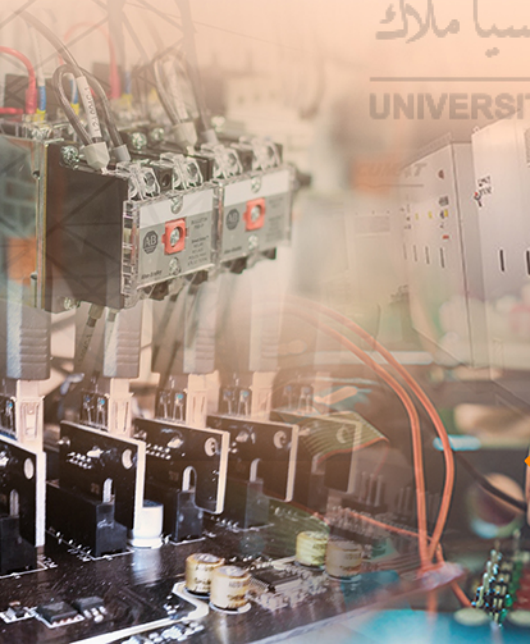
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ACADEMIC HANDBOOK

SESSION 2019/2020

DIPLOMA & BACHELOR PROGRAMMES

FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNIKAL MALAYSIA MELAKA



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Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia.
Tel: +606 270 1241 Faks: +606 270 1038

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UNIVERSITY MANAGEMENT

PROF. DR. RAHA ABDUL RAHIM

VICE CHANCELLOR

PROF. DATUK Ts. DR. MOHD RAZALI BIN MUHAMAD

DEPUTY VICE CHANCELLOR (ACADEMIC & INTERNATIONAL)

PROF. DR. ZULKIFILIE BIN IBRAHIM

DEPUTY VICE CHANCELLOR (RESEARCH & INNOVATION)

ASSOC. PROF. DR. NURULFAJAR BIN ABD MANAP

DEPUTY VICE CHANCELLOR (STUDENT AFFAIRS)

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

VISION

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

MISSION

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

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

MOTTO

Excellence Through Competency

GENERAL EDUCATIONAL GOALS

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

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

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

4. To foster development and innovation activities in collaboration with industries for the prosperity of the Nation.

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.

DEAN WELCOMING SPEECH

Bismillahir Rahmanir Rahim

Assalamu'alaikum and a Very Good Day

All praises are due to Allah s.w.t, the most Gracious, and with His Mercy the Academic Handbook of Diploma and Bachelor Degree for the Academic Session of 2019/2020 has been successfully published by the Faculty of Electrical Engineering, Universiti Teknikal Malaysia Melaka.

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

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

This year, the faculty offers three (3) undergraduate programmes; i.e.: two (2) bachelor programs and one (1) diploma program. The Diploma of Electrical Engineering (DEK) will focus on practical aspect and fulfills the requirement of Engineering Technology Accreditation Council (ETAC) for accreditation. For our degree programs, the faculty still maintains new intake for both Bachelor of Electrical Engineering (BEKG) and Bachelor of Mechatronics Engineering (BEKM) programs. The Bachelor of Electrical Engineering (BEKG) is a broad-based program where the specialization starts in semester 6 of the program. On the other hand, Bachelor of Mechatronics Engineering (BEKM) program focuses more on the mechatronics systems design and analysis. These bachelor programs have fulfilled the Board of Engineers (BEM) requirement for an engineering program that is accredited by the Engineering Accreditation Council (EAC).

This handbook provides a brief overview about the faculty, curriculum structure, academic advisory system, university grading system and syllabus contents of various programs; which serves as a reference for the new intake of Academic Session of 2019/2020. Hopefully, it will provide guidance for students in

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

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

Wassalam.

“Towards Academic Excellence”

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

FACULTY ORGANISATION STRUCTURE

ASSOCIATE PROF. Ir. DR. MD NAZRI BIN OTHMAN
DEAN

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

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

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

DR. MAASPALIZA BINTI AZRI
HEAD OF DEPARTMENT
ELECTRICAL ENGINEERING

DR. NIK SYAHRIM BIN NIK ANWAR
HEAD OF DEPARTMENT
MECHATRONICS ENGINEERING

DR. SAZUAN NAZRAH BINTI MOHD AZAM
HEAD OF DEPARTMENT
DIPLOMA STUDIES

DR. AZRITA BINTI ALIAS
COORDINATOR
ELECTRICAL ENGINEERING

KYAIRUL AZMI BIN BAHARIN
LABORATORY
COORDINATOR

DR. AIMIE NAZMIN BIN AZMI
POST GRADUATE
COORDINATOR

NOR-ALIZA BINTI IBRAHIM
SENIOR ASSISTANT REGISTRAR
ACADEMIC & STUDENTS' DEVELOPMENT

RAIHATUL JANNAH BINTI ABDULLAH
SENIOR ASSISTANT REGISTRAR
ADMINISTRATION & FINANCE UNIT

FACULTY AT A GLANCE

Faculty of Electrical Engineering (FKE) was established in early 2001 and officially began to operate from 22nd June 2001 after obtaining an authorization from Malaysia Ministry of Education. Initially, the faculty's temporary campus was situated at Taman Tasik Utama, Ayer Keroh and later was allocated to the UTeM's main campus at Durian Tunggal.

In order to uphold the academic pillar that being decended to the faculty, a managerial team leaded by Dean was established and assisted by three (3) Deputy Deans, three (3) Heads of Department, three (3) Program Coordinator and two (2) Senior Assistant Registrar. Other than that, the combination of lecturers that excel in various fields provide a strong academic background inside faculty as well as high commitment in educating our new generation to become outstanding graduates that equipped with knowledge, technical competencies and well versed soft skills.

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

Undergraduate Programmes:

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

Postgraduate Programmes:

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

2. Electrical Engineering (Mixed-Mode)
   a) Master of Electrical Engineering (Industrial Power) - MEKP

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

FACULTY MISSION, MOTTO AND OBJECTIVES

FACULTY'S MISSION

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

FACULTY'S MOTTO

Towards Academic Excellence

FACULTY'S OBJECTIVES

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

CURRICULUM STRUCTURE

DIPLOMA PROGRAMME

During the first year of study, the student will be equipped with fundamental courses such as mathematics, science and computer programming to provide the foundation for learning engineering courses. The student also taking introduction of electrical and electronic courses. After that, during the second year, the student shall continue learning core programme courses and undertake the diploma project. Finally, during the third year, students are required to undergo an Industrial Training for 16 weeks.

BACHELOR PROGRAMMES

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

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

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

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

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

The professional certification preparatory course is compulsory for all bachelor degree students registered with the University starting from 2017/2018 intake and onwards. The students are expected to choose, register and complete one (1) professional certification preparation course before the end of their study. The Faculty will offer Basic Hydraulic Technology Certification Course (BEKG 4710) starting from session 2018/2019.

Rexroth
Bosch Group

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

Suruhanjaya Tenaga
Energy Commission

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

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

ADMISSION REQUIREMENTS

MINIMUM REQUIREMENTS TO REGISTER IN DIPLOMA PROGRAMME

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

MINIMUM REQUIREMENTS TO REGISTER IN BACHELOR PROGRAMMES

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

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

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

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

GRADING SYSTEM

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

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

Table 1: Grading System and Point

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

GRADUATION REQUIREMENT

PROGRAMME	GRADUATION REQUIREMENT
Diploma of Electrical Engineering	Award of a Diploma will be made in two (2) regular semesters. Students are only eligible to be awarded a Diploma after the following conditions are met: i. Students must obtain Kedudukan Baik (KB) in the last semester. ii. Minimum credit hours requirements for the award of a Diploma is 90 credits which consists of 70 credits of Core Program (P) courses including 8 credits of Industrial Training, 14 credits of Compulsory University (W) courses and 6 credits for Elective (E) courses. iii. Has applied for the award, recommended by the Faculty and approved by the Senate. iv. Other requirements set by the university.
Bachelor of Electrical Engineering	Award of a Degree will be made in two (2) regular semesters. Students are only eligible to be awarded a Degree after the following conditions are met: i. Students must obtain Kedudukan Baik (KB) in the last semester. ii. Passed all courses required for curriculum requirements: • Minimum credit hour requirements for the award of a Degree is 135 credits hour which consists of 108 credits of Core courses (P), 9 credits of Elective Program (E) courses, 4 credits of Elective University (E) courses, 5 credits of Industrial Training (P) and 14 credits of University Requirements (W) courses. iii. Has applied for the award, recommended by the Faculty and approved by the Senate. iv. Other requirements set by the university.
Bachelor of Mechatronics Engineering	Award of a Degree will be made in two (2) regular semesters. Students are only eligible to be awarded a Degree after the following conditions are met: i. Students must obtain Kedudukan Baik (KB) in the last semester. ii. Passed all courses required for curriculum requirements: • Minimum credit hour requirements for the award of a Degree is 135 credits hour which consists of 106 credits of Core courses (P), 6 credits of Elective Program (E) courses, 4 credits of Elective University (E) courses, 5 credits of Industrial Training (P) and 14 credits of University Requirements (W) courses. iii. Has applied for the award, recommended by the Faculty and approved by the Senate. iv. Other requirements set by the university.

GRADUATES CAREER PROSPECTS

DIPLOMA IN ELECTRICAL ENGINEERING

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

BACHELOR IN ELECTRICAL ENGINEERING AND MECHATRONICS ENGINEERING

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

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

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

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

SOFT SKILLS (KI)

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

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

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

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

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

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

2. Soft Skills Development via Supporting-Oriented Programme

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

3. Soft Skills Development via Campus Activities and Lifestyle

    - Residential College
    - Campus Environment

ACADEMIC ADVISORY SYSTEM

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

CHARACTERISTICS OF THE SEMESTER SYSTEM

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

THE IMPORTANCE OF AN ACADEMIC ADVISOR (PA)

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

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

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

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

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

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

FLOW OF ACADEMIC ADVISORY SYSTEM IN UTeM:

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

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

List of External Examiner

EXTERNAL EXAMINER	QUALIFICATIONS	POSITION	APPOINTMENT PEROID
Professor Dr. Yahaya Bin Md Sam (BEKG)	1. Doctor of Philosophy (Ph.D), Universiti Teknologi Malaysia 2. M.Sc. In Control Systems, University of Sheffield, Australia 3. B. Eng. (Hons), Electrical Engineering, Universiti Teknologi Malaysia	Senior Director Centre for Quality and Risk Management (QRiM), UTM	1 August 2019 to 31 July 2021
Professor Ir. Dr. Mohd Rizal Bin Arshad (BEKM)	1. Doctor of Philosophy (Ph.D) in Electronic Engineering, University of Liverpool, United Kingdom 2. Master of Science in Electronic Control Enggineering, University of Salford, United Kingdom 3. Bachelor of Engineering (Hons) in Medical Electronics & Instrumentation, University of Liverpool, United Kingdom	Professor, School of Electrical and Electronic Engineering, Universiti Sains Malaysia (USM)	1 September 2018 to 31 Ogos 2020

Assoc. Prof. Ts. Dr. Mohd Rusllim Mohamed (DEK)	1. Doctor of Philosophy (Ph.D) in Electrical Engineering, Universiti Malaysia Pahang 2. M.Sc. In Electrical Engineering, Universiti Teknologi Tun Hussien Onn 3. B. Eng. (Hons), Electronic Engineering, University of Warwick, Coventry, United Kingdom	Director, Centre for Academic Innovation & Competitiveness (CAIC), UMP	1 October 2019 to 30 September 2021

List of Industrial Advisory Panel

INDUSTRIAL ADVISORY PANEL	POSITION	APPOINTMENT PERIOD
Ir. Mohd Tajudin Romli (BEKG)	Managing Director, RMS ENGINEERING SDN. BHD.	1 September 2019 to 31 August 2021
En. Mohammad Faizal Ali (BEKG)	Chief Executive Officer, Vectolabs Sdn. Bhd.	1 September 2019 to 31 August 2021
Ir. Zaki Kudus (BEKG)	Chief Executive Officer, AHAR Consultants.	1 September 2019 to 31 August 2021
Ir. Mohd Yusrizal Mohd Yusof (BEKG)	Managing Director, TNB	1 September 2019 to 31 August 2021
Ir. Ts. Mohd Azlan bin Othman (BEKG)	Head of Electrical Unit, JKR	1 September 2019 to 31 August 2021
Ir. Dr. Harriezan Ahmad (BEKG)	Manager, TNB	1 September 2019 to 31 August 2021
Chai Seang EE (BEKG)	Factory Manager, Hitachi Cable (Johor) Sdn. Bhd.	1 September 2019 to 31 August 2021

Dr. Ir. Kenny Ang Teoh Ong (BEKG)	Director, Control Easy Technology Sdn. Bhd.	1 September 2019 to 31 August 2021
Ir. Rajmal Buang (BEKG)	Managing Director, RBW Engineering	1 September 2019 to 31 August 2021
Ir. Effendy Bin Muhamad @ Muhamad Yasin (DEK)	Principal Electrical Engineer, ENHILL Consultant	1 September 2019 to 31 August 2021
Ir. Azizi Ahmad (DEK)	HOD / Principal Engr. - Instrumentation, Control and Telecommunication, Ranhill WorleyParsons	1 September 2019 to 31 August 2021
Ir. Dr. Iryani Mohamed Rawi (DEK)	Head (Product Certification), TNB	1 September 2019 to 31 August 2021

DIPLOMA PROGRAMME

DIPLOMA IN ELECTRICAL ENGINEERING (DEK)

DIPLOMA IN ELECTRICAL ENGINEERING (DEK)

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

PROGRAMME EDUCATIONAL OBJECTIVES (PEO) - DIPLOMA PROGRAMME

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

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

PROGRAMME OUTCOMES (PO) - DIPLOMA PROGRAMME

Programme Outcome (PO) are statements describing what students are expected to know and be able to perform or attain by the time of graduation. These are related to the knowledge profile (DK1-DK7) that students acquire throughout the programme.

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

NO	PROGRAMME OUTCOMES (PO)
	Upon graduation, graduates should be able to :-
1.	Knowledge: Apply knowledge of applied mathematics, applied science, engineering fundamentals and an engineering specialisation as specified in DK1 to DK4 respectively to wide practical procedures and practices.
2.	Problem analysis: Identify and analyse well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity (DK1 to DK4)
3.	Design/development of solutions: Design solutions for welldefined technical problems and assist with the design of systems, components or processes to meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (DK5).
4.	Investigation: Conduct investigations of well-defined problems; locate and search relevant codes and catalogues, conduct standard tests and measurements.
5.	Modern Tool Usage: Apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations (DK6).
6.	The Engineer and Society: Demonstrate knowledge of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering technician practice and solutions to well-defined engineering problems (DK7).
7.	Environment and Sustainability: Understand and evaluate the sustainability and impact of engineering technician work in the solution of well-defined engineering problems in societal and environmental contexts (DK7).

NO	PROGRAMME OUTCOMES (PO)
	Upon graduation, graduates should be able to :-
8.	Ethics: Understand and commit to professional ethics and responsibilities and norms of technician practice
9.	Individual and Team Work: Function effectively as an individual, and as a member in diverse technical teams.
10.	Communications: Communicate effectively on well-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work, and give and receive clear instructions.
11.	Project Management and Finance: Demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member or leader in a technical team and to manage projects in multidisciplinary environments.
12.	Life Long Learning: Recognise the need for, and have the ability to engage in independent updating in the context of specialised technical knowledge.

COURSE IMPLEMENTATION - DEK

The number of credits required to be awarded a Diploma is **90** credits.

This course will take two (2) years and eight (8) months minimum which emphasis on the latest technology and up to date skills.

The composition of the credits is as follows:

Components		Credit Hours	Percentage
Compulsory University Course (W)		14	15.56%
Core Course (P)	Engineering	58	77.78%
	Science & Mathematics	12	
Elective (E)		6	6.66%
Total		90	100%

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

CURRICULUM STRUCTURE - DEK

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

TYPE OF		YEAR 1				YEAR 2			YEAR 3	
COURSE	SEMESTER KHAS PERMULAAN	SEMESTER 1		SEMESTER 2	SEMESTER 3	SEMESTER 3	SEMESTER 4		SEMESTER 5	
CORE PROGRAM (P)		DEKA 1212 ALGEBRA	SEMESTER BREAK	DEKA 1222 CALCULUS	DEKC 1313 MICROPROCESSOR	DEKA 2333 DIFFERENTIAL EQUATION	DEKA 2342 ENGINEERING MATHEMATICS	LONG SEMESTER BREAK	DEKU 3118 INDUSTRIAL TRAINING	
		DEKA 1113 PHYSICS		DITG 1113 COMPUTER PROGRAMMING	DEKA 1312 SAFETY AND HEALTH FOR ENGINEERS	DEKE 2123 POWER ELECTRONICS	DEKP 2213 POWER SYSTEM			
		DEKE 1113 PRINCIPLE OF ELECTRICAL AND ELECTRONICS		DEKE 1213 ANALOGUE ELECTRONICS		DEKC 2113 CONTROL SYSTEM ENGINEERING	DEKP 2214 DIPLOMA PROJECT			
		DEKE 1123 DIGITAL ELECTRONICS		DEKP 1213 ELECTRICAL CIRCUIT I		DEKE 2113 ELECTRICAL MACHINE				
		DEKC 1113 INSTRUMENTATION & MEASUREMENT		DMCG 1323 INTRODUCTION TO MECHANICAL SYSTEM		DEKP 2113 ELECTRIC CIRCUIT II				
		DEKP 1111 BASIC ELECTRICAL SKILL		DEKP 1211 ELECTRICAL WORKSHOP		DEKC 2123 AUTOMATION				
CREDIT HOUR SEMESTER		15		15	5	18	9		8	70
ELECTIVE (E)							CHOOSE 2 OUT OF 3 ELECTIVE COURSE			
							DEKP 2223 RENEWABLE ENERGY AND APPLICATION			
							DEKP 2233 BUILDING MAINTENANCE AND MANAGEMENT			
							DEKC 2213 INDUSTRIAL ROBOTIC			
							6			6
UNIVERSITY REQUIREMENT (W)	DLHW 1012 FOUNDATION ENGLISH	DLHW 2422 ENGLISH FOR EFFECTIVE COMMUNICATION		DLHW 3432 ENGLISH FOR MARKETABILITY	DTMW 1012 FUNDAMENTAL OF ENTERPRENEURIAL ACCULTURATION					
	DLHW 1742 LEADERSHIP	DKKX 1XX1 CO-CURRICULUM I		DKKX 2XX1 CO-CURRICULUM II						
	DLHW 1032 MALAYSIAN STUDIES									
CREDIT HOUR SEMESTER	6	3		3	2					14
TOTAL CREDIT	6	18		18	7	18	15		8	90

CREDIT HOURS - DEK

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

SEMESTER	CODE	COURSE	CATEGORY	CREDIT HOUR
SEMESTER KHAS PERMULAAN	DLHW 1012	FOUNDATION ENGLISH	W	2
	DLHW 1742	LEADERSHIP	W	2
	DLHW 1032	MALAYSIAN STUDIES	W	2
			TOTAL	**6**
SEMESTER 1	DEKA 1212	ALGEBRA	P	2
	DEKA 1113	PHYSICS	P	3
	DEKP 1111	BASIC ELECTRICAL SKILL	P	1
	DEKE 1113	PRINCIPAL OF ELECTRICAL AND ELECTRONICS	P	3
	DEKE 1123	DIGITAL ELECTRONICS	P	3
	DEKC 1113	PRINCIPAL OF INSTRUMENTATION & MEASUREMENT	P	3
	DLHW 2422	ENGLISH FOR EFFECTIVE COMMUNICATION	W	2
	DKKX 1XX1	CO-CURRICULUM I	W	1
			TOTAL	**18**
SEMESTER 2	DEKA 1222	CALCULUS	P	2
	DEKP 1213	ELECTRICAL CIRCUIT I	P	3
	DMCG 1323	INTRODUCTION TO MECHANICAL SYSTEM	P	3
	DITG 1113	COMPUTER PROGRAMMING	P	3
	DEKE 1213	ANALOGUE ELECTRONICS	P	3
	DEKP 1211	ELECTRICAL WORKSHOP	P	1
	DLHW 3432	ENGLISH FOR MARKETABILITY	W	2
			TOTAL	18
SEMESTER KHAS	DEKA 2332	SAFETY AND HEALTH FOR ENGINEERS	P	2
	DEKC 1313	MICROPROCESSOR	P	3
	DTMW 1012	FUNDAMENTAL OF ENTREPRENEURIAL ACCULTURATION	W	2
			TOTAL	**7**
SEMESTER 3	DEKA 2333	DIFFERENTIAL EQUATION	P	3
	DEKE 2123	POWER ELECTRONICS	P	3
	DEKC 2113	CONTROL SYSTEM ENGINEERING	P	3
	DEKE 2113	ELECTRICAL MACHINE	P	3
	DEKP 2113	ELECTRIC CIRCUIT II	P	3
	DEKC 2123	AUTOMATION	P	3
			TOTAL	**18**

SEMESTER	CODE	COURSE	CATEGORY	CREDIT HOUR
SEMESTER 4	DEKA 2342	ENGINEERING MATHEMATICS	P	2
	DEKP 2213	POWER SYSTEM	P	3
	DEKP 2214	DIPLOMA PROJECT	P	4
	CHOOSE ONLY TWO (2) COURSES			
	DEKP 2223	RENEWABLE ENERGY AND APPLICATION	E	3
	DEKP 2233	BUILDING MAINTENANCE AND MANAGEMENT	E	3
	DEKC 2213	INDUSTRIAL ROBOTIC	E	3
			TOTAL	15
SEMESTER 5	DEKU 2363	INDUSTRIAL TRAINING	P	8
			TOTAL	8
			TOTAL CREDIT	90

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

STUDENT LEARNING TIME - DEK

Semester	Code	Course	Face-to-Face Learning				Self Learning Activities	Formal Assessment	Total
			Teacher Centered (TC)	Student Centered Learning (SCL)			Student Direct Learning / Revision / Exercise	Continuous Learning + Final Examination	
			Lecture	Tutorial	Practical	PBL / Other SCL Activities			
Special Semester	DLHW 1012	FOUNDATION ENGLISH	28	3			45	4	80
	DLHW 1742	LEADERSHIP	28	3			45	4	80
	DLHW 1032	MALAYSIAN STUDIES	28	3			45	4	80
1	DLHW 2422	ENGLISH FOR EFFECTIVE COMMUNICATION	28	3			45	4	80
	DKKX 1XX1	CO-CURRICULUM I			40				40
	DEKA 1113	PHYSICS	28	3	24		60	5	120
	DEKA 1212	ALGEBRA	28	3			45	4	90
	DEKE 1113	PRINCIPLE OF ELECTRICAL AND ELECTRONICS	28	3	24		60	5	120
	DEKC 1113	INSTRUMENTATION & MEASUREMENT	28	1	24	3	59	5	120
	DEKE 1123	DIGITAL ELECTRONICS	28	1	24	3	59	5	120
	DEKP 1111	BASIC ELECTRICAL SKILL			40		0		40
2	DLHW 3432	ENGLISH FOR MARKETABILITY	28	3			45	4	80
	DEKA 1222	CALCULUS	28	3			45	4	80
	DITG 1113	COMPUTER PROGRAMMING	28	12	16		59	5	120
	DMCG 1323	INTRODUCTION TO MECHANICAL SYSTEM	28	3	24		60	5	120
	DEKP 1213	ELECTRICAL CIRCUIT I	28	1	24	3	59	5	120
	DEKP 1211	ELECTRICAL WORKSHOP			40		0		40
	DEKE 1213	ANALOGUE ELECTRONICS	28	1	24	3	59	5	120
	DKKX 2XX1	CO-CURRICULUM II			40				40

Special Semester	DTMW 1012	FUNDAMENTAL OF ENTREPRENEURIAL ACCULTURATION	28	3			45	4	80
	DEKC 1313	MICROPROCESSOR	28		24	9	57	2	120
	DEKA 1312	SAFETY AND HEALTH FOR ENGINEERS	28	6	3		41	2	80
3	DEKP 2113	ELECTRICAL CIRCUIT II	28	1	24	3	59	5	120
	DEKE 2123	POWER ELECTRONICS	28	1	24	3	59	5	120
	DEKA 2333	DIFFERENTIAL EQUATIONS	47	3			65	5	120
	DEKM 3753	ELECTRICAL MACHINES	28	3	24		60	5	120
	DEKC 2123	AUTOMATION	28		24	9	57	2	120
	DEKC 2113	CONTROL SYSTEM ENGINEERING	28	3	24		60	5	120
4	DEKA 2342	ENGINEERING MATHEMATICS	28	3			45	4	80
	DEKP 2213	POWER SYSTEM	28	1	24	3	59	5	120
	DEKP 2214	DIPLOMA PROJECT				20	140		160
	CHOOSE ONLY TWO (2) ELECTIVE COURSES								
	DEKP 2223	RENEWABLE ENERGY AND APPLICATION	28	3	24		60	5	120
	DEKP 2233	BUILDING MAINTENANCE AND MANAGEMENT	28	3	24		60	5	120
	DEKC 2213	INDUSTRIAL ROBOTIC	28	3	24		60	5	120
5	DEKU 3118	INDUSTRIAL TRAINING					320		320
TOTAL HOURS			**831**	**64**	**584**	**59**	**2037**	**127**	**3730**

SUBJECT DETAILS FOR DIPLOMA PROGRAMME (DEK)

DEKA 1212
ALGEBRA

Learning Outcomes

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

1. Describe the fundamental concepts of functions and graphs, polynomials, matrices, trigonometry and complex number.
2. Solve the mathematical problems that involve linear system, nonlinear equation, trigonometry and complex number by using an appropriate technique.
3. Apply the knowledge of algebra to deal with the engineering problems.

Synopsis

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

References

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

DEKA 1113
PHYSICS

Learning Outcomes

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

1. Explain basic concept in physics, covering aspect such as mechanics, electric and thermodynamics.
2. Use concepts systematically to solve problems in mechanics, fluid mechanics and electric.
3. Exhibit effective communication skills through oral presentation.

Synopsis

This course covers three major fields which are mechanics, fluid mechanics and electric. The topics covers in this course are: Forces, Acceleration and Newton's Second Law of Motion, Motion with a Changing Velocity, Circular Motion, Conservation of Energy, Linear Momentum, Fluids, Electric Forces and Fields, Electric Potential, Electric Current and Circuits, Magnetic Forces and Fields, Electromagnetic Induction. Experiments covered Mechanics and Electricity.

References

1. Giancolli, D.C., Physics for Scientists and Engineers with Modern Physics, 4th Ed. Pearson Prentice Hall 2009.
2. Walker, J.S., Physics, 5th edition, Pearson, 2016.
3. Giambatista A., Richardson B.M and Richardson R.C., College Physics, 2nd edition. Mc-Graw Hill, 2013.
4. Serway, R.A., Jewett, J.W., Physics for Scientists and Engineers with Modern Physics 10th Ed, Cengage Learning 2019.

DEKC 1113
INSTRUMENTATION & MEASUREMENT

Learning Outcomes

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

1. Understand of electrical measurement and instrumentation principles.
2. Analyze various methods/techniques involve in measurement and instrumentation of electrical engineering.
3. Demonstrate related experiment on measurement and instrumentation of electrical engineering.
4. Work effectively in group to complete the given tasks based on electrical engineering problem.

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

References

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

DEKE 1113
PRINCIPLE OF ELECTRICAL AND ELECTRONICS

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Explain and demonstrate the understanding of basic laws and operations of electronic devices in electrical and electronics circuit.
2. Analyze electrical and electronics circuits using appropriate rules and laws.
3. Measure electrical and electronics circuit parameters using appropriate tools.

Synopsis
This course will expose students to the fundamental knowledge in electrical and electronics engineering. It covers topics related to basic laws and introduction to electronics devices that usually used in electrical and electronic circuits. It starts with an introduction to basic element in electrical and electronics such as voltage, current and circuit elements. Then the student will be introduced to basic laws in circuit analysis such as Ohm's law, voltage, and current divider and Kirchoff's law. After that, the electronics devices will be introduced to the student including an introduction to semiconductors, diode, BJT, FET, and its analysis and applications.

References

1. C.K. Alexander and M.N.O. Sadiku, Fundamentals of Electric Circuit, 6th Ed 2017, McGraw Hill.
2. J.W.Nilson, S.A.Riedel, Electric Circuits, 10th Ed 2015, Pearson Education, Inc
3. Boylestad R.,L. Nashelsky, Electronic Devices and Circuit Theory, Pearson Education Inc., Eleventh Edition 2013
4. T.L. Floyd, Principles of Electric Circuits, 9th Ed 2013, Pearson Education, Inc.

DEKP 1111
BASIC ELECTRICAL SKILLS

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Apply the knowledge of basic electronic measurement, basic microcontroller programming, and electronic soldering processes.
2. Demonstrate appropriate instruments / tools handling skills required to solve engineering problems adequetly.
3. Comply with rules, procedure and ethics skills through experiment project.
4. Cooperate effectively as a teamwork during laboratory activities.
5. Search, manage and synthesis related information in order to further apprehend their laboratory activities.

Synopsis
In this workshop, students will be exposed to three basic engineering work; Basic Electronic Measurement, Basic microcontroller programming, and Basic introduction to electronic components and soldering process. For the first session, student will be introduced to use several measurement equipment such as voltmeter, ammeter, multimeter, oscilloscope, etc for a given circuit, students need to measure the current and voltage at certain load. After that, student will be exposed to the basic microcontroller programming which is able to control the circuitry design in real time hardware assembling process (arduino circuitry) is carried out and will be assess with a mini project at the end of the session.

References

1. Graphic Symbols for Electrical and Electronics Diagrams, IEEE Std 315-1975 (Reaffirmed 1993).
2. Aminurrashid N., Mohd Hanif C.H., Mohd Razali M.S., & Sulaiman, S. Proteus Professional Design, FKE Resource. UTeM.2011.
3. Arduino for Dummies, 2nd Edition. Nussey John. 2018.

DEKP 1213
ELECTRICAL CIRCUIT I

Learning Outcome

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

1. Introduction to basic law in electric circuit and apply method of analysis.
2. Apply and solve circuit theorems in analyzing electrical circuits.
3. Analyze circuits using appropriate simulation and hardware tools.

Synopsis

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

References

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

DEKA 1222
CALCULUS

Learning Outcomes

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

1. Identify limits and continuity of functions using computational methods of limits.
2. Solve derivatives of algebraic, trigonometric, logarithmic and exponential functions using differentiation techniques.
3. Solve integrals of algebraic, trigonometric, logarithmic and exponential functions using integration techniques.
4. Apply the knowledge of calculus to deal with the engineering problems.

Synopsis

This subject enchances two main parts in Calculus which consists of differential and integral which will be solved using analytical and numerical techniques. This subject serves to give students good understanding knowledge the basic concept of derivative and integration in solving application related to mathematics and engineering problems.

References

1. Abd Wahid et. Al, The First Course of Calculus for Science and Engineering Students, Penerbit UTHM, 2013
2. James Stewart, Calculus, 8th Edition, Cengage Learning, 2016.
3. Ron Larson & Bruce Edwards, Calculus of a Single Variable, 11th Edition, Cengage Learning, 2018.
4. Steven Chapra, Numerical Methods for Engineers, 7th Edition, Mc Graw Hill, 2015.

DEKE 1213
ANALOGUE ELECTRONICS

Learning Outcomes

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

1. Define the characteristics and operation of the BJT, Power Amplifier and Operational Amplifier.
2. Analyse the characteristics and operation of the Active Filter, Voltage Regulator, and Feedback and Oscillator.
3. Conduct and demonstrates practical experiments of BJT, Power Amplifier, Operational Amplifier, Active Filter, Voltage Regulator, and Feedback and Oscillator.
4. Work effectively in group to complete the given tasks based on electrical engineering problem.

Synopsis

This subject serves as an electronic fundamental course for engineering students. The topics that will be covered including the BJT, Power Amplifier, Operational Amplifier,

Active Filter, Voltage Regulator, and Feedback and Oscillator. Introduction to the use of P-Spice and Proteus simulation software for circuit designing as well as hardware experiments during laboratory will be implemented.

References

1. Boylestad R.,L. Nashelsky, Electronic Devices and Circuit Theory, Pearson Education Inc., Eleventh Edition 2013.
2. Thomas L. Floyd, Elecronic Devices: Conventional Current Version, Pearson Education Inc., Nineth Edition, 2012.
3. Atikah Razi et al., 2nd Edition 2017, Introduction to Analogue Electronics Module, Penerbit Universiti Teknikal Malaysia Melaka.

DEKP 1211
ELECTRICAL WORKSHOP

Learning Outcomes

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

1. Demonstrate appropriate troubleshoot skills on relay control circuit and domestic wiring installation.
2. Ability to apply and use engineering drawing software tools for design electrical system.
3. Demonstrate the ability to awernes the safety, regulation and responsibility through practical competence on the relay control circuit and domestic wiring installation.
4. Demonstrate the ability to work in a team for the practical competence on circuitry design.

Synopsis

This workshop will expose student to relay control circuit, and domestic wiring installation. Concentration is given on the safety aspects and quality of works. Then the students also will be exposed the basic engineering software AutoCAD where to the 2D basic engineering drawing in which involve creating, editing, plotting and electrical services system.

References

1. Ir Md Nazri, Aminudin, Md Hairul Nizam, Engineering Practice: Wiring System & Motor Starter, Modul 2, UTeM, 2007.
2. Guidelines for Electrical Wiring in Residential Buildings, Suruhanjaya Tenaga, 2008.
3. Teo Cheng Yu, Principles and Design of Low Voltage System, 2nd Ed, Byte Power Publications, Singapore, 2012.
4. Leach, J. A. Autocad Instructor 2016: A Student Guide for In-depth Coverage of Autocad's Commands and Features, SDC Publications, 2016.

DEKC 1313
MICROPROCESSOR

Learning Outcomes

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

1. Able to describe microprocessor (Motorola 68000) architecture, its operation and the interfacing circuitry of microprocessor-based systems.
2. Develop and construct a microprocessor based system including writing instruction set in assembly language.
3. Demonstrate the ability to work in a team for the microprocessor based project.
4. Present in oral and written regarding output of microcontroller-based system project.
5. Demonstrate the basic skills of project management in managing the microprocessor based project.
6. Demonstrate the element of self learning in the microprocessor based project.

Synopsis

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

References

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

5. Wilcox A.D., 68000 Microcomputer Systems, Prentice Hall, 1997.

DEKA 1312
SAFETY AND HEALTH FOR ENGINEERS

Learning Outcomes

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

1. Demonstrate an understanding of knowledge with the types of hazard and workplace injury prevention, risk management, planning, organization, training and incident investigations.
2. Identify the Occupational Safety and Health knowledge, practices and responsibilities.
3. Collect and sort the relevant to the given talk of safety standards and regulations that must be maintained in compliance with regulatory requirements and within engineering limits.
4. Discuss current engineering safety and health issues and practices that impacting engineering professionals
5. Recognize the important of safety and health that need to be engage during professional work.

Synopsis

The main purpose of this course is to instill the recognition of the need for and the ability to engage in life-long learning among students. Through presentation by Invited speakers from the industry, DOSH and academia, students will be exposed to topics such as Department of Safety and Health (DOSH) & National Institute of Occupational Safety and Health and knowledge of contemporary safety and health issues in related to engineering fields. Presentation case study by the student with a given topic of safety and health will also be included.

References

1. Roger L. Brauer, Ph.D., CSP, PE, Safety and Health for Engineers, Second Edition, Wiley-Interscience. (2006).
2. Occupational Safety and Health Master Plan 2016-2020, Department of Occupational Safety and Health, Ministry of Human Resources, Malaysia (2016).
3. ACT 514: OCCUPATIONAL SAFETY AND HEALTH ACT 1994.
4. ACT 139: FACTORIES AND MACHINERY ACT 1967 (REVISED - 1974) Incorporating latest amendment - Act A1268 of the year 2006.

DEKC 2123
AUTOMATION

Learning Outcomes

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

1. Solve problems based on provided information by applying the concept of Automation, Programmable Logic Controller
2. Design a solution for a well defined technical problems based on provided information by using PLC, Pneumatic, Hydraulic and other automation components
3. Conduct investigations of well-defined problems for the automation system based on design requirement, symbols and schematic diagram.
4. Demonstrate the understanding of the sustainability and impact of the automation system towards the environment and society.
5. Search for a suitable information and defined all related informations into well defined problems.

Synopsis

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

References

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

DEKC 2113
CONTROL SYSTEM ENGINEERING

Learning Outcomes

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

1. Describe fundamental knowledge of control system and the transient response of a linear time invariant system.
2. Develop a mathematical model for a linear time invariant system.
3. Analyze a linear time invariant system in time and frequency domain.
4. Search, manage and synthesize information to solve control problems in frequency domain using root locus and/or bode plot techniques.
5. Demonstrate experiments of control systems as well as to analyze and interpret data.

Synopsis

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

References

[1] Nise, S Norman, Control Systems Engineering, 8th Edition, John Wiley & Sons Inc., 2019.

[2] Ogata, Katsuhiko, Modern Control Engineering, 5th Edition, Prentice Hall, 2010.

[3] Dorf, R.C. & Bishop, R.H., Modern Control Systems, 13th Edition, Prentice Hall, 2016.

[4] Syed Najib, Azrita Alias, Aliza Che Imran, Sahazati Md Rozali, Saleha Mohamed Salleh, Basic Control System, Penerbit Universiti Teknikal Malaysia Melaka, 2008.

DEKE 2123
POWER ELECTRONICS

Learning Outcomes

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

1. Explain the semiconductor power switches and analyze the performance of rectifiers, choppers and inverters in power converter application.
2. Demonstrate the ability of performing experimental works involving power electronics converters and devices.
3. Demonstrate the ability of communication skills through project presentation.

Synopsis

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

References

[1] Daniel W. Hart, Introduction to Power Electronics International Edition, Mc-Graw Hill 2011.

[2] Muhammad H. Rashid. Power Electronics – Circuits, Devices, and Applications, 3rd Edition, Prentice Hall, 2004.

[3] Issa Batarseh, Power Electronic Circuits, John Wiley & Sons, 2004.

[4] Ned Mohan, Tore M. Undeland, William P. Robbins, Power Electronics – Converters, Applications and Design, 3rd Edition, John Wiley and Sons, 2003.

[5] V.R Moorthi, Power Electronics- Devices, Circuits, and Industrial Applications, Oxford, 2005.

DEKA 2333
DIFFERENTIAL EQUATIONS

Learning Outcomes

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

1. Describe the fundamental concepts of the first and second order differential equations, Laplace transform and Fourier Series
2. Solve differential equation using an appropriate technique.
3. Apply the knowledge of differential equation to deal with the engineering problems.

Synopsis

This subject consists of 5 chapters: First order linear differential equations, Second order linear differential equations with constants coefficients, Laplace transform, Fourier series and Partial Differential Equations. The syllabuses are developed based on these three different stages which are exposing the learner's on the fundamental concept of differential equation, various techniques to solve different equation and lastly, apply the various solving techniques to the learner's engineering problem.

References
1. Rahifa et. al, Differential Equations for Engineering Students, Penerbit UTeM 2019.
2. Abd Wahid Md Raji & Mohd Nor Mohamad, Differential Equations for Engineering Students, 2016.
3. Dennis G. Zill, Differential Equations with Boundary Value Problems, 9th Edition. Cencage Learning, 2018.
4. Steven Chapra, Numerical Methods for Engineers, 7th Edition, Mc Graw Hill, 2015.

DEKP 2113
ELECTRICAL CIRCUIT II

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Describe and apply the principle of AC voltage and current generation, RMS, average value and RLC circuits for single phase and three phase systems.
2. Apply transient analysis on first order and second order electric circuits and conduct steady state analysis to solve AC circuit by using mesh, nodal and appropriate circuit theorems.
3. Demonstrate the ability to use appropriate engineering tool to analysing an AC circuits by simulation and hardware.
4. Able to search, manage and synthesize information.

Synopsis
This subject will cover the transient analysis for first order and second order electric circuits. Then, the students will be exposed to the principle of AC voltage and current generations, RMS, average value and RLC circuits analysis. Furthermore, the basic concept and principles to conduct Nodal and Mesh analysis, Thevenin's, Norton's and Superposition Theorems on single phase AC system will be covered in this course. Finally, this course also introduced the basic concept of three phase connections (star and delta) in power system network.

References
1. C.K. Alexander and M.N.O. Sadiku, Fundamentals of Electric Circuits, 5th Ed, McGraw-Hill, (2013).
2. J.W. Nilsson and S.A. Riedel, Electric Circuits, 9th Ed, Pearson Education, Inc, (2011).
3. T.L. Floyd, Principles of Electric Circuits, 9th Ed, Pearson Education, Inc, (2010).
4. Edward Hughes, Electrical & Electronic Technology, 12th Edition, Pearson Prentice Hall, (2016).

DEKA 2342
ENGINEERING MATHEMATICS

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Recognise the multivariable function and extend the principle ideas of calculus in such function.
2. Solve the mathematical problems that involve vector calculus.
3. Apply the knowledge of engineering mathematics to deal with engineering problems.

Synopsis
This subject consists of three chapters: Multivariable Functions, Double Integral and Vector-valued Functions. The syllabus is extended from subject Calculus which emphasizing the concepts of the functions with several variables, double integrals of functions in Cartesian and polar coordinates system and also vector-valued function.

References
1. Yudariah M.Yusof et.al., Multivariable Calculus for Independent Learners, 2nd Edition, Pearson, 2011.
2. Ron Larson & Bruce Edwards, Mutivariable Calculus, 11th Edition, Cencage Learning, 2018.
3. James Stewart, Mutivariable Calculus, 8th Edition, Cencage Learning, 2016.

DEKP 2213
POWER SYSTEM

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Describe the basic concept of power system and their components.
2. Describe the basic principle and parameter calculation for transmission and distribution system.
3. Calculate the fault level and short circuit current in symmetrical and asymmetrical faults.
4. Demonstrate the ability to use appropriate engineering tools in electrical power system.

Synopsis
The aim of this course is to introduce the basis of electrical power engineering in relation to energy generation, transmission and distribution system. Then, basic principle and application of per unit method for generating the impedance diagram from simple electrical network will be introduced. The student also will be exposed to the fundamental and operating principles of power transformer and transmission line. Furthermore, basic principle of Gauss Seidel and Newton-Raphson methods for power flow analysis will be discussed. Finally, the course will cover the symmetrical fault level and short circuit current calculations for simple electrical network using per-unit method.

References

1. Edward Hughes, Electrical & Electronic Technology, 12th Edition, Pearson Prentice Hall, 2016.
2. Glover and Sharma, Power System Analysis and Design, 6th Edition, Thomson Learning, 2016.
3. Hadi Saadat, Power System Analysis, 3rd Edition, 2011.
4. John J. Grainger, William D. Stevenson Jr, Power System Analysis, 2nd Edition, McGraw-Hill, 2016.

DEKP 2233
BUILDING MAINTENANCE AND MANAGEMENT

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Analyze any regulation and standard related to building maintenance and management problem.
2. Design the elecrical and mechanical drawing compenent in building maintainace services.
3. Use appropriate engineering tools for the practical competence on building maintenance and management.
4. Demonstrate awareness of safety element in building management compenent in electrical and mechanical system.
5. Demonstrate awareness of environment and sustainability in building maintenance and management.
6. Search for proper techniques for building audit.

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

References
This course covers the concept of building services and systems for mechanical, electrical, plumbing engineering, building floor plans, elevat

1. Moncef Krarti, Energy Audit of Building Systems – An Engineering Approach, CRC Pres, 2011.
2. Mechanical and Electrical Equipment for Buildings, 11th Edition, Walter T. Grondzik, Alison G. Kwok, Benjamin Stein, John S. Reynolds, John Wiley & Sons, 31 Jan 2011.
3. Stein B. Reynolds J.S. & McGuinness W.J. Mechanical and Electrical Equipment for Buildings, 7th Edition, Volume 1 & 2, John Wiley & Sons.
4. Building Maintenance Management, 2nd Edition Chanter B, Swallow P, Wiley-Blackwell, May 2008.
5. Alexander, Sadiku, Fundamentals of Electric Circuits, 5th edition, 2013.

DEKC 2213
INDUSTRIAL ROBOTIC

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Identify, apply and analysis of basic knowledge of industrial robot system component including motion profile and mechanical aspect.
2. Apply specific robotic programming and simulations for industrial robots used in industrial automation systems.
3. Demonstrate ability to use robotic technologies in a safety manners.
4. Demonstrate ability to use robotic technologies in a sustainable operation.

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, basic robot programming and industrial robot applications. Experiments will include robot programming in an industrial application setting.

References

1. Craig, J. J., Introduction to Robotics, Mechanics and Control, 3rd Ed., Addison Wesley Longman, 2014.
2. Groover, Industrial Robotics, Mc Graw Hill, 2012.
3. Man Zhihong, Robotics, Prentice Hall, 2nd ed., 2005.

DEKP 2223
RENEWABLE ENERGY AND APPLICATIONS

Learning Outcomes

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

1. Identify and analyze various types of renewable energy, characteristics, performance and their application.
2. Design an appropriate renewable energy system to suit with specific need, criteria and conditions.
3. Demonstrate awareness of the design and installation procedure of renewable energy system with consideration of safety, legal and societal issues.
4. Evaluate the impact of the renewable energy technology in terms of electricity supply sustainability.

Synopsis

The subject intends to expose to the students the most recent development on the sustainable electrical resources. This subject also introduces the students various form of sustainable energy resources and their connection to the electrical network. The students also exposed to different types of photovoltaic materials,characteristics and the design procedure to create a photovoltaic system. In addition, there will be a brief intro to the other sustainable energy applications such as wind turbine, hydro, biomas, etc.

References

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

DEKU 3118
INDUSTRIAL TRAINING

Learning Outcomes

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

1. Apply appropriate techniques and technical knowledge which is relevant for student field of study.
2. Demonstrate the ability to adapt with working environment and practice working efficiently and ethically.
3. Demonstrate soft skill especially communication skill at all level. Work affectively as an individual, team members and as a leader as well.
4. Acquire new knowledge, life-long learning and aware to new technology.

Synopsis

All Diploma students are required to undergo industrial training as part of their curiculum to complete their two and half (2 1/2) years course after semester 4 of studies for a 16-weeks period of training at respective industrial companies. It is compulsory for all students to undergo the Industrial Training Programme. In general, the aim of industrial training are to give exposure, experience and professional skills to various aspects of engineering discipline, in particular in electrical engineering related industries. The students are also expected to be familiarized with efficient, accountable and ethical conduct as they will be supervised directly under the company's personnel as well as supervisors from the faculty. Apart from that, the assessment will be made by the appointed faculty supervisors & the industry supervisors. A PO survey is also embedded inside the assessment form by the industry supervisors. There will also be a survey by the students prior to completion of their training. After completing the industrial training, students have to submit a formal report following the faculty format. Evaluation will be based on faculty supervisor report, industrial supervisor report and student logbook toward grading whether pass or fail.

References

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

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

DMCG 1323 INDTRODUCTION TO MECHANICAL SYSTEM

Learning Outcomes

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

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

Synopsis

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

References

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

DLHW 1012 FOUNDATION ENGLISH

Learning Outcomes

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

Synopsis

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

References

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

DLHW 2422 ENGLISH FOR EFFECTIVE COMMUNICATION

Learning Outcomes

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

Synopsis

This course is designed to provide students with the necessary communication skills to communicate effectively. The skills covered are speaking, reading and writing. The elements of grammar are taught to complement the topics covered in this course. The documents covered are product descriptions and manual instructions. Students demonstrate interpersonal skills through speeches and role-play. The elements of problem-based learning (PBL) are especially exercised during the oral presentation of the product and manual descriptions as well as role-play.

References

1. Azar, B. S. (2010). *Understanding and using English grammar*. New York: Longman.

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

DLHW 3432
ENGLISH FOR MARKETABILITY

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

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

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

DITG 1113
COMPUTER PROGRAMMING

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Describe the fundamental principle of problem solving, programming techniques and programming structures in program development
2. Explain problem solutions based on the principles of problem solving, programming technique and programming structures
3. Produce program codes by applying suitable programming structure and techniques

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

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

DTMW 1012
FUNDAMENTAL OF ENTERPRENEURIAL ACCULTURATION

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

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

References

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

DKXX XXX1
CO-CURRICULUM I &II

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

BACHELOR PROGRAMME

PROGRAMME EDUCATIONAL OBJECTIVES (PEO) - BACHELOR PROGRAMME

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

BACHELOR OF ELECTRICAL ENGINEERING (BEKG)	
The objectives of this programme are to produce creative and innovative Professional who:	
1.	Practice electrical engineering knowledge in broad applications.
2.	Attain a successful career, possess excellent leadership quality, able to work independently and practice ethical conduct.
3.	Engage with life-long learning and adapt to constantly evolving technology and entrepreneurial skills in decision making.

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

PROGRAMME OUTCOMES (PO) - BACHELOR PROGRAMME

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

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

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

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

BACHELOR OF ELECTRICAL ENGINEERING (BEKG)

BACHELOR OF ELECTRICAL ENGINEERING (BEKG)

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

PROGRAMME IMPLEMENTATION - BEKG

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

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

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

CURRICULUM STRUCTURE - BEKG

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

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

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

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

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

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

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

EQUIVALENT CODE AND PRE-REQUISITE - BEKG

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

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

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

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

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

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

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

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

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

STUDENT LEARNING TIME (SLT) - BEKG

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

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

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

SUBJECT DETAILS FOR BACHELOR PROGRAMME (BEKG)

BEKB 1131
ELECTRICAL ENGINEERING WORKSHOP I

Learning Outcomes

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

1. Construct three phase motor starter control circuit.
2. Apply the basic concept for electrical simulation using Pspice and PROTEUS simulation tools.
3. Apply the basic concept for electrical schematic diagram using AUTOCAD tools
4. Apply the basic microcontroller programming language for dynamic mechanism application.
5. Demonstrate team work and present the results in oral and technical report writing.

Synopsis

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

References

1. Ir Md Nazri, Aminudin, Md Hairul Nizam, Engineering Practice: Wiring System & Motor Starter, Module 2, UTeM, 2007.
2. Massimo Banzi, Getting Started with Arduino, 2nd Ed., O'reilly, 2011.
3. K.A. Charles, N.O. Sadiku, Fundamentals of Electric Circuits, 6th Ed., McGraw Hill, 2016.
4. James Leach, AutoCAD 2016 - Instructor, SDS Publications, 2016.
5. Dennis Fitzpatrick, Analog design and Simulation using OrCAD Capture and PSpice, Elsevier, 2012.

BEKB 1231
ELECTRICAL ENGINEERING WORKSHOP II

Learning Outcomes

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

1. Construct three phase motor starter control circuit.
2. Apply the basic concept for electrical schemetic diagram using AUTOCAD tools.
3. Apply the basic microcontroller programming language for dynamic mechanism application.
4. Demonstrate team work and present the results through oral and technical writing.

Synopsis

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

References

1. Ir Md Nazri, Aminudin, Md Hairul Nizam, Engineering Practice: Wiring System & Motor Starter, Modul 2, UTeM, 2007.
2. Massimo Banzi, Getting Started with Arduino, 2nd Ed., O'reilly, 2011.
3. K.A. Charles, N.O. Sadiku, Fundamentals of Electric Circuits, 6th Ed., McGraw Hill, 2016.
4. James Leach, AutoCAD 2016 - Instructor, SDS Publications, 2016.
5. Arduino microcontroller reference: https://www.arduino.cc/2012.

BEKB 2331
ELECTRICAL ENGINEERING LABORATORY I

Learning Outcomes

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

1. Construct series and parallel RLC circuits using electrical components and PSPICE simulation correctly.

2. Measure the electrical characteristics of single-phase and three-phase RLC circuit using appropriate measurement equipments precisely.
3. Identify and describe basic characteristics and operation of digital components such basic gates and it's combinational, adder, and flip-flops clearly.
4. Identify and describe basic circuit and operation of analogue application circuit such as active filter, amplifier, voltage regulator, and oscillator clearly.
5. Exhibit communication skills from lab report writing.

Synopsis

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

References

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

BEKB 2431
ELECTRICAL ENGINEERING LABORATORY II

Learning Outcomes

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

1. Simulate Discrete-Time & Continuous-Time Signal as well as Fourier series using MATLAB / SIMULINK software.
2. Simulate power system (generation / transmission / distribution) using PSCAD
3. Contruct transmission line components as well as voltage, current, and power measurements equipment properly and safety in laboratory environment
4. Exhibit the problem solving and critical thinking during any issues
5. Demostrate soft skill such as spirit of teamwork
6. Write and present techinal report systematically

Synopsis

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

References

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

BEKB 3551
ELECTRICAL ENGINEERING LABORATORY III

Learning Outcomes

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

1. Construct of rectifier, chopper, inverter and other power electronic devices accurately
2. Describe the performance of synchronous and induction mahine properly
3. Analyze the performance of the open-loop and closed-loop system according to specifications.
4. Exhibit soft skills such as communication skill.

Synopsis

This course is intended to provide the student knowledge about the fundamental of power electronics, electrical machines and control systems through experimental works.

The experiments are designed to expose student on the pratical aspects of the above mentioned fields.

References

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

BEKB 3673
INTEGRATED DESIGN PROJECT

Learning Outcomes

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

1. Design solutions by synthesizing electrical engineering knowledge that will solve complex electrical engineering problem in accordance to relevant standards and with appropriate consideration for public health and safety, cultural, societal, environmental and sustainability factors.
2. Utilize modern engineering and IT tools in facilitating solution to complex electrical engineering problems with an understanding of the limitations.
3. Evaluate the impact of the designed product, components or processes, in terms of safety, environmental and sustainability factors.
4. Demonstrate effective teamwork skills in completing the electrically integrated design project.
5. Apply project management and financial knowledge effectively in completing the electrically integrated design project.

Synopsis

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

References

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

BEKC 2433
SIGNAL AND SYSTEM

Learning Outcomes

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

1. Apply the basic knowledge of signals and systems for continuous-time and discrete-time signals.
2. Analyze the linear time-invariant (LTI) systems in time-domain and frequency-domain.
3. Analyze the LTI systems using Z-Transform method.

Synopsis

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

References

1. Philips, C. L., Parr, J. M., Signals, Systems and Transforms, 5th Ed., Prentice Hall, 2014.

2. Oppenheim, A. V., Willsky, A. S., Signals and Systems, 2nd Ed., Prentice Hall, 2014.
3. M.J. Roberts, Signals and System Analysis Using Transform Methods and MATLAB, 2nd Ed., Mc Graw Hill, 2012).

BEKC 2453
COMMUNICATION SYSTEMS

Learning Outcomes

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

1. Describe the basic principles of analogue & digital communication, data and computer network
2. Analyse the analogue and digital communication techniques that are typically used in communication systems
3. Explain the concept of computer system network

Synopsis

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

References

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

BEKC 3543
MICROPROCESSOR

Learning Outcomes

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

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

Synopsis

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

References

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

BEKC 3523
CONTROL SYSTEMS ENGINEERING

Learning Outcomes

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

1. Describe the basic features and configuration of control systems and derive the mathematical model of physical system in frequency and time domains

2. Analyse control system performance and stability of linear control system in time and frequency domains
3. Employ root locus method and its role in control system design
4. Analyse the asymptotic approximation Bode plots performances for first order and second order systems

Synopsis
This subject introduces the students to the fundamental ideas and definition of control systems such as block diagrams, plants or processes, open-loop and closed-loop control systems, transfer functions and transient and steady state responses. Students will be taught on how to obtain mathematical models for actual physical systems such as electrical, mechanical, electromechanical and simple fluid flow systems in transfer function and state space equation. Methods of system representation such as block diagram representation and signal flow graphs will be examined. The students will also be exposed to techniques of analysing control systems such as time domain analysis and stability. Besides, the student will be taught on the Root locus method and system performance analyse using Bode diagrams. Finally, an introduction to the design and analysis of control systems using MATLAB will also be given.

References

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

BEKC 3663
INSTRUMENTATION AND CONTROL

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

1. Apply and analyze the appropiate instrumentation elements for a data acquisition system.
2. Design compensators and controllers for control systems in time and frequency domain.
3. Design a controller and observer for a state variable feedback system.

Synopsis
This course divides the contents into two parts; Control Sys tem and Instrumentation. Control system part introduces students to the controller design of Linear Time Invariant (LTI) Systems by using Root Locus, Ziegler Nichols and state variable feedback systems. In state variable feedback systems, students will study the controllability and observability of LTI systems in state-spaceform, and design a state feedback controller with full-state feedback observer by using pole placement approach. Instrumentations part exposes students to the concepts of data acquisition system (such as sensors & transducers, signal conditioning & processing, A/D and D/A conversion, interfacing standards and data presentation).

References

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

BEKC 4773
INTELLIGENCE CONTROL SYSTEMS

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

1. Utilize the simulation tools for AI applications such as Simulink and MATLAB for appropriate industrial case studies.
2. Design basic fuzzy logic or neural network systems according to the engineering problem.
3. Demonstrate and analyze the performance of fuzzy logic and/or neural network using Simulink/MATLAB or other specified tools.

Synopsis
Artificial Intelligence (AI) is a field of study concerns on allowing machines to imitate human's thinking or behaviour. By applying AI techniques, machines would be able to solve complex engineering problems such as predicting numbers of defect products in factory, optimizing a water tank system, classifying patients based on symtomps of a disease and etc. In this course students will be focusing on two popular sub topics in Artificial Intelligence area which is Neural Network

and Fuzzy Logic. Students will be exposed towards the concept of Neural Network and/or Fuzzy Logic and its implementation methods in controlling engineering system using appropriate tools such as SIMULINK/MATLAB.

References

1. Michael Negnevitsky; Artificial Intelligence A Guide to Intelligent System, 2nd Edition, 2005.
2. S.N. Sivanandam, S.Sumathi & S.N. Deepa; Introduction to Fuzzy Logic Using MATLAB, 2007.
3. Kevin M. Passino, Stephen Yurkovich; Fuzzy Control; 1998.
4. Timothy J. Ross; Fuzzy Logic With Engineering Applications; McGraw-Hill International Editions; 2010.
5. Simon Haykin; Neural Networks A Comprehensive Foundation; 2nd Edition; Prentice Hall; 2008.
6. Satish Kumar; Neural Networks A Classroom Approach; International Edition; McGraw Hill; 2005.
7. Hung T.Nguyen, Nadipuram R.Prasad, Carol L. Walker, Ebert A. Walker; A First Course in Fuzzy and Neural Control Chapman and Hall; 2003

BEKC 4683
DIGITAL CONTROL SYSTEMS

Learning Outcomes

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

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

Synopsis

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

References

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

BEKE 2333
ANALOGUE ELECTRONICS

Learning Outcomes

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

1. Explain the operation of BJT/FET amplifier, power amplifier, osscillatoractive filter and voltage regulator
2. Analyze the BJT/FET amplifier, power amplifier, osscillatoractive filter and voltage regulator
3. Design the analogue circuit system for signal amplification
4. Work effectively as individual or in group to complete the given tasks.

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 and FET are the devices usually used in amplifiers, small signal amplifier, power amplifiers (class A and class AB), oscillator, active filters and voltage regulators.

References

1. Bolysted, R., Nashelsky, L., Electronic Devices and Circuit Theory, 12th Edition, Prentice Hall, 2014.
2. Floyd, T., Electronic Devices, 10th, Edition Prentice Hall, 2018
3. Aliminian, A., Kazimierczuk, M. K., Electronic Devices: A Design Approach, 1st Edition, Prentice Hall, 2004.
4. Russell, L. M., Robert, D., Foundations of Electronics Circuits and Devices, 5th Edition, Thomson Delmar Learning, 2007.

BEKE 3533
ELECTRICAL MACHINES

Learning Outcomes

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

1. Understanding on basic principle of electromechanical energy conversion and operation of electrical machines.
2. Analyze dynamic parameters and performances of electrical machines in terms of torque density, power efficiency and speed.
3. Design an electrical machines based on given requirements and constraints.

Synopsis

Introduction to selected type of both DC and AC electrical machines which cover physical construction, equivalent electrical circuit diagrams and working principles. The machine performances like torque, speed and efficiency are investigated. The starting and control techniques are also investigated for a better machine selection of appropriate application.

References

1. Stephen J. Chapman, Electric Machinery Fundamentals, 4th ed., McGraw-Hill, 2012.
2. Charles I. Hubert, Electric Machines: Theory, Operation, Applications, Adjustment, and Control, 2nd ed., Prentice Hall, 2006.
3. Fitzgerald, Kingsley, Umans, Electric Machinery, 6th ed., McGraw-Hill, 2014.
4. Theodore Wildi, Electric Machines, Drives & Power System, 5th ed., Prentice Hall, 2005.

BEKE 3543
POWER ELECTRONICS

Learning Outcomes

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

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

Synopsis

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

References

1. Daniel W. Hart, Power Electronics, McGraw Hill, International Edition, 2011.
2. Muhammad H. Rashid. Power Electronics – Circuits, Devices, and Applications, 3rd Edition, Prentice Hall, 2013.
3. Issa Batarseh, *Power Electronic Circuits*, John Wiley & Sons, 2004.
4. Ned Mohan, Tore M. Undeland, William P. Robbins, *Power Electronics–Converters, Applications and Design*, 3rd Edition, John Wiley and Sons, 2003.

BEKE 3673
INDUSTRIAL POWER ELECTRONICS

Learning Outcomes

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

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

Synopsis

This course will discuss the principles of power generation, power application, and power quality improvement by means of power electronic devices. The basic operation and design of power supply and gate driver will be reviewed at glance. Subsequently, students will be given fundamental knowledge

on how to design common power electronic systems used in industrial applications. The basic operation and designed of switched mode power supply (SMPS), power electronics in solar applications, high voltage direct current (HVDC), flexible AC Transmission Systems (FACTS), electric/hybrid vehicles and active filter will be exposed to the students.

References

1. 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. Daniel W. Hart, Introduction to Power Electronics, Prentice Hall, 2006.
5. N.G Hingorani and L. Gyugyi, Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems. Piscataway, NJ: IEEE Press, 2000.
6. Muhammad H. Rashid, Power Electronics – Circuits, Devices, and Applications, 4th Edition, Prentice Hall, 2013
7. Hirofumi Akagi, Edson Hirokazu Watanabe, Mauricio Aredes, Instantaneous Power Theory and Applications to Power Conditioning, Wiley-IEEE Press, 2007.
8. Chris Mi, Abul Masrur, david Gao, Hybrid Electric Vehicles: Principles and Applications with practical, John Wiley & Son, 2011.
9. Ned Mohan, Tore M. Undeland, William P. Robbins, Power Electronics–Converters, Applications and Design, 3rd Edition, John Wiley and Sons, 2003

BEKE 4753
ELECTRICAL DRIVES

Learning Outcomes

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

1. Analyse the characteristics and dynamic modeling of electrical machine and drives
2. Analyze the performance parameters of the electrical drives.
3. Design control strategy to drive the machine for optimum performance.
4. Operate as a team member or leader in a team project.
5. Engage in an independent and life long learning.

Synopsis

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

References

1. R. Krishnan, Electric Motor Drives, Modeling, Analysis and Control, Prentice Hall, 1st Ed., 2001.
2. Austin Hughes, Electric motor and drives: Fundamentals, types and application, Newnes, 4th edition, 2013.
3. Piotr Wach, Dynamics and control of electrical drives, springer 2011.
4. Mukhtar Ahmad, High Performance AC Drives: Modelling Analysis and Control, Springer, 2010.
5. André Veltman, Duco W. J. Pulle, R. W. A. A. De Doncker, Fundamentals of electrical drives, Springer, 2007.
6. Seung-Ki Sul, Control of Electric Machine Drive System, John Wiley & Sons, 2011.

BEKE 4763
MODERN ELECTRICAL DRIVES

Learning Outcomes

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

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

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

BEKE 4873
ELECTRIC MACHINE DESIGN

Learning Outcomes

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

1. Demonstrate fundamental understanding of the interaction of the electromagnetic and mechanical engineering disciplines related to electrical machine design.
2. Identify of the differences in construction, performance and operation between the main topologies of electrical machines.
3. Select and employ techniques to design an electrical machine and select the appropriate materials for the application at hand.

Synopsis

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

References

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

BEKG 1123
PRINCIPLES OF ELECTRIC AND ELECTRONICS

Learning Outcomes

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

1. Explain the basic electrical and electronics principles, circuit schematics and components.
2. Solve basic electric DC circuits using electrical and electronics principles
3. Explain the operating principles of semiconductor devices for Diode, BJT, FET and Op Amp.
4. Analyze the operating principles of semiconductor devices and electrical and electronics to solve the Diode, BJT, FET and Op-Amp circuits.

Synopsis

This course will discuss about the basic principles of electrical and electronics; such as fundamental knowledge on electric element, principles of electricity, units associated with basic electrical quantities, symbol and components. Then the study on how to apply circuit theory to the solution of simple circuits and networks by the application of Ohm's law and Kirchhoff's laws, and the concepts of potential and current dividers in solving DC series and parallel circuit is explained. Then, the behaviour of semiconductors and the way in which they are employed in diodes will be discussed. The semiconductor theory and devices covers the atomic structures, energy band, P-type and N-type and how these materials are employed to form devices such as diode and BJTs. Then the application and calculation of diode, DC biasing of Bipolar Junction Transistor(BJT),DC biasing of Field Effect Transistor (FET) and Operational-Amplifier (Op-Amp) circuits is explained.

References

1. Charles K. Alexander and Matthew N. O. Sadiku, Fundamentals of Electric Circuits, McGraw Hill, 5th Ed. (2013)

2. Floyd, T., Electronic Devices, 9th, Edition Prentice Hall, 2014.
3. Robert L. Boylestad and Louis Nasheslsky, Electronic Devices and Circuit Theory, Pearson, 11th Ed. (2014)
4. Allan R. Hambley, Electrical Engineering Principles & Application, Pearson, 6th Ed. (2014)

BEKG 1233
PRINCIPLES OF INSTRUMENTATION AND MEASUREMENT

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

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

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

BEKG 2433
ELECTRICAL SYSTEMS

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Explain the major components of an electrical power system (generation, transmission, and distribution system)
2. Calculate the AC voltage and current characteristic in AC circuits.
3. Analyze the single and three phase circuits by emphizing on complex power and power factor correction
4. Analyze the magnetic, single phase transformer and three phase transformer equivalent circuits.

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 for single phase and balance three phase system. In addition, magnetic circuit, construction and operation of transformer will be discussed in this subject.

References
1. Glover, Sarma, Power System Analysis and Design, 4th ed., Thomson Learning, 2008.- main reference
2. Hadi Saadat, Power System Analysis, 2nd ed., Mc-Graw Hill, 2004.
3. William D. Stevenson, Jr., Elements of Power System Analysis, 4th ed., Mc-Graw Hill, 1998.
4. Grainger and Stevenson Jr, Power System Analysis, Mc-Graw Hill, 1994.
5. Arthur R. Bergen, Power System Analysis, 2nd ed., Prentice Hall, 2000

BEKG 2443
ENGINEERING MATHEMATICS II

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Describe the fundamental concepts of multivariable functions, multiple integrals and vector calculus
2. Solve the mathematical problems that involve function of several variable, multiple integrals and vector calculus.
4. Apply the knowledge of advanced engineering mathematics to deal with the engineering problems.

Synopsis
This course consists of three chapters: Function of Several Variables: Functions of Two or More Variables, Limit and

Continuity, Partial Derivatives, Total Differential, Chain Rule, Implicit Differentiation and Local Extrema. Multiple Integrals: Double Integral, Double Integral Over Non-Rectangular Regions, Double Integral in Polar Coordinates, Triple Integral, Triple Integral in Cylindrical and Spherical Coordinates and Moment and Centre of Gravity. Vector Calculus: Vector fields, Line integral, Green's theorem, Curl and Divergence, Parametric surfaces and their Areas, Surface integrals, Stoke's theorem and Divergence theorem.

References

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

BEKM 4863
INDUSTRIAL ROBOTICS

Learning Outcomes

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

1. Identify the solution of complex kinematics and dynamics problem
2. Design a robotic manipulator workcell for manufacturing purposes.
3. Explain the working principles of robot manipulator drive, flexible manfacturing system and quality control in industrial robotic network

Synopsis

This course is an introduction to the basic principle of robotic technology inindustry. Robotic systems fundamental which includes forward and reverse kinematics of the basic robotic are introduce. Fundamental mathematics, scientific and engineering knowledge will be applied in this course to the solution of complex robotic problems. In developing the solution of integration of robotic components, the robotic actuation and drive systems are introducing; i.e. pneumatic and hydraulic systems, mechanical actuation systems, and electrical acuation systems. Student will be exposed to industrial field topics such as production system and integration of industrial robotic in flexible manufacturing system. The quality production will be analyze using six sigma and DMAIC procedure.

References

1. Craig, J. J., Introduction to Robotics, Mechanics and Control, 3rd Ed., Addison Wesley Longman, 2017.
2. Man Zhihong, Robotics, Prentice Hall, 2nd ed., 2005
3. Stadler, W., Analytical Robotics and Mechatronics, McGraw Hill, 1995.
4. Fuller, J. L., Robotics: Introduction, Programming and Projects, 2nd Ed., Prentice Hall, 1998.
5. Saeed B. Niku, Introduction to Robotics, Prentice-Hall, 2001.
6. Bolton, W., Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, 4th ed., Prentice-Hall, 2008
7. Groover, W., Industrial Robotics: Technology, Programming and Applications, McGraw Hill, 1986.

BEKP 2453
ELECTROMAGNETIC THEORY

Learning Outcomes

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

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

Synopsis

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

References
1. Fawwaz T. Ulaby, Fundamental of Applied Electromagnetics 7th edition, Pearson Education, 2015.
2. Matthew N.O. Sadiku, Elements of Electromagnetics, 6th edition, Oxford University Press, 2014.
3. Rao, N.P., Elements of Engineering Electromagnetics, 6th Edition, Pearson Education, 2004.
4. Raju, G.S.N., Electromagnetic Field Theory and Transmission Lines, 1st Edition, Pearson Education, 2006

BEKP 3653
POWER SYSTEM AND HIGH VOLTAGE

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Analyze the problems on power system regarding to generation and transmission line models.
2. Apply per unit system to produce quantities and elements for single-line diagram.
3. Dentify and analyze the conduction and breakdown theory in gas, solid and liquid dielectrics.
4. Describe and explain the various topics pertaining to high voltage application and technology.

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

References
1. Hadi Saadat, Power System Analysis, International ed., McGraw Hill, 2004.
2. Grainger and Stevenson Jr, Power System Analysis, International ed., McGraw Hill, 1994.
3. M S Naidu and V Kamaraju, High Voltage Engineering, McGraw Hill 2004.
4. E. Kuffel, W. S. Zaengl and J. Kuffel, High Voltage Engineering: Fundamentals, Newnes, 2000.

BEKC 3673
INDUSTRIAL CONTROL AND AUTOMATION

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Explain the principles and fundamentals of industrial control systems and automations system.
2. Analyze complex structure of control processes based on pneumatic and hydraulic applications, as well as by using feedback and feedforward control systems.
3. Design automated PLC based systems with consideration for specific needs.

Synopsis
This subject will cover sensors, instrumentation and control systems commonly used in the industry. The instrumentation part includes topics such as sensors, signal conditioning and conversion, transducers & actuators, and data acquisition. The industrial control portion covers the evaluation and types of control systems, centralized system, distributed control systems (DCS), fieldbuses, PID controllers and their operations. It will include other common control systems such as feedforward, cascade, ratio, time-delay compensation, sequence control. Besides, it will cover appropriate controllers for process control industries, too.

References
1. Andrew Parr, Industrial Control Handbook, 3rd Edition, Newnes (Elsevier), 2000.
2. W. Bolton, Instrumentation and Control Systems, Newnes (Elsevier), 2004
3. Seborg, Edgar, Mellichamp, Doyle, Process Dynamics and Control, 3rd Edition, Wiley, 2011
4. W. Bolton, Mechatronics: Electronic Control System in Mechanical and Electrical Eng., 5th Edition, Pearson, 2012.
5. Chester L. Nachtigal, Instrumentation and Control: Fundamental and Applications, Wiley, 1990

BEKP 3683
DISTRIBUTION SYSTEM DESIGN

Learning Outcomes

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

1. Analyze and breaking down the information of design parameters into component parts.
2. Create the design of low voltage system by using standard design procedures.
3. Apply the concept and technical specification of low voltage protection system
4. Apply the Acts, Regulations and Standard related to electrical installation and its safety.

Synopsis

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

References

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

BEKP 4773
POWER SYSTEMS ANALYSIS

Learning Outcomes

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

1. Develop the Per-Unit system from one line diagram and analyzed the power flow analysis using Gauss Seidel and Newton Raphson method.
2. Investigate the balanced and unbalanced faults in Power System and the stability of synchronous machine
3. Work effectively as individual or in group to complete the given task.
4. Engage in independent and life long learning

Synopsis

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

References

1. Hadi Saadat, Power System Analysis, International 3rd ed. McGraw Hill, 2011
2. "Grainger and Stevenson Jr, Power System Analysis, McGraw Hill, 1994.
3. Sarma and Glover, Power System Analysis and Design, 5th ed. Brooks/Cole, 2012.

BEKP 4843
RENEWABLE ENERGY

Learning Outcomes

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

1. Interpret the government policy in relation to renewable energy development both technically and economically.
2. Analyse the selected forms of distributed generators and their associated connection impacts to the electrical grid
3. Design the grid-connected solar photovoltaic system and evaluate the system performance accordingly

Synopsis

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

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

BEKP 4853
ENERGY UTILLIZATION AND CONSERVATION

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Identify and analyze energy consumption for different type of electricity tariff, demand side tariff initiative, penalty in electricity bill and correction strategy for different sector
2. Design and establish a Sustainable Energy Management System (SEMS) strategy for an organization.
3. Conduct and implement procedural energy auditing and interpret data through measurement & verification practices with economic aspect for energy management project.
4. Apply energy policies, regulation, act, energy efficient, green and renewable technologies toward energy utilization and conservation.

Synopsis
This course introduces energy utilization and conservation through the understanding of its energy policies, regulation and act such as electricity supply act 1990 (act 447) and electricity regulation 1994, energy commission act 2001 (act 610) and efficient management of electrical energy regulation (emeer) 2008 at distribution level. The syllabus covers the important of energy efficient equipment, green and renewable technologies towards utilization and conservation. Furthermore, analysis of different electricity tariff categories and energy auditing procedure will be conducted and implemented. Finally, this course will also cover the evaluation of the economic aspect in energy management project through measurement and verification practices.

References
1. Energy Manager Training Course Material, Malaysia Green Technology Corporation (Mgtc), 2015.
2. Energy Audit Training Course Material, Malaysia Green Technology Corporation (Mgtc), 2015.
3. Management, Measurement And Verification Of Performance Contracting, James P. Waltz, 2003.
4. Gilbert M.Masters, Renewable And Efficient Electric Power Systems, Wiley, 2005.
5. Measurement And Verification Course Material, Malaysia Green Technology Corporation (Mgtc), 2016.
6. Energy Efficiency And Conservation Guidelines For Malaysian Industries, Part 1: Electrical Energy-Use Equipment, Suruhanjaya Tenaga (St), Second Edition, 2008.

BEKP 4873
POWER SYSTEM PROTECTION

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Apply the basic principles of power system protection.
2. Analyze the use of Current Transformer (CT), Voltage Transformer (VT), fuse and circuit breaker for protection through technical justification.
3. Design the coordination for protection system scheme.
4. Design appropriate protection schemes for electrical equipment such as transformer, generator and motor.

Synopsis
This subject introduces the fundamental of power system protection and relaying, protection principle and coordination in power system network. Detail explanation on various type of protection schemes such as overcurrent protection, transformer protection, distance protection and differential protection. Also the theory and applications of the main components used in power system protection and device such as protection relay, circuit breaker (CB), CTs, VTs, will be discussed.

References
1. Khim Sang, Wong, Power Distribution and Protection, Second Edition, Prentice Hall 2003.
2. Y.G. Paithankar, Fundamentals of Power System Protection, Prentice Hall of India, 2004.
3. Abdullah Asuhaimi Mohd Zin, Kejuruteraan Sistem Kuasa, UTM, 2003
4. Glover ,Sarma, Power System Analysis and Design, Third Edition, Brooks/Cole 2011.

BEKP 4883
HIGH VOLTAGE ENGINEERING

Learning Outcomes

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

1. Identify and analyze the conduction and breakdown theory in gas, solid and liquid dielectrics.
2. Explain the fundamental knowledge of generation and measurement of high voltage AC, DC and impulse.
3. Examine the high voltage testing, insulation coordination and diagnostics on materials and electrical apparatus.
4. Analyze the overvoltage phenomenon in electric power system.

Synopsis

This subject is intended give students deep knowledge about high voltage engineering it focusses on the characteristics of conduction and breakdown in gas, solid and liquid dielectrics. Generation of high voltages AC, DC and impulses, their measurements and testing techniques on materials and electrical apparatus according to standard are also covered. Students are also exposed to overvoltages phenomenon in electric power systems

References

1. M.S. Naidu & V. Kamaraju, 5th Edition, McGraw Hill, 2013.
2. E. Kuffel, W.S. Zaengl & J. Kuffel, High Voltage Engineering Fundamentals, Newnes, 2nd ed., 2000.
3. Dieter Kind & Kurt Feser, High Voltage Test Techniques, Newnes, 2nd ed., 2001.

BEKU 1123
ELECTRIC CIRCUIT I

Learning Outcomes

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

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

Synopsis

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

References

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

BEKU 2333
ELECTRIC CIRCUIT II

Learning Outcomes

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

1. Analyze first order and second order circuit for transient and steady state response.
2. Apply Laplace transforms method to analyze circuit response in frequency domain.
3. Analyze the frequency response of RLC circuits and the characteristics of RLC filters.
4. Analyze various topology of two-port network in electrical circuit analysis.

Synopsis

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

References

1. K.A. Charles,N.O. Sadiku, Fundamentals of Electric Circuits, 6th Ed. McGraw Hill,2016
2. Robbins and Miller, Circuit Analysis and Practice, 5th Ed., Thomson and Delmar, 2013
3. Nilsson and Riedel, Electric Circuits, Prentice Hall, Electric Circuits (11th Edition).
4. Thomas L. Floyd. Electric Circuits Fundamnetals. 8th Edition, Pearson, 2009.

BEKU 3695
INDUSTRIAL TRAINING

Learning Outcomes

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

1. Apply appropriate techniques and technical knowledge which is relevant for student field of study.
2. Demonstrate the ability to adapt with working environment and practice working efficiently and ethically.
3. Demonstrate soft skill especially communication skill at all level.
4. Work affectively as an individual, team members and as a leader as well.
5. Acquire new knowledge, life-long learning and aware to new technology.

Synopsis

All bachelor degree students are required to undergo industrial training as part of their curiculum to complete their four (4) years course for the Bachelor of Electrical Engineering (BEKG) and Bachelor of Mechatronic Engineering (BEKM). It is compulsory for all degree program students to undergo the Industrial Training Programme.In general, the aim of industrial training are to give exposure, experience and professional skills to various aspects of engineering discipline, in particular in electrical engineering related industries. The students are also expected to be familiarized with efficient, accountable and ethical conduct as they will be supervised directly under the company's personnel as well as supervisors from the faculty. Apart from that, the assessment will be made by the appointed faculty supervisors & the industry supervisors.

References

1. Dasar Latihan Industri KPT, 2010
2. Garis Panduan Latihan Industri UTeM, 2017
3. Dokumen Jawatankuasa Latihan Industri FKE

BEKU 4792
FINAL YEAR PROJECT 1

Learning Outcomes

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

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

Synopsis

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

References

Depend on each student project's references.

BEKU 4861
ENGINEERING SEMINAR

Learning Outcomes

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

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

Synopsis

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

BEKU 4894
FINAL YEAR PROJECT II

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Identify, formulate, research literature and analyze problem.
2. Conduct investigation using research based knowledge and methods.
3. Apply ethical principles in project implementation
4. Present the results in written and in oral format effectively.
5. Identify basic entrepreneurship skills in project management.
6. Apply reasoning informed by contextual knowledge.
7. Engage in independent and lifelong learning.

Synopsis
This course is the second part of Final Year Project I, in second semester. Students will continue their project from FINAL YEAR PROJECT I (BEKU 4792) during the second semester, and they should accomplish the projects completely either in hardware, software or both of them. Students needs to write-up a good final report (in thesis format), as a part of the course's assessment.

References
Depend on each student project's references.

BENG 1413
DIGITAL ELECTRONICS

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

1. Describe the basic concept of digital circuits that form complex electronic systems.
2. Analyze the basic digital circuits based on combinational and sequential components.
3. Communicate effectively through effective report writing or oral presentation.

Synopsis
The outcome of this course is to deliver knowledge, understanding and application of the digital electronic circuits. This course comprises of several topics such as number systems and codes, logic gates and boolean algebra, combinational logic circuits, MSI logic circuits and flip flops, and integrated circuit logic families. Students also will be exposed to design integrated circuit for the project assignment. This course will also expose the students to current application in the industry such as a Metal Oxide Semiconductor Field Effect Transistor (MOSFET), Complementary Metal Oxide Semiconductor (CMOS) technology and Integrated Circuit Packaging.

References
1. Thomas L. Floyd. Digital Fundamentals. Eleventh Edition, Prentice Hall, 2014.
2. Ronald J. Tocci, N. Widmer, G. Moss. Digital Systems, Principles and Applications. 11th Edition, Prentice Hall, 2011.
3. Roger l. Tokheim. Digital Electronics, Principles and Applications. McGraw-Hill, 2013.

BENG 2143
ENGINEERING STATISTICS

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

Synopsis
The outcome of this course is to deliver statistical techniques and tools for data analysis. The course begins with data description. Then, students will be exposed to normal and sampling distributions, estimation and hypothesis testing for one and two populations. In addition, ANOVA, simple linear regression, multiple linear regression and polynomial regression will be taught in this course. Apart from that, students will learn non-parametric statistics. Finally, students will apply their knowledge using statistical software application which are widely used in the industry.

References
1. Farah Shahnaz Feroz, Nortazi Sanusi, Hanissah Mohamad, A Student's Guide to Engineering Statistics, Peneribit UTeM, 2019

2. Prem S.Mann, Introductory Statistics Using Technology, 9th Edition, John Wiley, 2016.
3. Douglas C. Montgomery, George C.Runger, Applied Statistics and Probability for Engineers, 6th Edition, John Wiley, 2013.
4. Richard Johnson, John Freund, Irwin Miller,Miller And Freund's Probability and Statistics for Engineers, 9th Edition, Pearson – Prentice Hall, 2017.
5. Sharifah Sara, Hanissah, Fauziah, Nortazi, Farah Shahnaz, Introduction To Statistics & Probability A Study Guide, Pearson-Prentice Hall, 2008

BENG 4322
ENGINEER AND SOCIETY

Learning Outcomes

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

1. Apply ethical principles and commitment, to professional ethics, responsibilities and norms of engineering practice
2. Apply reasoning informed by contextual knowledge to assess health, safety and legal issues and its subsequent responsibilities, relevant to professional practice
3. Understand the needs for sustainable development and the impact of engineering solutions on society and environment

Synopsis

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

References

1. The Institution Of Engineer, "Engineering Professionalism and Ethics" 4th Ed, 1995.
2. Charles B. Fleddermann, Engineering Ethics, 3rd Ed, Prentice Hall, 2008.
3. Mike W Martin, Roland Schinzinger, Ethics in Engineering, 4th Ed, McGraw-Hill, 2005.
4. Charles E Harris JR, Michael S Pritchard, Michael J Rabin, "Engineering Ethics" 2nd Ed, Thomson and Wadsworth, 2003.

SERVICE COURSES (FTMK)

BITG 1233
COMPUTER PROGRAMMING

Learning Outcomes

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

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

Synopsis

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

References

1. Gaddis, T., (2015), "Starting Out with C++ Brief Version: From Control Structures Through Objects 8th Edition", Pearson Education.
2. Abdullah, N. et. al, (2018), "Lab Module Computer Programming (edition 2018), FTMK, UTeM.
3. Friedman, Koffman (2011), "Problem Solving, Abstraction and Design using C++", 6th Edition, Pearson Education.
4. Etter, D.M., Ingber, J.A., (2012), "Engineering Problem Solving with C++", 3rd Edition, Pearson Education.
5. Hanly, J.R, (2002), "Essential C++ for Engineers and Scientists", 2nd Addison Wesley

SERVICE COURSES (FKM)

BMCG 1013
DIFFERENTIAL EQUATIONS

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Describe the basic concept of first and second order differential equations, Laplace Transform and Fourier series.
2. Select an appropriate technique to solve problems involving differential equations.
3. Apply the concept of differential equations in solving engineering problems.

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

References

1. Muzalna M. J., Irmawani J., Rahifa R., Nurilyana A. A. (2018). Module 2: Differential Equations, Penerbit UTeM.
2. Khoo, C.F., Syed Ahmad, S.S., Othman, Z. & Lok, Y.Y. ((2009). Numerical Methods Third Edition. Pearson Prentice Hall.

BMCG 1523
ENGINEERING GRAPHICS AND CAD

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Explain the engineering graphics fundamentals.
2. Construct technical drawing using manual sketching and computer aided design.
3. Communicate by using engineering drawings.

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

References

1. Omura,G & Benton,B., 2015, *Mastering Autocad 2016 And Autocad Lite 2016*, John Wiley & Sons Inc., Indiana, USA.
2. Er. R. K. Dhawan, 2010, Engineering Graphics (In First Angle Projection), 1st Ed., S. Chand Technical, India.
3. Mohd Rizal Alkahari et. al., 2009, *Modul Lukisan Berbantu Komputer,* Penerbit Universiti Teknikal Malaysia Melaka, Melaka.
4. Giesecke, F.E., Mitchell, A., Spencer, H.C., Hill, I.L., Dygdon, J.T., and Novak, J.E., 2008, *Technical Drawing*, 13th Ed., Prentice Hall, New York.
   Khairul Anuar Hanafiah, 1999, *Lukisan Berbantu Komputer,* Penerbit Universiti Teknologi Malaysia, Skudai.

BMCG 2432
INTRODUCTION TO MECHANICAL ENGINEERING

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Describe basic concepts and fundamental principles of mechanical engineering mechanics.
2. Apply basic concepts and fundamental principles to solve mechanical engineering problems.
3. Analyze basic problems in mechanical engineering.

Synopsis
This course consists of basic principles of
Static: General principle, Force vector and Equilibrium of Particle
Dynamics: Apply Newton's 2nd Law in Kinematics and Kinetics of Particle,
Mechanics: Principle of Stress & Strain and Torsion

Thermodynamics: Property table of pure substance, Closed and open system with respect to first law of thermodynamics and refrigeration cycles.

References

1. Hibbeler, R.C, Engineering Mechanics: Statics, 12th Editions, Prentice Hall.(2010)
2. Beer, F. P., Vector Mechanics for Engineers, Dynamics SI Units, 9th Edition, McGraw-Hill, (2010)
3. Hibbeler, R.C, Engineering Mechanics, Dynamics, 12th Editions, Prentice hall.(2010)

BMFG 1313
ENGINEERING MATHEMATICS

Learning Outcomes

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

1. Describe the fundamental concepts of matrices, eigenvalues and eigenvector, complex numbers, interpolation, differentiation, integration and vector-valued functions
2. Solve the mathematical problems that involve matrices, eigenvalues and eigenvector, complex numbers, interpolation, differentiation, integration and vector-valued functions by using an appropriate technique
3. Apply the knowledge of engineering mathematics to deal with the engineering problems

Synopsis

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

References

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

BMFG 1213
ENGINEERING MATERIALS

Learning Outcomes

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

1. Explain the basic concepts of engineering materials in terms of interatomic bonding and crystal structure.
2. Analyze the properties of engineering materials based on its structure.
3. Describe the processing methods for engineering materials.

Synopsis

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

References

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

BMFG 4623
ENGINEERING ECONOMY AND MANAGEMENT

Learning Outcomes

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

1. Explain the principles and terminology of engineering economy, concepts of time value of money, and risk planning.
2. Apply the concepts, principle and techniques in project management and engineering economy.
3. Analyze complex problems and scenario using engineering economy factors (F/P, P/F, P/A, A/P, F/A, A/F, P/G, A/G factors)
4. Evaluate and select between alternatives using suitable methods such as Present Worth, Future Worth, Annual Worth Analysis; Rate of Return and Breakeven & Payback Analysis.
5. Evaluate the project risk in engineering project.

Synopsis

The course covers engineering economy and managing project & risk. Engineering economy discusses about the time value of money and interest relationship; engineering economy factors; nominal and effective interest rates; worth analysis; breakeven and payback analysis; which are useful to define certain project criteria that are utilized by engineers and project managers to select the best economic choice among several alternative. Management of risk incorporates the concepts of probability and statistics in the evaluation of alternatives. This allows management to determine the probability of success of failure of the project.

References

1. Blank, L and Tarquin, A., 2012, Engineering Economy, 7thEdition, McGraw Hill.*
2. Whitman D. and Terry R., 2012, Fundamentals of Engineering Economics and Decision Analysis, Morgan& Claypool Publishers.
3. Sullivan W.G, Wicks E.M, Koelling C.P., 2012, Engineering Economy, 15th Edition, Prentice hall international
4. Park C.S., 2011, Contemporary Engineering Economics, 5th Edition, Pearson.

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

BTMW 4012
ENTERPRENEURSHIP TECHNOLOGY

Learning Outcomes

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

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

Synopsis

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

References

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

UiTM Entrepreneurship Study Group. Revised Edition (2010). Fundamentals of Entrepreneurship. Pearson

BLHC 4032
CRITICAL AND CREATIVE THINKING

Learning Outcomes

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

1. Identify the basic principles of critical and creative thinking skills to solve everyday problems
2. Provide feedback on issues related to the development of critical and creative thinking skills

3. Solve problems of case studies on current issues related to their field of study
4. Analyze future market requirements and propose a solution based products.

Synopsis

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

References

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

BLHL 1012
MALAY COMMUNICATION I

Learning Outcome

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

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

Synopsis

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

References

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

BLHL 1XX2
ARABIC

Learning Outcomes

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

1. Use the basic Arabic grammar correctly and apply the information from the text
2. Construct sentences and apply selected vocabulary in a report.
3. Demonstrate communication skills.

Synopsis

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

References

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

BLHL 1XX2
JAPANESE

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

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

References

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

BLHL 1XX2
MANDARIN

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

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

References

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

BLHW 1702
TAMADUN ISLAM DAN TAMADUN ASIA (TITAS)

Learning Outcomes
In the end of the course, student will be able to:
1. Menjelaskan konsep asas ketamadunan
2. Menghubungkait sejarah dengan kemajuan tamadun bangsa di dunia
3. Menganalisis isu dan cabaran peradaban dunia

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

Rujukan

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

BLHW 1742
MALAYSIAN STUDIES

Learning Outcomes

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

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

Synopsis

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

References

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

BLHW 2712
ETHNIC RELATIONS

Learning Outcomes

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

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

Synopsis

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

References

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

BLHW 2752
MALAYSIAN CULTURE

Learning Outcomes

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

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

Synopsis

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

References

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

BKXX XXX1
CO-CURRICULUM I &II

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

BACHELOR OF MECHATRONICS ENGINEERING (BEKM)

BACHELOR OF MECHATRONICS ENGINEERING - BEKM

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

PROGRAMME IMPLEMENTATION - BEKM

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

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

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

CURRICULUM STRUCTURE - BEKM

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

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

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

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

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

CREDIT HOUR AND PRE-REQUISITE - BEKM

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

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

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

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

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

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

STUDENT LEARNING TIME (SLT) - BEKM

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

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

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

SUBJECT DETAILS FOR BACHELOR PROGRAMME (BEKM)

BEKB 1131
ELECTRICAL ENGINEERING WORKSHOP I

Learning Outcomes

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

1. Construct three phase motor starter control circuit.
2. Apply the basic concept for electrical simulation using Pspice and PROTEUS simulation tools.
3. Apply the basic concept for electrical schematic diagram using AUTOCAD tools
4. Apply the basic microcontroller programming language for dynamic mechanism application.
5. Demonstrate team work and present the results in oral and technical report writing.

Synopsis

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

References

1. Ir Md Nazri, Aminudin, Md Hairul Nizam, Engineering Practice: Wiring System & Motor Starter, Module 2, UTeM, 2007.
2. Massimo Banzi, Getting Started with Arduino, 2nd Ed., O'reilly, 2011.
3. K.A. Charles, N.O. Sadiku, Fundamentals of Electric Circuits, 6th Ed., McGraw Hill, 2016.
4. James Leach, AutoCAD 2016 - Instructor, SDS Publications, 2016.
5. Dennis Fitzpatrick, Analog design and Simulation using OrCAD Capture and PSpice, Elsevier, 2012.

BEKB 1231
ELECTRICAL ENGINEERING WORKSHOP II

Learning Outcomes

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

1. Construct three phase motor starter control circuit.
2. Apply the basic concept for electrical schemetic diagram using AUTOCAD tools.
3. Apply the basic microcontroller programming language for dynamic mechanism application.
4. Demonstrate team work and present the results through oral and technical writing.

Synopsis

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

References

1. Ir Md Nazri, Aminudin, Md Hairul Nizam, Engineering Practice: Wiring System & Motor Starter, Modul 2, UTeM, 2007.
2. Massimo Banzi, Getting Started with Arduino, 2nd Ed., O'reilly, 2011.
3. K.A. Charles, N.O. Sadiku, Fundamentals of Electric Circuits, 6th Ed., McGraw Hill, 2016.
4. James Leach, AutoCAD 2016 - Instructor, SDS Publications, 2016.
5. Arduino microcontroller reference: https://www.arduino.cc/2012.

BEKC 2421
CONTROL SYSTEM ENGINEERING LABORATORY

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

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

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

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

BEKC 2433
SIGNALS & SYSTEMS

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

1. Apply the basic knowledge of signals and systems for continuous-time and discrete-time signals.
2. Analyze the linear time-invariant (LTI) systems in time-domain and frequency-domain.
3. Analyze the LTI systems using Z-Transform method.

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

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

BEKC 2453
COMMUNICATION SYSTEMS

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

1. Describe the basic principles of analogue & digital communication, data and computer network
2. Analyse the analogue and digital communication techniques that are typically used in communication systems
3. Explain the concept of computer system network

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

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

BEKC 3533
INTRODUCTION TO CONTROL SYSTEMS

Learning Outcomes

Upon completion of this course, the student should be able to:
1. Describe the basic features and configuration of control systems and derive the mathematical model of physical system in frequency and in time domain.
2. Analyze control system performance and stability of linear control system in time and frequency domain.
3. Able to employ root locus method and its role in control system design.
4. Analyze the asymptotic approximation bode plots performances for first order and second order systems.

Synopsis

This course will introduces the students to the fundamental ideas and definition of control systems such as block diagrams, plants or processes, open-loop and close loop control systems, transfer functions, and transient and steady state responses. Students will be taught how to obtain mathematical models for actual physical systems such as electrical, mechanical, electromechanical and simple fluid flow systems in transfer function and state space equation. Methods of system representation such as block diagram representation and signal flow graphs will be examined. The students will also be exposed to techniques of analysing control systems such as time domain analysis and stability. Besides, the student will be taught on the design techniques such as Root locus and Bode plot. Finally, an introduction to the design and analysis of control systems using MATLAB will also be given.

References
1. Bishop, Dorf, *Modern Control Systems*, 12th Edition, Prentice Hall, 2010.
2. Gene F. Franklin, J.David Powell, Abbas Emami-Naeini, *Feedback Control of Dynamic Systems*, 6th Edition, Pearson, 2010.
3. Ogata Katsuhiko, *Modern Control Engineering*, 5th Edition, Prentice Hall, 2010.
4. Gopal, *Control Systems: Principles & Design*, 3rd Edition, Tata McGraw Hill, 2008.
5. Nise, S Norman, *Control Systems Engineering*, 6th Edition, John Wiley & Sons Inc., 2011.
6. Graham C. Goodwin, Stefan F. Graebe, Mario E. Salqado, *Control System Design*, Prentice Hall, 2001.

BEKC 3543
MICROPROCESSOR

Learning Outcomes

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

Synopsis

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

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

BEKC 3643
CONTROL SYSTEM ENGINEERING

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Understand and interpret control systems characteristics and specifications.
2. Analyze the problems of a system and point out the proposed solution.
3. Design and construct the compensators in time domain, frequency domain and state variable fedback systems.

Synopsis
This subject addresses compensator design in control systems engineering. In particular, the design of active and passive compensators via root locus technique; passive compensator via frequency response technique; state feedback controller design using pole placement technique; integral control and observer design via pole placement technique. The compensator design concentrates on systems that can be modeled by Ordinary Differential Equations (ODEs), and that satisfy certain linearity and time-invariance conditions. Student must have sufficient knowledge in differential equations, basic concepts of control systems and signals & systems.

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

BEKC 4753
PLC & AUTOMATION

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Explain the principles and fundamentals of programmable logic controllers (PLCs) and elements of automations system.
2. Use tools and equipments for PLC programming that related to industrial applications.
3. Design a basic automated PLC based system with consideration for specific needs.
4. Demonstrate communication skill through team work activities effectively.

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

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

BEKC 4683
DIGITAL CONTROL SYSTEMS

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Transform continuous-time signals into discrete-time signals and to represent LTI digital control systems in z-domain.
2. Analyze the stability and performance of digital control systems in time, frequency, and z domains.
3. Analyze the digital control systems represented in state space model.

4. Design a digital PID controller and digital lead-lag compensators using root locus and frequency response methods, and state feedback using a pole-placement method.

Synopsis

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

References

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

BEKC 4773
INTELLIGENT CONTROL SYSTEMS

Learning Outcomes

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

1. Utilize the simulation tools for AI applications such as Simulink and MATLAB for appropriate industrial case studies.
2. Design basic fuzzy logic or neural network systems according to the engineering problem.
3. Demonstrate and analyze the performance of fuzzy logic and/or neural network using Simulink/MATLAB or other specified tools

Synopsis

Artificial Intelligence (AI) is a field of study concerns on allowing machines to imitate human's thinking or behaviour. By applying AI techniques, machines would be able to solve complex engineering problems such as predicting numbers of defect products in factory, optimizing a water tank system, classifying patients based on symtomps of a disease and etc. In this course students will be focusing on two popular sub topics in Artificial Intelligence area which is Neural Network and Fuzzy Logic. Students will be exposed towards the concept of Neural Network and/or Fuzzy Logic and its implementation methods in controlling engineering system using appropriate tools such as SIMULINK/MATLAB.

References

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

BEKC 4883
ADVANCED MANUFACTURING SYSTEM

Learning Outcomes

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

1. Explain the principles of manufacturing operation in advanced manufacturing system.
2. Investigate the operation of manufaturing system in advanced manufacturing industries.
3. Design an assembly line for production system using manufacturing system approach.

Synopsis

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

models in this and product design using CAD/CAM in production system.

References

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

BEKE 2422
ANALOGUE ELECTRONICS APPLICATION

Learning Outcomes

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

1. Describe the operation of small signal analysis and power amplification for electronics analogue devices.
2. Analyze the BJT, power amplifier, active filter, oscillator and voltage regulator.
3. Design active filter circuit, oscillator and voltage regulator in solving electrical engineering problem.

Synopsis

This course contains the application of electronic analogue devices in solving electrical engineering problems; focuses on small signal analysis (BJT), power amplification, active filter, oscillator and voltage regulator. In power amplification, three classes of the power amplifier are introduced which are power amplifier class A, class B and class AB. The active filter covers the usage of transistor or op-amps with RC circuit in producing the low-pass filter, high-pass filter, band-pass filter and band-stop filter. The wave generation using op-amp and timer 555 is applied in the oscillator part. Finally, the concept of voltage regulator based on transistor for linear shunt and series regulator as well as the integrated circuit voltage regulator is covered.

References

1. Floyd, T., *Electronic Devices*, 10th, Edition Prentice Hall, 2018.
2. Bolysted, R., Nashelsky, L., *Electronic Devices and Circuit Theory*, 11th Edition, Prentice Hall, 2014.
3. Aliminian, A., Kazimierczuk, M. K., *Electronic Devices: A Design Approach*, 1st Edition, Prentice Hall, 2004.
4. Russell, L. M., Robert, D., *Foundations of Electronics Circuits and Devices*, 5th Edition, Thomson Delmar Learning, 2007.

BEKG 1123
PRINCIPLES OF ELECTRIC AND ELECTRONICS

Learning Outcomes

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

1. Explain the basic electrical and electronics principles, circuit schematics and components.
2. Solve basic electric DC circuits using electrical and electronics principles
3. Explain the operating principles of semiconductor devices for Diode, BJT, FET and Op Amp.
4. Analyze the operating principles of semiconductor devices and electrical and electronics to solve the Diode, BJT, FET and Op-Amp circuits.

Synopsis

This course will discuss about the basic principles of electrical and electronics; such as fundamental knowledge on electric element, principles of electricity, units associated with basic electrical quantities, symbol and components. Then the study on how to apply circuit theory to the solution of simple circuits and networks by the application of Ohm's law and Kirchhoff's laws, and the concepts of potential and current dividers in solving DC series and parallel circuit is explained. Then, the behaviour of semiconductors and the way in which they are employed in diodes will be discussed. The semiconductor theory and devices covers the atomic structures, energy band, P-type and N-type and how these materials are employed to form devices such as diode and BJTs. Then the application and calculation of diode, DC biasing of Bipolar Junction Transistor(BJT),DC biasing of Field Effect Transistor (FET) and Operational-Amplifier (Op-Amp) circuits is explained.

References

1. Charles K. Alexander and Matthew N. O. Sadiku, Fundamentals of Electric Circuits, McGraw Hill, 5th Ed. (2013)

2. Floyd, T., Electronic Devices, 9th, Edition Prentice Hall, 2014.
3. Robert L. Boylestad and Louis Nasheslsky, Electronic Devices and Circuit Theory, Pearson, 11th Ed. (2014)
4. Allan R. Hambley, Electrical Engineering Principles & Application, Pearson, 6th Ed. (2014)

BEKG 1233
PRINCIPLES OF INSTRUMENTATION AND MEASUREMENT

Learning Outcomes

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

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

Synopsis

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

References

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

BEKG 2433
ELECTRICAL SYSTEMS

Learning Outcomes

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

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

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 for single phase and balance three phase system. In addition, magnetic circuit, construction and operation of transformer will be discussed in this subject.

References

1. Glover, Sarma, Power System Analysis and Design, 4th ed., Thomson Learning, 2008.- main reference
2. Hadi Saadat, Power System Analysis, 2nd ed., Mc-Graw Hill, 2004.
3. William D. Stevenson, Jr., Elements of Power System Analysis, 4th ed., Mc-Graw Hill, 1998.
4. Grainger and Stevenson Jr, Power System Analysis, Mc-Graw Hill, 1994.
5. Arthur R. Bergen, Power System Analysis, 2nd ed., Prentice Hall, 2000

BEKG 2452
NUMERICAL METHODS

Learning Outcomes

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

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

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

Synopsis

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

References

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

BEKM 2321
MECHANICAL ENGINEERING LABORATORY

Learning Outcomes

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

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

Synopsis

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

References

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

BEKM 2342
INTRODUCTION TO MECHATRONICS SYSTEMS

Learning Outcomes

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

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

Synopsis

This course introduces the concept of mechatronic system and its element and integration. Topics that are covered includes the following: Introduction to sensors and transducers, performance terminology, static and dynamic characteristics. Example of relevant sensors, selection of sensors. Inputting data by switches. Introduction to signal conditioning, operational amplifier, protection, filtering, wheatstone bridge, digital signal, multiplexers, data acquisition, digital signal processing, pulse modulation. Displays, data presentation elements, magnetic recording, displays, data acquisition systems, testing and calibration. Introduction to actuation systems, introduction to pneumatic and hydraulic systems, directional control valves, pressure control valves, cylinders, process control valves, rotary actuators. Introduction to mechanical systems, types of motion, kinematic chain, cams, gear trains, ratchet and pawl, belt and chain drives, bearings, mechanical aspects of motor selection. Introduction to electrical systems, mechanical swtiches, solid-state switches, solenoids, D.C. motors, A.C. motors, stepper motors. Mathematical models, machanical system building blocks, electrical system building blocks, fluid system building blocks, thermal system building blocks. System model of engineering systems, rotational-translational systems, electromechanical systems and hydraulic-mechanical systems. Brief description of mechatronics system related topics: system transfer

function, frequency response, closed loop controller, digital logic, microprocessor, assembly language, C language, input/output systems or interfacing, programmable logic controllers, communication systems, fault finding.

References

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

BEKM 3453
MICROCONTROLLER TECHNOLOGY

Learning Outcomes

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

1. Describe and explain a microcontroller's architecture, operations of peripherals and subsystems, internal registers, program compilation and simulation.
2. Apply interrupt functions, digital sensory system and develop a functioning system using the microcontroller.
3. Control Direct Current (DC), servo and stepper motors using microcontroller and relevant driver circuit(s).
4. Explain and interface the microcontroller's Analog to Digital converter, serial communication, with external devices such as memory, analog sensors, Liquid Crystal Displays (LCD) and keypad.
5. Develop and integrate a microcontroller based system application and analyze the problem related for troubleshooting for problem solving recommendation.
6. Utilize the microcontroller based system application software or hardware for compilation and transferring machine code.
7. Explain the design solution in presentation, technical report, and product video.

Synopsis

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

References

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

BEKM 3543
ELECTROMECHANICAL SYSTEM

Learning Outcomes

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

1. Comprehend the basic principle of electromechanical energy conversion and operation of electrical machines.
2. Investigate and analyze the torque speed characteristics of electric motors and their corresponding drive requirements
3. Design the drive for electrical motors according to application requirements and appropriate mechanical model

Synopsis

This course focuses on the applications of electrical machines as primary mover for mechanical systems. Students are introduced to the basic principle of electromagnetics and the constructions of electrical machines. Then, an emphasis is put on electric motors and how to control them. Finally, students are exposed to general steps required in analyzing a drive system for mechanisms, modelling the mechanism's dynamics and selecting appropriate motor and its drive for the application.

References

1. Wildi T., 'Electrical Machines, Drives and Power systems', Prentice Hall, 2002.

2. Crowder, R. 'Electric Drives and Electromechanical Systems', Newnes, 2006
3. Chapman, Stephen J. ' Electric Machinery Fundamentals', 5th Ed. McGrawHill, 2002.
4. Tobin, Stephen M. 'DC Servos: Application and Design with MATLAB', CRC Press, 2010

BEKM 3641
MECHATRONICS ENGINEERING LABORATORY I

Learning Outcomes
Upon completion of this laboratory course, the student should be able to:
1. Design and analyze a controller for mechatronics system by using PLC.
2. Design and demonstrate the appropriate solution to actuate a mechatronic system by using pneumatic and hydraulic circuits.
3. Analyze and evaluate the accuracy of the integrated PLC and electropneumatic system performance by using statistical method.
4. Exhibit technical writing to solve complex problem.

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

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

BEKM 3653
INTEGRATED DESIGN PROJECT

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Design solutions by synthesizing electrical engineering knowledge that will solve complex electrical engineering problem in accordance to relevant standards and with appropriate consideration for public health and safety, cultural, societal, environmental and sustainability factors.
2. Utilize modern engineering and IT tools in facilitating solution to complex electrical engineering problems with an understanding of the limitations.
3. Evaluate the impact of the designed product, components or processes, in terms of safety, environmental and sustainability factors.
4. Demonstrate effective teamwork skills in completing the electrically integrated design project.
5. Apply project management and financial knowledge effectively in completing the electrically integrated design project.

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

References
1. Dieter, G.E. & Schmidt, L.C.(2013). Engineering Design, 5th Edition, McGraw Hill.

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

BEKM 4751
MECHATRONICS ENGINEERING LABORATORY II

Learning Outcomes

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

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

Synopsis

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

References

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

BEKM 4763
ROBOTICS

Learning Outcomes

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

1. Apply knowledge in physics and mathematics to the solution of complex kinematics and dynamics.
2. Analyze the effects of controller gains on the motion of a robotics system.
3. Design robot trajectories based on safety and environmental needs.

Synopsis

This subject introduces robotic fundamentals including kinematics (forward, reverse, jacobian, singularity), dynamics and trajectory generation of robots. Fundamental mathematics, scientific and mechatronics engineering knowledge will be applied in this subject to the solution of complex robotic problems. In developing the solution of the robotics problem, student will be exposed to influential factors that might affect the design of the solution including safety and environmental factors. Throughout the semester, student will be exposed to robotics simulation software to enhance their understanding of robotics knowledge.

References

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

BEKM 4783
MACHINE VISION

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

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

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

BEKM 4823
DATA COMMUNICATIONS & COMPUTER NETWORKING

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

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

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

BEKU 1123
ELECTRIC CIRCUIT 1

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Analyse electrical circuit using Ohm's Law and Kirchhoff's Laws.

2. Apply Mesh and Nodal methods for DC and AC circuit analysis.
3. Analyze DC an AC circuits using Superposition, Thevenin, Norton and Maximum Power Transfer Theorems.

Synopsis

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

References

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

BEKU 1231 ELECTRICAL & ELECTRONICS ENGINEERING LABORATORY

Learning Outcomes

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

1. Measure the electrical characteristics of single-phase and three-phase ac circuit precisely.
2. Construct the combination of logic circuit and ICs using suitable and appropriate components.
3. Perform simulations of RLC circuits in order to study their characteristics.
4. Exhibit good communication skills through technical writing.

Synopsis

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

References

1. Charles K. Alexander and Matthew N. O. Sadiku, *Fundamentals of Electric Circuits*, Mcgraw Hill, 5th Ed., 2013.
2. Robbins and Miller, *Circuit Analysis And Practice*, 5th Ed., 2012.
3. Thomson And Delmar. Nilsson and Riedel, *Electric Circuits,* 9th Ed., 2010.
4. Addison-Wesley, Prentice Hall. Hughes, *Electrical Technology*, 10th Ed. Prentice Hal

BEKU 3695 INDUSTRIAL TRAINING

Learning Outcomes

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

1. Apply appropriate techniques and technical knowledge which is relevant for student field of study.
2. Demonstrate the ability to adapt with working environment and practice working efficiently and ethically.
3. Demonstrate soft skill especially communication skill at all level.
4. Work affectively as an individual, team members and as a leader as well.
5. Acquire new knowledge, life-long learning and aware to new technology.

Synopsis

All bachelor degree students are required to undergo industrial training as part of their curiculum to complete their four (4) years course for the Bachelor of Electrical Engineering (BEKG) and Bachelor of Mechatronic Engineering (BEKM). It is compulsory for all degree program students to undergo the Industrial Training Programme.In general, the aim of industrial training are to give exposure, experience and professional skills to various aspects of engineering discipline, in particular in electrical engineering related industries. The students are also expected to be familiarized with efficient, accountable and ethical conduct as they will be supervised directly under the company's personnel as well as supervisors from the faculty. Apart from that, the assessment will be made by the appointed faculty supervisors & the industry supervisors.

References
1. Dasar Latihan Industri KPT, 2010
2. Garis Panduan Latihan Industri UTeM, 2017
3. Dokumen Jawatankuasa Latihan Industri FKE

BEKU 4861
ENGINEERING SEMINAR

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Identify the professional engineering knowledge, practices and responsibilities.
2. Collect and sort relevant information with regards to the given technical talk.
3. Discuss current engineering issues and practices that impacting engineering professionals.

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

BEKU 4792
FINAL YEAR PROJECT 1

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Conduct proper literature survey and identify the problems, objectives and scope of project clearly
2. Select, plan and execute a proper methodology in problem solving
3. Present the project proposal in written and in oral format effectively
4. Work systematically and commit to professional ethics

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

References
Depend on each student project's references.

BEKU 4894
FINAL YEAR PROJECT II

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Identify, formulate, research literature and analyze problem.
2. Conduct investigation using research based knowledge and methods.
3. Apply ethical principles in project implementation
4. Present the results in written and in oral format effectively.
5. Identify basic entrepreneurship skills in project management.
6. Apply reasoning informed by contextual knowledge.
7. Engage in independent and lifelong learning.

Synopsis
This course is the second part of Final Year Project I, in second semester. Students will continue their project from FINAL YEAR PROJECT I (BEKU 4792) during the second semester, and they should accomplish the projects completely either in hardware, software or both of them. Students needs to write-up a good final report (in thesis format), as a part of the course's assessment.

References
Depend on each student project's references.

SERVICE COURSES (FKEKK)

BENG 1413
DIGITAL ELECTRONICS

Learning Outcomes

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

1. Describe the number system, basic concept and terminology of digital circuits that form complex electronic systems.
2. Analyze the basic digital circuits based on combinational and sequential components.
3. Communicate effectively through effective report writing or oral presentation.

Synopsis

The outcome of this course is to deliver knowledge, understanding and application of the digital electronics. The course begin with the introductory concepts of digital technology, number systems and codes. Then, logic gates and Boolean algebra will be explored. Apart from that, combinational logic circuits and functions of combinational logic will be introduced. Students will also be enlightened with latches and flip-flops. Finally, this course will also introduce integrated circuit technology where students also will be explored to semiconductor technology for the project assignment. This course will also expose the students to current application in the digital electronics industry.

References

1. Thomas L. Floyd. Digital Fundamentals. 11th Edition, Prentice Hall, 2014.
2. Ronald J. Tocci, N. Widmer, G. Moss. Digital Systems, Principles and Applications. 11th Edition, Prentice Hall, 2011.
3. Roger l. Tokheim. Digital Electronics, Principles and Applications. 8th Edition, McGraw-Hill, 2013.

BENG 2143
ENGINEERING STATISTICS

Learning Outcomes

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

1. Apply the concepts of data description, normal and sampling distributions, estimation and hypothesis testing, ANOVA, regression and non-parametric tests to solve mathematical problems.
2. Analyze engineering data using descriptive statistics.
3. Deduce statistical inference for engineering problems by using the techniques of estimation, hypothesis testing and regression.

Synopsis

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

References

1. Farah Shahnaz Feroz, Nortazi Sanusi, Hanissah Mohamad, *A Student's Guide to Engineering Statistics*, Peneribit UTeM, 2019
2. Prem S.Mann, Introductory Statistics Using Technology, 9th Edition, John Wiley, 2016.
3. Douglas C. Montgomery, George C.Runger, *Applied Statistics and Probability for Engineers*, 6th Edition, John Wiley, 2013.
4. Richard Johnson, John Freund, Irwin Miller, Miller And Freund's, *Probability and Statistics for Engineers*, 9th Edition, Pearson – Prentice Hall, 2017.
5. Jay L. Devore, *Probability and Statistics for Engineering and the Sciences*, 9th Edition, Thomsons – Duxbury, 2015.
6. Sharifah Sara, Hanissah, Fauziah, Nortazi, Farah Shahnaz, *Introduction to Statistics & Probability A Study Guide*, Pearson-Prentice Hall, 2008

BENG 4322
ENGINEER AND SOCIETY

Learning Outcomes

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

1. Apply ethical principles and commitment, to professional ethics, responsibilities and norms of engineering practice
2. Apply reasoning informed by contextual knowledge to assess health, safety and legal issues and its subsequent responsibilities, relevant to professional practice

3. Understand the needs for sustainable development and the impact of engineering solutions on society and environment.

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

References

1. The Institution Of Engineer, "Engineering Professionalism and Ethics" 4th Ed, 1995.
2. Charles B. Fleddermann, Engineering Ethics, 3rd Ed, Prentice Hall, 2008.
5. Mike W Martin, Roland Schinzinger, Ethics in Engineering, 4th Ed, McGraw-Hill, 2005.
6. Charles E Harris JR, Michael S Pritchard, Michael J Rabin, "Engineering Ethics" 2nd Ed, Thomson and Wadsworth, 2003.

SERVICE COURSES (FTMK)

BITG 1233
COMPUTER PROGRAMMING

Learning Outcomes
In the end of the course, student will be able to:
1. Identify the fundamental principles of problem solving, programming techniques and structures in program development.
2. Explain the principles of problem solving and programming techniques to solve given problems.
3. Construct computer program codes by applying suitable programming structures and techniques.

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

References

1. Gaddis, T., (2015), "Starting Out with C++ Brief Version: From Control Structures Through Objects 8th Edition", Pearson Education.
2. Abdullah, N. et. al, (2018), "Lab Module Computer Programming (edition 2018), FTMK, UTeM.
3. Friedman, Koffman (2011), "Problem Solving, Abstraction and Design using C++", 6th Edition, Pearson Education.
4. Etter, D.M., Ingber, J.A., (2012), "Engineering Problem Solving with C++", 3rd Edition, Pearson Education.
5. Hanly, J.R, (2002), "Essential C++ for Engineers and Scientists", 2nd Addison Wesley

SERVICE COURSES (FKM)

BMCG 1013
DIFFERENTIAL EQUATIONS

Learning Outcomes
Upon completion of this course, the student should be able to:
1. Describe the basic concept of first and second order differential equations, Laplace Transform and Fourier series.
2. Select an appropriate technique to solve problems involving differential equations.
3. Apply the concept of differential equations in solving engineering problems.

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

Laplace transform, Fourier series and partial differential equations and solving using numerical methods which is finite difference method (Parabolic, Hyperbolic).

References

1. Muzalna M. J., Irmawani J., Rahifa R., Nurilyana A. A.
2. (2018). Module 2: Differential Equations, Penerbit UTeM.
3. Khoo, C.F., Syed Ahmad, S.S., Othman, Z. & Lok, Y.Y. ((2009). Numerical Methods Third Edition. Pearson Prentice Hall.

BMCG 1123
STATICS & MECHANICS OF MATERIAL

Learning Outcomes

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

1. State the basic concept of force and material mechanics.
2. Identify the force and stress on a mechanical system.
3. Analyze the force and stress on a mechanical system.

Synopsis

Statics

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

Material Mechanics

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

References

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

BMCG 1253
DYNAMICS & MECHANISM

Learning Outcomes

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

1. Apply and analyze the principle of kinematics of a particle.
2. Apply and analyze the principle of kinematics of a rigid body
3. Understand and apply the concept of belt amd gear system
4. Analyze gyroscopic effect and fundamental vibration problem of a system

Synopsis

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

References

1. Fadilah, et. all, Dynamics and Mechanism: Part 1, Penerbit UTeM, 2013.
2. Fadilah, et. all, Dynamics and Mechanism: Part 1, Penerbit UTeM, 2013
3. Hibbeler, R. C., Engineering Mechanics, Dynamics, 13th Edition, Prentice Hall. (2012)
4. Beer, F. P., Vector Mechanics for Engineers, Dynamics SI Units, 10th Edition, McGraw-Hill, (2012)

Roslan Abdul Rahman, Che Abas Che Ismail dan Mohd Yunus Abdullah, Mekanik Mesin, Penerbit UTM, Johor.(2013).

BMCG 1523
ENGINEERING GRAPHICS AND CAD

Learning Outcomes

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

1. Explain the engineering graphics fundamentals.
2. Construct technical drawing using manual sketching and computer aided design.
3. Communicate by using engineering drawings.

Synopsis

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

References

5. Omura,G & Benton,B., 2015, *Mastering Autocad 2016 And Autocad Lite 2016*, John Wiley & Sons Inc., Indiana, USA.
6. Er. R. K. Dhawan, 2010, Engineering Graphics (In First Angle Projection), 1st Ed., S. Chand Technical, India.
7. Mohd Rizal Alkahari et. al., 2009, *Modul Lukisan Berbantu Komputer,* Penerbit Universiti Teknikal Malaysia Melaka, Melaka.
8. Giesecke, F.E., Mitchell, A., Spencer, H.C., Hill, I.L., Dygdon, J.T., and Novak, J.E., 2008, *Technical Drawing*, 13th Ed., Prentice Hall, New York.
9. Khairul Anuar Hanafiah, 1999, *Lukisan Berbantu Komputer,* Penerbit Universiti Teknologi Malaysia, Skudai.

BMCG 2372
FLUID MECHANICS

Learning Outcomes

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

1. Define basic concept in fluid mechanics.
2. Apply fluid mechanics equations in solving problems related to fluid mechanics.
3. Analyze problems related to fluid mechanics and solve them in a systematic manner.

Synopsis

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

References

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

BMCG 3643
HYDRAULIC & PNEUMATIC SYSTEMS

Learning Outcome

1. Explain the common hydraulic and pneumatic components, their use, symbols, and their applications in industry.
2. Analyze mathematical models of hydraulic and pneumatic circuits to study the performance of the system.
3. Design hydraulic and pneumatic system manually and using related computer software.
4. Simulate and troubleshoot the circuit of the hydraulic and pneumatic system.

Synopsis

This course covers the introduction of hydraulic and pneumatic systems, types of pump, compressor, working principles, types of valve, actuator, and performance of the fluid power system. The understanding enhanced to the fluid power system ancillaries, sensors, fluid power circuit design, and electrical control. The computer software is used to design and simulate the fluid power circuit. The programmable logic controller has been utilized one step ahead to control the pneumatic robotic and mobile hydraulics.

References

1. Esposito A. 2013. *Fluid Power with Applications* .7th Ed. Prentice Hall. New Jersey.

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

BMCG 3653
THERMODYNAMICS & HEAT TRANSFER

Learning Outcomes
After completion of the course, the students should be able to:
1. Describe basic terms of thermodynamics and use property tables to define the state of the systems.
2. Apply the concept of First Law of Thermodynamics in Closed Systems and Control Volumes.
3. Apply the concept of Second Law of Thremodynamics to determine the performance of heat engines, refrigerators and heat pumps.
4. Implement the concept of heat transfer such as conduction, convection and radiation through plates, cylinders and spheres including electronics system such as transistor and electric wire.

Synopsis
This course covers the basic concepts and definitions of engineering thermodynamics, energy, work and heat, properties of pure substances (relationships of P-v, T-v, P-T and Ts diagrams), First Law of Thermodynamics and Second Law of thermodynamics. It also will cover the different modes of heat transfer, definition of conduction, convection, radiation, thermal conductivity, Fourier's law of conduction, heat transfer coefficients, Newtons's law of cooling, Steffan-Boltzman constant, emissivity of black bodies, heat transfer through plates, cylinders and spheres.

Reference
1. Cengel, Y. A. and Boles, M. A..2014. *Thermodynamics: An Engineering Approach*, 8th Ed, McGraw Hill.Singapore.
2. Sonntag, R.E. and Borgnakke, C. 2012. Fundamentals of Thermodynamics, 8th Ed, John Wiley & Sons, Inc.New York.
3. S.C.Gupta,2009. *Thermodynamics*, 2nd Ed, Pearson Education (Singapore) Pte. Ltd.
4. Morad, N.A., Mulop, N. and Darus, A. N. 2011. *Introduction to Thermodynamics for Engineering Students,* 1st Ed, Pearson Malaysia Sdn Bhd.

SERVICE COURSES (FKP)
BMFG 1113
ENGINEERING MATHEMATICS

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

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

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

BMFG 1213
ENGINEERING MATERIALS

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

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

References

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

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

BTMW 4012
ENTERPRENEURSHIP TECHNOLOGY

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

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

References

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

BLHC 4032
CRITICAL AND CREATIVE THINKING

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

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

solutions are based on the product market requirements from multiple perspectives and thinking outside the box.

References

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

BLHL 1012 MALAY COMMUNICATION I

Learning Outcome

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

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

Synopsis

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

References

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

BLHL 1XX2 ARABIC

Learning Outcomes

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

1. Use the basic Arabic grammar correctly and apply the information from the text
2. Construct sentences and apply selected vocabulary in a report.
3. Demonstrate communication skills.

Synopsis

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

References

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

BLHL 1XX2 JAPANESE

Learning Outcomes

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

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

Synopsis

This course is designed for students who do not have any background in Japanese. It provides students with the knowledge to enable them to understand and communicate in the oral and written forms. This course encompasses the

listening, speaking, reading and writing components. The grammar introduced is related to the language used daily by the Japanese. In addition, two types of Japanese language writing systems; Hiragana and Katakana are also introduced. Students are also exposed to elementary reading materials.

References

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

BLHL 1XX2 MANDARIN

Learning Outcomes

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

1. Demonstrate the ability to converse in Mandarin with correct and accurate pronunciation and intonation.
2. Use the rules of Chinese writing and the theory of word and sentence formation.
3. Interpret the information in the simple text.

Synopsis

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

References

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

BLHW 1702 TAMADUN ISLAM DAN TAMADUN ASIA (TITAS)

Learning Outcomes

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

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

Synopsis

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

Rujukan

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

BLHW 1742 MALAYSIAN STUDIES

Learning Outcomes

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

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

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

References

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

BLHW 2712
ETHNIC RELATIONS

Learning Outcomes
In the end of the course, student will be able to:
1. Menganalisis peranan hubungan etnik dan kepentingannya dalam proses pembangunan Malaysia.
2. Menghubungkait respons tentang isu dan cabaran etnik budaya di Malaysia.
3. Merumus isu-isu perpaduan dan cadangan untuk memperkasakannya di Malaysia.

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

References

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

BLHW 2752
MALAYSIAN CULTURE

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

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

References

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

BKXX XXX1
CO-CURRICULUM I &II

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

FACULTY STAFF MEMBERS

LIST OF FACULTY STAFF MEMBERS

ADMINISTRATIVE & OFFICE MANAGEMENT

ASSOCIATE PROF. Ir. DR. MD NAZRI BIN OTHMAN
Dean
: nazri@utem.edu.my
: 270 2111 / 2114
: C/1-14 & A/1-5

ASSOCIATE PROF. Ts. DR. MOHD LUQMAN BIN MOHD JAMIL
Deputy Dean (Academic)
: luqman@utem.edu.my
: 270 2186
: C/1-15 & A/3-20

Ir. DR. NORAZHAR BIN ABU BAKAR
Deputy Dean (Research & Postgraduate Studies)
: norazhar@utem.edu.my
: 270 2175
: C/1-13 &A/G-1

NOR-ALIZA BINTI IBRAHIM
Senior Assistant Registrar
Unit of Academic & Student Development
: noraliza@utem.edu.my
: 270 2127
: C/1-2

ASSOCIATE PROF. DR. HIDAYAT BIN ZAINUDDIN
Deputy Dean (Student Development)
Ph.D (Univ. of Southampton)
MSc. (Univ. of Strathclyde)
B.Eng. (UTM)
Area of interest : High Voltage Insulation, Condition Monitoring and Finite Element Modelling
: hidayat@utem.edu.my
: 270 2125
: B/1-2 & B/3-20

RAIHATUL JANNAH BINTI ABDULLAH
Senior Assistant Registrar
Unit of Administrative & Finance
: jannah@utem.edu.my
: 270 2121
: C/1-5

ADAWIYAH BINTI MD. JANI
Senior Admin Assistant Officer (KUP)
Unit of Academic & Student Development
: adawiyah@utem.edu.my
: 270 2128
: C/G-6

KAMISAH BINTI JALIL
Office Secretary
Unit of Administrative & Finance
: kamisah@utem.edu.my
: 270 2112 / 2115
: C/1-20

NUR HASRIHA BINTI MOHAMAD
Assistant Accountant (W27)
Unit of Administrative & Finance
: nurhasriha@utem.edu.my
: 270 2122
: C/1-20

RAIMI HUMAIRA BINTI RABU
Office Secretary
Unit of Administrative & Finance
: raimi@utem.edu.my
: 270 2116
: C/1-20

SITI AISHAH BINTI MAT ZAIN
Senior Admin Assistant
Unit of Administrative & Finance
: aishah@utem.edu.my
: 270 2117
: C/1-20

SUHANA BINTI ARIFFIN
Senior Admin Assistant (KUP)
Unit of Administrative & Finance
: suhana@utem.edu.my
: 270 2118
: C/1-20

NORMALISZA BINTI MUSTAPA
Senior Admin Assistant
Unit of Administrative & Finance
: normalisza@utem.edu.my
: 270 2119
: C/G-6

NORIZAH BINTI MAT
Assistant Accountant
Unit of Administrative & Finance
: norizah@utem.edu.my
: 270 2120
: C/1-20

ABDUL AZIZ BIN ABU BAKAR
Office General Assistant
Unit of Administrative & Finance
: abdaziz@utem.edu.my
: 270 2123
: C/1-20

MUHAMAD SYAHMI BIN AYOB
Admin Assistant
Unit of Academic & Student Development
: syahmi@utem.edu.my
: 270 2130
: C/1-20

DEPARTMENT OF ELECTRICAL ENGINEERING

ACADEMIC

DR. MAASPALIZA BINTI AZRI
Head of Department / Senior Lecturer
Ph.D. in Power Electronics, University of Malaya, Malaysia.
M.Eng. (Power), UPM
B.Eng. (Electrical Engineering), UiTM
Area of Interest *: Power Electronics Converter, Renewable Energy*
: maaspaliza@utem.edu.my
☎ : 270 2185
: C/1-3 & A/2-20

DR. AZRITA BINTI ALIAS
Coordinator of Department / Senior Lecturer
Ph.D in Electrical Engineering, Universiti Malaya
M. Eng. (Electrical), UTM
B.Eng in.Electrical (Contol & Instrumentation), UTM
Area of Interest : *Control Design & Application, Power Converters*
: azrita@utem.edu.my
☎ : 270 2160
: A/1-3

DATUK PROF. DR. MOHD RUDDIN BIN AB. GHANI FASc
Professor
Ph.D in System & Control, UMIST, UK
M.Sc. in System Engineering, University of London
B.Eng. in Electrical Engineering
Area of Interest : *Control System Engineering*
: dpdruddin@utem.edu.my
☎ : 270 2172
: A/2-5

PROF. DR. Ir. MARIZAN BIN SULAIMAN
Director of CRIM / Professor
Ph.D, M.Sc., B.Sc., in Electrical Engineering University of Missouri-Columbia (UMC), USA
Area of Interest *: Power System Modeling, Control and Automation, Energy Efficiency and E-Learning*
: marizan@utem.edu.my
☎ : 270 1304
: B/1-21

PROFESSOR. DR. ZULKIFILIE BIN IBRAHIM
Deputy Vice Chancellor / Professor
Ph.D (Power Electronics & Control), Liverpool John Moores University
B.Eng. (Electrical Engineering), UTM
Area of Interest *: Power Electronics, Electric Motor Drives, Fuzzy Logic, Embedded Control Design & Application*
: drzulkifilie@utem.edu.my
☎ : 270 2784
: C/1-14 & A/1-19

ASSOC. PROF. Ir. DR. MD NAZRI BIN OTHMAN
Dean / Associate Professor
PhD in Electrical Eng., Uni. Of Nottingham, United Kingdom
M.Sc. Electrical Engineering, University of Nottingham, UK
B.Sc. Electrical Engineering, Memphis State University, USA
Area of Interest *: Design & Analysis of Electric Machines, Electric Motor Drives*
: nazri@utem.edu.my
☎ : 270 2111 / 2114
: C/1-14 & A/1-5

ASSOC. PROF. Ts. DR. MOHD LUQMAN BIN MOHD JAMIL
Deputy Dean (Academic) / Associate Professor
PhD in Electrical Engineering, The University of Sheffield, UK
M.Sc. in Electrical Power Engineering, University of Newcastle upon Tyne, UK
B.Eng. in Electrical Engineering, UiTM
Area of Interest *: Design, Analysis & Control of Electric Machines*
: luqman@utem.edu.my
☎ : 270 2186
: C/1-15 & A/3-20

ASSOC. PROF. DR. HIDAYAT BIN ZAINUDDIN
Deputy Dean (Student Development) / Associate Professor
Ph.D (Univ. of Southampton)
MSc. (Univ. of Strathclyde)
B.Eng. (UTM)
Area of Interest *: High Voltage Insulation, Condition Monitoring and Finite Element Modelling*
: hidayat@utem.edu.my
☎ : 270 2125
: B/1-2 & B/3-20

ASSOCIATE PROF. Ir. DR. ROSLI BIN OMAR
Associate Professor
Ph.D in Electrical Engineering
M.Sc. in Electrical and Electronic
B.Eng in Electrical
***Area of Interest** : Power Quality, Power System, Power Electronics and Renewable Energy*
: rosliomar@utem.edu.my
☎ : 270 2137
: A/G-20

ASSOCIATE PROF. Ir. DR. GAN CHIN KIM
Associate Professor
PhD Imperial College London
M.Eng. (Electrical Engineering), UTM
B.Eng. (Electrical Engineering), UTM
***Area of Interest** : Power Distribution Network Planning, Integration of Disributed Technologies and Solar PV System*
: ckgan@utem.edu.my
☎ : 270 1310
: A/2-19

ASSOCIATE PROF. Ir. Ts. DR. ABDUL RAHIM BIN ABDULLAH
Associate Professor
PhD Electrical Engineering UTM
M.Sc., B.Eng. in Electrical Engineering, UTM
***Area of Interest** : Power Electronics & Drives, Signal Processing*
: abdulr@utem.edu.my
☎ : 270 1313
: A/3-2

ASSOCIATE PROF. DR. KASRUL BIN ABDUL KARIM
Associate Professor
PhD Electrical Engineering, University of Nottingham, UK
M.Sc. Real Time Power Electronics & Control Systems, University of Bradford, UK
B.Eng. Electrical & Electronics Eng, UMS
***Area of Interest** : Power Electronics & Drives*
: kasrul@utem.edu.my
☎ : 270 2187
: B/2-3

ASSOCIATE PROF. DR. TAY CHOO CHUAN
Associate Professor
Ph.D Mathematics , UKM
M.Sc (Quality and Productivity Improvement), UKM
B.Sc (Hons) Mathematics, UKM
Area of Interest : Mathematics, Quality & Productivity Improvement.
: tay@utem.edu.my
☎ : 270 2164
: B/3-18

ASSOCIATE PROF. DR. RAJA NOR FIRDAUS KASHFI RAJA OTHMAN
COE-CeRIA Manager/ Associate Professor
PhD in Electrical Engineering, UPM
M.Sc in Electrical Engineering, UPM
B. Eng in Electrical & Electronics, UPM
***Area of Interest** : Applied Magnetic, Electrical Machine, Magnetic Sensor & Drives*
: norfirdaus@utem.edu.my
☎ : 270 2210
: B/2-2

ASSOCIATE PROF. DR. ROZAIMI BIN GHAZALI
Associate Professor
Ph.D in Electrical Engineering, Universiti Teknologi Malaysia
B.Eng. in Electrical Engineering (Control and Instrumentation), Universiti Teknologi Malaysia
***Area of Interest** : Adaptive Robust Control, Sliding Mode Control, System Identification, Hydraulic and Pneumatic Systems, Motion Control, Biomedical Engineering*
: rozaimi.ghazali@utem.edu.my
☎ : 270 8087
: A/3-16

DR. MUHAMMAD NIZAM BIN KAMARUDIN
Senior Lecturer
Ph.D in Electrical Engineering, Malaysia
M.Sc. Automation and Control, United Kingdom
B.Eng. (Hons.) Electrical, Malaysia
***Area of Interest** : Stability Analysis and Control of Dynamical System*
: nizamkamarudin@utem.edu.my
☎ : 270 2197
: A/2-4

DR. ELIA ERWANI BINTI HASSAN
Senior Lecturer
Ph.D in Electrical Engineering, UiTM
M.Eng. (Electrical Engineering), UTM
B.Eng. (Electrical Engineering), UiTM
***Area of Interest** : Power Systems*
: erwani@utem.edu.my
☎ : 270 2249
: A/1-21

DR. AIDA FAZLIANA BINTI ABDUL KADIR
Senior Lecturer
Ph.D (Electrical Engineering), UKM
M.Eng. (Electrical Engineering), UTM
B.Eng. (Electrical Engineering), UTM
***Area of Interest** : Power Quality, Distributed Generation and Optimization.*
: fazliana@utem.edu.my
☎ : 270 2132
: A/1-2

DR. FAIRUL AZHAR BIN ABDUL SHUKOR
Senior Lecturer
D. Eng in Electrical Machine Design, Shinshu University, Japan.
M.Sc. (Electrical Power Engineering), UPM
B.Eng. (Electrical and Electronic Engineering), UPM

***Area of Interest** : Power Electronics, Electrical Machine Design and Drives*
: fairul.azhar@utem.edu.my
☎ : 270 2198
: B/2-22

Ir. DR. NORAZHAR BIN ABU BAKAR
Deputy Dean (Research & Postgraduate Studies) / Senior Lecturer
Ph.D in Electrical Engineering, Curtin Uni., Australia
M.Sc.(Eng.) in Control Systems, University of Sheffield
B.Eng. (Hons) in Electronic and Electrical Engineering, University of Leeds
Diploma in Electrical Eng. (Power), UiTM
***Area of Interest** : Control Systems, Power Systems*
: norazhar@utem.edu.my
☎ : 270 2175
: A/G-1 / C/1-20

DR. RAHIFA BINTI RANOM
Senior Lecturer
Ph.D (Mathematics), University of Southampton, UK
M.Sc. (Mathematics), UTM
B.Sc. (Industrial Mathematics), UTM
***Area of Interest** : Applied Mathematics, Numerical Analysis, Mathematical Modelling, Asymptotic Analysis*
: rahifa@utem.edu.my
☎ : 270 2217
: A/G-4

DR. JURIFA BINTI MAT LAZI
Senior Lecturer
Ph.D in Electrical Engineering, UTeM
M.Eng. (Electrical Engineering), UTM
B.Eng. (Electrical Engineering), UTM
***Area of Interest** : Power System Machine Drives and Power Electronics, Sensorless PMSM Drives.*
: jurifa@utem.edu.my
☎ : 270 2131
: A/1-20

DR. FAZLLI BIN PATKAR
Senior Lecturer
PhD Electrical Engineering, Liverpool John Moores University,UK
M.Eng (Electrical-Power), UTM
B.Eng (Electrical), UTM
***Area of Interest** : Power Electronics & Motor Drives*
: fazlli@utem.edu.my
☎ : 270 2191
: B/3-19

DR. WAHIDAH BINTI ABD. HALIM
Senior Lecturer
PhD Electrical Engineering, UM
M.Sc. Electrical Power Engineering, UPM
B.Eng. Electrical Engineering, UTM
***Area of Interest** : Power Electronics Converter, Renewable Energy*
: wahidahhalim@utem.edu.my
☎ : 270 2190
: A/2-2

DR. NORHAFIZ BIN SALIM
Senior Lecturer
Ph.D in Power (Renewable Energy) (Yokohama National University, Jepun)
M.Eng. in Electrical Enginering (Power), UTM
B.Eng. in Electrical Engineering (Power Industry), UTeM
***Area of Interest** : Power electronics & Flexible Transmission System, Power Systems*
: norhafiz@utem.edu.my
☎ : 270 2146
: B/G-8

Ir. DR. AMINUDIN BIN AMAN
Senior Lecturer
Ph.D in High Voltage Engineering, UTM
Master in Electrical Engineering (Power System), UTM
Area of Interest : High Voltage Solid Insulation and Power System
: aminudin@utem.edu.my
☎ : 270 2136
: & B/1-16

DR. MOHD HENDRA BIN HAIRI
Senior Lecturer
Ph.D in Electrical Engineering, The University of Manchester
M.Eng in Electrical Engineering, UTM B.Eng in Electrical Engineering, USM
Area of Interest : Power systems (protection)
: hendra@utem.edu.my
☎ : 270 2133
: A/2-22

DR. FARHAN BIN HANAFFI
Senior Lecturer
Ph.D in Electric & Electronic Eng. (Strathclyde University, United Kingdom)
M.Eng. (Power), UTM
B.Eng. (Electrical Engineering) UTM
Area of Interest : High voltage engineering, electrical grounding and lightning protection
: farhan@utem.edu.my
☎ : 270 2150
: B/G-20

DR. KHAIRUL ANWAR BIN IBRAHIM
Senior Lecturer
PhD in Electrical Engineering, Universiti Tenaga Nasional (UNITEN)
M.Eng., B.Sc. in Electric Power Engineering, Rensselaer Polytechnic Institute, New York,USA
***Area of Interest** : Energy efficiency, Distribution technical losses, Smart Grid technologies, Distributed Energy Resources, Power Distribution Network Planning.*
: khairulanwar@utem.edu.my
☎ : 270 2153
: A/3-6

DR. INTAN AZMIRA BINTI WAN ABDUL RAZAK
Senior Lecturer
Ph.D in Electric & Electronic Eng. Universiti Tenaga Nasional (UNITEN)
Master of Engineering (Electric-Power), UTM
B.Eng. (Electrical Engineering-Industrial Power), KUTKM
Area of Interest : Power System Planning
: intan.azmira@utem.edu.my
☎ : 270 2239
: A/3-4

DR. AUZANI BIN JIDIN
Senior Lecturer
PhD Electrical Engineering UTM
M.Sc., B.Eng. in Electrical Engineering, UTM
***Area of Interest** : Power Electronics & Motor Drives*
: auzani@utem.edu.my
☎ : 270 2188
: A/3-3

DR. AZZIDDIN BIN MOHAMAD RAZALI
Senior Lecturer
Ph.D. in Electrical Engineering, Memorial University of Newfoundland, Canada.
M.Eng., B.Eng. in Electrical Engineering, UTM
***Area of Interest** :Power Electronics, Machine Drives and Power Quality.*
: azziddin@utem.edu.my
☎ : 270 2196
: A/3-19

DR. NUR HAKIMAH BINTI AB AZIZ
Senior Lecturer
M.Eng. in Electrical Power Engineering, UniSA, Australia
B.Eng in Electrical Engineering, UTM
Area of Interest : Condition Monitoring, Dielectric Ageing, Diagnostics and Prognostics
💻 : hakimah@utem.edu.my
☎ : 270 2134
📠 : A/G-22

DR. MOHD ZULKIFLI BIN RAMLI
Senior Lecturer
M.Eng. in Electrical Engineering, UTM
B.Eng. in Electrical Engineering (Mechatronic), UTM
Area of Interest :Power Electronics Converter, Renewable Energy and Power Quality.
💻 : mohd.zulkifli@utem.edu.my
☎ : 270 2199
📠 : B/G-2

DR. AZIAH BINTI KHAMIS
Senior Lecturer
PhD in Electric, Electronics and Systems, UKM.
Msc in Power Distribution Engineering, Newcastle University, UK.
Bachelor Electrical and Electronics Engineering, UPM
Area of Interest: Intelligent Application of Power System Study, Distributed Generation, Microgrid
💻 : aziah@utem.edu.my
☎ : 270 2142
📠 : B/G-3

DR. HYREIL ANUAR BIN KASDIRIN
Deputy Dean (Centre for Graduate Studies/ PPS) / Senior Lecturer
Ph.D in Control Systems & Artificial Inteligence, Uni.of Sheffield, United Kingdom
M.Sc. in Engineering (Control Systems), The University of Sheffield
B.Eng. (Hons) Electrical Engineering (Communication), **UiTM**
Area of Interest : Control Systems and Artificial Intelligence
💻 : hyreil@utem.edu.my
☎ : 270 2785
📠 : B/1-6

DR. MOHD RUZAINI BIN HASHIM
Senior Lecturer
PhD in Automation,Control and System Engineering, University of Sheffield,UK
M.Sc. (Eng.) Electronic and Electrical Engineering, University of Leeds
Bachelor of Engineering (Hons) Electrical , UiTM
Diploma in Electrical Eng. (Electronic), UiTM
Area of Interest : Optimization algorithm, Control, Electronic, Automation
💻 : ruzaini@utem.edu.my
☎ : 270 2174
📠 : A/G-3

DR. ZULHANI BIN RASIN
Senior Lecturer
PhD (Electrical Engineering), The University of New South Wales, Australia
M.Eng. in Electrical (Electronics & Communications), UTM
B.Eng. (Electrical Engineering), University of Electro-Communication, Tokyo
Area of Interest : Photovoltaic inverter, EV drives and energy storage management
💻 : zulhani@utem.edu.my
☎ : 270 2200
📠 : B/2-21

Ir. DR. MD HAIRUL NIZAM BIN TALIB
Senior Lecturer
M.Sc. Electrical Engineering, University of Nottingham, UK
B.Eng.Electrical Engineering, UTM
***Area of Interest** : Power System & Control*
💻 : hairulnizam@utem.edu.my
☎ : 270 2189
📠 : C/1-18

DR. NURUL AIN BINTI MOHD SAID
Senior Lecturer
PhD in Electrical Engineering, UNSW, Sydney.
M.Sc. in Electrical Power Engineering with Business, University of Strathclyde, UK
B.Eng. (Electrical Engineering), UTM
***Area of Interest** : Power Electronics, Electric Motor Drives*
💻 : nurulain@utem.edu.my
☎ : 270 2207
📠 : B/1-2

DR. EZREEN FARINA BINTI SHAIR
Lecturer
Ph.D (Electronic Engineering), UPM
M.Eng (Electrical – Mechatronics and Automatic Control), UTM
B.Eng (Electrical – Control and Instrumentation), UTM
Area of Interest: Bio-signal Processing, Machine Learning, Artificial Intelligence, Control System, Instrumentation
: ezreen@utem.edu.my
☎ : 270 2182
: A/1-9

KYAIRUL AZMI BIN BAHARIN
Laboratory Coordinator / Senior Lecturer
M. Eng. Sc Electical Engineering
(Power Systems) UNSW, Australia
Bachelor of Electrical Engineering
(Industrial Power), KUTKM
Area of Interest *: Renewable Energy, Smart Grid*
: kyairulazmi@utem.edu.my
☎ : 270 2141
: B/2-6

MUHAMAD KHAIRI B ARIPIN
Senior Lecturer
M.Sc. in Automation & Control, University of Newcastle upon Tyne
B.Eng. (Electrical – Instrumentation & Control), UTM
Dip. in Electrical Engineering (Power), UTM
Area of Interest*: Control System Engineering, Vehicle Dynamics Control, Industrial Instrumentation & Automation*
: khairiaripin@utem.edu.my
☎ : 270 2162
: B/1-3

ARFAH BINTI AHMAD
Lecturer
M.Sc. (Statistics), UKM
B.Sc. (Statistics), UKM
Area of Interest *: Statistical Analysis, Statistical Modelling, Survey & Sampling, Mathematical Modelling*
: arfah@utem.edu.my
☎ : 270 2238
: B/1-16

STUDY LEAVE

MOHD SHAHRIL BIN AHMAD KHIAR
Lecturer
M Eng. (Electrical Engineering) UNITEN
B.Sc. in Electrical Engineering (Electrical and Electronics), Korea University
Diploma in Electrical System Engineering, Dong Yang Technical College, South Korea
Area of Interest : Transformer Diagnostics and Condition Monitoring, Renewable Energy and Smart Grid
: mohd.shahril@utem.edu.my
: 270 2147
: B/G-17

ATIKAH BINTI RAZI
Lecturer
M.Eng. in Electrical Engineering (Industrial Electronic & Control), UM
B.Eng. in Electrical Engineering (Power), UTM
Area of Interest : Power Electronics & Drives
: atikah@utem.edu.my
: 270 2244
: A/2-8

MUSA BIN YUSUP LADA
Senior Lecturer
M.Sc. in Electrical Engineering, UTeM
B.Eng. (Hons) in Electrical Engineering (Power Electronic & Drives), UTeM
Area of Interest: Power electronics converter, active power filter, Renewable energy.
: musayl@utem.edu.my
: 270 2292
: B/2-8

MOHAMAD RIDUWAN BIN MD NAWAWI
Senior Lecturer
M.Sc. in Advanced Control and System Engineering, University of Manchester, UK
B.Eng. (Hons) Electronic Engineering, University of Surrey, UK
Area of Interest : Control System Engineering, Nonlinear System, Process Control
: riduwan@utem.edu.my
: 270 2176
: B/3-10

NUR ASMIZA BINTI SELAMAT
Lecturer
M.Eng (Electrical-Mechatronic & Automatic Control), UTM
Bachelor of Engineering (Electrical), UTM
Area of Interest : Control system engineering, Modeling, Optimization technique
: *nurasmiza@utem.edu.my*
: 270 2179
: A/G-16

NUR HAZAHSHA BINTI SHAMSUDIN
Senior Lecturer
M.Eng in Engineering (Electrical Energy and Power System), UM
B.Eng. in Electrical Engineering (Power), UiTM
Dip. In Electrical Engineering (Communication) UiTM
Area of Interest : Distribution System Optimization and Power Quality
: nurhazahsha@utem.edu.my
: 270 2152
: A/1-1

MOHAMAD FAIZAL BIN BAHAROM
Senior Lecturer
M.Eng Electrical Engineering UTM
B.Eng. of Electrical Engineering (Power Industrial), UTeM
Area of Interest : Power system, Power System Protection and High Voltage
: mohamad.faizal@utem.edu.my
: 270 2151
: B/2-1

MOHAMAD FANI BIN SULAIMA
Senior Lecturer
M.Eng. in Engineering (Industrial Electronic & Control), UM
B.Eng in Electrical & Electronic Engineering (Distribution Power System), Tokai University Japan
Area of Interest : Distribution System Optimization, Safety Instrumented Automation System and PLDS
: fani@utem.edu.my
: 270 2251
: C/3-3

MOHD HAFIZ BIN JALI
Senior Lecturer
M.Eng. Industrial Electronic & Control, UM
B.Eng. (Electrical), UiTM
Area of Interest : Bio signal processing, Human assist technology and Artificial Intelligent
: mohd.hafiz@utem.edu.my
: 270 2243
: B/3-9

Ir. FAUZAL NAIM BIN ZOHEDI
Lecturer
M. Eng (Industrial Electronics & Control) , UM
Bachelor of Electrical Engineering (Electronic), UMP
Area of Interest : Control, Instrument & Automation
: fauzal@utem.edu.my
: 270 2250
: B/G-20

SITI AZURA BINTI AHMAD TARUSAN
Lecturer
M.Eng. in Engineering (Industrial Electronic & Control), UM
B.Eng. (Electrical Engineering), UTM
Area of Interest : Power Electronics & Drives
: sitiazura@utem.edu.my
: 270 2208
: B/1-15

SYAHAR AZALIA BINTI AB SHUKOR
Lecturer
M.Eng. in Electrical Engineering (Power), UTM
B.Eng. (Hons) in Electrical Engineering (Power Electronics & Drives), UTeM
Dip. in Electrical Engineering, UTeM
Area of Interest : Power Electronics Application, Renewable Energy System
: syaharazalia@utem.edu.my
: 270 2241
: B/G-1

Ir. IMRAN SUTAN BIN CHAIRUL
Senior Lecturer
Master in Engineering (Electrical) UNITEN
B.Eng. (Hons) in Electrical Engineering (Industrial Power) UTeM.
Area of Interest: Transformer Diagnostics and Condition Monitoring, Renewable Energy and Smart Grid
: imransc@utem.edu.my
: 270 2206
: B/G-9

TARMIZI BIN AHMAD IZZUDDIN
Lecturer
M.Eng, Universiti Malaya.
Bsc, Eng (Electronic Control System Engineering), University of Shimane University, Japan
Diploma in Electronic Control System Engineering, Kumamoto National College of Technology, Japan
Area of Interest : Electronic Control System, Artificial Intelligence
: tarmizi@utem.edu.my
: 270 2177
: A/3-15

LOI WEI SEN
Senior Lecturer
M. Sc Engineering Mathematics (UTM)
B. Sc. Mathematics (UTM)
Area of Interest : Nonlinear wave & Solitons, Optical Solitons, Applied Mathematics
: loiws@utem.edu.my
: 270 2209
: B/G-19

DEPARTMENT OF MECHATRONIC ENGINEERING

ACADEMIC

DR. NIK SYAHRIM BIN NIK ANWAR
Head of Department/ Senior Lecturer
Lecturer
Ph.D in Electrical (sensor and Instrumentation), USM
M.Sc. in Mechatronic s, University of Applied Science Aachen, Germany
B.Eng. (Hons) in Mechatronics (FH HN)
***Area of Interest**: Microwave imaging, Sensor & Instrumentation.*
: syahrim@utem.edu.my
: 270 2221
: A/3-21

ASSOCIATE PROF. DR. MARIAM BINTI MD. GHAZALY
Deputy Director of CAES / Associate Professor
D. Eng. & M. Eng. (Mechano-Micro Engineering), Tokyo Institute of Technology, Japan
M. Eng. (Electrical-Mechatronics and Automatic Control Engineering), UTM
B. Eng. in Electrical Engineering, UTM
***Area of Interest**: Precision Motion Systems, Control System, Actuator Design*
: mariam@utem.edu.my
: 270 2216
: A/2-6

ASSOCIATE PROF. Ts. DR. MUHAMMAD FAHMI BIN MISKON
Director of PPPA / Associate Professor
Ph.D in Electrical and Computer Engineering (Robotics), Monash University, Australia
M.Sc. in Electrical Engineering
(Mechatronics) University of Newcastle, UK
B.Eng. in Electrical Engineering (Mechatronics), UTM
***Area of Interest**: Wearable robots, Artificial intelligence*
: fahmimiskon@utem.edu.my
: 270 1545
: B/2-23

Ir. DR. ANUAR BIN MOHAMED KASSIM
Senior Lecturer
D.Eng in System Innovation Engineering, Tokushima University, Japan
M.Eng in System Innovation Engineering, University of Tokushima, Japan
B.Eng. in Electrical Electronic Engineering, Ehime University, Japan
***Area of Interest**: Robotics and Automation, Precision Agriculture, Smart Farming, System Innovation, Sensor and Instrumentation, Control System.*
: anuar@utem.edu.my
: 270 2227
: B/3-3

ASSOCIATE PROF. Ir. DR. AHMAD ZAKI BIN SHUKOR
Associate Professor
Ph.D (Robotics and Motion Control), Yokohama National University, Japan
M.Eng. (Electrical Power Engineering) University of South Australia, Adelaide
B.Eng. (Electrical-Mechatronics Engineering), UTM
***Area of Interest**: Embedded Control Design & Application, Mobile Robots*
: zaki@utem.edu.my
: 270 2211
: B/2-24

ASSOCIATE PROF. DR. MOHD SHAHRIEEL BIN MOHD ARAS
COE-CeRIA Coordinator / Associate Professor
Ph.D in Electrical Engineering, UTM
M.Eng. Electrical Engineering (Mechatronic and Automatic Control), UTM
Bachelor of Electrical Engineering (Hons), UiTM
Diploma in Electrical Engineering (Electronics), UiTM
***Area of Interest**: Underwater Robotics, Fuzzy logic, Neural Network, and System Identification*
: shahrieel@utem.edu.my
: 270 2215
: A/G-21

ASSOCIATE PROF. DR. CHONG SHIN HORNG
Associate Professor
Ph.D in Mechano-Micro Engineering (Precision & Control Engineering), Tokyo Institute of Technology, Japan
M.Eng in Electrical Engineering, UTM
B.Eng in Electrical Engineering (Instrumentation & Automation), UTM
***Area of Interest**: Motion Control, Mechatronics Application, Precision Engineering*
: horng@utem.edu.my
: 270 2159
: A/2-21

DR. FARIZ BIN ALI @ IBRAHIM
Senior Lecturer
Ph.D (Robotics), Yokohama National University), Japan
M.Eng. (Electrical Engineering), University of South Australia, Adelaide
B.Eng. (Electrical Engineering-Mechatronics) UTM
***Area of Interest**: Robotics, Humanoid*
: fariz@utem.edu.my
: 270 2212
: B/2-23

DR. HAIROL NIZAM BIN MOHD SHAH
Senior Lecturer
Ph.D in Electrical (Mechatronic), UTeM
M.Sc. in Electrical Engineering (Mechatronics), UTeM
B.Eng. in Electric-Electronic Engineering, UMS
Diploma in Electric-Electronic Engineering, UTM
***Area of Interest**: Vision System, Image Processing, Robotics*
: hnizam@utem.edu.my
: 270 2223
: A/G-19

DR. LOH SER LEE
Senior Lecturer
Ph.D in Mathematics(UTM)
M.Sc in Mathematics (UTM)
B.Eng in Industrial Mathematics(UTM)
***Area of Interest**: Computational Mathematics, Optimization, Channel Assignment*
: slloh@utem.edu.my
: 270 2158
: A/2-15

ASSOCIATE PROF. DR. MUHAMMAD HERMAN BIN JAMALUDDIN
Associate Professor
Doctor of Engineering (Haptics), Yokohama National University, Japan
M.Sc. in Electrical Engineering (Mechatronic System), UTeM
B.Eng. in Electrical Engineering (Mechatronics), UTM
***Area of Interest**: Haptics, Mechatronic, Embedded System, Robotic, Electronics, Information & Communication Technology (ICT) Design & Application*
: herman@utem.edu.my
: 270 2213
: C/1-4 & B/1-23

DR. NURDIANA BINTI NORDIN @ MUSA
Senior Lecturer
Ph.D. in Mechatronics Engineering, University of Auckland, New Zealand
M.Sc in Mechatronics Engineering, University of Siegen, Germany
B.Sc in Mechatronics Engineering, UIAM
***Area of Interest**: Computer vision, Stochastic estimation, Machine learning, Biomechanics.*
: nurdiana@utem.edu.my
: 270 2220
: A/2-3

DR. NUR ILYANA BINTI ANWAR APANDI
Senior Lecturer
Ph.D (Electrical and Information Engineering), The University of Sydney, Australia
M.Sc. in Modelling in Applied Mathematics, University of East Anglia, UK
B.Sc. (Industrial Mathematics), UTM
***Area of Interest**: Applied Mathematics, Mathematical Modelling, Wireless Telecommunication, Computational Mathematics*
: ilyana@utem.edu.my
: 270 2230
: A/1-22

DR. SAIFULZA BIN ALWI @ SUHAIMI
Senior Lecturer
Ph.D in Electrical & Comp. Engineering, Yokohama National University, Japan.
M.Eng., Inst. Of Tech. Japan
B.Eng. (Hons) Control Engineering & Science, Kyushu Inst. of Tech.
***Area of Interest**: Industrial Automation & Discrete Event System*
: saifulza@utem.edu.my
: 270 2166
: B/2-5

Ir. DR. SHARIN BIN AB. GHANI
Senior Lecturer
Ph.D in Electrical Engineering (UTM)
M.Eng. in Electrical Engineering, UNITEN
B.Eng. (Hons) in Electrical Engineering, UTeM
***Area of Interest**: Transformer Diagnostics and Condition Monitoring, Renewable Energy and Smart Grid*
: sharinag@utem.edu.my
: 270 2203
: B/G-10

AINAIN NUR BINTI HANAFI
Senior Lecturer
M.Sc. in Control System, University of Sheffield
B.Eng. (Electrical Engineering), Universiti Teknologi MARA
***Area of Interest**: Control systems, nonlinear systems, fault tolerant control*
: ainain@utem.edu.my
: 270 2165
: A/1-4

ZAMANI MD SANI
Senior Lecturer
M.Sc. Electrical & Electronics Engineering (Real-Time Vision System), USM
B.Eng. (Electrical & Electronics Engineering), USM
***Area of Interest**: Image Processing and Embedded System*
: zamaisani@utem.edu.my
☎ : 270 2232
: A/3-16

MOHD BAZLI BIN BAHAR
Lecturer
M.Eng. in Mechatronics Engineering, UTeM
B.Eng. in (Mechatronics Engineering with honours, UTeM
: mohdbazli@utem.edu.my
☎ : 270 2238
: B/1-10

NURUL FATIHA BINTI JOHAN
Lecturer
M.Sc. in Mechatronics Engineering, UIA
B.Eng. (Mechatronic Engineering), UTeM
***Area of Interest**: Control System, Mechatronic System, Electromechanical System, Fuzzy Logic, Embedded System & Application*
: nfatiha@utem.edu.my
☎ : 270 2233
: C/1-11

ASSOCIATE PROF. DR. AHMAD ANAS BIN YUSOF
Associate Professor
Ph.D in Mechanical and Civil Engineering, Gifu Universiti, Japan
M.Eng in Mechanical, Universiti Teknologi Malaysia
B.Eng in Mechanical, Universiti Teknologi Malaysia
***Area of Interest**: Robotics, Mechatronics, Thermal-Fluids*
: anas@utem.edu.my
☎ : 270 4356
: B/3-1

FADILAH BINTI ABDUL AZIS
Lecturer
M.Sc. in Mechatronics, University of Siegen, Germany
B.Eng. (Hons) in Mechatronics Engineering, UIAM
***Area of Interest**: Nonlinear Control and Unmanned Vehicle System*
: fadilah@utem.edu.my
☎ : 270 2219
: A/2-9

NORAFIZAH BINTI ABAS
Lecturer
M.Sc. in Mechatronics Engineering, IIUM
B.Eng. (Hons) in Mechatronics Engineering, IIUM
***Area of Interest**: Rehalibitation, Engineering & Asisstive Technology, Nonlinear Control and Autonomous Agent.*
: norafizahabas@utem.edu.my
☎ : 270 2229
: B/3-17

DR. MOHD FAID BIN YAHYA
Lecturer
Ph.D (Robotics), Universiti Sains Malaysia,
M.Sc. (Mechatronics Engineering), IIUM
B Eng. (Mechatronics Engineering), IIUM
***Area of Interest**: Vision-Based Robot Control, Robotics, Machine Vision, Control System*
Discrete Event System
: faid@utem.edu.my
☎ : 270 2253
: B/2-8

DR. MOHD KHAIRI BIN MOHAMED NOR
Senior Lecturer
Ph.D in Information system, Yamagata University
M.Sc. in Control System, The university of Sheffield
B.Eng in Mechanical System, Takushoku University
***Area of Interest**: Control Engineering, Robotic*
: khairi@utem.edu.my
☎ : 270 4473
: B/3-21

STUDY LEAVE

NURSABILLILAH BINTI MOHD ALI
Senior Lecturer
M.Sc. in Mechatronics Engineering, UIA
B.Eng. (Hons) in (Mechatronics Engineering)
Dip. in (Electronics Engineering), UTeM
***Area of Interest**: Image Processing, Intelligent System, Pattern Recognition*
: nursabilillah@utem.edu.my
: 270 2234
: B/1-10

MOHD ZAMZURI BIN AB. RASHID
Senior Lecturer
B.Eng. (Hons) in Mechatronics Engineering, UIAM
M.Sc. in Mechatronics Engineering, UIA
***Area of Interest**: Control system, Robotics, System modelling.*
: zamzuri@utem.edu.my
: 270 2228
: A/G-8

NUR MAISARAH BINTI MOHD SOBRAN
Lecturer
M.Eng. Electrical Engineeing (Mechatronics and Automatic Control), UTM
B.Eng. (Hons) Electrical (Electrical-Mechatronic) UTM
***Area of Interest**: Artificial Intelligent Control, Robotics and Electrical Car.*
: nurmaisarah@utem.edu.my
: 270 2237
: B/1-17

DEPARTMENT OF DIPLOMA STUDIES

ACADEMIC

DR. SAZUAN NAZRAH BINTI MOHD AZAM
Lecturer/ Head of Department Diploma Studies
Ph.D in Control System (Model Preditive Control), DTU, Denmark
Master of Science in Advanced Process Control, Universiti Teknologi Petronas
B.Eng. Electrical Engineering, UiTM
***Area of Interest**: Control System & Instrumentation*
: sazuan@utem.edu.my
: 270 2171
: B/2-16

DR. AIMIE NAZMIN BIN AZMI
Senior Lecturer/ Post Graduate Coordinator
Ph.D in Renewable Energy (Uni. Agder, Norway)
M.Eng. Sc. Energy System, The University of New South Wales, Sydney
B.Eng. (Hons) Electrical Engineering (Industrial Power), UTeM
***Area of Interest**: Zero Energy Building, Renewable Energy, Energy System*
: aimienazmin@utem.edu.my
: 270 2145
: B /3-1

DR. JUNAINAH BT SARDI
Lecturer
Ph.D in Electrical Engineering (Energy Storage), University of Queensland, Australia
Master of Science (Electrical Engineering), UPM
B.Eng. (Electrical Engineering), UTM
***Area of Interest**: Energy storage, Renewable energy, Distribution system*
: junainah@utem.edu.my
: 270 2139
: B/G-22

ALIAS BIN KHAMIS
Senior Lecturer
M.Sc. in Electrical Engineering, UPM
B.Eng. in Electrical Engineering, UiTM
***Area of Interest**:*
: alias@utem.edu.my
: 270 2135
: A/G-2

IRMA WANI BINTI JAMALUDIN
Senior Lecturer
Master of Science (Mathematics), UTM
Bachelor of Science (Hons) Industrial Mathematics, UTM
***Area of Interest**: Algebra and Analysis, Applied Mathematics*
: irma@utem.edu.my
: 270 2218
: A/G-5

AHMAD AIZAN BIN ZULKEFLE
Senior Lecturer
M.Sc. (Electrical Engineering & Power Electronics), University of Bradford, UK
B.Eng. (Electrical Engineering), UTM
Dip. (Electrical Power), UTM
***Area of Interest**: Fabrication and Characterization of Thin Film Solar Cell*
: aizan@utem.edu.my
: 270 2196
: B/3-2

LIM WEE TECK
Lecturer
Master of Science in Electrical Engineering, UTeM
B.Eng. in Electrical Engineering (Control, Instrumentation & Automation), UTeM
***Area of Interest**: Machine Vision, Industrial Automation, Embedded System*
: limwt@utem.edu.my
: 270 2183
: B/G-19

Ir. MOHD SAFIRIN BIN KARIS
Senior Lecturer
M.Eng. (Electrical - Mechatronics & Automatic Control), UTM
B. Eng. (Electrical Engineering - Telecommunications), UTM
***Area of Interest**: Telecommunications, and Control, Instrumentations and Automations*
: safirin@utem.edu.my
: 270 2173
: B/1-8

MOHD FAIRUS BIN ABDOLLAH
Lecturer
M.Eng. (Electrical - Mechatronics & Automatic Control), UTM
B.Eng. (Electrical), UTM
***Area of Interest**: Control & Intrumentation*
: mfairus@utem.edu.my
: 270 2167
: B/G-21

MOHD SAIFUZAM BIN JAMRI
Lecturer
M.Eng. in Electrical Engineering (Power), UTM
B.Eng. (Hons) in Electrical Engineering, UTeM
***Area of Interest**: Power Electronics & Drives*
: saifuzam@utem.edu.my
: 270 2201
: A/2-17

AINE IZZATI BINTI TARMIZI
Lecturer
Master of Science (Electrical Power Engineering with Business) University of Strathclyde, Glasgow, UK
B.Eng. (Electrical Engineering), UTM
***Area of Interest**: Power System, High voltage and EMC*
: aineizzati@utem.edu.my
: 270 2154
: A/3-8

ANIS NIZA BINTI RAMANI
Lecturer
M.Eng. in Electrical Enginering (Power), UTM
B.Eng. in Electrical Engineering (Power Industry), UTeM
***Area of Interest**: Power system, High Voltage and Grounding*
: anisniza@utem.edu.my
: 270 2140
: A/2-10

DR. WAN MOHD BUKHARI BIN WAN DAUD
Lecturer
Phd in Automatic Control and Systems Engineering, The University of Sheffield
M. Sc.(Electrical Engineering), UTM
B.Eng. in Electrical Engineering (Medical Electronics) , UTM
***Area of interest:** Bio Instrumentation and Signal Processing*
: bukhari@utem.edu.my
: 270 2184
: B/2-17

MOHAMAD NA'IM BIN MOHD NASIR
Senior Lecturer
Master of Engineering (Electrical-Power), UTM
B.Eng. (Electrical Engineering), UTM
***Area of Interest**: Renewable Energy, Power Systems*
: mohamad.naim@utem.edu.my
: 270 2156
: B/2-15

MOHD RUSDY BIN YAACOB
Senior Lecturer
M.Sc. in Mechatronics, University of Siegen, Germany
B.Eng. (Hons) in Mechatronics Engineering, UIAM
***Area of Interest**: Experimental Fluid Mechanics, Turbulence theory, Instrumentation & Measurements*
: rusdy@utem.edu.my
: 270 2363
: A/3-17

HAZRIQ IZZUAN BIN JAAFAR
Senior Lecturer
M.Eng. (Electrical - Mechatronics and Automatic Control), UTM
B.Eng. (Electrical - Power), UTM
***Area of Interest**: Control System, Power System & Optimization Techniques*
: hazriq@utem.edu.my
: 270 2178
: A/3-1

NORHASLINDA BINTI HASIM
Lecturer
M.Eng. (Electrical - Mechatronics & Automatic Control), UTM
B.Eng. (Hons) Electrical Engineering (Instrumentation), UiTM
***Area of Interest**: Motion Control & Precision Engineering*
: norhaslinda@utem.edu.my
☎ : 270 2170
: B/G-19

NUR ZAWANI BINTI SAHARUDIN
Lecturer
M.Eng in Engineering (Electrical Energy and Power System), UM
B.Eng in Electrical Engineering (Industrial Power), UTeM
***Area of Interest**: Power Systems & Flexible Transmission System*
: nurzawani@utem.edu.my
☎ : 270 2149
: A/1-8

NURLIYANA BINTI BAHARIN
Lecturer
M.Eng. in Electrical Engineering, UNITEN
B.Eng. (Electrical), UTM
***Area of Interest**: Power system, High Voltage*
: liyana@utem.edu.my
☎ : 270 2245
: A/1-10

ARFAH SYAHIDA BINTI MOHD NOR
Lecturer
Mechatronic and Automatic Control), UTM
B.Eng. (Electrical – Instrumentation and Control), UTM
***Area of Interest**: Control System and Instrumentation*
: arfahsyahida@utem.edu.my
☎ : 270 2238
: A/1-17

NOR HIDAYAH BINTI RAHIM
Lecturer
Master of Electrical Engineering, UNITEN
B.Eng. (Electrical Engineering), UTM
***Area of Interest**: High Voltage, Electrical Power System*
: hidayah.rahim@utem.edu.my
☎ : 270 2148
: B/3-15

STUDY LEAVE

Ir. MOHD KHAIRI BIN MOHD ZAMBRI
Senior Lecturer
M.Eng. in Electrical Engineering (Electrical Energy & Power System), UM
Bachelor of Electrical Engineering (Industrial Power), KUTKM
***Area of Interest**: Power system engineering (transient analysis & power quality)*
: khairi_z@utem.edu.my
☎ : 270 2163
: B/3-16

NUR RAFIQAH BINTI ABDUL RAZIF
Lecturer
M.Sc. Mathematics (UTM)
B.Sc. Industrial Mathematics (UTM)
***Area of Interest**: Operational Research, Applied Mathematics*
: nurrafiqah@utem.edu.my
☎ : 270 2246
: A/G-17

NORHAZILINA BINTI BAHARI
Lecturer
M.Eng. in Electrical Engineering (Power), UTM
B.Eng. (Hons) in Electrical Engineering, UTeM
Dip. In Electrical Engineering (Communication), UTM
***Area of Interest**: Renewable Energy, Power Electronics & Motor Drives*
: hazilina@utem.edu.my
☎ : 270 2202
: A/G-9

MASHITAH BINTI CHE RAZALI
Lecturer
M.Eng. (Electrical), UTM
B.Eng. (Electrical – Instrumentation and Control), UTM
***Area of Interest**: Process Control, Control Design and Applications*
: mashitah@utem.edu.my
☎ : 270 2247
: A/1-15

NUR LATIF AZYZE BIN MOHD SHAARI AZYZE
Lecturer
M.Eng in Electrical (Mechatronic and Automatic Control)
B.Eng. (Mechatronics Engineering) with honours, UTM
Dip. in (Mechatronic Engineering), UTM
***Area of Interest**: Humanoid Robot, Mobile Robot, Artificial Intelligence Control*
: latifazyze@utem.edu.my
☎ : 270 2235
: A/3-10

TECHNICAL

SUBKI BIN MAT KAHAR
Senior Assistant Engineer
: subki@utem.edu.my
: 270 2194
: Advanced Digital Signal Processing Research Lab
: Makmal Mesin Elektrik 1

MOHD YUSRI BIN JAMIL
Senior Assistant Engineer
: yusri@utem.edu.my
: 270 2252
: Solar PV System and Smart Grid Laboratory
: Makmal Sistem Kuasa 2

MOHD ARIF BIN MOHD NOR
Senior Assistant Engineer
: arif@utem.edu.my
: 270 2214
: Underwater Technology Research Lab
: Bengkel Mekatronik
: Makmal Sistem Perlindungan

AHAMAD FUAD BIN JAAPAR
Assistant Engineer
: fuad@utem.edu.my
: 270 2193
: Makmal Teknologi Elektrik
: Bilik Pasca Siswazah 1 & 2

MOHD SYAKRANI BIN AKHBAR
Assistant Engineer
: syakrani@utem.edu.my
: 270 2118
: Makmal Pneumatik & Hidraulik
: Makmal Kecekapan Tenaga

SAHRIL BIN BAHAR
Assistant Engineer
: sahril@utem.edu.my
: 270 2195
: Electric Vehicle Drives Reasearch Lab
: Makmal Sistem Kuasa 1

MOHD FIRDAUS BIN GHAZALI
Assistant Engineer
: mfirdaus@utem.edu.my
: 270 2138
: Robotics and Industrial Automation Research Lab
: Bengkel Kuasa Industri

MOHD FADHIL BIN IBRAHIM
Assistant Engineer
: mohdfadhil@utem.edu.my
: 270 2204
: Power Electronic and Drives Research Lab
: Makmal Elektronik Kuasa

AZLIANI BINTI MD NGARI
Assistant Engineer
: azliani@utem.edu.my
: 270 2168
: Makmal Sistem Kawalan
: Motion Control Research Lab

SYED ALIF BIN SYED ARIFFIN
Assistant Engineer
: aliff@utem.edu.my
: 270 2205
: Rehabilitation Engineering And Assistive Technology (REAT)
: Makmal Elektrik & Elektronik 1

NORLIAH BINTI MAHAT
Assistant Engineer
: norliahmahat@utem.edu.my
: 270 2225
: Makmal Robotik & Automasi
: Makmal Simulasi Elektronik Kuasa

SITI FATIMAH BT KAMARUDIN
Assistant Engineer
: sitifatimah@utem.edu.my
: 270 2169
: Makmal Simulasi CIA
: Bengkel CIA & Mekatronik

ABD RAHIM BIN BABA
Assistant Engineer
: abdrahim@utem.edu.my
: 270 2129
: Electrical Machine Design Reasearch Lab
: Makmal Aplikasi Elektronik Kuasa

MOHD WAHYUDI BIN MD HUSSAIN
Assistant Engineer
: wahyudi@utem.edu.my
: 270 2155
: High Voltage Engineering Research Laboratory
: Makmal Mesin Elektrik 2

MOHD HELMAN BIN ABD. RAHMAN
Assisteant Engineer
: helman@utem.edu.my
: 270 2224
: Makmal Mikropemproses

MOHD SUFIAN BIN OMAR
Assistant Engineer
: msufian@utem.edu.my
: 270 2242
: Makmal PSM & Stor Komponen

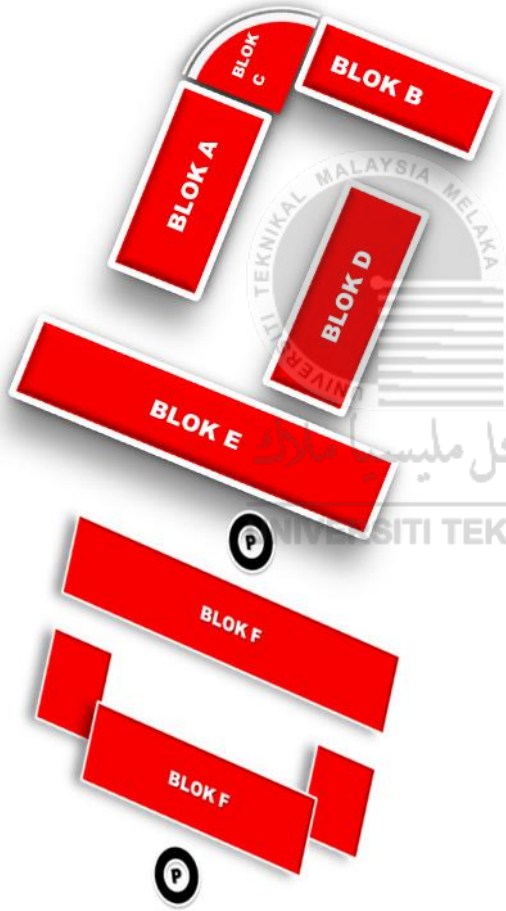
MOHD FAUZI BIN ROSLAN
Assistant Engineer
: fauziroslan@utem.edu.my
: 270 2226
: Makmal Instrumentasi & DSP
: Makmal Sistem Mekatronik

NORHISHAM BIN ABU SEMAN
Assistant Engineer
: norhisham@utem.edu.my
: 270 2157
: Energy and Power System Research Lab
: Makmal PLC & Kawalan Proses

FACILITIES & INFRASTRUCTURE

FACILITIES & INFRASTRUCTURE

FKE'S BUILDING MAP



BLOCK A

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

BLOCK B

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

BLOCK C

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

BLOCK D

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

BLOCK E

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

BLOCK F

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

LIST OF FKE LABORATORY

TEACHING AND LEARNING LABORATORIES (UNDERGRADUATE)

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

Power System Lab 2

Electrical Technology Lab

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

RESEARCH LABORATORIES (POSTGRADUATE)

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

CERIA Workshop

Machine Drive Lab

APPENDIX

APPENDIX A: STUDENT AUDIT FORM - DEK PROGRAM

INSTRUCTIONS TO STUDENTS (COMPULSARY FOR EACH SEMESTER)

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

ACADEMIC ADVISOR NAME :	
STUDENT NAME :	
MATRIX NO. :	
COHORT/YEAR OF ENTRY :	
HP CONTACT :	
EMAIL :	

CATEGORY	COURSE STATUS	STATUS HW	CREDIT HOURS		TO BE FILLED IN BY STUDENTS IN EACH SEMESTER						
					KHAS 0	1	2	KHAS 1	3	4	5
E	-	-	6	6							
P	-	-	60	68							
	LI	HW	8								
W	-	-	14	16							
	KK	-	2								
		Total credit	90								

LIST OF COURSE GRADES

SEMESTER	CODE	COURSE	CATEGORY	CREDIT	TO BE FILLED IN BY STUDENTS			
					GRADE	STATUS (UM)	GPA	CGPA
SPECIAL SEMESTER 0	DLHW 1012	FOUNDATION ENGLISH	W	2				
	DLHW 1742	LEADERSHIP	W	2				
	DLHW 1032	MALAYSIAN STUDIES	W	2				
			TOTAL	**6**				
SEMESTER 1	DEKA 1212	ALGEBRA	P	2				
	DEKA 1113	PHYSICS	P	3				
	DEKP 1111	BASIC ELECTRICAL SKILL	P	1				
	DEKE 1113	PRINCIPAL OF ELECTRICAL AND ELECTRONICS	P	3				
	DEKE 1123	DIGITAL ELECTRONICS	P	3				
	DEKC 1113	INSTRUMENTATION & MEASUREMENT	P	3				

					TO BE FILLED IN BY STUDENTS			
SEMESTER	**CODE**	**COURSE**	**CATEGORY**	**CREDIT**	**GRADE**	**STATUS (UM)**	**GPA**	**CGPA**
	DLHW 2422	ENGLISH FOR EFFECTIVE COMMUNICATION	W	2				
	DKKX 1XX1	CO-CURRICULUM I	W	1				
			TOTAL	**18**				
SEMESTER 2	DEKA 1222	CALCULUS	P	2				
	DEKP 1213	ELECTRICAL CIRCUIT I	P	3				
	DMCG 1323	INTRODUCTION TO MECHANICAL SYSTEM	P	3				
	DITG 1113	COMPUTER PROGRAMMING	P	3				
	DEKE 1213	ANALOGUE ELECTRONICS	P	3				
	DEKP 1211	ELECTRICAL WORKSHOP	P	1				
	DLHW 3432	ENGLISH FOR MARKETABILITY	W	2				
	DKKX 2XX1	CO-CURRICULUM I	W	1				
			TOTAL	**18**				
SPECIAL SEMESTER I	DEKA 2332	SAFETY AND HEALTH FOR ENGINEERS	P	2				
	DEKC 1313	MICROPROCESSOR	P	3				
	DTMW 1012	FUNDAMENTAL OF ENTREPRENEURIAL ACCULTURATION	W	2				
			TOTAL	**7**				
SEMESTER 3	DEKA 2333	DIFFERENTIAL EQUATION	P	3				
	DEKE 2123	POWER ELECTRONICS	P	3				
	DEKC 2113	CONTROL SYSTEM ENGINEERING	P	3				
	DEKE 2113	ELECTRICAL MACHINE	P	3				
	DEKP 2113	ELECTRIC CIRCUIT II	P	3				
	DEKC 2123	AUTOMATION	P	3				
			TOTAL	**18**				
SEMESTER 4	DEKA 2342	ENGINEERING MATHEMATICS	P	2				
	DEKP 2213	POWER SYSTEM	P	3				
	DEKP 2214	DIPLOMA PROJECT	P	4				
	CHOOSE ONLY TWO (2) COURSES							
	DEKP 2223	RENEWABLE ENERGY AND APPLICATION	E	3				
	DEKP 2233	BUILDING MAINTENANCE AND MANAGEMENT	E	3				
	DEKC 2213	INDUSTRIAL ROBOTIC	E	3				
			TOTAL	**15**				
SEMESTER 5	DEKU 3118	INDUSTRIAL TRAINING	P (HW)	8				
			TOTAL	**8**				
			MINIMUM TOTAL CREDIT	**90**				

APPENDIX B: STUDENT AUDIT FORM - BEKG PROGRAM

INSTRUCTIONS TO STUDENTS (COMPULSARY FOR EACH SEMESTER)

Instructions for the student :	1. Fill in the **YELLOW HIGHLIGHTED SPACES** - your details and grade obtained for each subjects up the current. 2.Fill in "EXEMPTED" for credit exempted subjects, "PASS" or "FAIL" for BEKU3695 INDUSTRIAL TRAINING and BLHC 4032 CRITICAL AND CREATIVE THINKING and left "INSERT GRADE" for subjects not yet taken. 3. Return the completed form to your academic advisor.
Instructions for the academic advisor :	1. Double confirm the information trough the SMP system (Maklumat Kohort Pelajar). 2. Report the results/highlights any problem in regards to the audit to the program owner (HOD/TDA).

ACADEMIC ADVISOR NAME :	
STUDENT NAME :	
MATRIX NO. :	
COHORT/YEAR OF ENTRY :	
HP CONTACT :	
EMAIL :	

SYARAT MINIMUM KREDIT UNTUK KBA				
KATEGORI MP	**STATUS MP**	**STATUS HW**	**JUMLAH DIPERLUKAN**	**JUMLAH TERKINI DIPEROLEHI**
E (ELEKTIF)	**PROGRAM**	-	**9**	
	UNIVERSITY	-	**4**	
P (PROGRAM)	**OTHERS**	-	**96**	
	ENGINEERING SEMINAR	**HW**	**1**	
	LI	**HW**	**5**	
	PSM	-	**6**	
W	-	-	**12**	
	KURIKULUM	-	**2**	
JUMLAH KESELURUHAN			**135**	

LIST OF COURSE GRADES

SEMESTER OF STUDY	CODE	COURSES	CATEGORY	CREDIT	GRADE	CREDIT OBTAINED	REMARK BY PA
SEMESTER 1	BLHL 1XX2	ELECTIVE I (UNIVERSITY)	E	2	INSERT GRADE	0	
	BKKX XXX1	CO-CURRICULUM I	W	1	INSERT GRADE	0	
	BMFG 1113	ENGINEERING MATHEMATICS	P	3	INSERT GRADE	0	
	BITG 1233	COMPUTER PROGRAMMING	P	3	INSERT GRADE	0	
	BEKG 1123	PRINCIPLES OF ELECTRIC AND ELECTRONICS	P	3	INSERT GRADE	0	
	BMFG 1213	ENGINEERING MATERIALS	P	3	INSERT GRADE	0	
	BEKB 1131	ELECTRICAL ENGINEERING WORKSHOP I	P	1	INSERT GRADE	0	
		TOTAL CREDITS		**16**	**TOTAL CREDITS OBTAINED**	**0**	**REMARK BY PA**
		CUMULATIVE TOTAL CREDITS		**16**	**CUMULATIVE CREDITS OBTAINED**	**0**	
SEMESTER 2	BLHW 1702 / BLHL 1742	TITAS / MALAYSIAN STUDIES	W	2	INSERT GRADE	0	
	BLHW 1442	ENGLISH FOR ACADEMIC PURPOSE	W	2	INSERT GRADE	0	
	BKKX XXX1	CO-CURRICULUM II	W	1	INSERT GRADE	0	
	BMCG 1013	DIFFERENTIAL EQUATIONS	P	3	INSERT GRADE	0	
	BENG 1413	DIGITAL ELECTRONICS	P	3	INSERT GRADE	0	
	BEKU 1123	ELECTRIC CIRCUIT I	P	3	INSERT GRADE	0	
	BEKG 1233	PRINCIPLES OF INSTRUMENTATION AND MASUREMENT	P	3	INSERT GRADE	0	
	BEKB 1231	ELECTRICAL ENGINEERING WORKSHOP II	P	1	INSERT GRADE	0	
		TOTAL CREDITS		**18**	**TOTAL CREDITS OBTAINED**	**0**	**REMARK BY PA**
		CUMULATIVE TOTAL CREDITS		**34**	**CUMULATIVE CREDITS OBTAINED**	**0**	
SEMESTER 3	BLHW 2452	ACADEMIC WRITING	W	2	INSERT GRADE	0	
	BEKG 2443	ENGINEERING MATHEMATICS II	P	3	INSERT GRADE	0	
	BMCG 1523	ENGINEERING GRAPHICS AND CAD	P	3	INSERT GRADE	0	
	BEKE 2333	ANALOGUE ELECTRONICS	P	3	INSERT GRADE	0	
	BEKC 2433	SIGNALS AND SYSTEMS	P	3	INSERT GRADE	0	
	BEKU 2333	ELECTRIC CIRCUIT II	P	3	INSERT GRADE	0	
	BEKB 2331	ELECTRICAL ENGINEERING LABORATORY I	P	1	INSERT GRADE	0	
		TOTAL CREDITS		**18**	**TOTAL CREDITS OBTAINED**	**0**	**REMARK BY PA**

		CUMULATIVE TOTAL CREDITS		**52**	**CUMULATIVE CREDITS OBTAINED**	**0**	
SEMESTER 4	BLHW 2712 / BLHW 2752	ETHNIC RELATIONS / MALAYSIAN CULTURE	W	2	INSERT GRADE	0	
	BENG 2143	ENGINEERING STATISTICS	P	3	INSERT GRADE	0	
	BEKG 2433	ELECTRICAL SYSTEMS	P	3	INSERT GRADE	0	
	BEKP 2453	ELECTROMAGNETIC THEORY	P	3	INSERT GRADE	0	
	BEKC 2453	COMMUNICATION SYSTEMS	P	3	INSERT GRADE	0	
	BMCG 2432	INTRODUCTION TO MECHANICAL ENG	P	2	INSERT GRADE	0	
	BEKB 2431	ELECTRICAL ENGINEERING LABORATORY II	P	1	INSERT GRADE	0	
		TOTAL CREDITS		**17**	**TOTAL CREDITS OBTAINED**	**0**	**REMARK BY PA**
		CUMULATIVE TOTAL CREDITS		**69**	**CUMULATIVE CREDITS OBTAINED**	**0**	
SEMESTER 5	BLHW3462	ENGLISH FOR PROFESIONAL INTERACTION	W	2	INSERT GRADE	0	
	BEKE 3533	ELECTRICAL MACHINE	P	3	INSERT GRADE	0	
	BEKC 3523	CONTROL SYSTEM ENGINEERING	P	3	INSERT GRADE	0	
	BEKC 3543	MICROPROCESSOR	P	3	INSERT GRADE	0	
	BEKP 4773	POWER SYSTEM ANALYSIS	P	3	INSERT GRADE	0	
	BEKE 3543	POWER ELECTRONICS	P	3	INSERT GRADE	0	
		TOTAL CREDITS		**17**	**TOTAL CREDITS OBTAINED**	**0**	**REMARK BY PA**
		CUMULATIVE TOTAL CREDITS		**86**	**CUMULATIVE CREDITS OBTAINED**	**0**	
SEMESTER 6	BEKX XXX3	ELECTIVE 1 (PROGRAM)	E	3	INSERT GRADE	0	
	BEKE 4753	ELECTRICAL DRIVES	P	3	INSERT GRADE	0	
	BEKC 3663	INSTRUMENTATION AND CONTROL	P	3	INSERT GRADE	0	
	BEKP 4883	HIGH VOLTAGE ENGINEERING	P	3	INSERT GRADE	0	
	BEKB 3673	INTEGRATED DESIGN PROJECT	P	3	INSERT GRADE	0	
	BEKB 3551	ELECTRICAL ENGINEERING LABORATORY III	P	1	INSERT GRADE	0	
		TOTAL CREDITS		**16**	**TOTAL CREDITS OBTAINED**	**0**	**REMARK BY PA**
		CUMULATIVE TOTAL CREDITS		**102**	**CUMULATIVE CREDITS OBTAINED**	**0**	
SPECIAL SEMESTER	BEKU 3695	INDUSTRIAL TRAINING		5	PASS/FAIL	0	
		TOTAL CREDITS		**5**	**TOTAL CREDITS OBTAINED**	**0**	**REMARK BY PA**

		CUMULATIVE TOTAL CREDITS		**107**	**CUMULATIVE CREDITS OBTAINED**	**0**	
SEMESTER 7	BEKU 4861	ENGINEERING SEMINAR	P	1	PASS/FAIL	0	
	BEKU 4792	FINAL YEAR PROJECT I	P	2	INSERT GRADE	0	
	BEKP 4843	RENEWABLE ENERGY	P	3	INSERT GRADE	0	
	BMFG 4623	ENGINEERING ECONOMY AND MANAGEMENT	P	3	INSERT GRADE	0	
	BXXX XXX2	ELECTIVE II (UNIVERSITY)	E	2	INSERT GRADE	0	
	BEKX XXX3	ELECTIVE II (PROGRAM)	E	3	INSERT GRADE	0	
		TOTAL CREDITS		**14**	**TOTAL CREDITS OBTAINED**	**0**	**REMARK BY PA**
		CUMULATIVE TOTAL CREDITS		**121**	**CUMULATIVE CREDITS OBTAINED**	**0**	
SEMESTER 8	BTMW 4012	ENTREPRENEURSHIP TECHNOLOGY	W	2	INSERT GRADE	0	
	BENG 4322	ENGINEER AND SOCIETY	P	2	INSERT GRADE	0	
	BEKU 4894	FINAL YEAR PROJECT II	P	4	INSERT GRADE	0	
	BEKP 4853	ENERGY UTILIZATION AND CONSERVATION	P	3	INSERT GRADE	0	
	BEKX XXX3	ELECTIVE III (PROGRAM)	E	3	INSERT GRADE	0	
		TOTAL CREDITS		**14**	**TOTAL CREDITS OBTAINED**	**0**	
		CUMULATIVE TOTAL CREDITS		**135**	**CUMULATIVE CREDITS OBTAINED**	**0**	

APPENDIX C: STUDENT AUDIT FORM - BEKM PROGRAM

INSTRUCTIONS TO STUDENTS (COMPULSARY FOR EACH SEMESTER)

Instructions for the student :	1. Fill in the **YELLOW HIGHLIGHTED SPACES** - your details and grade obtained for each subjects up the current. 2.Fill in "EXEMPTED" for credit exempted subjects, "PASS" or "FAIL" for BEKU3695 INDUSTRIAL TRAINING and BLHC 4032 CRITICAL AND CREATIVE THINKING and left "INSERT GRADE" for subjects not yet taken. 3. Return the completed form to your academic advisor.
Instructions for the academic advisor :	1. Double confirm the information trough the SMP system (Maklumat Kohort Pelajar). 2. Report the results/highlights any problem in regards to the audit to the program owner (HOD/TDA).

ACADEMIC ADVISOR NAME :	
STUDENT NAME :	
MATRIX NO. :	
COHORT/YEAR OF ENTRY :	
HP CONTACT :	
EMAIL :	

SYARAT MINIMUM KREDIT UNTUK KBA				
KATEGORI MP	**STATUS MP**	**STATUS HW**	**JUMLAH DIPERLUKAN**	**JUMLAH TERKINI DIPEROLEHI**
E (ELEKTIF)	**PROGRAM**	-	**8**	
	UNIVERSITY	-	**4**	
P (PROGRAM)	**OTHERS**	-	**98**	
	ENGINEERING SEMINAR	**HW**	**1**	
	LI	**HW**	**5**	
	PSM	-	**6**	
W	-	-	**12**	
	KURIKULUM	-	**2**	
JUMLAH KESELURUHAN			**135**	

LIST OF COURSE GRADES

SEMESTER OF STUDY	CODE	COURSES	CATEGORY	CREDIT	GRADE	CREDIT OBTAINED	REMARK BY PA
SEMESTER 1	BLHW 1442	ENGLISH FOR ACADEMIC PURPOSE	W	2	INSERT GRADE	0	
	BKKX XXX1	CO-CURRICULUM I	W	1	INSERT GRADE	0	
	BMFG 1313	ENGINEERING MATHEMATICS I	P	3	INSERT GRADE	0	
	BEKG 1123	PRINCIPLES OF ELECTRIC AND ELECTRONICS	P	3	INSERT GRADE	0	
	BMFG 1213	ENGINEERING MATERIALS	P	3	INSERT GRADE	0	
	BEKM 2342	INTRODUCTION TO MECHATRONIC	P	2	INSERT GRADE	0	
	BEKB 1131	ELECTRICAL ENGINEERING WORKSHOP I	P	1	INSERT GRADE	0	
		TOTAL CREDITS		**15**	**TOTAL CREDITS OBTAINED**	**0**	**REMARK BY PA**
		CUMULATIVE TOTAL CREDITS		**15**	**CUMULATIVE CREDITS OBTAINED**	**0**	
SEMESTER 2	BKKX XXX1	CO-CURRICULUM II	W	1	INSERT GRADE	0	
	BMCG 1013	DIFFERENTIAL EQUATIONS	P	3	INSERT GRADE	0	
	BENG 1413	DIGITAL ELECTRONICS	P	3	INSERT GRADE	0	
	BMCG 1523	ENGINEERING GRAPHICS AND CAD	P	3	INSERT GRADE	0	
	BEKU 1123	ELECTRIC CIRCUIT I	P	3	INSERT GRADE	0	
	BMCG 1123	STATICS & MECHANICS OF MATERIAL	P	3	INSERT GRADE	0	
	BEKB 1231	ELECTRICAL ENGINEERING WORKSHOP II	P	1	INSERT GRADE	0	
		TOTAL CREDITS		**17**	**TOTAL CREDITS OBTAINED**	**0**	**REMARK BY PA**

		CUMULATIVE TOTAL CREDITS		**32**	**CUMULATIVE CREDITS OBTAINED**	**0**	
SEMESTER 3	BEKG 2443	ENGINEERING MATHEMATICS II	p	3	INSERT GRADE	0	
	BITG 1233	COMPUTER PROGRAMMING	P	3	INSERT GRADE	0	
	BEKU 2333	ELECTRIC CIRCUIT II	P	3	INSERT GRADE	0	
	BEKG 1233	PRINCIPLES OF INSTRUMENTATION AND MEASUREMENT	P	3	INSERT GRADE	0	
	BMCG 1253	DYNAMICS & MECHANISM	P	3	INSERT GRADE	0	
	BMCG 2372	FLUID MECHANICS	P	2	INSERT GRADE	0	
	BEKU 1231	ELECTRICAL & ELECTRONICS ENGINEERING LABORATORY	P	1	INSERT GRADE	0	
		TOTAL CREDITS		**18**	**TOTAL CREDITS OBTAINED**	**0**	**REMARK BY PA**
		CUMULATIVE TOTAL CREDITS		**50**	**CUMULATIVE CREDITS OBTAINED**	**0**	
SEMESTER 4	BLHW 2452	ACADEMIC WRITING	W	2	INSERT GRADE	0	
	BENG 2143	ENGINEERING STATISTICS	P	3	INSERT GRADE	0	
	BEKC 2433	SIGNAL & SYSTEMS	P	3	INSERT GRADE	0	
	BEKE 2422	ANALOGUE ELECTRONICS APPLICATIONS	P	2	INSERT GRADE	0	
	BEKC 3533	INTRODUCTION TO CONTROL SYSTEM	P	3	INSERT GRADE	0	
	BEKC 3543	MICROPROCESSOR	P	3	INSERT GRADE	0	
	BEKM 2321	MECHANICAL ENGINEERING LABORATORY	P	1	INSERT GRADE	0	
		TOTAL CREDITS		**17**	**TOTAL CREDITS OBTAINED**	**0**	**REMARK BY PA**
		CUMULATIVE TOTAL CREDITS		**67**	**CUMULATIVE CREDITS OBTAINED**	**0**	

SEMESTER 5	BLHW 3462	ENGLISH FOR PROFESSIONAL INTERACTION	W	2	INSERT GRADE	0	
	BMFG 4623	ENGINEERING ECONOMY AND MANAGEMENT	P	3	INSERT GRADE	0	
	BEKG 2433	ELECTRICAL SYSTEMS	P	3	INSERT GRADE	0	
	BEKM 3453	MICROCONTROLLER TECHNOLOGY	P	3	INSERT GRADE	0	
	BEKM 3543	ELECTROMECHANICAL SYSTEMS	P	3	INSERT GRADE	0	
	BEKC 3643	CONTROL SYSTEM ENGINEERING	P	3	INSERT GRADE	0	
	BEKC 2421	CONTROL SYSTEMS LABORATORY	P	1	INSERT GRADE	0	
		TOTAL CREDITS		**18**	**TOTAL CREDITS OBTAINED**	**0**	**REMARK BY PA**
		CUMULATIVE TOTAL CREDITS		**85**	**CUMULATIVE CREDITS OBTAINED**	**0**	
SEMESTER 6	BLHW 1702	TITAS	W	2	INSERT GRADE	0	
	BEKM 3653	INTEGRATED DESIGN PROJECT	P	3	INSERT GRADE	0	
	BEKC 4753	PLC & AUTOMATION	P	3	INSERT GRADE	0	
	BMCG 3643	HYDRAULIC & PNEUMATIC SYSTEMS	P	3	INSERT GRADE	0	
	BMCG 3653	THERMODYNAMICS & HEAT TRANSFR	P	3	INSERT GRADE	0	
	BEKM 3641	MECHATRONIC SYSTEM ENGINEERING LABORATORY I	P	1	INSERT GRADE	0	
		TOTAL CREDITS		**15**	**TOTAL CREDITS OBTAINED**	**0**	**REMARK BY PA**
		CUMULATIVE TOTAL CREDITS		**100**	**CUMULATIVE CREDITS OBTAINED**	**0**	
SPECIAL SEMESTER II	BEKU 3695	INDUSTRIAL TRAINING	P	5	PASS/FAIL	0	
		TOTAL CREDITS		**5**	**TOTAL CREDITS OBTAINED**	**0**	**REMARK BY PA**

		CUMULATIVE TOTAL CREDITS		**105**	**CUMULATIVE CREDITS OBTAINED**	**0**	
SEMESTER 7	BLHL 1XX2	ELECTIVE I (UNIVERSITY)	E	2	INSERT GRADE	0	
	BEKU 4792	FINAL YEAR PROJECT I	P	2	INSERT GRADE	0	
	BEKM 4763	ROBOTICS	P	3	INSERT GRADE	0	
	BEKC 2453	COMMUNICATION SYSTEMS	P	3	INSERT GRADE	0	
	BEKM 4751	MECHATRONIC SYSTEM ENGINEERING LABORATORY II	P	1	INSERT GRADE	0	
	BEKU 4861	ENGINEERING SEMINAR	P	1	PASS/FAIL	0	
	BEKM 4783 / BEKC 4873	ELECTIVE I (PROGRAM) :MACHINE VISION / ARTIFICIAL INTELLIGENCE	E	3	INSERT GRADE	0	
		TOTAL CREDITS		**15**	**TOTAL CREDITS OBTAINED**	**0**	**REMARK BY PA**
		CUMULATIVE TOTAL CREDITS		**120**	**CUMULATIVE CREDITS OBTAINED**	**0**	
SEMESTER 8	BTMW 4012	TECHNOPRENEURSHIP	W	2	INSERT GRADE	0	
	BLHW 2712	ETHNIC RELATIONS	W	2	INSERT GRADE	0	
	BENG 4322	ENGINEER AND SOCIETY	P	2	INSERT GRADE	0	
	BEKU 4894	FINAL YEAR PROJECT II	P	4	INSERT GRADE	0	
	BXXX XXX2	ELECTIVE II (UNIVERSITY)	E	2	INSERT GRADE	0	
	BEKC 4683/ BEKC 4883/ BEKM 4823	ELECTIVE I (PROGRAM) :DIGITAL CONTROL SYSTEMS/ ADVANCED MANUFACTURING SYSTEMS/ DATA COMMUNICATIONS & COMPUTER NETWORKING	E	3	INSERT GRADE	0	

		TOTAL CREDITS	15	TOTAL CREDITS OBTAINED	0	
		CUMULATIVE TOTAL CREDITS	135	CUMULATIVE CREDITS OBTAINED	0	

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Faculty of Electrical Engineering (FKE)
Universiti Teknikal Malaysia Melaka,
Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia.
Phone: +606 - 270 2112 Fax: +606 - 270 1044
E-mail: fke@utem.edu.my

www.utem.edu.my

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