
3. Anton, H., Bivens, I., Davis, S., & Polaski, T. (2009). *Calculus: multivaria*ble (9th ed.). Addison-Wesley.

4. Briggs, W., Cochran, L., & Gillett, B. (2011). *Calculus: early transcendentals*. Pearson Education.
5. Goldstein, L. J., et al. (2010). *Calculus and its applications* (12th ed.). Pearson Education.
6. Stewart, J. (2008). *Calculus: early transcendentals* (6th ed.). Brooks/Cole.

BEEU 2033
ADVANCED CALCULUS FOR TECHNOLOGY / KALKULUS LANJUTAN UNTUK TEKNOLOGI

LEARNING OUTCOMES

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

1. Apply the basic knowledge of vector functions and multivariable functions to solve the related problems.
2. Use appropriate methods to find the solutions of the differential equations.
3. Solve application problems using appropriate techniques.

SYNOPSIS

This course has two parts. The first part introduces the vector-valued functions which include the derivative, integration, arc length and curvature of vector functions, partial derivatives that include limits and continuity, chain rule, and maximum and minimum values, and multiple integrals which include the double and triple integrals of multivariable functions. The second part of the course covers the solutions of ordinary differential equations. The topics include solving the first order differential equations using the separable, exact differentiation, and linear equations methods. While solutions of the second order equations covers the homogeneous and the non-homogeneous equations using the undetermined coefficients methods and variation parameters.

REFERENCES

1. James, S. (2016). *Calculus* (8th ed.). Cengage Learning.
2. Anton, H., Bivens, I., & Davis, S. (2013). *Calculus: Early Transcendentals* (10th ed.). John Wiley & Sons.
3. Nagle, K. R., Saff, E. B. & Snider, A. D. (2012). *Fundamentals of differential equations* (8th ed.). Pearson.
4. Stewart, J. (2012). *Multivariable Calculus* (7th ed.). Brooks/Cole.
5. Brannan, J. R. & Boyce, W. E. (2011). *Differential equations with boundary value problems: modern methods and applications* (2nd ed.). International Student Version. Wiley.

BEEU 2043
STATISTICAL METHODS / KAEDAH STATISTIK

LEARNING OUTCOMES

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

1. Apply the knowledge of probability and statistics to solve the related problems.
2. Solve problems in statistical inferences related to hypothesis testing, regression and ANOVA.
3. Solve real application problems using appropriate statistical software.

SYNOPSIS

This course covers the concept of probability and statistics and their real application problems. Probability

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

1. Montgomery, D. C. & Runger, G. C. (2011). *Applied statistics and probability for engineers* (5th ed.). John Wiley & Sons.
2. Navidi, W. (2011). *Statistics for engineers and scientists* (3rd ed.). McGraw-Hill.
3. Vining, G. G. & Kowalski, S. (2011). *Statistical methods for engineers* (3rd ed.). Brooks/Cole Cengage Learning.
4. Weiss, N.A. (2008). Introductory Statistics. (8th ed.). PearsonsVining, G. G. & Kowalski, S. (2011). Statistical methods for engineers (3rd ed.). Brooks/Cole Cengage Learning.

BEEU 4053
ENGINEERING ETHICS & OSHE / ETIKA KEJURUTERAAN & KKPP

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

1. Harris, C. E., Michael S. Pritchard, and Michael J. Rabins. Engineering Ethics: Concepts and Cases. Belmont, CA: Wadsworth, 2009. Print.
2. Fleddermann, C. B. (2014). Engineering Ethics (4th ed.). Pearson.
3. Martin, M. K. & Schinzinger, R. (2010). Engineering Ethics (2nd ed.). McGraw-Hill.
4. Undang-undang Malaysia. Akta 768, Akta Teknologis dan Juruteknik (2015). Occupational Safety and Health Act, 1994
5. Factories and Machinery Act, 1967.

SUBJECT DETAILS FOR JTKE PROGRAMMES

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

1. Uday A. Bakshi and Ajay V. Bakshi, Electrical Measurements and Instrumentation, Technical Publication, 2014.
2. Mohd Razali Mohd Sapiee et. Al, Instrumentation System, Penerbit UTeM, 2019.
3. Muhammad Sharil Yahya et. Al, Pengukuran & Instrumentasi, Penerbit UTeM, 2013.
4. Alan S. Moris and Reza Langari, Measurement and Instrumentation: Theory and Application, Second Edition, Academic Press, 2015.
5. Robert B. Northrop, Introduction to Instrumentation and Measurements, 3rd edition, CRC Press Taylor and Francis Group, 2018.

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

1. Aminurrashid Noordin et. al (2014), Digital Electronics & Systems, Penerbit UTeM.
2. Thomas Floyd, Digital Fundamentals, Global Edition, 11th Edition, Jan 2015, Pearson New International Edition.
3. Ronald Tocci, Neal Widmer, Greg Moss, Digital Systems Principles and Applications: 11th Edition, Jul 2013, Pearson New International Edition.
4. Thomas Floyd, Digital Electronics a Systems Approach, CourseSmart eTextBook, Oct 2012, Pearson New International Edition.

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

1. David Planchard, Marie Planchard, (2012), Engineering Design with SolidWorks 2012, SDC.
2. Bertoline, G.R., & Wiebe, E.N., et. (2011), Fundamental of Graphics Communication, 6th Edition, McGraw Hill.
3. Dassault System, (2014), Introducing SolidWorks Manual 2014.

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

1. Thomas L. Floyd, Principles of Electric Circuits, 9th Ed., Pearson, 2010.
2. Charles Alexander and Matthew Sadiku, Fundamentals of Electric Circuits, 5th Ed., McGraw Hill, 2013.
3. Allan H. Robbins and Wilhelm C Miller, Circuit Analysis Theory and Practice, 5th Ed., Delmar and Cengage Learning, 2012.
4. James W. Nilsson and Susan Riedel, Electric Circuits, 10th Ed., Prentice Hall, 2014.

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

1. Ulaby, F., Electromagnetics for Engineers, Pearson Education, 2005.
2. Hayt, W. and Buck, J., Engineering Electromagnetics, 6th Edition, McGraw Hill International Edition, 2001.
3. Sadiku, M.N.O., Elements of Electromagnetics, 3rd Edition, Oxford University Press, 2001.
4. Raju, G.S.N., Electromagnetic Field Theory and Transmission Lines, 1st Edition, Pearson Education, 2006.
5. Paul, C, Whites, K, and Nasar, S., Introduction to Electromagnetic Fields, 3rd Edition, McGraw Hill,1998.

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

1. Charles, K.A & Sadiku, N.O (2013). Fundamental of Electric Circuit (5th ed.). McGraw-Hill.
2. Nilsson, J. W. & Riedel, S. (2015). Electric Circuit (10th ed.). Prentice Hall.
3. Glisson, T. H. (2011). Introduction to Circuit Analysis and Design. Springer.
4. Hayt, W. H. (2012). Engineering Circuit Analysis (8th ed.). McGraw-Hill.
5. O'Maley, J. (2011). Basic Electric Circuit. McGraw-Hill.

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.
2. Perform the experiment of semiconductor devices using simulation software and electronic components 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

1. Thomas L. Floyd, Electronic Devices, 9th, Pearson, 2012.
2. Robert L. Bolysted, Louis Nashelsky, Electronic Devices and Circuit Theory, 11th Edition, Pearson, 2013.
3. S. Salivahanan, N. Suresh Kumar, Electronic devices and circuits, 3rd Edition, McGraw-Hill, 2012.
4. Atul P. Godse, Uday A. Bakshi, Electronic devices & circuits, Technical Publication Pune, 2011.

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

1. Gaddis, T., (2015), Starting Out with C++: From Control Structures through Objects, 8th Edition, Global Edition, Pearson Education.
2. Daniel Liang, Y, (2014), Introduction to Programming with C++, 3rd Edition, Pearson Education.
3. Deitel, H.D., (2014), C++ How to Program,9th Edition, Pearson Education.
4. Nell, D., (2013), Programming and Problem Solving with C++: Comprehensive, 6th Edition, Jones & Bartlett Learning.
5. Gregoire, M., (2011), Professional C++, 2nd Edition, John Wiley & Son.

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. 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

1. Akta Bekalan Elektrik 1990 (Akta 447) & Peraturan-Peraturan Elektrik 1994 (Pindaan 2015), 2015.
2. Malaysian Standard International Electrotechnical Commission (MS IEC) 60364, 2015.
3. Caddick, John, Electrical Safety Handbook, McGraw Hill, 2012.
4. Brian Scaddan, 17th Edition Wiring Regulations, Newnes, 2011.

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

1. Akta Bekalan Elektrik 1990 (Akta 447) & Peraturan-Peraturan Elektrik 1994 (Pindaan 2015), 2015.
2. Malaysian Standard International Electrotechnical Commission (MS IEC) 60364, 2015.

3. Caddick, John, Electrical Safety Handbook, McGraw Hill, 2012.
4. Brian Scaddan, 17th Edition Wiring Regulations, Newnes, 2011.

PRE-REQUISITE

BEEI 1311
ELECTRICAL WORKSHOP I / BENGKEL ELEKTRIK I

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

1. Hughes, Electrical & Electronics Technology, 11th ed., Prentice Hall, Feb 2012.
2. Bird, J.O., Electrical Circuit Theory and Technology, 5th ed., Routledge, Nov 2013.
3. Bird, J.O., *Electrical Principles and Technology for Engineering,* Elsevier, 2013.
4. Aminurrashid Noordin et. al*, Principles of Electric & Electronics (Part 1),* Penerbit UTeM, 2013.
5. Asri Din et, al*, Principles of Electric & Electronics (Part 2),* Penerbit UTeM, 2013.

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

1. Stephen J. Chapman, Electric Machinery Fundamentals, 5th ed., McGraw-Hill, 2011.
2. Austin Hughes, Electric Motors and Drives: Fundamentals, Types and Applications, Newnes, 2013.
3. Fitzgerald, Kingsley, Umans, Electric Machinery, 7th ed., McGraw-Hill, 2013.
4. Theodore Wildi, Electric Machines, Drives & Power System, 6th ed., Prentice Hall, 2013.

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.
3. Report the analysis of transient and steady state performance for first and second order control 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

1. Norman S. Nise, Control Systems Engineering, 6th Edition, John Wiley & Sons Inc., 2011.
2. Katsuhiko Ogata, Modern Control Engineering, 5th Edition, Pearson, 2010.
3. Richard C. Dort, Robert H. Bishop, Modern Control Systems, 12th Edition, Pearson, 2011.
4. Syed Najib Syed Salim, Maslan Zainon, Control Systems Engineering, 2nd Edition, Penerbit UTeM, 2016.
5. Gopal, M, Control Systems: Principles and Design, 4th Edition, Mc Graw Hill, 2012.
6. Khalil Azha Mohd Annuar et. Al., Introduction to Control System, Penerbit UTeM, 2015

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

1. JD Glover, MS Sarma, TJ Overbye, Power System Analysis & Design, 5th (SI) Edition, Thomson, 2012.
2. Hadi Saadat, Power System Analysis, 3rd Edition, Mc Graw Hill, 2011.
3. S. Ramar, S. Kuruseelan, Power System Analysis, PHI Learning, Pvt. Ltd., 2013.
4. Glover, Sarma, Power System Analysis and Design, 3rd ed., Thomson Learning, 2002.

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, subrutines, 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
3. http://www.mikroe.com/eng/chapters/view/1/introduction-world-of-microcontrollers/ (online PIC book)
4. Ibrahim, Dogan (2010), SD card projects using the PIC microcontroller, Newnes/Elsevier, 2010.
5. Deshmukh, Ajay V (2011), Microcontrollers: Theory and Applications, McGraw-Hill.

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

1. Çengel, Y. A. Introduction to Thermodynamics and Heat Transfer + EES Software. McGraw-Hill, New York, 2nd Ed., 2009
2. Holman J.P.,"Heat Transfer", Mc Graw-Hill, 9th.Ed., 2002
3. Cengel, Y.A. and Boles, M.A., 2014, Thermodynamics: An Engineering Approach, 8th Ed., McGraw-Hill Education.
4. Borgnakke, C. and Sonntag, E.E., 2012, Fundamentals of Thermodynmics, 8th Ed., Wiley
5. Dutta B.K.,"Heat Transfer:Principles and Applications",PHI, 2001

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

1. Ned Mohan, Power electronics: a first course, John Wiley & Sons, 2012.
2. Daniel W. Hart, Power electronics, McGraw-Hill, 2011.
3. Ioinovici, Adrian, Power electronics and energy conversion systems, John Wiley & Sons, 2013.
4. Fang Lin Luo, Hong Ye. Power electronics: advanced conversion technologies – Circuits, Devices, and Applications, Taylor & Francis, 2010.

5. D S. Sivanagaraju, M. Balasubba Reddy, A. Mallikarjuna Prasad, Power electronics, PHI Learning, 2012.

SEMESTER 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

1. Subramanyam, B. (2012). Power System Analysis, I K International Publishing House.
2. Kothari, D.P. (2011). Modern Power System Analysis, 4th Edition, McGraw Hill Education.
3. Pai, M.A. (2014). Computer Techniques in Power System Analysis, 3rd Edition, McGraw Hill Education.
4. Pai, M.A. (2014). Computer Techniques in Power System Analysis, 3rd Edition, McGraw Hill Education.
5. Saadat, H. (2011). Power System Analysis, 3rd Edition, PSA Publishing LLC.

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

1. Perez, Adrover E. (2012), Introduction to PLCs: A Beginner's Guide to Programmable Logic Controllers, CRC Press.

2. Macaulay, Tyson (2012), Cybersecurity for Industrial Control Systems: SCADA, DCS, PLC, HMI, and SIS, CRC Press.
3. Frank, Lamb (2013), Industrial Automation, McGraw-Hill.
4. Doug, Arent (2013), Automation Systems of the 21st Century: New Technologies, Applications and Impacts on the Environment & Industrial Processes, Nova Science.

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

1. Glover, J.D., Sarma, M.S., Overbye, T.J. Power System; Analysis and Design. Toronto: Thomson, 2008.
2. John J. Grainger, William D. Stevenson Jr, Power System Analysis, Macgraw-Hill 2009.

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

1. Electric Drives – an integrative approach, Ned Mohan, MNPERE, Minneapolis.
2. Power Electronic Control of AC Motors – JMD Murphy & FG Turbull, Pergamon Press.
3. Electric motor drives, R. Krishnan, Prentice–Hall, 2001.

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 effetively

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

1. *Manual Projek Sarjana Muda (PSM),* Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

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

1. Power System Protection, Y.G. Paithankar, S.R. Bhide, PHI Learning Private Limited, 2015.

2. Power System Protection, P.M. Anderson, Wiley, 2015.
3. Art and Science of Protective Relaying, General Electric, 2015.
4. Network Protection and Automation Guide, Areva, 2015.

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

1. M.S. Naidu and V Kamaraju, High Voltage Engineering, McGraw Hill 2004.
2. High Voltage Engineering Fundamentals, Newnes, 2000.
3. Dieter Kind & Kurt Feser, 1st publication, High Voltage Test Techniques
4. Hussain Ahmad, Kilat dan Perlindungan, Penerbit UTM,1998.
5. E. Kuffel, W.S. Zaengl & J. Kuffel, High Voltage Engineering Fundamentals

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

1. Electricity Supply Acts 1990 (Act 447) and Regulations (Amendment 2019), 2019.
2. Malaysian Standard International Electrotechnical Commission (MS IEC) 60364, 2015.
3. Boca Raton, The Electric Power Engineering Handbook, 3rd Ed., CRC Press, 2018.
4. H.L Wilis, R.R. Schrieber, Aging Power Delivery Infrastructures, 2nd Ed., CRC Press, 2017.
5. U.A Bakshi, M.V Bakshi, Transmission & Distribution, 2nd Ed., India Technical Pub., 2018.

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

1. *Manual Projek Sarjana Muda (PSM),* Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

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 it components. Describe RTU, SCADA and master station protocol and communication. Explain about Distribution Management System (DMS) and Energy Management System (EMS).

REFERENCES

1. Boca Raton, The Electric Power Engineering Handbook, 3rd Ed., CRC Press, 2012.
2. H.L Wilis, R.R. Schrieber, Aging Power Delivery Infrastructures, 2nd Ed., CRC Press, 2013.
3. U.A Bakshi, M.V Bakshi, Transmission & Distribution, 2nd Ed., India Technical Pub., 2012.
4. M. Cepin, Assessment of Power System Reliability: Methods and Applications, Springer, 2011.

BEEY 3803
SISTEM TENAGA DIPERBAHARUI/ RENEWABLE ENERGY SYSTEM

LEARNING OUTCOMES

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

1. Classify general principles and technology of Renewable Energy Systems for electrical power generation.
2. Perform experiments of Renewable Energy Systems for system performance.
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

1. Leon Freris & David Infield, Renewable Energy in Power System, Wiley 2008.
2. Godfrey Boyle, renewable Energy: Power for Sustainable Future, Oxford 2014.
3. D.P Kothari, KC Singal, Rakesh Ranjan, Renewable Energy Sources and Emerging Technologies, Prentice Hall of India, 2008.

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

1. Dale H. Besterfield, "Quality Control", 7th Edition, Prentice Hall, 2004
2. Douglas C. Montgomery, "Introduction to Statistical Quality Control", 5th Edition, John Wiley and Sons, 2005
3. Dona C. S. Summers, "Quality", 3rd Edition, Prentice Hall, 2003
4. Mark A. Fryman, "Quality and Process Improvement", Thomson Learning, 2002
5. Amiyata Mitra, "Fundamentals of Quality Control", 2nd Edition, Prentice Hall, 1998

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

1. Curtis D. Johnson, Process Control Instrumentation Technology, 8th ed. Pearson, 2014.
2. Dale E. Seborg, Process dynamics and control, 3rd ed,Hoboken, NJ: John Wiley & Sons, 2011.
3. Myke King, Process Control: A Practical Approach, Chichester: John Wiley & Sons, 2011.

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

1. Curtis D. Johnson, Process Control Instrumentation Technology, 8th ed. Pearson, 2014.
2. Dale E. Seborg, Process dynamics and control, 3rd ed,Hoboken, NJ: John Wiley & Sons, 2011.
3. Myke King, Process Control: A Practical Approach, Chichester: John Wiley & Sons, 2011.

BEEY 4413
ENERGY EFFICENCY / 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

1. Hadi Saadat, Power System Analysis, 2nd Ed., Mc Graw Hill, 2004.
2. Wildi, T., Electrical Machines, Drives and Power Systems, 5th Ed., Prentice Hall, 2002.
3. Marizan Sulaiman, Ekonomi dan Pengurusan Sistem Kuasa, Utusan Publications & Distributors

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

1. Fundamentals of Power System Economics, Daniel S. Kirschen, Goran Strbac: Wiley, 2015.
2. Power System Economics, Steven Stoft: IEEE Press, 2015.
3. Risk Assessment of Power Systems, Wenjuan Li: IEEE Press, 2015.
4. Power Markets and Economics, Barrie Murray: Wiley, 2015.

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

1. Dugan, Roger C. Electrical Power Systems Quality. New York: McGraw Hill, 2012.
2. Caramia, Pierluigi. Power Quality Indices in Liberalized Markets. Chichester: John Wiley, 2009.
3. Vedam, R. Sastry. Power Quality: VAR Compensation in Power Systems. Boca Raton, FL: CRC, 2009.
4. Baggini, Angelo B. Handbook of Power Quality. Hoboken, NJ: John Wiley and Sons, 2008.

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

1. Uday A. Bakshi and Ajay V. Bakshi, Electrical Measurements and Instrumentation, Technical Publication, 2014.
2. Mohd Razali Mohd Sapiee et. Al, Instrumentation System, Penerbit UTeM, 2019.
3. Muhammad Sharil Yahya et. Al, Pengukuran & Instrumentasi, Penerbit UTeM, 2013.
4. Alan S. Moris and Reza Langari, Measurement and Instrumentation: Theory and Application, Second Edition, Academic Press, 2015.
5. Robert B. Northrop, Introduction to Instrumentation and Measurements, 3rd edition, CRC Press Taylor and Francis Group, 2018.

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

1. David Planchard, Marie Planchard, (2012), Engineering Design with SolidWorks 2012, SDC.
2. Bertoline, G.R., & Wiebe, E.N., et. (2011), Fundamental of Graphics Communication, 6th Edition, McGraw Hill.
3. Dassault System, (2014), Introducing SolidWorks Manual 2014.

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

1. Aminurrashid Noordin et. al (2014), Digital Electronics & Systems, Penerbit UTeM.
2. Thomas Floyd, Digital Fundamentals, Global Edition, 11th Edition, Jan 2015, Pearson New International Edition.
3. Ronald Tocci, Neal Widmer, Greg Moss, Digital Systems Principles and Applications, 11th Edition, Jul 2013, Pearson New International Edition.

4. Thomas Floyd, Digital Electronics a Systems Approach, CourseSmart eTextBook, Oct 2012, Pearson New International Edition.
5. Michael A.M. Digital Devices and Systems wih PLD Applications, Delmar Publisher.

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

1. Thomas L. Floyd, Principles of Electric Circuits, 9th Ed., Pearson, 2010.
2. Charles Alexander and Matthew Sadiku, Fundamentals of Electric Circuits, 5th Ed., McGraw Hill, 2013.
3. Allan H. Robbins and Wilhelm C Miller, Circuit Analysis Theory and Practice, 5th Ed., Delmar and Cengage Learning, 2012.
4. James W. Nilsson and Susan Riedel, Electric Circuits, 10th Ed., Prentice Hall, 2014.

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, 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
produce by more than one current carrying conductor.

REFERENCES

1. John W. Jewett, Jr. Raymond A. Serway, (2014), Physics for Scientists and Engineers, 9th Edition, BROOKS/COLE CENGAGE Learning.
2. Matthew N. O. Sadiku (2015) Principles of Electromagnetics, 6th Edition, Oxford University Press.
3. Ulaby, F. (2012) Electromagnetics for Engineers, Pearson Education, 6th Edition.
4. Hayt, W. and Buck, J., (2011) Engineering Electromagnetics, 8th Edition, McGraw Hill International Edition.
5. Raju, G.S.N. (2006) Electromagnetic Field Theory and Transmission Lines
6. 1st Edition, Pearson Education.

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

1. Charles, K.A & Sadiku, N.O (2013). Fundamental of Electric Circuit (5th ed.). McGraw-Hill.
2. Nilsson, J. W. & Riedel, S. (2015). Electric Circuit (10th ed.). Prentice Hall.
3. Glisson, T. H. (2011). Introduction to Circuit Analysis and Design. Springer.
4. Hayt, W. H. (2012). Engineering Circuit Analysis (8th ed.). McGraw-Hill.
5. O'Maley, J. (2011). Basic Electric Circuit. McGraw-Hill.

PRE-REQUISITE

BEEI 1303
ELECTRIC CIRCUIT FUNDAMENTAL / PENGENALAN LITAR ELEKTRIK

BEEI 1453
ELECTRONIC PRINCIPLR / PRINSIP ELEKTRONIK

LEARNING OUTCOMES

At the end of the subject, students should be able to:

1. Apply Apply knowledge of semiconductor devices in electronic circuit. (PLO1,C4).
2. Perform the experiment of electronic circuit for semiconductor devices using simulation software and electronic components. (PLO4,P4).

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

1. Thomas L. Floyd, Electronic Devices, 9th, Pearson, 2012.
2. Robert L. Bolysted, Louis Nashelsky, Electronic Devices and Circuit Theory, 11th Edition, Pearson, 2013.
3. S. Salivahanan, N. Suresh Kumar, Electronic devices and circuits, 3rd Edition, McGraw-Hill, 2012.
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

1. Gaddis, T., (2015), Starting Out with C++: From Control Structures through Objects, 8th Edition, Global Edition, Pearson Education.
2. Daniel Liang, Y, (2014), Introduction to Programming with C++, 3rd Edition, Pearson Education.
3. Deitel, H.D., (2014), C++ How to Program,9th Edition, Pearson Education.
4. Nell, D., (2013), Programming and Problem Solving with C++: Comprehensive, 6th Edition, Jones & Bartlett Learning.

5. Gregoire, M., (2011), Professional C++, 2nd Edition, John Wiley & Son.

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

1. Akta Bekalan Elektrik 1990 (Akta 447) & Peraturan-Peraturan Elektrik 1994 (Pindaan 2015), 2015.
2. Malaysian Standard International Electrotechnical Commission (MS IEC) 60364, 2015.
3. Caddick, John, Electrical Safety Handbook, McGraw Hill, 2012.
4. Brian Scaddan, 17th Edition Writing Regulations, Newness, 2011.

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

connection which will lead towards a complete electrical machine training system to be used for laboratory activities.

REFERENCES

1. Electric machinery fundamentals, Stephen J. Chapman, 5th ed., New York, NY: McGraw-Hill, 2012.
2. Electric machines, Mulukutla S. Sarma, Mukesh K. Pathak., Singapore: Cengage Learning, 2010.
3. Fitzgerald & Kingsley's electric machinery, Stephen D. Umans., 7th ed., New York, NY: McGraw-Hill Companies, 2014.
4. Electric machines, D.P. Kothari, I.J. Nagrath., 4th ed., New Delhi: Tata McGraw-Hill, 2010 (Rep. 2011).
5. Linear electric machines, drives, and maglevs handbook, Ion Boldea, Boca Raton, FL: CRC Press/Taylor & Francis, 2013.

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

1. Hughes, Electrical & Electronics Technology, 11th ed., Prentice Hall, Feb 2012.
2. Bird, J.O., Electrical Circuit Theory and Technology, 5th ed., Routledge, Nov 2013.
3. Bird, J.O., *Electrical Principles and Technology for Engineering,* Elsevier, 2013.
4. Aminurrashid Noordin et. al*, Principles of Electric & Electronics (Part 1),* Penerbit UTeM, 2013.
5. Asri Din et, al*, Principles of Electric & Electronics (Part 2),* Penerbit UTeM, 2013.

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

1. Akta Bekalan Elektrik 1990 (Akta 447) & Peraturan-Peraturan Elektrik 1994 (Pindaan 2015), 2015.
2. Malaysian Standard International Electrotechnical Commission (MS IEC) 60364, 2015.
3. Caddick, John, Electrical Safety Handbook, McGraw Hill, 2012.
4. Brian Scaddan, 17th Edition Writing Regulations, Newness, 2011.

PRE-REQUISITE

BEEI 1311
ELECTRICAL WORKSHOP 1/ BENGKEL 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

1. Hibbeler R. C., 2010, Engineering Mechanics - Statics, 12th Edition, Prentice Hall, New York.
2. Beer, F. P. and Johnston Jr., E. R. and Eisenberg, E. R., 2010, Vector Mechanics for Engineers - Statics, 9th Ed. in SI Units, McGraw Hill, New York.

3. Gere J. M., 2012, Mechanics of Materials, Thompson.
4. Hibbeler.R.C. 2013. Mechanics of Materials 9th SI Edition. Prentice Hall.
5. Hibbeler R.C., 2013, Statics and Mechanics of Materials, 3rd SI Ed., Prentice Hall, New York.

SEMESTER 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, subrutines, 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.
3. http://www.mikroe.com/eng/chapters/view/1/introduct io n-world-of-microcontrollers/ (online PIC book).
4. Ibrahim, Dogan (2010), SD card projects using the PIC microcontroller, Newnes/Elsevier, 2010.
5. Deshmukh, Ajay V (2011), Microcontrollers: Theory and Applications, McGraw-Hill.

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.
3. Report the analysis of transient and steady state performance for first and second order control 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

1. Norman S. Nise, Control Systems Engineering, 6th Edition, John Wiley & Sons Inc., 2011.
2. Katsuhiko Ogata, Modern Control Engineering, 5th Edition, Pearson, 2010.
3. Richard C. Dort, Robert H. Bishop, Modern Control Systems, 12th Edition, Pearson, 2011.
4. Syed Najib Syed Salim, Maslan Zainon, Control Systems Engineering, 2nd Edition, Penerbit UTeM, 2016.
5. Gopal, M, Control Systems: Principles and Design, 4th Edition, Mc Graw Hill, 2012.
6. Khalil Azha Mohd Annuar et. Al., Introduction to Control System, Penerbit UTeM, 2015

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

1. Ned Mohan, Power electronics: a first course, John Wiley & Sons, 2012.
2. Daniel W. Hart, Power electronics, McGraw-Hill, 2011.
3. Ioinovici, Adrian, Power electronics and energy conversion systems, John Wiley & Sons, 2013.
4. Fang Lin Luo, Hong Ye. Power electronics: advanced conversion technologies – Circuits, Devices, and Applications, Taylor & Francis, 2010.
5. D S. Sivanagaraju, M. Balasubba Reddy, A. Mallikarjuna Prasad, Power electronics, PHI Learning, 2012.

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 realted 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

1. Yuan, C.S., 2006, Fluid Mechanic I, Pearson Prentice Hall, Malaysia.
2. Munson, B. R., Young D. F. and Okiishi, T. H., 2006, Fundamentals of Fluid Mechanics, 5th Ed., John Wiley & Sons, Inc, Asia.
3. Som, S. K. and Biswas, G., 2004, Introduction to Fluid Mechanics and Fluid Machines, 2nd Ed., Tata McGraw- Hill, New Delhi.
4. Douglas, J. F., Gasiorek J. M. and Swaffield, J. A., 2001, Fluid Mechanics, 4th Ed., Prentice Hall, Spain.
5. Cengel, Y. A. and Cimbala, J. M., 2006, Fluid Mechanics: Fundamentals and Applications, International Edition, McGraw-Hill, Singapore.
6. Streeter, V. L. and Wylie, E. B., 1983, Fluid Mechanics, First SI Metric Ed., McGraw-Hil, Singapore

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

1. Perez, Adrover E. (2012), Introduction to PLCs : A Beginner's Guide to Programmable Logic Controllers, CRC Press.
2. Macaulay, Tyson (2012), Cybersecurity for Industrial Control Systems: SCADA, DCS, PLC, HMI, and SIS, CRC Press.
3. Frank, Lamb (2013), Industrial Automation, McGraw-Hill.
4. Doug, Arent (2013), Automation Systems of the 21st Century: New Technologies, Applications and Impacts on the Environment & Industrial Processes, Nova Science.

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

1. JD Glover, MS Sarma, TJ Overbye, Power System Analysis & Design, 5th (SI) Edition, Thomson, 2012.
2. Hadi Saadat, Power System Analysis, 3rd Edition, Mc Graw Hill, 2011.
3. S. Ramar, S. Kuruseelan, Power System Analysis, PHI Learning, Pvt. Ltd., 2013.
4. Glover, Sarma, Power System Analysis and Design, 3rd Ed., Thomson Learning, 2002.

BEEA 3393
CONTROL SYSTEM ENGINEERING / KEJURUTERAAN SISTEM KAWALAN

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

1. Nise, S Norman, Control Systems Engineering, 6th Edition, John Wiley & Sons (Asia) Pte Ltd, 2011
2. Bishop, Dorf, Modern Control Systems, 12th Edition, Pearson Education, 2011.
3. Ogata, Katsuhiko, Modern Control Engineering, 5th Edition, Prentice Hall, 2010.
4. Gopal, M, Control Systems: Principles and Design, 4th Edition, Mc Graw Hill, 2012.

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

1. W. Stalling, Data and Data Communications, 8th Edition, Prentice Hall, 2007.
2. Behrouz A. Forouzan, Data Communication and Networking, 4th Edition, McGraw Hill, 2007.
3. Douglas E. Corner, Computer Networks and Internet with Internet Application, 4th Edition, Prentice Hall, 2004.

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 effetively.

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

1. *Manual Projek Sarjana Muda (PSM),* Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

BEEA 3454
MOTION CONTROL SYSTEM/ SISTEM KAWALAN PENGGERAK

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
2. Mechatronics – W. Bolten, Pearson, 2010
3. Introduction to Mechatronics and measurement Systems, Alciatore, 2009, 3e, TMH
4. Mechatronics system design – Devdas shetty & Richard A. Kolk, Thomson, 2007
5. Industrial Electronics, Thomas E. Kissell, Prentice – Hall Publication.
6. Incremental Motion Control, B. C. Kuo, SRL Publishing Company
7. National Instrument web site
8. Siemens web site

BEEA 3443
PNEUMATIC & HYDRAULIC / PNEUMATIK & HIDRAULIK

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

1. Esposito A. (2014), "Fluid Power with Applications", 7th Edition, Pearson New International Edition.
2. Pany M. & Sabine S. (2012), "Pneumatic Basic Level", FESTO.
3. Pany M. & Sabine S. (2012), "Electropneumatic Basic Level", FESTO
4. Pany M. & Sabine S. (2012), "Hydraulic Basic Level", FESTO.
5. Pany M. & Sabine S. (2012), "Electrohydraulic Basic Level", FESTO.

BEEA 3433
INDUSTRIAL ROBOTICS / ROBOTIC INDUSTRI

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

1. K.H. Low, Robotics: Principles and Systems Modeling, 2nd edition, Prentice Hall, 2002.
2. Fuller, J.L., Robotics: Introduction, Programming and Projects, 2nd ed., Prentice Hall, 1998.
3. Man Zhilong, Robotics, 2nd. Edition, Prentice Hall, 2004.
4. S Niku, Saeed B, Introduction to Robotics analysis, system, applications, Prentice Hall, 2001.

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

1. *Manual Projek Sarjana Muda (PSM),* Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

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

1. Groover, M. P. (2014), "Automation, Production Systems, and Computer-Integrated Manufacturing", 4th Ed., Prentice Hall.
2. Groover, M. P. (2012), "Fundamentals of Modern Manufacturing: Materials, Processes, and Systems", 5th Ed., John Wiley & Sons Inc.
3. Kalpakjian, S. & Schmid, S. R. (2013), "Manufacturing, Engineering, and Technology", 7th Ed., Prentice Hall.
4. Dima I. C. (2013), "Industrial Production Management in Flexible Manufacturing Systems", 1st Ed., IGI Global.
5. Brezina T. & Jablonski R. (2014), "Mechatronics 2013: Recent Technological and Scientific Advances", Springer.

6. Bolton W. (2013), "Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, 5th Ed., Prentice Hall.

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

1. Curtis D. Johnson, Process Control Instrumentation Technology, 8th ed. Pearson, 2014.
2. Dale E. Seborg, Process dynamics and control, 3rd ed, Hoboken, NJ: John Wiley & Sons, 2011.
3. Myke King, Process control: a practical approach, Chichester: John Wiley & Sons, 2011.

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

1. Davis, E. R. (2012), Computer & Machine Vision: Theory, Algorithm, Practicalities, 4th Edition, Academic Press.
2. Pratt, W.K., (2014), Introduction to Digital Image Processing, CRC Press.
3. Solomon, C., (2011), Fundamentals of Digital Image Processing: A Practical Approach with Examples in Matlab, Wiley-Blackwell.
4. Mukhopadhyay, J., (2011), Image and Video Processing in the Compresses Domain, CRC Press.
5. Corke, P., (2011), Robotics, Vision and Control: Fundamental Algorithms in MATLAB, Springer.
6. Pietikainen, M., (2011), Computer Vision Using Local Binary Patterns, Springer.

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 architechture (software and hardware), communication and engineering drawing.
2. Completes the experiment on DCS hardware and doftware 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

1. Glover, J.D., Sarma, M.S. & Overbye, T.J. (2017). Power System Analysis and Design, 6th Edition, Cengage Learning.
2. ABB System 800xA Installation, Update and Upgrade Getting started, Version 6.0, 2016.
3. Thomas E. Marlin, Process Control, 2nd Edition, 2015.
4. B. R. Mehta, Reddy Y. J, Applying Foundation Fieldbus, 2016.
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

1. Groover, M. P. (2015), "Automation, Production Systems, and Computer-Integrated Manufacturing", 4th Ed., Pearson Education.
2. Groover, M. P. (2012), "Fundamentals of Modern Manufacturing: Materials, Processes, and Systems", John Wiley & Sons Inc.
3. Kalpakjian, S. & Schmid, S. R. (2013), "Manufacturing, Engineering, and Technology", 7th Ed., Prentice Hall.
4. Dima I. C. (2013), "Industrial Production Management in Flexible Manufacturing Systems", 1st Ed., IGI Global.
5. Brezina T., Jablonski R. (2014), "Mechatronics 2013: Recent Technological and Scientific Advances", Springer.
6. Bolton W. (2012), "Mechatronics: A Multidisciplinary Approach", 5th Ed., Harlow, England: Pearson.

BEEA 4853
ADVANCED CONTROL SYSTEM / SISTEM KAWALAN LANJUTAN

LEARNING OUTCOMES

Upon completing this subject, the student should be able to

1. Assess concepts, principals and theories relating to advance control system.
2. Demonstrate the advanced control systems & strategies in simulation using Labview, Matlab and Simulink.
3. Work effectively either individually or in a group to solve control system problems.

SYNOPSIS

This elective course introduces the fundamental concepts, principles and application of advanced control system techniques and analysis. The course material shall include three general topics. Chapter 1 covers state-space representations, controllability & observability, state variable feedback design and state observer. Sampling & Z transform, stability in Z plane and digital compensator design are included in chapter 2. While chapter 3 comprises artificial intelligence in engineering i.e. Fuzzy Logic System and Neural Network.

REFERENCES

1. Roland S.Burns; Advanced Control Engineering, Butterworth-Heinemann, 2001
2. Elmer P. Dadios; Fuzzy Logic – Controls, Concepts, Theories and Applications, 2012
3. Michael Negnevitsky; Artificial Intelligence A Guide to Intelligent System, Kindle Edition, 2011.
4. Dorf & Bishop; Modern Control System 13th Edition, Pearson, 2017.

5. Robert H. Bishop; Modern Control Systems with LabView, National Technology & Science Press, 2012.
6. Norman S.Nise; Control Systems Engineering, 6th Edition, John Wiley & Sons, Inc, 2011.

BEEA 4863
MACHINE LEARNING /
SISTEM PEMBELAJARAN MESIN

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.
2. Stephen Marsland, *Machine Learning: An Algorithmic Perspective,* CRC Publisher, 2009.

BMMM 3523
MAINTENANCE TECHNOLOGY & ASSET MANAGEMENT /
TEKNOLOGI PENYELENGGARAAN & PENGURUSAN ASET

LEARNING OUTCOMES

Upon completing this subject, the student should be able to

1. Distinguish the method and strategy for maintenance and asset management.
2. Reproduce by using computerized maintenance management system in maintenance problem.
3. Present the best practices of maintenance and asset management.

SYNOPSIS

Students will be introduced to the maintenance strategy, calculating the life of each unit machine and instrument. Identifying maintenance workshop and scheduling, maintenance organisation, effective use of maintenance resources, maintenance system, maintenance best practices, engineering economy such as weibull and pareto analysis,cost estimation, asset replacement analysis, risk analysis and control,application of reliability data, accident prevention, fire protection and cost control.

REFERENCES

1. R.C. Mishra, K. Pathak, 2013, *Maintenance Engineering and Management*, PHI Learning Pvt. Ltd.
2. B.S. Dhillon, 2002, Engineering Maintenance : A Modern Approach,CRC Press.
3. Terry Wireman, 2010, *Benchmarking Best Practices in Management Maintenance*, Industrial Press.
4. John D. Campbell, Andrew K.S. Jardine, Joel McGlynn, 2010, *Asset Management Excellence:*

Optimizing Equipment Life-Cycle Decisions, 2nd Edition, CRC Press
5. Nicholas Anthony John Hastings, 2009, *Physical Asset Management,* Springer
6. John S. Mitchell, John E. Hickman, J.E. Amadi-Echendu and H. Paul Barringer, 2006, *Physical Asset Management Handbook*
7. Terry Wireman, 2005, *Developing Performance Indicators for Managing Maintenance, 2nd Edition*, Industrial Press Inc.

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.

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

1. Uday A. Bakshi and Ajay V. Bakshi, Electrical Measurements and Instrumentation, Technical Publication, 2014.
2. Mohd Razali Mohd Sapiee et. Al, Instrumentation System, Penerbit UTeM, 2019.
3. Muhammad Sharil Yahya et. Al, Pengukuran & Instrumentasi, Penerbit UTeM, 2013.
4. Alan S. Moris and Reza Langari, Measurement and Instrumentation: Theory and Application, Second Edition, Academic Press, 2015.
5. Robert B. Northrop, Introduction to Instrumentation and Measurements, 3rd edition, CRC Press Taylor and Francis Group, 2018.

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

1. David Planchard, Marie Planchard, (2012), Engineering Design with SolidWorks 2012, SDC.
2. Bertoline, G.R., & Wiebe, E.N., et. (2011), Fundamental of Graphics Communication, 6th Edition, McGraw Hill.
3. Dassault System, (2014), Introducing SolidWorks Manual 2014.

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

1. Thomas L. Floyd, Principles of Electric Circuits, 9th Ed., Pearson, 2010.
2. Charles Alexander and Matthew Sadiku, Fundamentals of Electric Circuits, 5th Ed., McGraw Hill, 2013.
3. Allan H. Robbins and Wilhelm C Miller, Circuit Analysis Theory and Practice, 5th Ed., Delmar and Cengage Learning, 2012.
4. James W. Nilsson and Susan Riedel, Electric Circuits, 10th Ed., Prentice Hall, 2014.

SEMESTER 2

BEEY 133
DIGITAL ELECTRONICS & SYSTEM /
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.
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

1. Aminurrashid Noordin et. al (2014), Digital Electronics & Systems, Penerbit UTeM.
2. Thomas Floyd, Digital Fundamentals, Global Edition, 11th Edition, Jan 2015, Pearson New International Edition.
3. Ronald Tocci, Neal Widmer, Greg Moss, Digital Systems Principles and Applications, 11th Edition, Jul 2013, Pearson New International Edition.
4. Thomas Floyd, Digital Electronics a Systems Approach, CourseSmart eTextBook, Oct 2012, Pearson New International Edition.

BEEI 1323
ELECTRICS & MAGNETISM /
ELEKTRIK & KEMAGNETAN

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

1. John W. Jewett, Jr. Raymond A. Serway, (2014), Physics for Scientists and Engineers, 9th Edition, BROOKS/COLE CENGAGE Learning.
2. Matthew N. O. Sadiku (2015) Principles of Electromagnetics, 6th Edition, Oxford University Press.
3. Ulaby, F. (2012) Electromagnetics for Engineers, Pearson Education, 6th Edition.
4. Hayt, W. and Buck, J., (2011) Engineering Electromagnetics, 8th Edition, McGraw Hill International Edition.
5. Raju, G.S.N. (2006) Electromagnetic Field Theory and Transmission Lines, 1st Edition, Pearson Education.

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

1. Charles, K.A & Sadiku, N.O (2013). Fundamental of Electric Circuit (5th ed.). McGraw-Hill.
2. Nilsson, J. W. & Riedel, S. (2015). Electric Circuit (10th ed.). Prentice Hall.
3. Glisson, T. H. (2011). Introduction to Circuit Analysis and Design. Springer.
4. Hayt, W. H. (2012). Engineering Circuit Analysis (8th ed.). McGraw-Hill.
5. O'Maley, J. (2011). Basic Electric Circuit. McGraw-Hill.

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

1. Thomas L. Floyd, Electronic Devices, Pearson Education, Limited, 5 Jan 2017
2. Hughes, John M., Practical Electronics: Components and Techniques, O'Reilly Media, 2015
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
5. R. S. Khandpur, Printed Circuit Boards: Design, Fabrication, Assembly and Testing, Tata McGraw-Hill Education, 2005
6. Howard Manko, Solders and Soldering, Fourth Edition, McGraw Hill Professional, Mar 2001
7. Rudolf Strauss, Dr. Ing., FIM, SMT Soldering Handbook, second edition, Newnes, 1998

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

1. Abdul Kadir, (2016), C++ Programming a Practical Hands-on for Self Learning, 1st Edition, Penerbit Universiti, Universiti Teknikal Malaysia Melaka.
2. Gaddis, T., (2015), Starting Out with C++: From Control Structures through Objects, 8th Edition, Global Edition, Pearson Education.
3. Daniel Liang, Y, (2014), Introduction to Programming with C++, 3rd Edition, Pearson Education.

4. Deitel, H.D., (2014), C++ How to Program, 9th Edition, Pearson Education.
5. Nell, D., (2013), Programming and Problem Solving with C++: Comprehensive, 6th Edition, Jones & Bartlett Learning.

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.
2. Perform the experiment of semiconductor devices using simulation software and electronic components 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
2. Robert L. Bolysted, Louis Nashelsky, Electronic Devices and Circuit Theory, 11th Edition, Pearson, 2014.
3. S. Salivahanan, N. Suresh Kumar, Electronic Devices and Circuits, 3rd Edition.
4. Atul P. Godse, Uday A. Bakshi, Electronic Devices & Circuits, Technical Publication Pune, 2011.

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

installation involving planning (sizing of circuit breakers and cables), application designing (electrical drawing, single line diagram, commissioning (cable installation) and troubleshooting.

REFERENCES

1. Garis Panduan Pendawaian Elektrik Bangunan Kediaman, Cetakan Pe. Putrajaya: Suruhanjaya Tenaga (Energy Commission), 2015.
2. Panduan Teknik Rekabentuk Elektrik Edisi 4, vol. 43, no. 00. JKR MALAYSIA, 2011.
3. TNB, Electricity Supply Application Handbook, vol. 19, no. 2. Tenaga Nasional Berhad, 2019.
4. D. C. Operation, "Circuit Breakers for Overcurrent Protection for Household and Similar Installations MSIEC 60898," vol. 2007, p. 23, 2011.
5. E. I. Of, Electrical Installation of Buildings - Code of Practice. 2010.
6. Pemasangan Elektrik Voltan Rendah-MSIEC 60364, vol. 2012.
7. Residual Current Operated Circuit Breakers-MSIEC 61008. 2012.
8. M. Standard, Electrical Installation of Building-Guide to MS IEC 60364. 2012.

BEEY 2361
ELECTRICAL ENGINEERING TECHNOLOGY CAREER / KERJAYA TEKNOLOGI KEJURUTERAAN ELEKTRIK

LEARNING OUTCOMES

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

1. Identify the requirement of electrical engineering technology practices in terms of engineering ethics, economy, finance and law and route to professional engineering technologist.
2. Apply the main features of groups and team that affect teamwork or team effectiveness in relation to electrical engineering technology field.
3. Explain the professional experiences gain through industrial talk and industrial visit.

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

1. Hughes, Electrical & Electronics Technology, 11th ed., Prentice Hall, Feb 2012.
2. Bird, J.O., Electrical Circuit Theory and Technology, 5th ed., Routledge, Nov 2013.
3. Bird, J.O., Electrical Principles and Technology for Engineering, Elsevier, 2013.
4. Aminurrashid Noordin et. al, Principles of Electric & Electronics (Part 1), Penerbit UTeM, 2013.
5. Asri Din et, al, Principles of Electric & Electronics (Part 2), Penerbit UTeM, 2013.

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
2. Bolysted, R., Nashelsky, L., Electronic Devices and Circuit Theory, 11th Edition, Prentice Hall, 2012.
3. Floyd, T., Electronic Devices,9th, Edition Prentice Hall, 2012.
4. L.K. Maheswari, M.M.S. Anand, Analog Electronics, Eastern economy ed., 2012
5. Atul P. Godse, Uday A. Bakshi, Electronic circuits, 2009.

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

1. Peatman, J.B., Design with PIC microcontrollers, 8th ed., Prentice Hall, 1998.
2. http://www.mikroe.com/eng/chapters/view/1/introduction-world-of-microcontrollers/ (online PIC book).
3. Milan Verle., PIC Microcontroller, Mikroelektronika.
4. Milan Verle., PIC Microcontroller – Programming in C, Mikroelektronika.
5. Iovine, J., PIC Microcontroller Project Book, McGraw- Hill, USA 2000.

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.
3. Report the analysis of transient and steady state performance for first and second order control 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

1. Norman S. Nise, Control Systems Engineering, 6th Edition, John Wiley & Sons Inc., 2011.
2. Katsuhiko Ogata, Modern Control Engineering, 5th Edition, Pearson, 2010.
3. Richard C. Dort, Robert H. Bishop, Modern Control Systems, 12th Edition, Pearson, 2011.
4. Syed Najib Syed Salim, Maslan Zainon, Control Systems Engineering, 2nd Edition, Penerbit UTeM, 2016.
5. Gopal, M, Control Systems: Principles and Design, 4th Edition, Mc Graw Hill, 2012.
6. Khalil Azha Mohd Annuar et. Al., Introduction to Control System, Penerbit UTeM, 2015

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.
2. Md Nasir, Panduan Pendawaian Elektrik, IBSbuku, 2006.
3. Mohd Nazi, Teknologi Pemasangan Elektrik, DBP.
4. Akta Bekalan Elektrik (447 pindaan 2001).
5. Brian Saddan, IEE wiring regulations 3rd edition, Inspection, Testing and Certification, Newnes, 2001.

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

1. Glover & Sarma, Power System Analysis and Design, 5th Edition, Thomson Learning, 2012.
2. Hadi Saadat, Power System Analysis, 3rd Edition, McGraw Hill, 2010.
3. Arthur R. Bergen, Power System Analysis, 2nd Edition, Prentice Hall, 2000.
4. Grainger and Stevenson Jr., Power System Analysis, McGraw Hill, 1994.

5. Willian D. Stevenson Jr., Elements of Power System Analysis, 4th Edition, McGraw Hill, 1998.

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

1. Electric machinery fundamentals, Stephen J. Chapman, 5th ed., New York, NY: McGraw-Hill, 2012.
2. Electric machines, Mulukutla S. Sarma, Mukesh K. Pathak., Singapore: Cengage Learning, 2010.
3. Fitzgerald & Kingsley's electric machinery, Stephen D. Umans., 7th ed., New York, NY: McGraw-Hill Companies, 2014.
4. Electric machines, D.P. Kothari, I.J. Nagrath.,4th ed.., New Delhi: Tata McGraw-Hill, 2010 (Rep. 2011).
5. Linear electric machines, drives, and maglevs handbook, Ion Boldea, Boca Raton, FL: CRC Press/Taylor & Francis, 2013.

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

1. Ned Mohan, Power electronics: a first course, John Wiley & Sons, 2012.
2. Daniel W. Hart, Power Electronics, McGraw-Hill, 2011.
3. Ioinovici, Adrian, Power electronics and energy conversion systems, John Wiley & Sons, 2013.
4. Fang Lin Luo, Hong Ye. Power electronics: advanced conversion technologies – Circuits, Devices, and Applications, Taylor & Francis, 2010.
5. D S. Sivanagaraju, M. Balasubba Reddy, A. Mallikarjuna Prasad, Power electronics, PHI Learning, 2012

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.
2. Dieter, G.E. & Schmidt, L.C. (2013). Engineering Design, 5th Edition, McGraw Hill.
3. Theodore R. Bosela Ph.D. PE, 2003, Electrical Systems Design 1st Edition.
4. Ulrich, K.T. & Eppinger, S.D. (2008). Product Design and Development, 4th Edition, McGraw Hill.
5. Keith H. Sueker, Power Electronics Design: A
6. Practitioner's Guide, 2005.
7. Mahesh Patil, Pankaj Rodey, Control Systems for Power Electronics: A Practical Guide. Springer, 2015.
8. Ziyad Salameh, Renewable Energy System Design, 2014 Elsevier Inc.
9. Michael F. Ashby., 2010, Materials Selection in Mechanical Design, Fourth Edition 4th Edition, Butterworth-Heinemann; 4 Edition (October 5, 2010).
10. Malaysian standard guidelines. (Can be access via UTeM's library, guideline: http://bit.ly/2bCWuvi).

BEEY 3803
SISTEM TENAGA DIPERBAHARUI / RENEWABLE ENERGY SYSTEM

LEARNING OUTCOMES

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

1. Classify general principles and technology of Renewable Energy Systems for electrical power generation.
2. Perform experiments of Renewable Energy Systems for system performance.
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

1. Leon Freris & David Infield, Renewable Energy in Power System, Wiley 2008.
2. Godfrey Boyle, renewable Energy: Power for Sustainable Future, Oxford 2014.
3. D.P Kothari, KC Singal, Rakesh Ranjan, Renewable Energy Sources and Emerging Technologies, Prentice Hall of India, 2008.

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

1. James Larminie and John Lowry, “Electrical Vehicle”
2. John Wiley & Sons, 2012.
3. Mark Warner, “The Electric Vehicle Conversion handbook” –HP Books, 2011.
4. Iqbal Husain, “Electric & Hybrid Vehicles-Design Fundamentals”, Second edition, CRC press.
5. D. A. J. Rand, R. Woods R. M. Dell, “Batteries for Electric Vehicles”, New York, John Wiley and Sons.

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

1. Bruno Scrosati, Jurgen Garche and Werner Tilmetz, "Advances in Battery Technologies for Electric Vehicles" Elsevier Ltd., 2015.
2. Gianfranco Pistoia," Electric and Hybrid Vehicles", Elsevier, 2010.
3. H.A. Kiehne, "Battery Technology Handbook", 2nd Ed.,
   CRC Press, 2003.

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 effetively

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

1. *Manual Projek Sarjana Muda (PSM),* Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

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

1. Haitham Abu-Rub, Atif Iqbal, Jaroslaw Guzinski, High Performance Control of AC Drives with Matlab / Simulink Models, John Wileys & Sons Ltd., 2012.
2. Ned Mohan, Tore M. Undeland, William P. Robbins, Power Electronics-Converters, Applications and Design, 3rd Edition, John Wiley and Sons, 1995.
3. Ioinovici, Adrian, Power electronics and energy conversion systems, John Wiley & Sons, 2013.
4. Fang Lin Luo, Hong Ye. Power electronics: advanced conversion technologies – Circuits, Devices, and Applications, Taylor & Francis, 2010.
5. D S. Sivanagaraju, M. Balasubba Reddy, A. Mallikarjuna Prasad, Power electronics, PHI Learning, 2012.

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

1. Perez, Adrover E. (2012), Introduction to PLCs: A Beginner's Guide to Programmable Logic Controllers, CRC Press.
2. Macaulay, Tyson (2012), Cybersecurity for Industrial Control Systems: SCADA, DCS, PLC, HMI, and SIS, CRC Press.
3. Frank, Lamb (2013), Industrial Automation, McGraw-Hill.
4. Doug, Arent (2013), Automation Systems of the 21st Century: New Technologies, Applications and Impacts on the Environment & Industrial Processes, Nova Science.

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

1. Hamilton, Michael S., Energy Policy Analysis, A Conceptual Framework, M.E. Sharpe, Inc. 2013.
2. Gilbert M. Masters, Renewable and Efficient Electric Power Systems, Wiley, 2005.
3. Pratt, Joseph A. Exxon: Transforming Energy 1973-2005, 2013.

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

1. SEDA Malaysia, "Grid-Connected Photovoltaic Systems Design Course", 2015.
2. SEDA Malaysia, "Procedure for the Testing and Commissioning of Grid-Connected Photovoltaic Systems in Malaysia, 2015.
3. Global Sustainable Energy Solutions, "Grid-Connected PV Systems Design and Installation", 2012.

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

1. Abraham I. Pressman, Switching and Linear Power Supply, Power Converter Design, Hayden Book Company, Inc., 2004.
2. Ali Emadi, Abdolhosein Nasiri, Stoyan B. Bekiarov, Uninterrruptible Power Supplies and Active Filters, CRC PRESS, 2005.
3. Mehrdad Ehsani, Yimin Gao, Sebastien E. Gay, Ali Emadi, Modern Electric, Hybrid Electric, and Fuel Cell Vehicles. CRC PRESS, 2004.
4. N.G Hingorani and L. Gyugyi, Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems. Piscataway, NJ: IEEE Press, 2000.
5. Muhammad H. Rashid, Power Electronics – Circuits, Devices, and Applications, 4th Edition, Prentice Hall, 2013
6. Hirofumi Akagi, Edson Hirokazu Watanabe, Mauricio Aredes, Instantaneous Power Theory and Applications to Power Conditioning, Wiley-IEEE Press, 2007.
7. Chris Mi, Abul Masrur, david Gao, Hybrid Electric Vehicles: Principles and Applications with practical, John Wiley & Son, 2011.

BEEY 3863
PEMACU MOTOR DAN SISTEM TARIKAN / MOTOR DRIVE AND TRACTION SYSTEM

LEARNING OUTCOMES

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

1. Evaluate power electronics converters and control strategies for DC and AC motor drive system.
2. Conduct the investigation on the performance of DC and AC motor drives in various operating condition.
3. Demonstrate application of DC and AC drives in modern electrified traction system.

SYNOPSIS

This course aims to provide an overview of variable speed drive system employing power electronic control of DC and AC motor. The topics cover the DC motor drive system from a variable DC chopper supply and a fully controlled bridge supply. The AC induction motor, and its operation from a variable frequency variable voltage inverter are also investigated. The students are also exposed on the application of these drives mechanism in the electrified traction systems.

REFERENCES

1. I. Boldea, Syed A. Nasar and S.A. Nasar, Electric drives, CRC/Taylor & Francis, 2nd edition, 2006.
2. Mukhtar Ahmad, High Performance AC Drives: Modelling Analysis and Control, Spronger, 2010.
3. Andre Veltman, Duco W. J. Pulle, R. W. A. A. De Doncker, Fundamentals of electrical drives, Springer, 2007.
4. J. Pachl, Railway Operation and Control. VTD Rail Publishing, Mountlake Terrace (USA) 2004.

5. Bonnett, Clifford F. Practical railway engineering, London: Imperial College Press, 2005.
6. O.S. Lock, Railway Signalling, 3rd Edition, A & C Black, 1993

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

1. *Manual Projek Sarjana Muda (PSM),* Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

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 (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

1. Hadi Saadat, Power System Analysis, 2nd Ed., Mc Graw Hill, 2004.
2. Wildi, T., Electrical Machines, Drives and Power Systems, 5th Ed., Prentice Hall, 2002.
3. Marizan Sulaiman, Ekonomi dan Pengurusan Sistem Kuasa, Utusan Publications & Distributors

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

1. Akta Bekalan Elektrik 1990 (Akta 447) & Peraturan-Peraturan Elektrik 1994 (Pindaan 2015), 2015.
2. Malaysian Standard International Electrotechnical Commission (MS IEC) 60364, 2015.
3. Boca Raton, The Electric Power Engineering Handbook, 3rd Ed., CRC Press, 2012.
4. H.L Wilis, R.R. Schrieber, Aging Power Delivery Infrastructures, 2nd Ed., CRC Press, 2013.
5. U.A Bakshi, M.V Bakshi, Transmission & Distribution, 2nd Ed., India Technical Pub., 2012.

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

1. Introduction to Electromagnetic Compatibility (EMC), Clayton R. Paul, 2nd edition, Wiley, 2006.
2. Electric machinery fundamentals, Stephen J. Chapman, 5th ed., New York, NY: McGraw-Hill, 2012.
3. Electric machines, Mulukutla S. Sarma, Mukesh K. Pathak., Singapore: Cengage Learning, 2010.
4. Fitzgerald & Kingsley's electric machinery, Stephen D. Umans., 7th ed., New York, NY: McGraw-Hill Companies, 2014.
5. Electric machines, D.P. Kothari, I.J. Nagrath.,4th ed.., New Delhi: Tata McGraw-Hill, 2010 (Rep. 2011).
6. Linear electric machines, drives, and maglevs handbook, Ion Boldea, Boca Raton, FL: CRC Press/Taylor & Francis, 2013.

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

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

BEEY 4913
KENDERAAN ELEKTRIK HIBRID / HYBRID ELECTRIC VEHICLE

LEARNING OUTCOMES

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

1. Accessing the various architectures and working principle of hybrid electric vehicles in term of energy storage and conversion, transmission, and control subsystems.
2. Assemble various component of hybrid electrical vehicle energy management through simulation [PO5, P5].
3. Function effectively as a team in analyzing hybrid electric vehicle performances

SYNOPSIS

Introduction to architectures and technologies associated with hybrid electric vehicles including their components and working principle. Specific topics include electric and hybrid electric drive trains, energy storage (batteries/ ultracapacitors, fuel cells), electromechanical energy conversion (induction and permanent magnet motors and generators), power electronics, vehicle-level modeling and control, and optimization.

REFERENCES

1. I. Boldea, Syed A. Nasar and S.A. Nasar, Electric drives, CRC/Taylor & Francis, 2nd edition, 2006.
2. Mukhtar Ahmad, High Performance AC Drives: Modelling Analysis and Control, Spronger, 2010.
3. Andre Veltman, Duco W. J. Pulle, R. W. A. A. De Doncker, Fundamentals of electrical drives, Springer, 2007.

4. J. Pachl, Railway Operation and Control. VTD Rail Publishing, Mountlake Terrace (USA) 2004.
5. Bonnett, Clifford F. Practical railway engineering, London: Imperial College Press, 2005.
6. O.S. Lock, Railway Signalling, 3rd Edition, A & C Black, 1993

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.

SUBJECT DETAILS FOR JTKEK PROGRAMMES

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

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.
2. Handbook of International Electrical Safety Practices, Peri, WILEY.
3. Audel House Wiring, All New 8th Edition, Paul Rosenberg, 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, 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

1. Thomas L. Floyd, Principles of Electric Circuits, 9th Ed., Pearson, 2010.
2. Charles Alexander and Matthew Sadiku, Fundamentals of Electric Circuits, 5th Ed., McGraw Hill, 2013.

3. Allan H. Robbins and Wilhelm C Miller, Circuit Analysis Theory and Practice, 5th Ed., Delmar and Cengage Learning, 2012.
4. James W. Nilsson and Susan Riedel, Electric Circuits, 10th Ed., Prentice Hall, 2014.

SEMESTER 2

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

1. Paul J. Deitel, Harvey Deitel, “C How to program,” 8th Edition, Pearson, 2015.
2. Nicholas J. Macias, “I Can C Clearly Now: Ideas and Exercises for Advancing your Programming Skills,” 1st Edition, Indepdent Publisher, 2019.
3. Zed A. Shaw, “Learn C the Hard Way,” 1st Edition, Addison-Wesley, 2015.

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, β_{dc} and α_{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

1. Boylestad R., Nashelsky L., *"Electronic Devices and circuit Theory",* Ninth Edition, Prentice Hall Inc., 2006.
2. Floyd, "Electronic Devices", Sixth Edition, Prentice Hall, 2002.
3. R P Punagin, "Basic Electronics", Mc-Graw Hill, 2000.

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

1. Hughes E., Electrical Technology, Longman, 11th Edition, 2012.
2. Alexander, Sadiku, Fundamentals of Electric Circuits, Mc-Graw Hill, 4th Edition, 2009.
3. Thomas L. Flyod, Principles of Electric Circuits, 9th Edition, Pearson, 2010.
4. Hadi Saadat, Power System Analysis with Power System Toolbox Software, Mc-Graw Hill, 2ndEdition.
5. Mc Pherson G., Electrical Machine & Transformers, Wiley, 2nd Edition.

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.
2. Handbook of International Electrical Safety Practices, Peri, WILEY.
3. Audel House Wiring, All New 8th Edition, Paul Rosenberg, 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

1. Charles, K.A & Sadiku, N.O (2013). Fundamental of Electric Circuit (5th ed.). McGraw-Hill.
2. Nilsson, J. W. & Riedel, S. (2015). Electric Circuit (10th ed.). Prentice Hall.
3. Glisson, T. H. (2011). Introduction to Circuit Analysis and Design. Springer.
4. Hayt, W. H. (2012). Engineering Circuit Analysis (8th ed.). McGraw-Hill.
5. O'Maley, J. (2011). Basic Electric Circuit. McGraw-Hill.

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 adjusment 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, under-damped system, reduction of multiple subsystems, blocks diagrams, feedback systems, signal flow graphs, Mason's rule, Routh- Hurwitz criterion and Gain Adjustment compensator design.

REFERENCES

1. Norman S. Nise, "Control Systems Engineering," 8th Edition, Willey, 2019.
2. Joseph Disterfrano III, Allen R. Stubberud, Ivan J. Williams, "Feedback and Control Systems", 2nd Edition, McGraw-Hill, 2013.

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

1. Boylestad R., Nashelsky L., *"Electronic Devices and circuit Theory",* Ninth Edition, Prentice Hall Inc., 2006.
2. S.H. Ruslan et.al. "ElektronikII" Penerbitan UTM 1998.
3. Floyd, *"Electronic Devices"*, Sixth Edition, Prentice Hall, 2002.
4. Theodore F. Bogart Jr., Jeffrey S. Beasley and Guillermore Rico, *"Electronic Devices and Circuits",* Sixth Edition, Pearson Education, 2004.

PRE-REQUISITE

BEEE 1323
ELECTRONIC FUNDAMENTALS / PENGENALAN ELEKTRONIK

BEET 2313
CONTINUOUS SIGNAL & SYSTEM /
ISYARAT & SISTEM BERTERUSAN

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

This subject will cover various topics such as **Introduction to Continuous-Time Signals and Systems**: Fundamental Concept, Transformations of Continuous-Time Signals, Signal Characteristics, Common Signals, Continuous-Time Systems and Its Properties, Convolution for Continuous-Time LTI Systems, Properties of Convolution, Properties of LTI Systems; **Fourier Series**: Introduction of continuous Fourier Series and Its Coefficients, Frequency Spectra, Fourier Series Properties; **Fourier Transform**: Definition, Properties of continuous Fourier Transform, Application of Fourier Transform, Energy and Power Density Spectra; **Laplace Transform**: Definition, Properties of Laplace Transform, Response of LTI Systems, etc.

REFERENCES

1. M.J. Roberts, Signals and Systems: Analysis Using Transform Methods & Matlab, 3rd Edition, McGraw-Hill Education, 2018.
2. Mrinal Mandal, Amir Asif, Continuous and Discrete Time Signals and Systems, Cambridge University Press, 2017.
3. Charles L. Philips, John M.Parr and Eve A.Riskin, Signals, Systems and Transforms, 5th Edition, Pearson, 2014.
4. Alan V. Oppenheim, Alan S. Willsky and S. Hamid Nawab, Signals and Systems, Pearson New International Edition, 2013.
5. Hwei P.Hsu, Schaum's Outline of Signals and Systems, McGraw-Hill Education, 2014.

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

1. Thomas L. Floyd, Digital Fundamentals, 11th Edition, Prentice Hall, 2015.
2. Ronald J.Tocci, Neal S.Widmer, Gregory L.Moss, Digital Systems: Principles and Applications, 12th Edition, Pearson Prentice Hall, 2017.
3. William Klietz, Digital Electronic: A Practical Approach with VHDL, 9th Edition, Pearson Prentice Hall, 2012.
4. Roger L Tokheim, Digital Electronic: Principles and Applications, 8th Edition, McGraw-Hill Education, 2013.

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.
3. Report effectively an assignment in a group.

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

1. Jeffrey S. Beasely, Jonathan D. Hymer, Gary M. Miller, Electronic Communication: a systems approach, Pearson, 2014.
2. Simon Haykin, Michael Moher, Communication systems, John Wiley & Sons, 2010.
3. Wayne Tomasi, Electronics Communications Systems Fundamentals Through Advanced, Prentice Hall, Fifth Edition, 2004.
4. John G. Proakis, Essentials of Communication Systems Engineering, Prentice Hall, 2005.

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

1. Boylestad R., Nashelsky L., *"Electronic Devices and circuit Theory",* Ninth Edition, Prentice Hall Inc., 2006.
2. Stanley, W.D., "*Op-Amps. and Integrated Linear Circuit*", Prentice Hall, 2002
3. Boylestad, R.L., 9th Edition, "*Electronic Devices*", Prentice Hall, 2006

BEET 2324
DATA COMMUNICATION & NETWORKING /
KOMUNIKASI & RANGKAIAN DATA

LEARNING OUTCOMES

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

1. Apply the principles of network fundamentals and routing protocols.
2. Manipulate the functionality, technologies and protocols in a converged switched network.
3. Solve a society/environment based assignment using problem-solver techniques.

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
2. B. A. Forouzan, Data Communications and Networking 4th Edition, McGraw Hill, 2007.
3. W. Stallings, Data & Computer Communication 8th Edition, Pearson, 2007.
4. Tomasi, W, Electronic Communication System: Fundamentals Through Advanced 5th Edition, Prentice Hall, 2004.
5. L. Peterson, B. Davie and M. Kaufmann, Computer Networks: A System Approach, 4th Edition, 2003.
6. J. Koruse and K. Ross, Computer Networking: A Top Down Approach Featuring the Internet, Addison-Wesley, 2003.

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.
3. Report effectively an assignment in a group.

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

1. MrinalMandal, Amir Asif, Continuous and Discrete Time Signals and Systems, Cambridge University Press, 2007.
2. C. K Alexander, M. N. O. Sadiku, *Fundamental of Electric Circuit*, 3rd Edition, McGraw Hill, 2006.
3. William D. Stanley, *Network Analysis with Applications*, 3rd Edition, Prentice Hall, 2000.
4. Charles L. Phillips, John M. Parr, Eve A. Riskin, *Signals, Systems and Transforms*, 3rd Edition, Prentice Hall, 2003.

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

1. Louis E. Frenzel, "Principles of Electronic Communication Systems 4th Edition", McGraw-Hill Education, 2015.
2. Jorge Olenewa, "Guide to Wireless Communications 4th edition", Course Technology, 2016.
3. Gerard Maral Michel Bousquet, "Satellite Communications Systems: Systems, Techniques and Technology 5th Edition", Wiley India Pvt.Ltd, 2014.
4. T. Viswanathan, Telecommunication Switching Systems and Networks 2nd edition, Prentice-Hall of India, 2015.
5. Rongqing Huiching," Introduction to Fiber-Optic Communications 1st Edition", Academic Press, 2019.

BEET 3363
TELECOMMUNICATION ELECTRONIC /
ELEKTRONIK TELEKOMUNIKASI

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.

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.
2. Modern telecommunications: basic principles and practices, M.J.N. Sibley, 2018.
3. Practical Communication Theory (2nd Edition), Adamy and Dave, 2014.
4. Radio frequency interference in communications systems, Bruce R. Albert, 2016.
5. Advanced electronic communications systems, W. Tomasi, 2004.

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.
3. Report effectively an assignment in a group.

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

1. Proakis, J. and Manolakis, D., 2014. *Digital Signal Processing* 4th ed., Pearson.
2. Mitra, S.K., 2011. Digital Signal Processing: A Computer-Based Approach, McGraw-Hill.
3. Oppenheim, A. V and Schafer, R.W., 2009. Discrete Time Signal Processing, 3rd ed., Pearson.
4. Mohd Saad, N and Abdullah, A. R., 2007. Real-Time Digital Signal Processing – A Practical Approach using TMS320C6713 DSP Processor, Penerbit UTeM.

BEEC 3483
FUNDAMENTAL OF MICROPROCESSOR & MICROCONTROLLER / ASAS MIKROPEMPROSES & MIKROPENGAWAL

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 covers basic fundamental of microprocessors and microcontroller, assembly language programming and hardware interfacing. This course is essentially divided into 3 sections. The first part covers on microprocessor / microcontroller-based Systems and Introduction to 68000 Microprocessor and PIC16F877A. The second part deals with some basic topics of microprocessor instruction set and high level language. The last segment examines topics on The 68000 hardware and PIC16F877A architecture, memory system and Input/output system.

REFERENCES

1. James L. Antonakos, The 68000 Microprocessor Hardware and Software Principles and Applications, Fourth Edition, Prentice Hall Inc., 2004.
2. Alan Clements, Microprocessor Systems Design 68000 Hardware, Software, and Interfacing, 3rd Edition, PWS Publishing Company, 1997.
3. Han-Way Huang, PIC Microcontroller to Software and Hardware Interfacing, Thomson Delmar Learning, 2004
4. John Morton, PIC Your Personal Introductory Course, 2nd Edition, Newnes, 2001.

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 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

1. M.N.O. Sadiku, *Elements of Electromagnetics*, 4th. Edition, Oxford University Press, 2007.
2. William H. Hayt, Jr., John A. Buck, *Engineering Electromagnetics*, 6th Ed., McGraw Hill, 2001.
3. F.T. Ulaby, Electromagnetics for Engineers, Pearson International Edition, Prentice-Hall, 2005.
4. Uma Mukheriji, Elektromagnetic Field Theory and Wave Propagation, Alpha Science International Ltd, 2006
5. G.S.N. Raju, Electromagnetic Field Theory and Transmission Lines, 2nd Impression, Pearson Education, 2008.
6. Joseph A. Edminister, Schaum's Outline of Theory and Problems of Electromagnetics, 2nd Edition, McGraw Hill, 1993

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 organisatition, 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

1. S.Thomas Foster., *"Managing Quality",* Second Edition, Pearson, Prentice Hall Inc.
2. Barrie G. Dale. *"Managing Quality",* Fifth Edition
3. Stephen R. Covey's book, *The 7 Habits of Highly Effective People*

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.
3. Report a society/environment-based assignment.

SYNOPSIS

This subject will discuss on Review of Baseband Signalling, BandpassSignalling, 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

1. Sklar B., D*igital Communications: Fundamentals and Applications*, 2nd Edition, Prentice Hall, 2002.
2. Proakis J.G., *Digital Communications*, 4th Edition, McGraw Hill, 2000.
3. Couch L.W., *Digital and Analog Communication Systems*, 7th Edition, Prentice Hall, 2007.

PRE-REQUISITE

BEET 2333
COMMUCNICATION PRINCIPLE / PRINSIP KOMUNIKASI

BEET 3393
TELECOMMUNICATION SWITCHING SYSTEM / SISTEM PENSUISAN 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.
3. Report an ethics/safety related assignment clearly.

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

1. V. Thiagarajan, "Telecommunication Switching Systems and Networks", Prentice-Hall India, 2007.
2. Roger L. Freeman, "Fundamental of Telecommunications",2nd Edition, Wiley-IEEE Press, 2005.
3. Roger L. Freeman, "Telecommunication System Engineering", 4th Edition, John Wiley & Sons Inc., 2004.
4. Marion Cole, "Introduction to Telecommunications: Voice, Data and the Internet", 2nd Edition, Prentice Hall, 2000.
5. E. Bryan Carne, "Telecommunication Primer: Data, Voice & Video Communications", 2nd Edition, Prentice Hall, 1999.
6. J. E. Flood, "Telecommunications, Switching, Traffic and Networks", Prentice Hall, 1999.
7. Marion Cole, "Telecommunications", Prentice Hall, 1999.

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 effetively.

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

1. *Manual Projek Sarjana Muda (PSM),* Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

BEET 3414
RF TECHNIQUE & 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

1. Pozar, "Microwave Engineering". John Wiley & Sons, 2004.
2. Liao', "Microwave Devices and Circuits". Prentice Hall, 1990.
3. R. Ludwig & P. Bretchko, "RF Circuit Design: Theory and Applications", Pearson Prentice Hall, 2000.
4. RE Collin, "Foundation for Microwave Engineering", Mc-Graw Hill Inc., 1992.
5. E.H Fooks, R. A Zakarevicious, "Microwave Engineering Using Microstrip Circuits", Prentice Hall, 1990.

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

1. *Manual Projek Sarjana Muda (PSM),* Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

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

1. Timothy Pratt, Charles Bostian, Jeremy Allnutt, "Satellite Communication", JWiley Publications 2nd Editions, 2003.
2. Wilbur L. Pritchard, Robert A Nelson, Hendri G. Suyderhoud, "Satellite Communication Enginering", Pearson Publications 2003.
3. M. Richharia,, Satellite Communication, BSP, 2003
4. K.n. Raja Rao, Fundamentals of Satellite Communications, PHI, 2004
5. G. Maral & M. Bousquet, Satellite Communications Systems, 4th Edition, John Wiley & Sons, 2002.
6. Dennis Roddy, Satellite Communications, 3rd Edition, McGraw Hill, 2001

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 **Introduction to Mobile Communication Systems:** Evolution of Mobile Radio Communications, Mobile Communication Standards: Advanced Mobile Phone System (AMPS), Extended Total Access Communications System (ETACS), Global System for Mobile Communication (GSM), General Packet Radio Service (GPRS), Universal Mobile Telecommunication Service (UMTS), Worldwide Interoperability for Microwave Access (WIMAX) and Long Term Evolution (LTE); **Cellular Concept:** Frequency Reuse, Handoff Strategies, Interference and System Capacity: Co-channel Interference, Adjacent Channel Interference, Cell Splitting, Sectoring; **Radio Wave Propagation in Mobile Communication Systems:** Introduction to radio wave propagation, Free-space propagation Model, Propagation Mechanisms: Reflection, Diffraction, Scattering, Path Loss Models: Log-distance Path Loss Model, Log-normal Shadowing. Propagation Models: Okumura, Hata Model. Fading and Multipath: Fast Fading, Slow Fading, Doppler Effect; **Channel Assignment and Error Control Techniques:** Fixed Channel Assignment, Dynamic channel assignment. Error control techniques, Forward Error Correction (FEC), Automatic Repeat Request (ARQ); **Convergence of IP Network in Cellular Network:** Introduction to Convergence Network, IP Core Network, Integration of IP Core Network in Cellular Network.

REFERENCES

1. Akaiwa & Yoshihiko, Introduction to Digital Mobile Communication, 2nd Edition, Wiley, 2015.
2. Juha Korhonen, Introduction to 4G mobile communications, London: Artech House, 2014.
3. Arokiamary, V. Jeyasri, Mobile Communication: 2nd Edition, India Technical Publications, 2012.

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

This subject will discuss on Introduction of Optical Communication System, Light Propagation in Optical Fibre, Transmission Characteristics of Optical Fibres, Optical Sources, Optical Detectors, Direct Detection Receiver Performance and Fibre Optical Network Applications.

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

1. Palais J.C., *Fiber Optic Communications*, Prentice Hall, 2004.
2. Downing J.N., *Fiber Optic Communications*, Prentice Hall, 2005.
3. Senior J.M., *Optical Fiber Communications: Principles and Practice*, Prentice Hall, 2008.
4. Petruzellis T., *Optoelectronics, Fiber Optics, and Laser Cookbook*, McGraw-Hill.
5. Agrawal G.P., *Fiber Optic Communication Systems*, Wiley Interscience, 2002.

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

1. C.A. Balanis: “Antenna Theory, Analysis & Design”, John Wiley 1997.
2. V. J. Fusco, “Foundation of Antenna Theory & Techniques”, Pearson Prentice Hall, 2005.
3. Stutzman and Thiele, *Antenna Theory and Design*, John Wiley, 1998.
4. Gary E. Evans, “Antenna Measurement Techniques”, Artech House 1990.
5. Warren L. Stutzman, “Polarization in Electromagnetic Systems”, Artech House 1993.

6. T. A. Milligan, "Modern Antenna Design" John Wiley, 2nd edition, 2005.

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.

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.
2. Handbook of International Electrical Safety Practices, Peri, WILEY.
3. Audel House Wiring, All New 8th Edition, Paul Rosenberg, 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, WILE.

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

1. Thomas L. Floyd, Principles of Electric Circuits, 9th Ed., Pearson, 2010.
2. Charles Alexander and Matthew Sadiku, Fundamentals of Electric Circuits, 5th Ed., McGraw Hill, 2013.

3. Allan H. Robbins and Wilhelm C Miller, Circuit Analysis Theory and Practice, 5th Ed., Delmar and Cengage Learning, 2012.
4. James W. Nilsson and Susan Riedel, Electric Circuits, 10th Ed., Prentice Hall, 2014.

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.
2. Handbook of International Electrical Safety Practices, Peri, WILEY.
3. Audel House Wiring, All New 8th Edition, Paul Rosenberg, 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, WILE.

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

1. Charles, K.A & Sadiku, N.O (2013). Fundamental of Electric Circuit (5th ed.). McGraw-Hill.
2. Nilsson, J. W. & Riedel, S. (2015). Electric Circuit (10th ed.). Prentice Hall.
3. Glisson, T. H. (2011). Introduction to Circuit Analysis and Design. Springer.

4. Hayt, W. H. (2012). Engineering Circuit Analysis (8th ed.). McGraw-Hill.
5. O'Maley, J. (2011). Basic Electric Circuit. McGraw-Hill.

PRE-REQUISITE

BEEI 1303
ELECTRICAL CIRCUIT FUNDAMENTAL /
PENGENALAN LITAR ELEKTRIK

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:

1. 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.
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.
3. Bipolar Junction Transistor: construction and operation of BJT, BJT characteristics and measurement technique, limits of operation, βdc and αdc, DC biasing – DC Load Lines. Amplification of signal. Transistor as a switch.
4. Field Effect Transistor: construction and operation of FET, FET characteristics & diagram, Shockley's equation, DC biasing – DC Load Lines-Graphical and mathematical approach.

REFERENCES

1. Boylestad R., Nashelsky L., *"Electronic Devices and circuit Theory"*, Ninth Edition, Prentice Hall Inc., 2006.
2. Floyd, "Electronic Devices", Sixth Edition, Prentice Hall, 2002.
3. R. P. Punagin, "Basic Electronics", Mc-Graw Hill, 2000.

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

1. Paul J. Deitel, Harvey Deitel, "C How to program," 8th Edition, Pearson, 2015.
2. Nicholas J. Macias, "I Can C Clearly Now: Ideas and Exercises for Advancing your Programming Skills," 1st Edition, Indepdent Publisher, 2019.
3. Zed A. Shaw, "Learn C the Hard Way," 1st Edition, Addison-Wesley, 2015.

SEMESTER 3

BEEC 1353
ADVANCED PROGRAMMING /
PENGATURCARAAN LANJUTAN

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

1. Tony Gaddis, Judy Walters, Godfrey Muganda, Starting Out with C++: From Control Structures Through Objects, Addison Wesley, 7th.Edition, 2012.
2. D.S. Malik, C++ Programming: From Problems Analysis to Program Design, Cengage Learning, 7nd Edition, 2015.
3. Nell Dale, C++ Plus Data Structures, 5th Edition, Jones & Bartlett Learning, 2013.

PRE-REQUISITE

BEEC 1313
PROGRAMMING FUNDAMENTAL /
ASAS PENGATURCARAAN

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 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

1. Boylestad R., Nashelsky L., *"Electronic Devices and circuit Theory",* Ninth Edition, Prentice Hall Inc., 2006.
2. S.H. Ruslan et.al. "Elektronik *II"* Penerbitan UTM 1998.
3. Floyd, *"Electronic Devices"*, Sixth Edition, Prentice Hall, 2002.
4. Theodore F. Bogart Jr., Jeffrey S. Beasley and Guillermore Rico, *"Electronic Devices and Circuits",* Sixth Edition, Pearson Education, 2004

PRE-REQUISITE

BEEE 1323
ELECTRONIC FUNDAMENTALS /
PENGENALAN ELEKTRONIK

BEEC 2404
DIGITAL ELECTRONICS / 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

1. Thomas L. Floyd, Digital Fundamentals, 11th Edition, Prentice Hall, 2015.
2. Ronald J.Tocci, Neal S.Widmer, Gregory L.Moss, Digital Systems: Principles and Applications, 12th Edition, Pearson Prentice Hall, 2017.

3. William Klietz, Digital Electronic: A Practical Approach with VHDL, 9th Edition, Pearson Prentice Hall, 2012.
4. Roger L Tokheim, Digital Electronic: Principles and Applications, 8th Edition, McGraw-Hill Education, 2013.

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

1. Mohd Ramzan Zainal, Badri Abd Ghani dan Yahya Samian, Lukisan Kejuruteraan Asas, UTM Skudai, 2000.
2. Yarwood, An Introduction to AutoCAD 2002, Prentice Hall, London, 2002.
3. F. E. Giesecke, Technical Drawing, 11th Ed., Prentice Hall, New York, 1999.
4. Jensen, D. H. Jay, Engineering Drawing and Design, 5th Ed., Glencoe and McGraw Hill, New York, 1996.

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.
3. Report effectively an assignment in a group.

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

1. Jeffrey S. Beasely, Jonathan D. Hymer, Gary M. Miller, Electronic Communication: a systems approach, Pearson, 2014.
2. Simon Haykin, Michael Moher, Communication systems, John Wiley & Sons, 2010.
3. Wayne Tomasi, Electronics Communications Systems Fundamentals Through Advanced, Prentice Hall, Fifth Edition, 2004.
4. John G. Proakis, Essentials of Communication Systems Engineering, Prentice Hall, 2005.

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 veryimportanttostudentsbecauseit gives emphasis on the design of circuits used in electronic systems

REFERENCES

1. Boylestad R., Nashelsky L., *"Electronic Devices and circuit Theory",* Ninth Edition, Prentice Hall Inc., 2006.
2. Stanley, W.D., "*Op-Amps. and Integrated Linear Circuit*", Prentice Hall, 2002
3. Boylestad, R.L., 9th Edition, "*Electronic Devices*", Prentice Hall, 2006

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, under-damped system, reduction of multiple subsystems, blocks diagrams, feedback systems, signal flow graphs, Mason's rule, Routh- Hurwitz criterion and Gain Adjustment compensator design.

REFERENCES

1. Nise, S Norman, Control Systems Engineering, 3th Edition, John Wiley & Sons Inc., United State of America, 2008.
2. Bishop, Dorf, Modern Control Systems, 10th Edition, Prentice Hall, 2008.
3. Smarajit Ghosh, "Control System: Theory and Applications", Pearson India, 2005.

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

1. Hughes E., Electrical Technology, Longman, 11th Edition, 2012.
2. Alexander, Sadiku, Fundamentals of Electric Circuits, Mc-Graw Hill, 4th Edition, 2009.
3. Thomas L. Flyod, Principles of Electric Circuits, 9th Edition, Pearson, 2010.
4. Hadi Saadat, Power System Analysis with Power System Toolbox Software, Mc-Graw Hill, 2ndEdition.
5. Mc Pherson G., Electrical Machine & Transformers, Wiley, 2nd Edition.

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

1. John Stenerson. Industrial Automation and Process Control. Prentice Hall. 2003.
2. Russell Biekert. CIM Technology. Goodheart-Wilcox: Illinois. 1998
3. Mikell P. Groover. Automation, Production Systems, and Computer-Integrated Manufacturing, 2nd Ed., Prentice Hall, 2008
4. Killian. Modern Control Technology: Components and Systems, 2nd Ed, Delmar, 2001

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

1. The microprocessor fundamental principles of software & hardware using 16-bit family. Nik Mohd Kamil Nik Yusoff, Hazizulden Abdul Aziz. Penerbit Universiti Malaysia Pahang (2012).

2. PIC Microcontroller and Embedded System, Using Assembly and C for PIC18. Muhammad Ali Mazidi et. al. Prentice Hall (2010).
3. PIC microcontroller programming. Mohanamba G. CreateSpace Independent Publishing (2015).

BEEE 3394
PROCESS INTRUMENTATION / PROSES INSTRUMENTASI

LEARNING OUTCOMES

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

1. Select an appopriates 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 process control block diagram, analog and digital processing, sensors: thermal, mechanical, and optical; final control operation, controller principles: discontinuous, continuous, and composite control modes; analog controllers, control-loop characteristics and system stability.

REFERENCES

1. Johnson, C. D., "Process Control Instrumentation Technology", 8th Ed., Prentice Hall Inc., 2006.
2. DeSa, Douglas O.J., "Instrumentation Fundamentals for Process Control", Taylor& Francis, 2001.
3. Morris, Alan S., "Measurement and Instrumentation Principles", 3rd Ed, Butterworth-Heinemann, 2001.

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, 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

1. Suarez Conor, Data Acquisition Handbook, Nj Clanrye International 2015.
2. John Park, Steve Mackay, Practical Data Acquisition for Instrumentation and Control Systems, Elsevier, 2003.

3. Bruce Mihura, LabVIEW for Data Acquisition, Prentice Hall 2001.
4. Kevin James, PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control, Newnes 2000.
5. Cornelius T. Leondes, Knowledge-Based Systems Techniques and Applications, 2000 Elsevier Ltd.
6. Labview Course Manual, National Instrument 2006.

SEMESTER 6

BEEE 3414
INDUSTRIAL PNUEMATICS /
PNEUMATIK PERINDUSTRIAN

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

1. Smct.Pt1, *Pneumatic Technology 1*, Textbook, SMC, Graphitype Printing Services, 1998.
2. Anthony Esposito, *Fluid Power with Applications*, 6th ed., Prentice Hall, 2003.
3. Z.L. Lansky, L.F. Schrod, *Industrial Pneumatic Control*, Marcel Dekker Inc, 1986.

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

1. Elecia White, "Making Embedded Systems: Design Pattern for Great Software", O" Reilly Media, 2011
2. Tim Wilmshurst, "Designing Embedded Systems with PIC Microcontrollers, Second Edition: Principles and Applications", Newnes, 2009.
3. Dogan Ibrahim "PIC Microcontroller Projects in C", Newnes, 2014

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 effetively

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

1. *Manual Projek Sarjana Muda (PSM),* Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

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

1. Muhammad H. Rashid, "Power Electronics - Circuit, Devices, and Applications", Prentice Hall, 2004.
2. Ned Mohan, "Electric Drives - An Integrative Approach", Prentice Hall,2003.

3. Muhammad H. Rashid, "Introduction to PSPICE Using ORCAD for Circuits and Electronics", Prentice Hall, 2003.

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

1. Jonathan W. Valvano (2011), Embedded Microcomputer Systems: Real Time Interfacing, CL-Engineering.
2. Tony Gaddis (2015), Starting Out with Java (5th Edition), Pearson.
3. Y. Daniel Liang (2014), Introduction to Java Programming, Comprehensive (9th Edition), Prentice Hall.
4. Wilbert O. Galitz (2007), The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques, Wiley.
5. HarpritSandhu (2008), Making PIC Microcontroller Instruments and Controllers, McGraw-Hill/TAB Electronics.
6. HarpritSandhu (2010), Running Small Motors with PIC Microcontrollers, McGraw-Hill/TAB Electronics.

BEEE 3814
SEMICODUCTOR 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

Integrated Circuits (ICs). Topics covered in this course are as follow Introduction to Microelectronic Fabrication, Cleanroom Technology, Safety & Protocol, Basics of Semiconductor, Wafer Manufacturing, Semiconductor Materials, Wafer Cleaning, Oxidation, Diffusion, Ion Implantation & Annealing, Metallization (CVD and PVD), Etching and Clean Technology

REFERENCES

1. Hwaiyu Geng, CMfgE, P.E. (Palo Alto, California), *"Semiconductor Manufacturing Handbook, Second Edition"*, McGraw-Hill Education; 2 edition (October 6, 2017).
2. ICON Group International, *"The 2018-2023 World Outlook for Semiconductor and Related Device Manufacturing"*, ICON Group International, Inc. (February 7, 2017)
3. Hong Xiao, "*3D IC Devices, Technologies, and Manufacturing (SPIE Press Monographs)*", SPIE-The International Society for Optical Engineering (April 30, 2016)
4. Peter Van Zant, "Microchip Fabrication: A Practical Guide to Semiconductor Processing, Sixth Edition 6th Edition", McGraw-Hill Education; 6 edition (January 7, 2014).

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 processess, materials, technologies of electronics packaging, surface mount assembly and printed board fabrications. Also cover an 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

1. Mikell P. Groover, *Automation, Production Systems and Computer- Integrated Manufacturing*, Prentice Hall (2007).
2. James A. Tompkins, *Facility Planning*, Wiley, 4th Edition, 2010.
3. R. Larry & W. Mattie, *Implementing World Class Manufacturing*, 2nd Edition, WCM Association, 2004.

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 organisatition, 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

1. S.Thomas Foster., *"Managing Quality",* Second Edition, Pearson, Prentice Hall Inc.
2. Barrie G. Dale. *"Managing Quality"*, Fifth Edition
3. Stephen R. Covey's book, *The 7 Habits of Highly Effective People.*

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

1. *Manual Projek Sarjana Muda (PSM),* Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

PRE-REQUISITE

BEEU 3764
BACHELOR DEGREE PROJECT I / PROJECT SARJANA MUDA I

BEEE 4814
INDUSTRAL ROBOTIC / ROBOTIK PERINDUSTRIAN

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

1. J.J. Craig, Introduction to Robotics: Mechanics and Control, 4th Ed., Upper Saddle River, NJ, Pearson Prentice Hall, 2018.
2. Saeed B. Niku, Introduction to Robotics: Analysis, Control, Applications, 2nd Edition, Wiley, 2010.
3. Groover, Industrial Robotics. McGraw-Hill, 2012.

BEEE 4824
ELECTRICAL DRIVES & CONTROL / PEMACU & KAWALAN ELEKTRIK

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

1. Theodore Wildi, Electrical Machines, Drives and Power Systems, Prentice Hall, 2006.
2. Norman S. Nise, Control System Engineering, Wiley, 4th Edition, 2005.
3. Mohamed A. El-Sharkawi, Fundamentals of Electric Drives, Brooks/Cole, 2000.
4. Michael E. Brumbach, Electronic Variable Speed Drives, Delmar Publishers, 2nd Edition.

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

1. Crouch, Alfred L., *Design-for-test For Digial IC's and Embedded Core Systems,* NJ Prentice Hall, 1
2. Sahu, Partha Pratim, *VLSI Design*, McGraw Hill, 2013
3. Ming-Bo Lin, *Introduction to VLSI systems: a logic, circuit, and system perspective*, CRC Press, 2012
4. Lavagno L., Scheffer L., Martin G., *EDA for IC system design, verification, and testing*, CRC Press, 2006
5. Godse, Atul P., Balshi Uday A., *Linear and Digital IC Applications*, Pune Technical Pub, 2008

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.

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

1. Thomas L. Floyd, 2010, Principles of Electric Circuits, 9th ed., Prentice Hall.
2. Earl Gates, 2014, Introduction to basic electricity and electronics technology, Clifton Park.
3. Soumitra Kumar Madal, 2013, Basic electronics, new Delhi: Tata McGraw Hill.

4. Atul P. Godse, Uday A. Bakshi, 2013, Basic Electronics, Pune, India: Technical Pub.
5. Om Prakash, 2013, Electronics coursebook, Anmol Publicalt.

BEEC 1323
COMPUTER ENGINEERING WORKSHOP I /
BENGKEL KEJURUTERAAN KOMPUTER

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

1. Handbook of International Electrical Safety Practices, Peri, WILEY.2010
2. Audel Guide to the 2011 National Electrical Code: All New Edition (Audel Technical Trades Series) - Paperback (Mar. 1, 2011) by Paul Rosenberg
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.

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

1. Michael A. Vine, C Programming 2nd Edition for The Absolute Beginner, Thomson Course Technology, USA, 2008.
2. Jeri R. Hanley, Elliot B. Koffman, Problem Solving and Program Design in C, 7th Edition, Pearson Education Inc, 2013.
3. Paul Deitel, Harvey Deitel, C How to Program 6th Edition, Pearson Education Inc, 2010.

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

1. Thomas L. Floyd, Principles of Electric Circuits, 9th Ed., Pearson, 2010.
2. Charles Alexander and Matthew Sadiku, Fundamentals of Electric Circuits, 5th Ed., McGraw Hill, 2013.
3. Allan H. Robbins and Wilhelm C Miller, Circuit Analysis Theory and Practice, 5th Ed., Delmar and Cengage Learning, 2012.
4. James W. Nilsson and Susan Riedel, Electric Circuits, 10th Ed., Prentice Hall, 2014.

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

1. Handbook of International Electrical Safety Practices, Peri, WILEY.2010
2. Audel Guide to the 2011 National Electrical Code: All New Edition (Audel Technical Trades Series) - Paperback (Mar. 1, 2011) by Paul Rosenberg
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
5. Industrial Bioseparations: Principles and Practice by Daniel Forciniti 2008

BEEC 2373
COMPUTER ORGANIZATION & ARCHITECTURE / ORGANISASI & SENIBINA KOMPUTER

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

1. William Stalling, Computer Organization & Architecture: Designing for Performance, 10th Edition, Prentice Hall, 2015.
2. A.P.Godse, D.A.Godse, Computer Organization And Architecture, 4th Edition, Technical Publications, 2013.
3. Linda Null, Julia Lobur, The essentials of Computer Organization and Architecture, 3rd Edition, Jones & Bartlett Learning, 2012.
4. Organization: design principles and applications, 2nd Edition, Tata McGraw-Hill, 2010.

BEEC 1353
ADVANCED PROGRAMMING / PENGATURCARAAN LANJUTAN

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

1. Tony Gaddis, Judy Walters, Godfrey Muganda, Starting Out with C++: From Control Structures Through Objects, Addison Wesley, 7th.Edition, 2012.
2. D.S. Malik, C++ Programming: From Problems Analysis to Program Design, Cengage Learning, 7nd Edition, 2015.
3. Nell Dale, C++ Plus Data Structures, 5th Edition, Jones & Bartlett Learning, 2013.

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

1. Michael Main and Walter Savitch, Data Structures and Other Objects Using C++, Fourth Edition, Pearson, 2011.

2. Adam Drozdek, Data Structures and Algorithms in C++, 4th Ed., Cengage Learning, 2013.
3. Varsha H. Patil, Data Structures Using C++, Oxford University Press, 2012.

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 analog modulation techniques through experiments that commonly used in telecommunication system.
3. Report effectively an assignment in a group.

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

1. Jeffrey S. Beasely, Jonathan D. Hymer, Gary M. Miller, Electronic Communication: a systems approach, Pearson, 2014.
2. Simon Haykin, Michael Moher, Communication systems, John Wiley & Sons, 2010.
3. Wayne Tomasi, Electronics Communications Systems Fundamentals Through Advanced, Prentice Hall, Fifth Edition, 2004.
4. John G. Proakis, Essentials of Communication Systems Engineering, Prentice Hall, 2005.

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 subject will cover various topics such as Introduction to Continuous-Time Signals and Systems: Fundamental Concept, Transformations of Continuous-Time Signals, Signal Characteristics, Common Signals, Continuous-Time Systems and Its Properties, Convolution for Continuous- Time LTI Systems, Properties of Convolution, Properties of LTI Systems; Fourier Series: Introduction of continuous Fourier Series and Its Coefficients; Fourier Transform: Definition, Properties of continuous Fourier Transform, Application of Fourier Transform, Energy and Power Density Spectra; Laplace Transform: Definition, Properties of Laplace Transform, Response of LTI Systems: Initial Condition, Transfer

Functions, Convolution, Transforms with Complex and Repeated Poles.

REFERENCES

1. Singh, Ravish R, Network analysis and synthesis, New Delhi, India: McGraw Hill Education (India), 2013.
2. Kumar, A. Anand, Signals and systems, 2nd Edition, New Delhi: PHI Learning, 2012.
3. Roberts, Michael J, Signals and systems: analysis using transform methods and MATLAB, 2nd Edition, New York, NY: McGraw-Hill, 2012
4. Palamides, Alex, Signals and systems laboratory with MATLAB, Boca Raton, Fla.: CRC Press, 2011.
5. Floyd, Thomas L, Electric circuits fundamentals, 8th Edition, Upper Saddle River, NJ: Prentice Hall, 2010.

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

1. Hughes E., Electrical Technology, Longman, 11th Edition, 2012.
2. Alexander, Sadiku, Fundamentals of Electric Circuits, Mc-Graw Hill, 4th Edition, 2009.
3. Thomas L. Flyod, Principles of Electric Circuits, 9th Edition, Pearson, 2010.
4. Hadi Saadat, Power System Analysis with Power System Toolbox Software, Mc-Graw Hill, 2ndEdition.
5. Mc Pherson G., Electrical Machine & Transformers, Wiley, 2nd Edition.

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

1. Oppel, Andrew J. Databases DeMYSTiFied. 2nd Edition. New York, NY: McGraw-Hill, 2011
2. Jeffrey A. Hoffer, Mary Prescott and Heikki Topi. Modern Database Management. 10th Edition. Prentice Hall. 2011
3. Alan Dennis Barbara, Haley Wixom and David Tegarden. Systems Analysis and Design with UML. 4th Edition. Wiley. 2012
4. Peter Rob and Carlos Coronel. Database Systems: Design, Implementation, and Management. Course Technology. 11th Edition. 2015

BEEC 2383
COMPUTER NETWORK & SYSTEM / SISTEM & RANGKAIAN KOMPUTER

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

This subject will discuss on Introduction to Computer Network and System, Networking Equipments and Data Communications, Network Architecture and Protocols, Local and Wide Area Networks, Client-Server Computing: Web technologies, Wireless, Mobile Computing and Mobile Data Access

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

1. Douglas Comer, Computer networks and Internets, 5thEd. Prentice Hall 2009.
2. William Stallings, Data and Computer Communication, 8th Ed. Prentice Hall, 2007.
3. Faurozan, B, Data Communication & Networking, 4th Ed. McGraw Hill, 2007.

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

1. Douglas E. Comer, The Internet Book, 4thedition. Pearson Prentice Hall, 2007.
2. BehrouzForouzan, Data Communications and Networking, 5th Edition, McGraw-Hill, 2012.
3. Jennifer Preece, Yvonne Rogers and Helen Sharp, Interaction Design: beyond human-computer interaction, (3rd Edition), John Wiley & Sons, 2011.
4. Dov Te'eni, Jane Carey and Ping Zhang, Human Computer Interaction: Developing Effective Organizational Information Systems, John Wiley & Sons, 2007.

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

1. Thomas L. Floyd, Digital Fundamentals (10 edition), Prentice Hall, 2008
2. Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, Digital Systems: Principles and Applications, (11 Edition) Pearson Prentice Hall, 2010
3. William Klietz, Digital Electronic: A Practical Approach, (8 Edition) Prentice Hall, 2007.
4. Marcovitz A. B., Introduction to Logic Design, 2nd Ed., McGraw Hill, 2005

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

1. William Stallings, Operating Systems: Internals and Design Principles 7th Ed., Pearson Education, 2012.
2. Silberschatz, A., Operating system concepts 9th Ed., John Wiley & Sons, 2014.
3. Haldar, S., Operating Systems, Pearson, 2010.
4. Smith R. W., Linux essentials, Wiley Publishing, 2012.
5. Blum R., Linux command line and shell scripting bible, Wiley Publishing, 2011.

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

1. James L. Hein (2009) Discrete Structures, Logic, and Computability, Jones & Bartlett Publishers
2. Harry Kesten (2010) Probability on Discrete Structures (Encyclopaedia of Mathematical Sciences), Springer.
3. Alexander Stanoyevitch (2011) Discrete Structures with Contemporary Applications. Chapman and Hall/CRC.
4. Hein, James L., "Discrete structures, logic, and computability", Jones and Bartlett Pub, 2010.

BEEC 3423
COMPUTER SYSTEM ENGINEERING /
KEJURUTERAAN SISTEM KOMPUTER

LEARNING OUTCOMES

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

1. Analyze the complexity of the computer system with respect to reliability and performance.
2. Adapt the concept and theory of computer system engineering to solve the given experimental problem
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; recoveryand 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 usability. Boca Raton, FL: CRC Press, 1st ed, 2013.
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

1. Siti Rahayu, Robiah, Mohd Faizal and Nazrulazhar (2006), Information Technology Security, Pearson, ISBN 13 978-983-3655-47-2.
2. Dieter Gollmann (2006). Computer Security
3. William Stallings (2006), 4th Edition, Cryptography and Network Security: Principles and Practice, Pearson International Edition, ISBN 0-13-202322-9.
4. Mark Merkow and Jim Breithaupt (2006), Information Security: Principles and Practices, Pearson Prentice Hall, ISBN 0-13-154729-1.
5. Security+ Guide to Network Security Fundamentals by Mark D. Ciampa 2008

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

1. The 68000 Microprocessor: Hardware and Software, Principles and Application. James L. Antonakos. Prentice Hall (2012)
2. PIC Microcontroller and Embedded System, Using Assembly and C for PIC18. Muhammad Ali Mazidi et. al. Prentice Hall (2010)
3. Pic microcontroller programming Mohanamba G. CreateSpace Independent Publishing (2015)
4. Microprocessor Theory and Applications with 68000/68020 and Pentium. Mohamed Rafiquzzaman. Wiley (2008)
5. Microprocessors Software and Hardware Design Using MC68000. M. H. Hassan. Innovate LLC (2008)

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 effetively.

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

1. *Manual Projek Sarjana Muda (PSM),* Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

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

1. Sommerville, I (2011) Software Engineering, 9th Edition: International Edition, Pearson Education.
2. IEEE Standards Association, "IEEE Std 12207-2008 Systems and software engineering – Software life cycle processes", 2008.
3. Sommerville, I (2011) Software Engineering, 9th Edition, Addison Wesley.
4. Pressman, R.S (2015) Software Engineering a Practitioner's Approach, 8th Edition. McGraw-Hill.
5. CMMI Product Team, "CMMI for Development, Version 1.2", August 2008.
6. Elmasri, Navathe, (2009) Fundamentals of Database Systems6th Edition. Addison Wesley.

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.
3. Report effectively an assignment in a group.

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

1. Proakis, J. and Manolakis, D., 2014. Digital Signal Processing 4th ed., Pearson.
2. Mitra, S.K., 2011. Digital Signal Processing: A Computer-Based Approach, McGraw-Hill.
3. Oppenheim, A. V and Schafer, R.W., 2009. Discrete Time Signal Processing, 3rd ed., Pearson.
4. Mohd Saad, N and Abdullah, A. R., 2007. Real-Time Digital Signal Processing – A Practical Approach using TMS320C6713 DSP Processor, Penerbit UTeM.

PRE-REQUISITE

BEET 2423
SIGNAL & SYSTEMS / ISYARAT & SISTEM

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

1. *Manual Projek Sarjana Muda (PSM),* Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

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 organisatition, 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

1. S.Thomas Foster., *"Managing Quality",* Second Edition, Pearson, Prentice Hall Inc.
2. Barrie G. Dale. *"Managing Quality",* Fifth Edition
3. Stephen R. Covey's book, *The 7 Habits of Highly Effective People*

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

1. R. Kamal, "Embedded Systems: Architecture, Programming and Design", Tata McGraw-Hill Education, 2011
2. E. Lipiansky, "Embedded Systems Hardware for Software Engineers", McGraw-Hill Education, 2011
3. T. Wilmshurst, "Designing Embedded Systems with PIC Microcontrollers", 2nd Edition, Newnes, 2010
4. D. Ibrahim, "Advanced PIC Microcontroller Projects in C: From USB to RTOS with the PIC18F Series", Elsevier, 2008
5. M.A. Mazidi, R.D. McKinlay, D. Causey, "PIC Microncontroller and Embedded System Using Assembly and C for PIC18", Pearson Prentice Hall, 2008
6. Shibu, "Introduction to Embedded Systems", Tata McGraw-Hill Education, 2009

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.

BEEC 4804
VLSI DESIGN & FABRICATION /
REKA BENTUK & FABRIKASI VLSI

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

1. Vilas S. Bagad, VLSI Technology and Design, Technical Pub., 2012
2. Sahu, Partha Pratim, VLSI Design, McGraw Hill, 2013
3. Ming-Bo Lin, Introduction to VLSI systems: a logic, circuit, and system perspective, CRC Press, 2012
4. Brown, Stephen, Fundamentals of digital logic with Verilog design, McGraw Hill, 2014

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

1. Jonathan W. Valvano (2011), Embedded Microcomputer Systems: Real Time Interfacing, CL-Engineering.
2. Tony Gaddis (2015), Starting Out with Java (5th Edition), Pearson.
3. Y. Daniel Liang (2014), Introduction to Java Programming, Comprehensive (9th Edition), Prentice Hall.
4. Wilbert O. Galitz (2007), The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques, Wiley.
5. HarpritSandhu (2008), Making PIC Microcontroller Instruments and Controllers, McGraw-Hill/TAB Electronics.
6. HarpritSandhu (2010), Running Small Motors with PIC Microcontrollers, McGraw-Hill/TAB Electronics.

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

1. Maria Petrou and Costas Petrou, "Image Processing: the Fundamentals", 2nd Ed,, John Wiley & Sons, 2010.
2. John C. Russ, The Image Processing Handbook, 6th Ed., CRC Press, 2011.
3. Milan Sonka and Vaclav Hlavac, "Image Processing, Analysis, and Machine Vision", 4th Ed., Cengage Learning, 2015.

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

1. Laplante, Philip A, "Real-time systems design and analysis: tools for the practitioner", Wiley-IEEE Press, 2012.
2. Cheng, Albert M. K., "Real-time systems: scheduling, analysis, and verification", Wiley-Interscience, 2002.
3. Bertolotti, Ivan Cibrario, "Real-time embedded systems: open-source operating systems perspective", CRC Press, 2012.
4. E.-R. Olderog and H, Dierks "Real-Time Systems: Formal Specification and Automatic Verification", Cambridge University Press, 2008.
5. Tarek F. Abdelzaher, Giorgio Buttazzo and KrithiRamamritham. "Real-Time Systems: The International Journal of Time-Critical Computing Systems", Springer, 2011.

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

1. Crouch, Alfred L., Design-for-test for Digial IC's and Embedded Core Systems, NJ Prentice Hall, 1
2. Sahu, Partha Pratim, VLSI Design, McGraw Hill, 2013
3. Ming-Bo Lin, Introduction to VLSI systems: a logic, circuit, and system perspective, CRC Press, 2012
4. Lavagno L., Scheffer L., Martin G., EDA for IC system design, verification, and testing, CRC Press, 2006
5. Godse, Atul P., Balshi Uday A., Linear and Digital IC Applications, Pune Technical Pub, 2008

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

Introduction to Industrial Safety and Health + Lab Safety, Equipment- theory, industrial practices, 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, Engineering: Environmental Health and Safety for Municiple Infrastructure, 6thEdition, Nelson
2. L. Nemerow, Franklin J. Agardy, Joseph A. Salvato, 2009, WILEY
3. Circuit Systems with MATLAB and PSpice, Won Y. Yang, Seung C. Lee, 2012, Hongrung Science
4. Managing, Controlling and Improving Quality, 1st Edition, Douglas C. Montgomery, Cheryl L. Jennings, Michele E. Pfund, 2010, WILEY
5. Clyde Coombs, Happy Holden; Printed Circuits Handbook, 7th 2016, McGraw-Hill Education
6. Engineering Design: A Project Based Introduction, 3rd Edition, 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

1. Thomas L. Floyd, Principles of Electric Circuits, 9th Ed., Pearson, 2010.
2. Charles Alexander and Matthew Sadiku, Fundamentals of Electric Circuits, 5th Ed., McGraw Hill, 2013.
3. Allan H. Robbins and Wilhelm C Miller, Circuit Analysis Theory and Practice, 5th Ed., Delmar and Cengage Learning, 2012.
4. James W. Nilsson and Susan Riedel, Electric Circuits, 10th Ed., Prentice Hall, 2014.

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

1. Paul J. Deitel, Harvey Deitel, "C How to program," 8th Edition, Pearson, 2015.
2. Nicholas J. Macias, "I Can C Clearly Now: Ideas and Exercises for Advancing your Programming Skills," 1st Edition, Indepdent Publisher, 2019.
3. Zed A. Shaw, "Learn C the Hard Way," 1st Edition, Addison-Wesley, 2015.

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, βdc and αdc, 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

1. Boylestad R., Nashelsky L., "Electronic Devices and circuit Theory", Ninth Edition, Prentice Hall Inc., 2006.
2. Floyd, "Electronic Devices", Sixth Edition, Prentice Hall,
2002.
3. R P Punagin, "Basic Electronics", Mc-Graw Hill, 2000

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

1. Mohd Ramzan Zainal, Badri Abd Ghani dan Yahya Samian, Lukisan Kejuruteraan Asas, UTM Skudai, 2000.
2. Yarwood, An Introduction to AutoCAD 2002, Prentice Hall, London, 2002.
3. F. E. Giesecke, Technical Drawing, 11th Ed., Prentice Hall, New York, 1999.
4. Jensen, D. H. Jay, Engineering Drawing and Design, 5th Ed., Glencoe and McGraw Hill, New York, 1996.

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 covers 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
2. Handbook of International Electrical Safety Practices, Peri, 2010, Wiley
3. Audel House Wiring, All New 8th Edition, Paul Rosenberg, 2004 Wiley
4. EMC and the Printed Circuit Board: Design, Theory and Layout Made Simple. 2005 Mark.I, Montrose, Wiley
5. Industrial Bioseparations: Principles and Practice, 2008. Daniel Forciniti, Wiley

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

1. Charles, K.A & Sadiku, N.O. Fundamental of Electric Circuit (6th ed.). 2016. McGraw-Hill.
2. Nilsson, J. W. & Riedel, S. Electric Circuit (10th ed.). 2015. Prentice Hall.
3. Hughes, Electrical & Electronics Technology, 11th ed. 2012. Prentice Hall, Feb 2012
4. McPherson G., An Introduction to Electrical Machine & Transformers. 1990. Wiley, 2nd Edition

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

1. Boylestad R., Nashelsky L., "Electronic Devices and circuit Theory", Ninth Edition, Prentice Hall Inc., 2006.
2. S.H. Ruslan et.al. "Elektronik II" Penerbitan UTM 1998.
3. Floyd, "Electronic Devices", Sixth Edition, Prentice Hall, 2002.
4. Theodore F. Bogart Jr., Jeffrey S. Beasley and Guillermore Rico, "Electronic Devices and Circuits", Sixth Edition, Pearson Education, 2004.

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,

Convolution for LTI Systems, Properties of Convolution, Properties of LTI Systems; Fourier Series And Discrete Time Fourier Series: Introduction of Fourier Series and Its Coefficients, Frequency Spectra, Fourier Series Properties; Fourier Transform And Discrete Time Fourier Transform: Definition, Properties of Fourier Transform, Application of Fourier Transform, Energy and Power Density Spectra; Laplace Transform: Definition, Properties of Laplace Transform, Response of LTI Systems: Initial Condition, Transfer Functions, Convolution, Transforms with Complex and Repeated Poles. Sampling Theory and aliasing.

REFERENCES

1. Alan V. Oppenheim, Alan S. Willsky and S. Hamid Nawab, Signals and Systems, 2nd Ed. 2015
2. Kumar, A. Anand, Signals and systems, 2nd Edition, New Delhi: PHI Learning, 2012.
3. Roberts, Michael J, Signals and systems: Analysis using transform methods and MATLAB, 2nd Edition, New York, NY: McGraw-Hill, 2012
4. Palamides, Alex, Signals and systems laboratory with MATLAB, Boca Raton, Fla.: CRC Press, 2011.
5. Floyd, Thomas L, Electric circuits fundamentals, 8th Edition, Upper Saddle River, NJ: Prentice Hall, 2010.

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

1. Thomas L. Floyd, Digital Fundamentals, 11th Edition, Prentice Hall, 2015
2. Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, Digital Systems: Principles and Applications, 12th Edition, Pearson Prentice Hall, 2016.
3. William Klietz, Digital Electronic: A Practical Approach, 8th Edition, Prentice Hall, 2007.
4. Marcovitz A. B., Introduction to Logic Design, 3rd Edition, McGraw Hill, 2005.

BEEZ 1213
INSTRUMENTATION & MEASUREMENT /
INSTRUMENTASI & PENGUKURAN

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

1. HS Kalsi, Electronic Instrumentation, 3rd Ed., Tata McGraw Hill, 2010.
2. Robert B. Northrop, " Introduction to Instrumentation and Measurements" 3rd Ed. CRC Press, 2017.
3. S Wolf, Richard F.M Smith, Reference Manual for Electronic Instrumentation Laboratories 2nd Ed., Prentice-Hall, 2004.
4. Calibration Book, Vaisala Oyj, Vaisala 2006.

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.
3. Report effectively an assignment in a group.

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

1. Wayne Tomasi, Electronics Communications Systems Fundamentals Through Advanced, Prentice Hall, 5th Edition, 2008.
2. John G. Proakis, Fundamentals of Communication Systems Engineering, Prentice Hall, 2013.
3. Frenzel, Communication Electronics/; Principles and Applications, McGraw Hill, 3rd Edition, 2000.

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 adjusment 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, under-damped system, reduction of multiple subsystems, blocks diagrams, feedback systems, signal flow graphs, Mason's rule, Routh- Hurwitz criterion and Gain Adjustment compensator design.

REFERENCES

1. Nise, S Norman, Control Systems Engineering, 3th Edition, John Wiley & Sons Inc., United State of America, 2008.
2. Bishop, Dorf, Modern Control Systems, 10th Edition, Prentice Hall, 2008.
3. Smarajit Ghosh, "Control System: Theory and Applications", Pearson India, 2005.

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

1. Boylestad R., Nashelsky L., "Electronic Devices and circuit Theory", Eleventh Edition, Prentice Hall Inc., 2014.
2. Floyd, "Electronic Devices", Ninth Edition, Prentice Hall, 2014.

3. Stanley, W.D., "Op-Amps. and Integrated Linear Circuit", Prentice Hall, 2002

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

1. Microcontrollers: Architecture, Programming, Interfacing and System Design, Rajkamal, 2nd Ed Pearson (2012)
2. PIC Microcontroller and Embedded System, Using Assembly and C for PIC18. Muhammad Ali Mazidi et. al. Prentice Hall (2010)
3. Pic microcontroller programming. Mohanamba CreateSpace Independent Publishing (2015)

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

1. M.N.O. Sadiku, Elements of Electromagnetics, 6th. Edition, Oxford University Press, 2014.
2. U. S. Inan, A. Inan and R. Said, Engineering Electromagnetics and Waves, 2nd Ed, Pearson 2015
3. S. M. Wentworth, Fundamentals of Electromagnetics with Engineering Applications, Wiley, 2006
3. Proakis, Manolikas, Digital Signal Processing : Principles, Algorithms, and Applications, 4th Edition, Pearson, 2013.

PRE-REQUISITE

BEET 2423
SIGNAL & SYSTEMS / ISYARAT & SISTEM

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.
3. Report effectively an assignment in a group.

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

1. Sanjit K.Mitra, Digital Signal Processing: A Computer Based Approach, 4th Ed.Mc Graw Hill,2010.
2. Oppenheim, Schafer, Discrete-time Signal Processing, Prentice-Hall, 2010

BEEC 2383
COMPUTER NETWORK & SYSTEM / SISTEM & RANGKAIAN KOMPUTER

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

Topics covered: Overview: Introduction to Computer Network and System, Networking Equipment and Data Communications, Network Architecture and Protocols, Local and Wide Area Networks, Client-Server Computing: Web technologies, Wireless, Mobile Computing and Mobile Data Access 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. Fundamental of IOT, Application of IOT.

REFERENCES

1. Faurozan, B, Data Communication & Networking, 5th Ed. McGraw Hill, 2014.
2. Vilas S. Bagad, Iresh A. Dhotre, Data Communication and Networking, 2nd Ed. India: Technical Pub., 2013. Chris Sanders, Practical Packet Analysis, 3rd Ed. Willian Pollock. 2017
3. Douglas Comer, Computer networks and Internets, 6thEd. Prentice Hall 2014.

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.
2. Richard G. Budynas and J. Keith Nisbett, Shigley's Mechanical Engineering Design (McGraw-Hill Series

in Mechanical Engineering) 10th Edition, January 27, 2014
3. Peter R. N. Childs, 2013, Mechanical Design Engineering Handbook Butterworth-Heinemann; 1 edition (November 18, 2013).
4. Michael F. Ashby., 2010, Materials Selection in Mechanical Design, Fourth Edition 4th Edition, Butterworth-Heinemann; 4 edition (October 5, 2010).

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

1. Annabel Z. Dodd, "The Essential Guide to Telecommunications." 5th Ed. Prentice Hall, 2012.
2. Afif Osseiran, Jose F. Monserrat, Patrick Marsch, Mischa Dohler, 5G Mobile and Wireless Communications Technology, Cambridge University Press, 2016.
3. Cory Beard and William Stallings, Wireless Communication Networks and System, Pearson, 2015
4. Bassem R. Mahafza, Radar System Analysis and Design Using MATLAB, 3rd Ed. CRC Press, 2013.
5. L. J. Ippolito Jr. Satellite Communications Systems Engineering: Atmospheric Effects, Satellite Link Design and System Performance, Wiley. 2017.
6. Bran Edgeworth, Aaron Foss, Ramiro Garza Rios, IP Routing on Cisco IOS, IOS XE, and IOS XR: An Essential Guide to Understanding and Implementing IP Routing Protocols (Networking Technology), Cisco Press, 2014.

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

1. Frank Gustrau, RF and Microwave Engineering: Fundamentals of Wireless Communications, Wiley. 2012
2. Pierre Jarry and Jacques N. Beneat, Microwave Amplifier and Active Circuit Design Using the Real Frequency Technique, Wiley-IEEE, 2016
3. Roger, C. Palmer, An Introduction to RF Circuit Design for Communication System, Copyright, 2016
4. Ahmad Shahid Khan, Microwave Engineering: Concepts and Fundamentals, CRC Press, 2014

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

1. F. Martini, M. Timmons, and R. Tallitsch, Human Anatomy. 2012.
2. E. N. Marieb and K. Hoehn, Human Anatomy & Physiology, 10th ed. Pearson, 2015.
3. C. L. Stanfield, Principles of Human Physiology, 6th ed. Pearson Education, 2016.
4. D. U. Silverthorn, Human Physiology: An Integrated Approach, 7th ed. Pearson Education, 2016.
5. E. N. Marieb and L. A. Smith, Human Anatomy and Physiolog Laboratory, 11th ed. Pearson, 2015

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

1. S. R. Sternberg, "Biomedical Image Processing," Computer (Long. Beach. Calif)., vol. 16, no. 1, pp. 22– 34, 1983.
2. W. Birkfellner, "Applied Medical Image Processing: A Basic Course," 2nd ed. CRC Press, 2014.
3. K. Najarian and R. Splinter, Biomedical Signal and Image Processing, 2nd ed. CRC Press, 2012.
4. M. Analoui, J. D. Bronzino, and D. R. Peterson, Medical
   Imaging: Principles and Practices. CRC Press, 2013.
5. M. Sonka and J. M. Fitzpatrick, Eds., Handbook of Medical Imaging, Volume. Medical Image Processing and Analysis. SPIE Publications, 2009.
6. M. D. Abràmoff, P. J. Magalhães, and S. J. Ram, "Image processing with ImageJ," Biophotonics International, vol. 11, no. 7. pp. 36–41, 2004.

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. Analysis the behaviour 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

1. Donald A. Neaman, Semiconductor Physics and Devices: Basic Principles, 4th Ed., McGraw-Hill, 2011
2. Umesh Mishra and Jasprit Singh, Semiconductor Device Physics and Design, Springer, 2014
3. Josef Lutz, Heinrich Schlangenotto, Uwe Scheuermann and Rik De Doncker, Semiconductor Power Devices: Physics, Characteristics, Reliability, Springer, 2011

BEEZ 4903
SEMICONDUCTOR PROCESS /
PROSES 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

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

1. Hwaiyu Geng, CMfgE, P.E. (Palo Alto, California), "Semiconductor Manufacturing Handbook, Second Edition", McGraw-Hill Education; 2 edition (October 6, 2017)
2. ICON Group International, "The 2018-2023 World Outlook for Semiconductor and Related Device Manufacturing", ICON Group International, Inc. (February 7, 2017)
3. Hong Xiao, "3D IC Devices, Technologies, and Manufacturing (SPIE Press Monographs)", SPIE-The, International Society for Optical Engineering (April 30, 2016)
4. Peter Van Zant, "Microchip Fabrication: A Practical Guide to Semiconductor Processing, Sixth Edition 6th Edition", McGraw-Hill Education; 6 edition (January 7, 2014).

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

1. Hee C. Lim Sensors interfacing with LabVIEW, CreateSpace Independent Publishing Platform, 2016
2. Maurizio D. P. Emilio, Data acquisition systems: From Fundamentals to Applied Design, Springer 2013.
3. Jacob Fraden, Handbook of Modern Sensors, Physics, Designs, and Applications, Springer.2015
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 effetively.

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

1. *Manual Projek Sarjana Muda (PSM),* Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

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

1. C.A. Balanis: “Antenna Theory, Analysis & Design”, 4th
   Ed. John Wiley 2016
2. Boris Levin, “Antenna Engineering: Theory and Problems" CRC Press, 2017
3. Stutzman and Thiele, Antenna Theory and Design, 3rd., John Wiley, 2012

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

1. Theodore S. Rappaport, Wireless Communications: Principles and Practice, 2nd Edition, Prentice Hall, 2004.
2. Wayne Tomasi, Electronic Communications Systems, 5th Edition, Prentice Hall, 2004.
3. W.C.Y. Lee, Mobile Cellular Telecommunications: Analog and Digital Systems, McGraw-Hill, 1995.
4. R. Blake, “Wireless Communication Technology", Thomson Delmar, 2003.
5. W.C.Y.Lee, "Mobile Communications Engineering: Theory and applications, Second Edition, McGraw-Hill International, 1998.
6. S. Hideichi, “Mobile Communications”, Ohmsha Ltd., 2000.

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

1. L. J. Street, Introduction to Biomedical Engineering Technology, 3rd ed. CRC Press, 2017.
2. Y. K. Chan, Biomedical Device Technology, 2nd ed. Charles C Thomas Pub Ltd, 2016.
3. A.B. Ritter, V. Hazelwood, A. Valdevit and A. N. Ascione, Biomedical Engineering Principles, CRC Press, 2011.
4. S. Chatterjee and A. Miller, Biomedical Instrumentation Systems. New York: Delmar Cengage Learning, 2010.
5. WHO, Maintenance and Repair of Laboratory, Diagnostic Imaging and Hospital Equipment, World Health Organization, 1994.

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

1. T. L. Beauchamp and J. F. Childress, Principles of Biomedical Ethics, 7th ed. Oxford University Press, 2012.
2. R. M. Veatch, A. M. Haddad, and D. C. English, Case Studies in Biomedical Ethics: Decision-making, principles and cases, 2nd ed. Oxford University Press, 2014.
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

1. Partha P. Sahu, VLSI Design, McGraw-Hill Education, 2013
2. Yuan Taur and Tak H. Ning, Fundamentals of Modern VLSI Devices, 2nd Ed. Cambridge University Press, 2013
3. Hongjiang Song, VLSI Analog Circuits: Algorithms, Architecture, Modeling, and Circuit Implementation, 2nd, McGraw Hill Professional, 2016
4. El-Hang Lee, Louay A. Eldada, Manijeh Razeghi, Chennupati Jagadis, VLSI Micro- and Nanophotonics: Science, Technology and Applications, CRC Press 2016IEC 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

1. Steven H. Voldman, ESD : Circuits and Devices, 2nd., Wiley, 2015

2. Charles H. Roth, Lizy Kurian John and Byeong Kil Lee, Digital Systems Using Verilog, Cengage Learning, 2016
3. Louis Scheffer, Luciano Lavagno, Igor L. Markov and Grant Martin, Electronic Design Automation for IC Implementation, Circuit Design, and Process Technology (Electronic Design Automation for Integrated Circuits Handbook), 2nd, CRC Press 2016

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

1. *Manual Projek Sarjana Muda (PSM),* Fakulti Teknologi Kejuruteraan, Universiti Teknikal Malaysia Melaka.

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 organisatition, 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

1. S.Thomas Foster., "Managing Quality", Second Edition, Pearson, Prentice Hall Inc.
2. Barrie G. Dale. "Managing Quality", Fifth Edition
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

1. Elecia White, "Making Embedded Systems: Design Pattern for Great Software", O'Reilly Media, 2011
2. Tim Wilmshurst, "Designing Embedded Systems with PIC Microcontrollers, Second Edition: Principles and Applications", Newnes, 2009.
3. Dogan Ibrahim "PIC Microcontroller Projects in C", Newnes, 2014

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

1. Timothy Pratt, Charles Bostian, Jeremy Allnutt, "Satellite Communication", JWiley Publications 2nd Editions, 2003.
2. Wilbur L. Pritchard, Robert A Nelson, Hendri G. Suyderhoud, "Satellite Communication Enginering", Pearson Publications 2003.
3. M. Richharia,, Satellite Communication, BSP, 2003
4. K.n. Raja Rao, Fundamentals of satellite Communications, PHI, 2004
5. G. Maral & M. Bousquet, Satellite Communications Systems, 4th Edition, John Wiley & Sons, 2002.
6. Dennis Roddy, Satellite Communications, 3rd Edition, McGraw Hill, 2001

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

Introduction to Terrestrial Systems: shape of the Earth, maps and coordinate systems/Datum, distances and direction on the surface of the Earth, errors calculations. Introduction to Radar: continuous scan, radar equations, types of radar dispersion characteristics. Hyperbolic Systems: OMEGA, DECCA, LORAN-C. Direction Finding: frequencies and transmitter, directivity, receiver antenna, accuracies. Aircraft Systems: VHF Omnidirectional Range (VOR), Distance Measuring Equipment (DME), Instrument Landing System (ILS), Microwave Landing System (MLS). Introduction to Satellite Systems: satellite orbits and geometry, satellite navigation principles, error calculations. TRANSIT: satellites, navigation principles, receiver, frequencies, accuracy. Coding of Satellite Signals: spread spectrum, spreading functions, correlation function, generation of the codes, receiver, spread spectrum in NAVSTAR/GPS. NAVSTAR/GPS: satellite orbits, satellites, control segment, navigation messages, receiver, differential GPS, accuracy, integration with other navigation systems. GLONASS: satellite orbits, navigation signals, codes, navigation messages, receiver, accuracy. Other Satellite Navigation Systems: TSIKADA, STARFIX, GEOSTAR/LOCSTAR,
NAVSTAR, Galileo, Beidou/Compass.

REFERENCES

1. John W. Betz, Engineering Satellite-Based Navigation and Timing: Global Navigation Satellite Systems, Signals, and Receivers, Wiley, 2015
2. Mohinder S. Grewal and Angus P. Andrews, Global Navigation Satellite Systems, Inertial Navigation, and Integration, Wiley.2013
3. B. Hofmann-Wellenhof, Klaus Legat and M. Wieser, Navigation Principles of Positioning and Guidance, Springer-Verlag, 2011

BEEZ 4843
BIOMEDICAL ENGINEERING MAINTENANCE / PENYELENGGARAN KEJURUTERAAN BIOPERUBATAN

LEARNING OUTCOMES

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

1. Evaluate and determine fault based learned concepts.
2. Manipulates learned concepts in solving problems of the medical devices and electronic circuits.
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

1. D. R. Tomal and A. S. Agajanian, Electronic Troubleshooting, 4th ed. McGraw-Hill Education, 2014.
2. R. Khandpur, Troubleshooting Electronic Equipment. McGraw-Hill Education TAB, 2006.
3. R. G. Gupta, Electronic Instruments and Systems: Principles, Maintenance and Troubleshooting. Tata Mcgraw-Hill Publishing Company Limited, 2001.
4. R. Pain, Practical Electronic Fault Finding and Troubleshooting. Oxford: Reed Educational and Professional Publishing Ltd, 1996.
5. R. Pease, Troubleshooting Analog Circuits (EDN Series for Design Engineers). Newnes, 1991
6. G. Cameron, TRIZICS : Teach yourself TRIZ, how to invent, innovate and solve “impossible” technical problems systematically. CreateSpace Independent Publishing Platform, 2010.
7. WHO, Maintenance and Repair of Laboratory, Diagnostic Imaging and Hospital Equipment, World Health Organization, 1994.

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

1. N. Özkaya, D. Leger, D. Goldsheyder, and N. Margareta, Fundamentals of Biomechanics: Equilibirium, Motion and Deformation, 4th ed. Springer, 2017.
2. N. Margareta and V. H. Frankel, Basic Biomechanics of Musculoskeletal System, 4th ed. Lippincott Williams & Wilkins, 2012.
3. J. Hamill, K. M. Knutzen, and T. R. Derrick, Biomechanical Basis of Human Movement, 4th ed. Lippincott Williams & Wilkins, 2015.

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

1. Louis Scheffer, Luciano Lavagno, Igor L. Markov and Grant Martin, Electronic Design Automation for IC Implementation, Circuit Design, and Process Technology (Electronic Design Automation for Integrated Circuits Handbook), 2nd, CRC Press 2016
2. Hongjiang Song, VLSI Analog Circuits: Algorithms, Architecture, Modeling, and Circuit Implementation, 2nd, McGraw Hill Professional, 2016
3. Yuan Taur and Tak H. Ning, Fundamentals of Modern VLSI Devices, 2nd Ed. Cambridge University Press, 2013

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

1. Louis Scheffer, Luciano Lavagno, Igor L. Markov and Grant Martin, Electronic Design Automation for IC Implementation, Circuit Design, and Process Technology (Electronic Design Automation for Integrated Circuits Handbook), 2nd, CRC Press 2016
2. Charles H. Roth, Lizy Kurian John and Byeong Kil Lee, Digital Systems Using Verilog, Cengage Learning, 2016
3. Louis Scheffer and Luciano Lavagno, EDA for IC System Design, Verification and Testing, CRC Press, 2016

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.

FACULTY STAFFS

ADMINISTRATION

DR. ROSTAM AFFENDI BIN HAMZAH
Dean
✉ : rostamaffendi@utem.edu.my
☎ : 06-270 4067
📍 : Dean's Office, 2nd Floor

MOHAMAD HANIFF BIN HARUN
Deputy Dean
(Student Development)
✉ : haniff@utem.edu.my
☎ : 06-270 4142
📍 : TDPP's Office, 2nd Floor

MARSITA BINTI MOHD SAID
Deputy Registrar
✉ : marsita@utem.edu.my
☎ : 06-270 1895
📍 : D5, 2nd Floor

NUR FADHLIYANA BINTI ROSLI
Office Secretary
✉ : nurfadhliyana@utem.edu.my
☎ : 06-270 1592
📍 : Admin, 2nd Floor

NOOR FAIEZ FAHMI BIN HAMIR
Administrative Assistant
✉ : faiez@utem.edu.my
☎ : 06-270 4030
📍 : Admin, 2nd Floor

AHMAD FITRI BIN ADAM
General Office Assistant
✉ : fitri@utem.edu.my
☎ : 06-270 4032
📍 : Admin, 2nd Floor

DR. SYED NAJIB BIN SYED SALIM
Deputy Dean
(Academic)
✉ : syednajib@utem.edu.my
☎ : 06- 270 4303
📍 : TDA's Office, 2nd Floor

DR. MOHD BADRIL BIN NOR SHAH
Head of Department
(Electrical)
✉ : badril@utem.edu.my
☎ : 06-270 4182
📍 : KJ's Office, 1st Floor

AHMAD FAIZAL BIN ABDUL RAHMAN
Principal Assistant Registrar
✉ : ahmadfaizal@utem.edu.my
☎ : 06-270 4031
📍 : D4, 2nd Floor

NABILAH HANANI BINTI ABU BAKAR
Office Secretary
✉ : nabilah.hanani@utem.edu.my
☎ : 06-270 4316
📍 : Admin, 2nd Floor

MUNIRAH BINTI ZAINAL
Administrative Assistant
✉ : munirah.zainal@utem.edu.my
☎ : 06-234 6821
📍 : Admin, 2nd Floor

IR. DR. MOHD FARRIZ BIN HJ MD BASAR
Deputy Dean
(Research & Industrial Link)
✉ : mfarriz@utem.edu.my
☎ : 06-270 4021
📍 : TDP's Office, 2nd Floor

AIMAN ZAKWAN BIN JIDIN
Head of Department
(Electronic & Computer)
✉ : aimanzakwan@utem.edu.my
☎ : 06-270 4146
📍 : KJ's Office, 1st Floor

MARSHAZLIYANA BINTI MD SHARIP
Senior General Office Assistant
✉ : marshazliyana@utem.edu.my
☎ : 06-270 4026
📍 : Admin, 2nd Floor

NOOR HAFIZA BINTI OTHMAN
Senior Administrative Assistant
✉ : noorhafiza@utem.edu.my
☎ : 06-270 4027
📍 : Admin, 2nd Floor

AHMAD ZAIFARHAN BIN ZAINORDIN
Administrative Assistant
✉ : zaifarhan@utem.edu.my
☎ : 06-270 1905
📍 : Admin, 2nd Floor

DEPARTMENT OF ELECTRICAL ENGINEERING TECHNOLOGY
INDUSTRIAL AUTOMATION AND ROBOTIC (BEEA)

TS DR SAHAZATI BINTI MD ROZALI
Course Coordinator/
Senior Lecturer
✉ : sahazati@utem.edu.my
☎ : 06-270 4305
📍 : BP20, 1st Floor FTK

TS DR ALIZA BINTI CHE AMRAN
Senior Lecturer
✉ : aliza@utem.edu.my
☎ : 06-270 4054
📍 : BP18, 1st Floor FTK

TS AHMAD IDIL BIN ABDUL RAHMAN
Senior Lecturer
✉ : idil@utem.edu.my
☎ : 06- 270 4301
📍 : BP33, BP29, 7th Floor FKM

SHAHRUDIN BIN ZAKARIA
Lecturer
✉ : shahrudinzakaria@utem.edu.my
☎ : 06- 270 4052
📍 : BP100, 2nd Floor FTK

MADIHA BINTI ZAHARI
Lecturer
✉ : madiha@utem.edu.my
☎ : 06-270 4097
📍 : BP15, 1st Floor FTK

TS MOHD ZAIDI BIN MOHD TUMARI
Lecturer
✉ : mohdzaidi.tumari@utem.edu.my
☎ : 06-270 4169
📍 : BP55, 7th Floor FKM

RAMLAN BIN LATIP
Senior Teaching Engineer
✉ : ramlan@utem.edu.my
☎ : 06-270 4203
📍 : BP86, 2nd Floor FTK

TS ROSNAINI BINTI RAMLI
Teaching Engineer
✉ : rosnaini@utem.edu.my
☎ : 06-270 4242
📍 : BP28, 1st Floor FTK

TS DR SYED NAJIB BIN SYED SALIM
Deputy Dean (Academic)/
Senior Lecturer
✉ : syednajib@utem.edu.my
☎ : 06-270 4303
📍 : TDA's Office, 2nd Floor FTK

TS AHMAD ZUBIR BIN JAMIL
Senior Lecturer
✉ : zubir@utem.edu.my
☎ : 06- 270 4055
📍 : BP2, 1st Floor FTK

AMINURRASHID BIN NOORDIN
Senior Lecturer
✉ : aminurrashid@utem.edu.my
☎ : 06- 270 4062
📍 : BP14, 1st Floor FTK

TS SALEHA BINTI MOHAMAD SALEH
Lecturer
✉ : saleha@utem.edu.my
☎ : 06-270 4043
📍 : BP21 1st Floor FTK

AB WAFI BIN AB AZIZ
Lecturer
✉ : wafi@utem.edu.my
☎ : 06- 270 4153
📍 : BP9, 7th Floor FKM

SITI NUR SUHAILA BINTI MIRIN
Lecturer
✉ : nursuhaila@utem.edu.my
☎ : 06-270 4180
📍 : BP92, 2nd Floor FTK

MUHAMMAD FAREQ BIN IBRAHIM
Teaching Engineer
✉ : fareq@utem.edu.my
☎ : 06-270 4214
📍 : BP 7, Ground Floor FTK

NURUL KAUSAR BIN AB MAJID
Teaching Engineer
✉ : nurulkausar@utem.edu.my
☎ : 06-270 4215
📍 : BP9, Ground Floor FTK

MOHAMAD HANIFF BIN HARUN
Deputy Dean (Student Development)/
Senior Lecturer
✉ : haniff@utem.edu.my
☎ : 06-270 4142
📍 : BP54, 1st Floor FTK

MASLAN BIN ZAINON
Senior Lecturer
✉ : maslan@utem.edu.my
☎ : 06-270 4044
📍 : BP14, 7th floor FKM

TS MOHD RAZALI BIN MOHAMAD SAPIEE
Lecturer
✉ : mohd.razali@utem.edu.my
☎ : 06- 270 4063
📍 : BP24, 1st Floor FTK

MUHAMMAD SALIHIN BIN SAEALAL
Lecturer
✉ : salihin@utem.edu.my
☎ : 06- 270 4158
📍 : BP8, 7th Floor FKM

TS SULAIMAN BIN SABIKAN
Lecturer
✉ : sulaiman@utem.edu.my
☎ : 06-270 4051
📍 : BP85, 1st Floor FTK

ROZILAWATI BINTI MOHD NOR
Lecturer
✉ : rozilawati@utem.edu.my
☎ : 06-2704184
📍 : BP29, 1st Floor FTK

TS JOHAR AKBAR BIN MOHAMAT GANI
Teaching Engineer
✉ : johar.akbar@utem.edu.my
☎ : 06-270 4199
📍 : BP 1, Ground Floor FTK

TC AZIZUL ARIFIN BIN ISA
Assistant Engineer
✉ : azizularifin@utem.edu.my
☎ : 06-270 4259

TC NURDIANA BINTI RASIB
Assistant Engineer
✉ : nurdianarasib@utem.edu.my
☎ : 06-270 4262

MUHAMAD SHUKRY BIN MAT YUSUF
Assistant Engineer
✉ : shukry@utem.edu.my
☎ : 06-270 4277

EZRIZIKRI BIN KAMARAZAMAN
Assistant Engineer
✉ : ezrizikri@utem.edu.my
☎ : 06-270 4273

TS MOHD HANIF BIN CHE HASAN
Lecturer (Study Leave)
✉ :hanif.hasan@utem.edu.my

KHALIL AZHA BIN MOHD ANNUAR
Lecturer (Study Leave)
✉ :khalilazha@utem.edu.my

DEPARTMENT OF ELECTRICAL ENGINEERING TECHNOLOGY
INDUSTRIAL POWER (BEEI)

TS DR MUHAMMAD SHARIL BIN YAHAYA
Course Coordinator
✉ : sharil@utem.edu.my
☎ : 06-270 4076
📍 : BP 23, 1th Floor FTK

ZUL HASRIZAL BIN BOHARI
Senior Lecturer
✉ :zulhasrizal@utem.edu.my
☎ :06-270 4497
📍 :BP20, 7th Floor FKM

MOHD HATTA BIN JOPRI
Lecturer
✉ : hatta@utem.edu.my
☎ : 06-270 4061
📍 : BP 9, 1st Floor FTK

NURBAHIRAH BINTI NORDDIN
Lecturer
✉ : nurbahirah@utem.edu.my
☎ : 06-270 4156
📍 : BP 38, 7th Floor FKM

AZHAN BIN AB RAHMAN
Lecturer
✉ : azhanrahman@utem.edu.my
☎ : 06-270 2144
📍 : BP 74, 1st Floor FTK

CHE WAN MOHD FAIZAL BIN CHE WAN MOHD ZALANI
Teaching Engineer
✉ : wanmohdfaizal@utem.edu.my
☎ : 06-270 4206
📍 : BP 75, 1st Floor FTK

TC ADDYAZIZI BIN MAT NAWI
Assistant Engineer
✉ : addyazizi@utem.edu.my
☎ : 06-270 4293

TS SYAHRUL HISHAM BIN MOHAMAD @ ABD RAHMAN
Lecturer (Study Leave)
✉ : syahrulhisham@utem.edu.my

IR DR MOHD FARRIZ BIN HJ MD BASAR
Deputy Dean(Research & Industrial Link)/ Senior Lecturer
✉ : mfarriz@utem.edu.my
☎ : 06-270 4021
📍 : TDP's Office, 2nd Floor FTK

TS MUSTAFA BIN MANAP
Lecturer
✉ : mustafa@utem.edu.my
☎ : 06-270 4075
📍 : BP 4, 1st Floor, FTK

NURUL ASHIKIN BINTI MOHD RAIS
Lecturer
✉ : nurulashikin@utem.edu.my
☎ : 06-270 4075
📍 : BP 48, 7th Floor FKM

IR MUHAMMAD SYAHRANI BIN JOHAL
Teaching Engineer
✉ : syarani@utem.edu.my
☎ : 06-270 4235
📍 : BP 53, 7th Floor FKM

TC MOHD HEDZUAN BIN HASBULLAH
Assistant Engineer
✉ : hedzuan@utem.edu.my
☎ : 06-270 4260

MOHAMAD ADLI BIN NUT JAMUDIN
Assistant Engineer
✉ : mohamadadli@utem.edu.my
☎ : 06-270 4298

MUHAMMAD FAIZAL BIN YAAKUB
Lecturer (Study Leave)
✉ : muhammadfaizal@utem.edu.my

ASRI BIN DIN
Senior Lecturer
✉ : asridin@utem.edu.my
☎ : 06-234 6588
📍 : BP 101, 2nd Floor FTK

TS ZAIHASRAF BIN ZAKARIA
Lecturer
✉ : zaihasraf@utem.edu.my
☎ : 06-270 4302
📍 : BP 1, 1st Floor FTK

MOHD YUNOS BIN ALI
Lecturer
✉ : yunos@utem.edu.my
☎ : 06-270 4115
📍 : BP 5, 1st Floor FTK

ARMAN HADI BIN AZAHAR
Lecturer
✉ : arman.hadi@utem.edu
☎ : 06-270 4185
📍 : BP 4, 1st Floor FTK

MUHAMAD FALIHAN BIN RAMLI
Teaching Engineer
✉ : falihan@utem.edu.my
☎ : 06-270 4236
📍 : BP 61, 7th Floor FKM

TC MOHD RAHIDAN BIN MOHAMAD
Assistant Engineer
✉ : rahidan@utem.edu.my
☎ : 06-270 4268

ADLAN BIN ALI
Lecturer (Study Leave)
✉ : adlan@utem.edu.my

DEPARTMENT OF ELECTRICAL ENGINEERING TECHNOLOGY
INDUSTRIAL AUTOMATION AND ROBOTIC (BEEY)

HALYANI BINTI MOHD YASSIM
Course Coordinator (BEEY)/Lecturer
✉ : halyani@utem.edu.my
☎ : 06-270 4174
🌍 : BP46, 7th Floor FKM

AZHAR BIN AHMAD
Senior Lecturer
✉ : azharahmad@utem.edu.my
☎ : 06-270 4304
🌍 : BP16, 7th Floor FKM

ZULKIFLI BIN IBRAHIM
Lecturer
✉ : zulkifliibrahim@utem.edu.my
☎ : 06-270 4080
🌍 : BP12, 1st Floor FTK

EMY ZAIRAH BINTI AHMAD
Lecturer
✉ : emyzairah@utem.edu.my
☎ : 06-270 4143
🌍 : BP 22, 7th Floor FKM

AMALIA AIDA BINTI ABD HALIM
Teaching Engineer
✉ : amalia@utem.edu.my
☎ : 06-270 4233
🌍 : BP8, 4th Floor, FKM

TC AZHAN BIN ABD RAUB
Assistant Engineer
✉ : azhan@utem.edu.my
☎ : 06-270 4255

TC AHMAD MAULANA BIN MAT ISA
Assistant Engineer
✉ : maulana@utem.edu.my
☎ : 06-270 4300

DR. MOHD BADRIL BIN NOR SHAH
Head of Department/Senior Lecturer
✉ : badril@utem.edu.my
☎ : 06-270 4182
🌍 : BP, 1st Floor FTK

MOHAMED AZMI BIN SAID
Senior Lecturer
✉ : azmisaid@utem.edu.my
☎ : 06- 270 4056
🌍 : BP25, 1st Floor FTK

DR ZIKRI ABADI BIN BAHARUDIN
Lecturer
✉ : zikri@utem.edu.my
☎ : 06-270 4033
🌍 : BP3, 7th Floor FKM

INTAN MASTURA BINTI SAADON
Lecturer
✉ : mastura@utem.edu.my
☎ : 06-270 4150
🌍 : BP 37, 7th Floor FKM

KAMILAH BINTI JAFFAR
Teaching Engineer
✉ : kamilah@utem.edu.my
☎ : 06-270 4211
🌍 : BP, 2nd Floor FTK

TC MUSA BIN ABD KARIM
Assistant Engineer
✉ : musakarim@utem.edu.my
☎ : 06-270 4263

TS SUZIANA BINTI AHMAD
Lecturer (Study Leave)
✉ : suziana@utem.edu.my

ASSOC. PROF. MOHD ARIFF BIN MAT HANAFIAH
Associate Professor
✉ : ariff@utem.edu.my
☎ : 06-270 4041
🌍 : Prof.2 1st Floor FTK

MOHD FIRDAUS BIN MOHD AB HALIM
Senior Lecturer
✉ : mohd.firdaus@utem.edu.my
☎ : 06-234 6636
🌍 : BP8, 1st Floor FTK

MAZREE BIN IBRAHIM
Lecturer
✉ : mazree@utem.edu.my
☎ : 06-270 4066
🌍 : BP29, 7th Floor FKM

TS AHMAD MUZAFFAR BIN ABD KADIR
Lecturer
✉ : muzaffar@utem.edu.my
☎ : 06-270 4160
🌍 : BP 58, 7th Floor FKM

ROHAINA BINTI JAAFAR
Teaching Engineer
✉ : rohaina@utem.edu.my
☎ : 06-270 4210
🌍 : BP 43, 7th Floor FKM

TC NASARUDDIN BIN SEMAN
Assistant Engineer
✉ : nasaruddin@utem.edu.my
☎ : 06-270 4283

MATHEMATICS

FADZILAH BINTI SALIM
Senior Lecturer
✉ : fadzilah@utem.edu.my
☎ : 06-270 4126
🌍 : BP 10, 1st Floor

NOR HAFIZAH BINTI HUSSIN
Lecturer
✉ : noorhafiza.hussin@utem.edu.my
☎ : 06-270 4148
🌍 : BP 8, Factory 4

IRIANTO
Lecturer
✉ : irianto@utem.edu.my
☎ : 06-270 4135
🌍 : BP 1, Factory 4

ADAM BIN SAMSUDIN
Mathematics Coordinator/Lecturer
✉ :adam.samsudin@utem.edu.my
☎ :06-270 4192
🌍 :BP3 , Factory 4

DEPARTMENT OF ELECTRONIC AND COMPUTER ENGINEERING TECHNOLOGY INDUSTRIAL ELECTRONICS (BEEE)

IR. MOHD SYAHRIN AMRI BIN MOHD NOH
BEEE Course Coordinator /Lecturer
✉ : syahrin@utem.edu.my
☎ : 06- 270 4118
📍 : BP60, 1st Floor FTK

MOHD FAUZI BIN AB RAHMAN
Senior Lecturer
✉ : mfauziar@utem.edu.my
☎ : 06- 270 4104
📍 : BP

TS. AHMAD NIZAM BIN MOHD JAHARI @ MOHD JOHARI
Lecturer
✉ : ahmad.nizam@utem.edu.my
☎ : 06- 207 4069
📍 : BP77, 1st Floor FTK

A SHAMSUL RAHIMI B A SUBKI
Lecturer
✉ : shamsulrahimi@utem.edu.my
☎ : 06- 270 4151
📍 : BP19, 7th Floor FKM

TS. EFFENDY ONN BIN SIAM
Senior Teaching Engineer
✉ : effendyonn@utem.edu.my
☎ : 06- 270 4204
📍 : BP62, 1st Floor FTK

RAEIHAH BINTI MOHD ZAIN
Teaching Engineer
✉ : raeihah@utem.edu.my
☎ : 06-270 4227
📍 : BP24, 7th Floor, FKM

TC. MUHAMMAD HELMY BIN ELIAS
Assistant Engineer
✉ : helmy@utem.edu.my
☎ : 06-270 4248

TC. MOHD SUKRI BIN MUSA
Assistant Engineer
✉ : sukri@utem.edu.my
☎ : 06-270 4282

ASSOC. PROF. TS. MOHD RAHIMI BIN YUSOFF
Assistant Vice Chancellor (Facilities Development and Management) */Associate Professor*
✉ : rahimi@utem.edu.my
☎ : 06- 270 4019
📍 : D59, 2nd Floor FTK

ZULHAIRI BIN OTHMAN
Senior Lecturer
✉ : zulhairi@utem.edu.my
☎ : 06- 270 4036
📍 : BP84, 1th Floor FTK

WAN NORHISYAM BIN ABD RASHID
Lecturer
✉ : norhisyam@utem.edu.my
☎ : 06- 270 4167
📍 : BP65, 7th Floor FKM

TS. IR. MOHAMMAD AFIF BIN KASNO
Assistant Director of CREATE/Lecturer
✉ : mohammad.afif@utem.edu.my
☎ : 06- 270 4177
📍 : BP50, 7th floor FKM

TS. TG MOHD FAISAL BIN TENGKU WOOK
Senior Teaching Engineer
✉ : tgfaisal@utem.edu.my
☎ : 06- 270 4212
📍 : BP95, 1st Floor FTK

TS. MOHD ANNUAR BIN ADIB
Teaching Engineer
✉ : mohdanuar@utem.edu.my
☎ : 06-270 4240
📍 : BP3, 1st Floor FTK

TC. MOHAMAD ALI MUSA BIN SARIF
Assistant Engineer
✉ : ali@utem.edu.my
☎ : 06-270 4270

SITI HALMA BINTI JOHARI
Senior Lecturer (Study Leave)
✉ : siti.halma@utem.edu.my
☎ : 06- 270 4102

KHAIRUL AZHA BIN A AZIZ
Senior Lecturer
✉ : khairulazha@utem.edu.my
☎ : 06- 270 4090
📍 : BP61, 1st Floor FTK

DR. FARA ASHIKIN BINTI ALI
Lecturer
✉ : fara@utem.edu.my
☎ : 06- 270 4084
📍 : D63, 2nd Floor FTK

TS. SHAHRIZAL BIN SAAT
Lecturer
✉ : shahrizal@utem.edu.my
☎ : 06- 270 4168
📍 : BP64, 7th Floor FTK

TS. KHAIRUL ANUAR BIN A RAHMAN
Senior Laboratory Manager/ Senior Teaching Engineer
✉ : khairulanuar@utem.edu.my
☎ : 06- 270 4198
📍 : BP57, 1st Floor FTK

FAREEZ ESWAN BIN MOHD SANI @ ARIFFIN
Teaching Engineer
✉ : farees@utem.edu.my
☎ : 06-270 4226
📍 : BP5, 7th Floor, FKM

TC. NORASHIKIN BINTI AHMAD SABRAN
Assistant Engineer
✉ : shikin@utem.edu.my
☎ : 06-270 4246

MUHAMMAD NURARIF BIN SAPEE
Assistant Engineer
✉ : nurarif@utem.edu.my
☎ : 06-270 4281

DEPARTMENT OF ELECTRONIC AND COMPUTER ENGINEERING TECHNOLOGY COMPUTER SYSTEMS (BEEC)

TS. SHAMSUL FAKHAR BIN ABD GANI
BEEC Course Coordinator/Lecturer
✉ : shamsulfakhar@utem.edu.my
☎ : 06- 270 4100
: BP48, 1st Floor FTK

TS. AHMAD FAIRUZ BIN MUHAMMAD AMIN
Lecturer
✉ : ahmadfairuz@utem.edu.my
☎ : 06- 270 4059
: BP41, 1st Floor FTK

NURLIYANA BINTI ABD MUTALIB
Lecturer
✉ : nurliyana@utem.edu.my
☎ : 06- 270 4112
: BP34, 1st Floor FTK

ROSZIANA BINTI HASHIM
Teaching Engineer
✉ : rosziana@utem.edu.my
☎ : 06- 270 4221
: BP25, 7th floor FKM

TC. MOHD MOHIDDEN BIN MANSOR
Assistant Engineer
✉ : mohidden@utem.edu.my
☎ : 06- 270 4251

HASRUL' NISHAM BIN ROSLY
Lecturer (Study Leave)
✉ : hasrul@utem.edu.my
☎ : 06- 270 4098

DR. JAMIL ABEDALRAHIM JAMIL ALSAYAYDEH
Senior Lecturer
✉ : jamil@utem.edu.my
☎ : 06- 270 4181
: BP99, 2nd Floor FTK

TS. NORFADZLIA BIINTI MOHD YUSOF
Lecturer
✉ : norfadzlia@utem.edu.my
☎ : 06- 270 4147
: BP 26, 7th Floor FKM

TS. IMRAN BIN HINDUSTAN
Lecturer
✉ : imranh@utem.edu.my
☎ : 06-270 4079
: BP26, 1st Floor FTK

NOOR MOHD ARIFF BIN BRAHIN
Teaching Engineer
✉ : mohdariff@utem.edu.my
☎ : 06- 270 4223
: BP 7, 7th floor FKM

TC. FAKHRUL RIDHUAN BIN IBRAHIM
Assistant Engineer
✉ : fakhrul@utem.edu.my
☎ : 06-270 4271

MOHD SAAD BIN HAMID
Lecturer (Study Leave)
✉ : mohdsaad@utem.edu.my
☎ : 06 - 270 4099

DR. SUHAILA BINTI MOHD NAJIB
Senior Lecturer
✉ : suhaila.najib@utem.edu.my
☎ : 06- 270 4186
: BP22, 1st Floor FTK

NORAIN BINTI RAHIM
Lecturer
✉ : norain.rahim@utem.edu.my
☎ : 06- 270 4154
: BP39, 7th Floor FKM

TS. NADZRIE BIN MOHAMOOD
Senior Teaching Engineer
✉ : nadzrie@utem.edu.my
☎ : 06- 270 4205
: BP40, 1st Floor FTK

TC. IZWAN BIN HAMDAN
Assistant Engineer
✉ : izwan@utem.edu.my
☎ : 06-270 4249

TC. MOHD FARID BIN JOHARI
Assistant Engineer
✉ : mohdfarid.johari@utem.edu.my
☎ : 06-270 4287

DEPARTMENT OF ELECTRONIC AND COMPUTER ENGINEERING TECHNOLOGY TELECOMUNICATIONS (BEET)

ZAHARIAH BINTI MANAP
Course Coordinator/Senior Lecturer
✉ : zahariah@utem.edu.my
☎ : 06- 270 4048
🏠 : D62B, 2nd Floor FTK

DR. A.K.M. ZAKIR HOSSAIN
Senior Lecturer
✉ : zakir@utem.edu.my
☎ : 06- 270 4318
🏠 : BP89, 1st Floor FTK

WIN ADIYANSYAH INDRA
Lecturer
✉ : adiyansyah@utem.edu.my
☎ : 06- 270 4312
🏠 : BP87, 1st Floor FTK

SITI ASMA BINTI CHE AZIZ
Lecturer
✉ : sitiasma@utem.edu.my
☎ : 06- 270 4161
🏠 : BP45, 7th Floor FKM

AZIEAN BINTI MOHD AZIZE
Lecturer
✉ : aziean@utem.edu.my
☎ : 06- 270 4175
🏠 : BP49, 7th Floor FKM

AZMAN BIN AWANG TEH
Lecturer
✉ : azman.awangteh@utem.edu.my
☎ : 06 - 270 4064
🏠 : D64, 2nd Floor FTK

TS. FAKHRULLAH BIN IDRIS
Teaching Engineer
✉ : fakhrullah@utem.edu.my
☎ : 06-270 4232
🏠 : BP66, 7th Floor, FKM

ZULKIFLI BIN SHARIFF
Senior Lecturer
✉ : zulkifli@utem.edu.my
☎ : 06- 270 4038
🏠 : BP15, Ground Floor FTK

DR. MUHAMMAD INAM ABBASI
Senior Lecturer
✉ : **DR. MUHAMMAD INAM ABBASI**
☎ : 06- 270 2401
🏠 : BP12, Ground Floor FTK

NORLEZAH BINTI HASHIM
Lecturer
✉ : norlezah@utem.edu.my
☎ : 06- 270 4096
🏠 : BP31, 1st Floor FTK

ADIB BIN OTHMAN
Lecturer
✉ : adib@utem.edu.my
☎ : 06- 270 4495
🏠 : BP2, 7th Floor FKM

TS. NIZA BINTI MOHD IDRIS
Lecturer
✉ : nizaidris@utem.edu.my
☎ : 06-270 4035
🏠 : BP27, 7th Floor FKM

TS. GLORIA RAYMOND TANNY
Teaching Engineer
✉ : gloria@utem.edu.my
☎ : 06- 270 4209
🏠 : BP81, 1st Floor FTK

TS. MOHD ERDI BIN AYOB
Teaching Engineer
✉ : erdi@utem.edu.my
☎ : 06-270 4237
🏠 : BP15, 7th floor FKM

TS. DR. MUHAMMAD ADAM WONG BIN ABDULLAH
Senior Lecturer
✉ : adamwong@utem.edu.my
☎ : 06- 270 2398
🏠 : D59, 2nd Floor FTK

ELIYANA BINTI RUSLAN
Lecturer
✉ : eliyana@utem.edu.my
☎ : 06- 270 4121
🏠 : BP19, 1st Floor FTK

WAN HASZERILA WAN HASSAN
Lecturer
✉ : haszerila@utem.edu.my
☎ : 06- 270 4162
🏠 : BP40, 7th Floor FKM

MOHD KHANAPIAH BIN NOR
Lecturer
✉ : khanapiah@utem.edu.my
☎ : 06- 270 4496
🏠 : BP14, Ground Floor FTK

AHMAD SAYUTHI BIN MOHAMAD SHOKRI
Lecturer
✉ : sayuthi@utem.edu.my
☎ : 06- 270 4107
🏠 : BP35, 1st Floor FTK

TS. MOHD FAIZAL BIN ZULKIFLI
Teaching Engineer
✉ : mohdfaizal.zulkifli@utem.edu.my
☎ : 06-270 4225
🏠 : BP30, 7th Floor FKM

TC. AZIZI BIN OSMAN
Assistant Engineer
✉ : azizi@utem.edu.my
☎ : 06-270 4254

TC. RAFIDAH BINTI AB.KASIM
Assistant Engineer
✉ : rafidah@utem.edu.my
☎ : 06-270 4269

TC. FADATU SALWA BINTI MUTANI
Assistant Engineer
✉ : fadatusalwa@utem.edu.my
☎ : 06-270 4276

TC. MOHD ZULFADLI BIN SAMIAN
Assistant Engineer
✉ : mohdzulfadli@utem.edu.my
☎ : 06- 270 4299

TS. ABDUL HALIM BIN DAHALAN
Lecturer (Study Leave)
✉ : abdulhalim@utem.edu.my
☎ : 06- 270 4046

NURULHALIM BIN HASSIM
Lecturer (Study Leave)
✉ : nurulhalim@utem.edu.my
☎ :06- 270 4128

MD ASHADI BIN MD JOHARI
Lecturer (Study Leave)
✉ : ashadi@utem.edu.my
☎ : 06- 270 4122

DEPARTMENT OF ELECTRONIC ENGINEERING TECHNOLOGY ELECTRONICS (BEEZ)

IZADORA BINTI MUSTAFFA
BETZ Course Coordinator/Lecturer
✉ : izadora@utem.edu.my
☎ : 06- 270 4057
: BP16, Ground Floor FTK

DR. ROSTAM AFFENDI BIN HAMZAH
Dean / Senior Lecturer
✉ : rostamaffendi@utem.edu.my
☎ : 06- 270 4067
: Dean' office 2nd Floor /BP30, 1st Floor FTK

DR. MOHD SYAFIQ BIN MISPAN
Senior Lecturer
✉ : syafiq.mispan@utem.edu.my
☎ : 06- 270 2399
: BP59, 1st Floor FTK

AIMAN ZAKWAN BIN JIDIN
Head of Department JTKEK / Senior Lecturer
✉ : aimanzakwan@utem.edu.my
☎ : 06- 270 4146
: BP88, 1st Floor FTK

TS. AHMAD FAUZAN BIN KADMIN
Lecturer
✉ : fauzan@utem.edu.my
☎ :06- 270 4101
: BP51, 1st Floor FTK

AHMAD NIZAMUDDIN BIN MUHAMMAD
Lecturer
✉ : nizamuddin@utem.edu.my
☎ : 06- 270 4164
: BP18, 7th Floor FKM

AMAR FAIZ BIN ZAINAL ABIDIN
Lecturer
✉ : amarfaiz@utem.edu.my
☎ : 06- 270 4189
: BP49, 1st Floor FTK

TS. SAIFULLAH BIN SALAM
Lab Manager/Senior Teaching Engineer
✉ : saifullah@utem.edu.my
☎ : 06- 270 4195
: BP46, 1st Floor FTK

DAYANASARI BINTI ABDUL HADI
Teaching Engineer
✉ : dayanasari@utem.edu.my
☎ : 06- 270 4208
: BP33, 1st Floor FTK

MATHEMATICS

RAHAINI BINTI MOHD SAID
Lecturer
✉ : rahaini@utem.edu.my
☎ : 06- 270 4144
: BP9, Factory 4

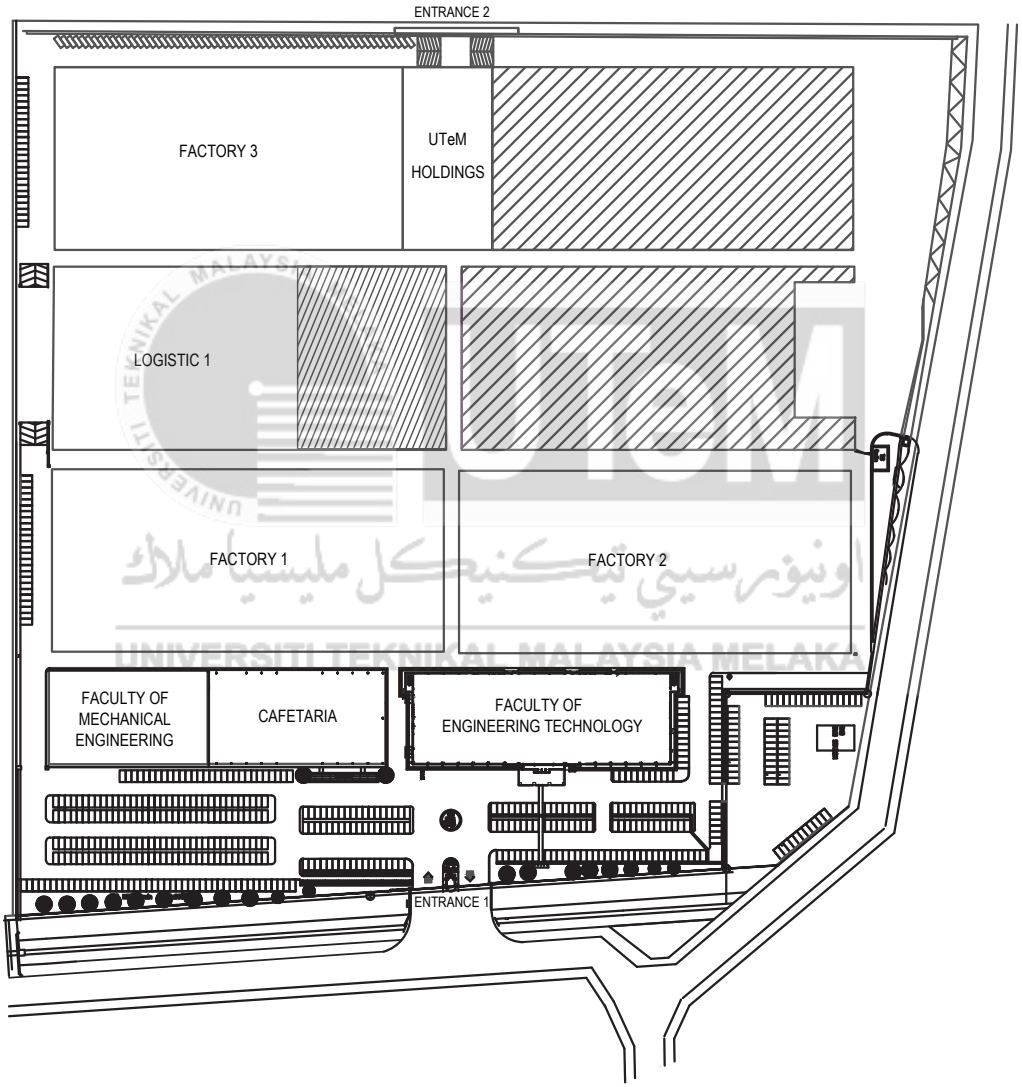
MUHAMMAD IZZAT ZAKWAN BIN MOHD ZABIDI
Lecturer
✉ : izzatzakwan@utem.edu.my
☎ :06- 270 4187
: BP2, Factory 4

AMINAH BINTI AHMAD
Lecturer (Study Leave)
✉ : aminah@utem.edu.my
☎ :06- 270 4131
: BP5, Factory 4

SITI HARYANTI BINTI HJ HAIROL ANUAR
Lecturer (Study Leave)
✉ : sitiharyanti@utem.edu.my
☎ :06- 270 4139
: BP6, Factory 4

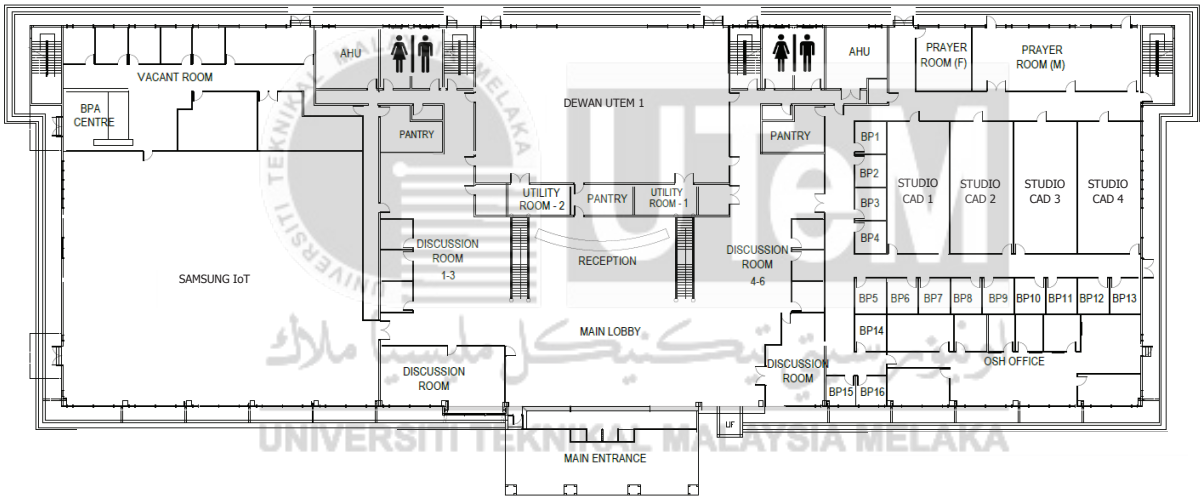
MAPS & LOCATIONS

FTKEE ACADEMIC BUILDING



FACULTY OF ENGINEERING TECHNOLOGY (FTK) LAB LOCATIONS

LEVEL G

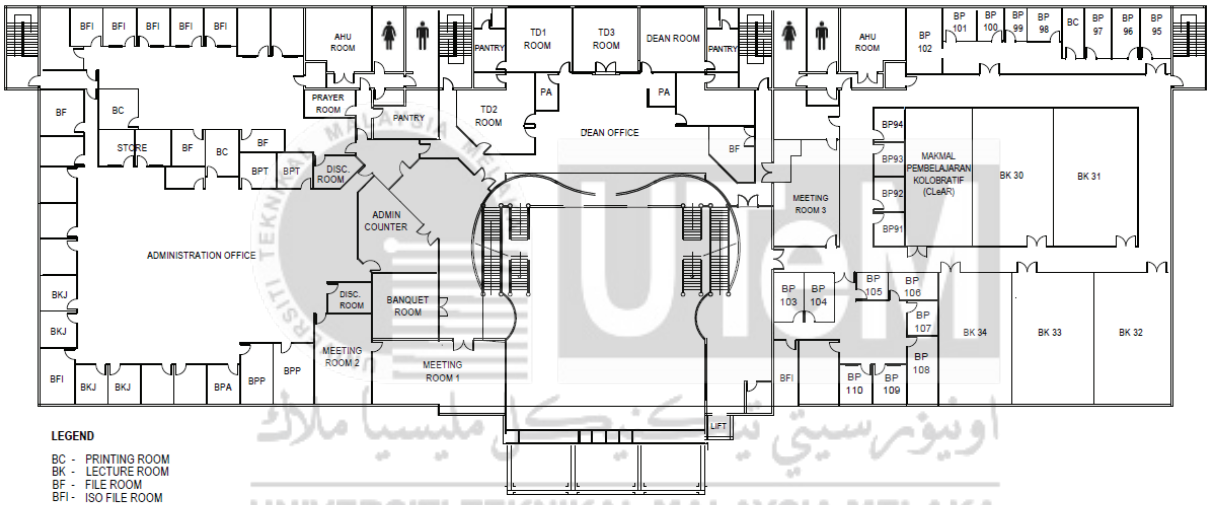


LEGEND:

BP - LECTURER ROOM
BPA - ACADEMIC ADMINISTRATION DEPARTMENT
OSH - OCCUPATIONAL SAFETY AND HEALTH

LEVEL 1

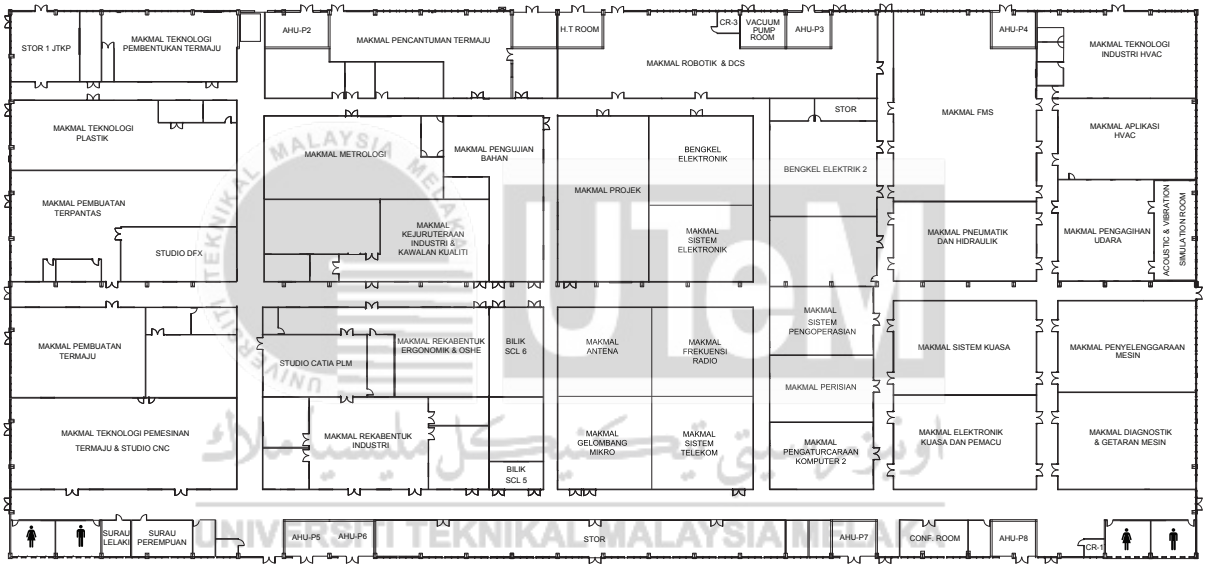
LEVEL 2



LEGEND

BC - PRINTING ROOM
BK - LECTURE ROOM
BF - FILE ROOM
BFI - ISO FILE ROOM
BP - LECTURER ROOM
KJ - HEAD OF DEPARTMENT
KPP - SENIOR REGISTRAR ASSISTANT
PA - PERSONAL ASSISTANT
PP - REGISTRAR ASSISTANT
PPT - ADMIN ASSISTANT OFFICER
TD1 - DEPUTY DEAN (ACADEMIC)
TD2 - DEPUTY DEAN (RESEARCH & NETWORK)
TD3 - DEPUTY DEAN (STUDENT DEVELOPMENT)

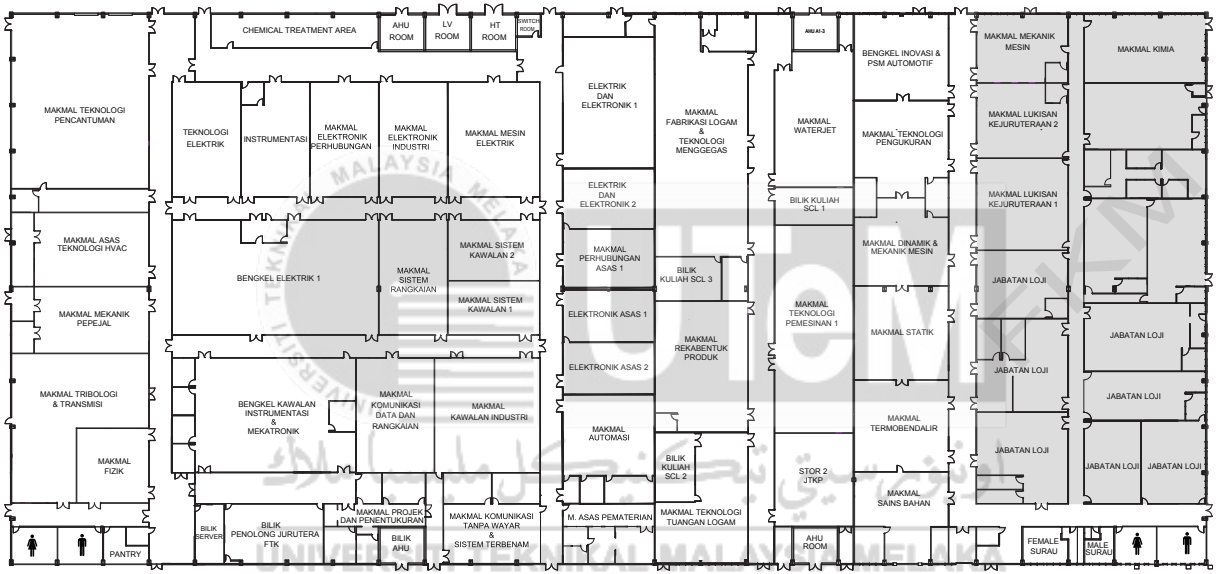
FACTORY 1



LEGEND

AHU - AIR HANDLING UNIT
SCL - STUDENT CENTRED LEARNING
HT - HIGH TENSION

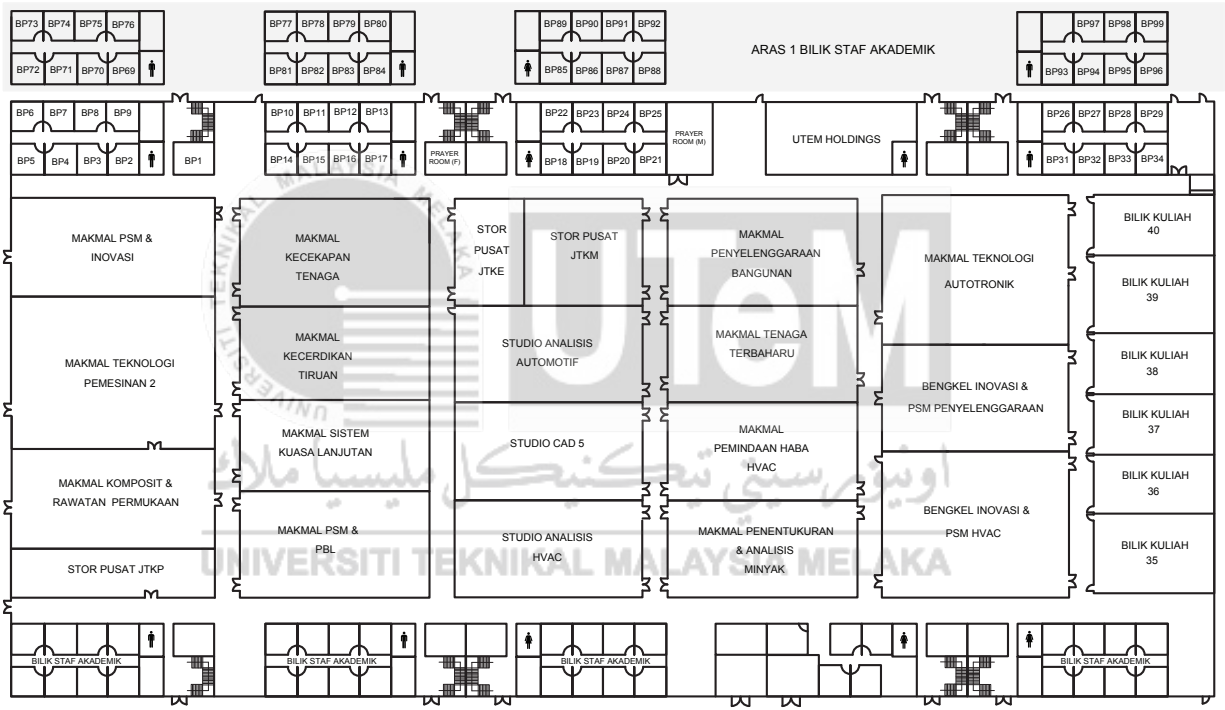
FACTORY 2



LEGEND

AHU - AIR HANDLING UNIT
SCL - STUDENT CENTRED LEARNING
HT - HIGH TENSION
LV - LIGHT VOLTAGE

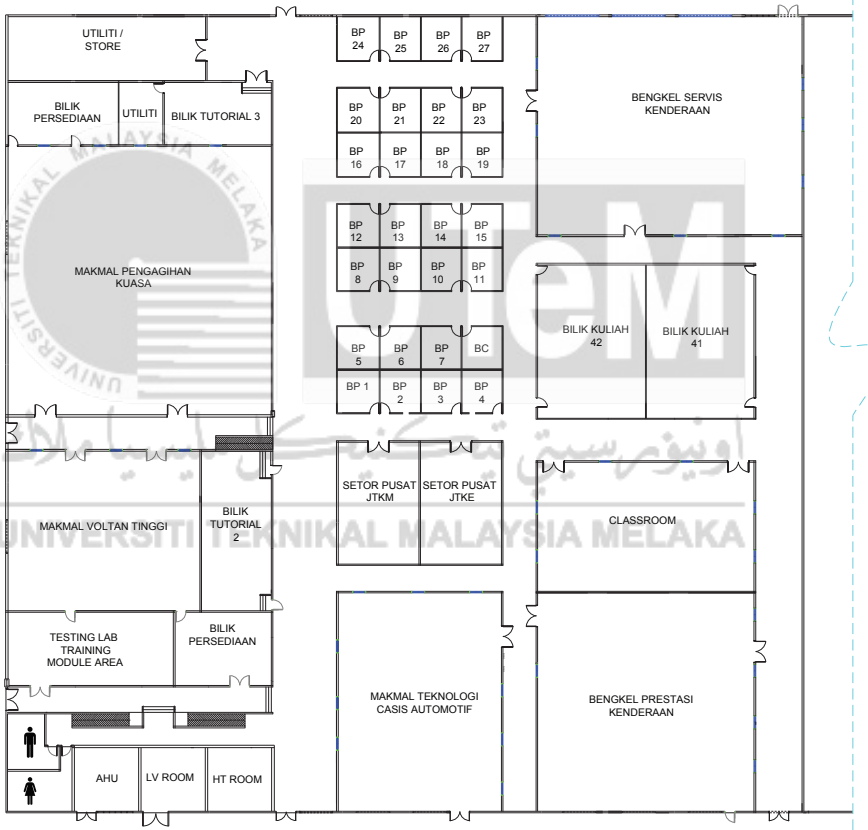
FACTORY 3



LEGEND

AHU - AIR HANDLING UNIT
SCL - STUDENT CENTRED LEARNING
BP - BILIK PENSYARAH

LOGISTIC 1

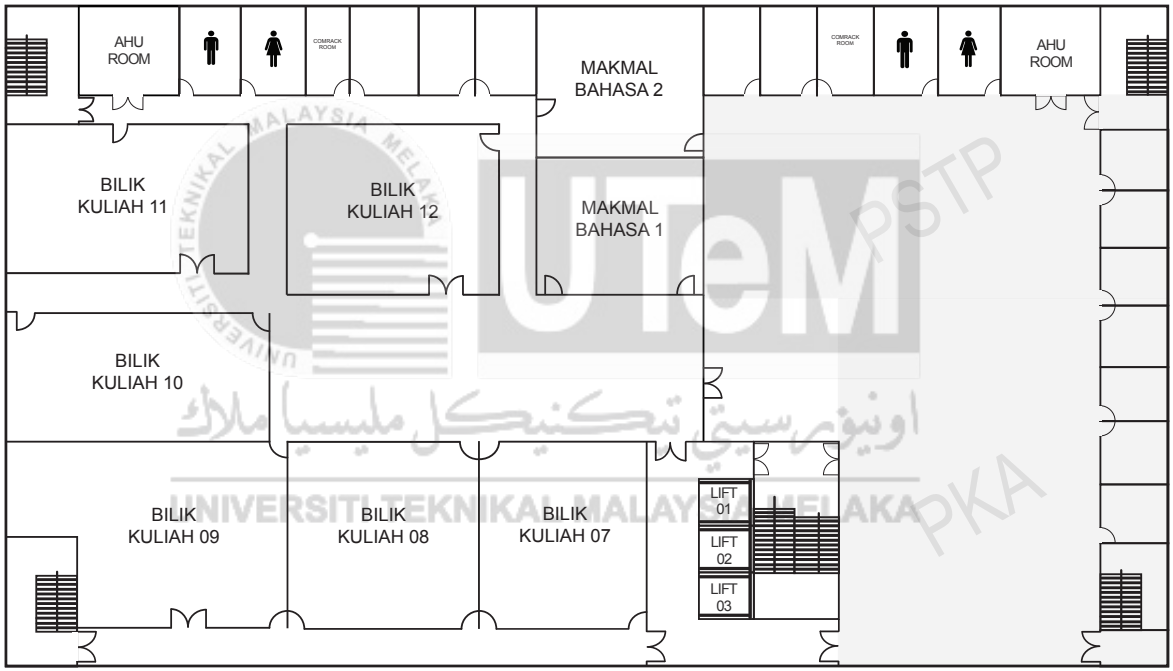


LEGEND :

HT - HIGH TENSION
LV - LIGHT VOLTAGE
BC - BILIK COMRACK
BP - BILIK PENGAJAR

FACULTY OF MECHANICAL ENGINEERING (FKM) ACADEMIC BUILDING

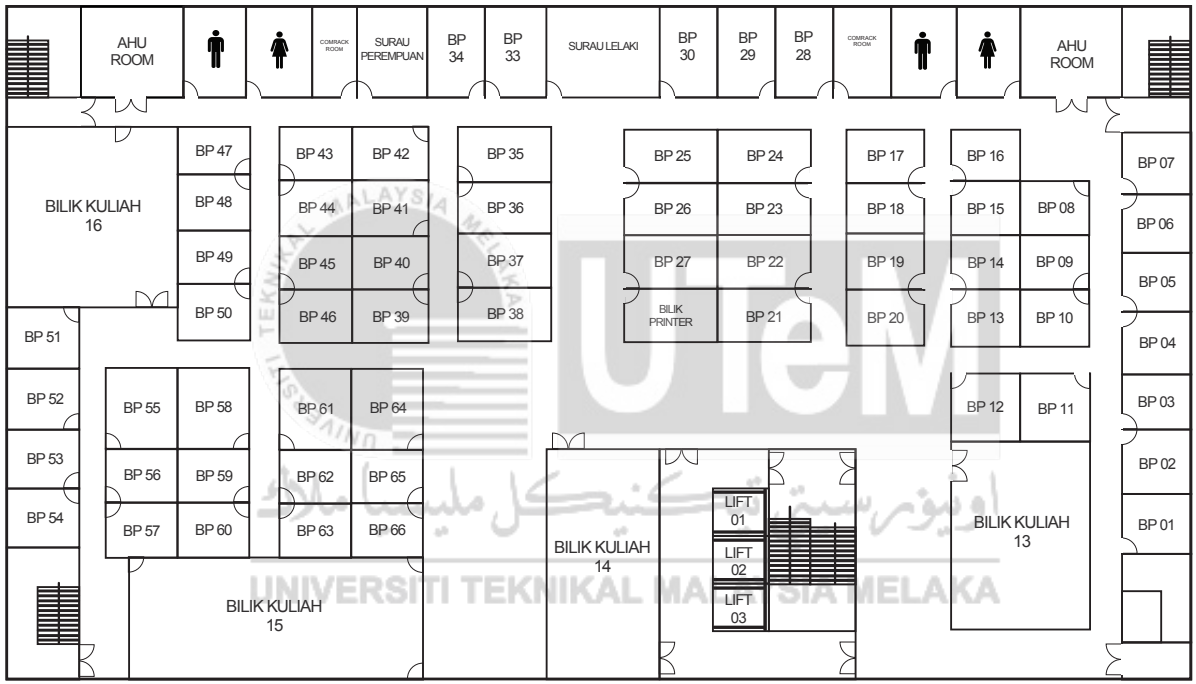
LEVEL 4 (FKM)



PETUNJUK:

PKA - PUSAT KELESTARIAN DAN ALAM SEKITAR
PSTP - PUSAT SUMBER & TEKNOLOGI PENGAJARAN

LEVEL 7 (FKM)



PETUNJUK:

BP - BILIK PENSYARAH

CREDITS

ADVISOR

Ts. Dr. Rostam Affendi bin Hamzah

CHAIRMAN

Rosnaini binti Ramli

EXECUTIVE COMMITTEE

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