UTeM

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ACADEMIC HANDBOOK 2022/2023

FOR BACHELOR DEGREE AND DIPLOMA PROGRAMMES

FACULTY OF ELECTRONIC AND COMPUTER ENGINEERING
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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ACADEMIC HANDBOOK 2022/2023

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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Vision, Mission and Motto of UTeM

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 & 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

Educational Goals and Objectives of UTeM

Educational Goals

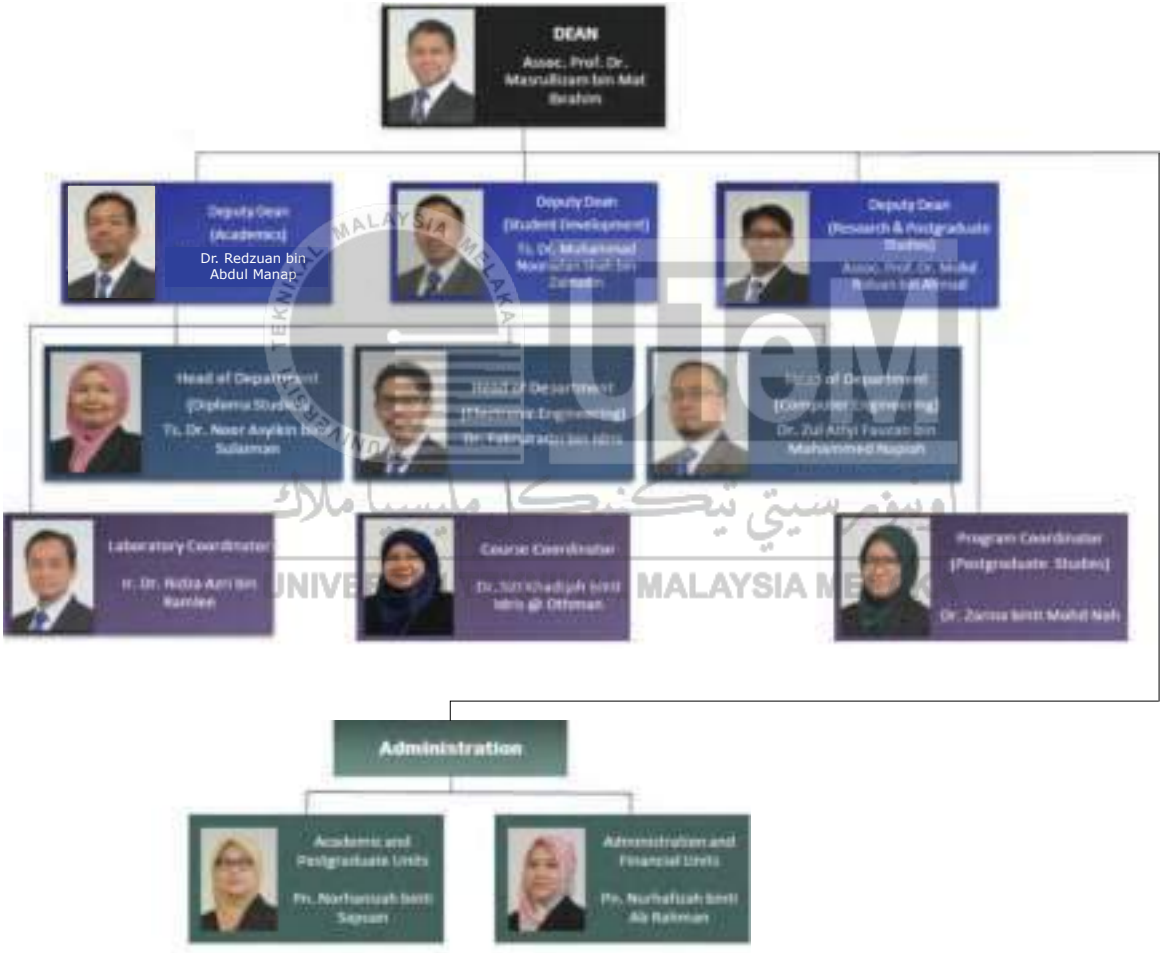
1. To conduct academic and professional programmes based on relevant needs of the industries.
2. To produce graduates with relevant knowledge, technical competency, soft skills, social responsibility and accountability.
3. To cultivate scientific method, critical thinking, creative and innovative problem solving and autonomy in decision making amongst graduates.
4. To foster research development and innovation activities in collaboration with industries for the development of national wealth.
5. To equip graduates with leadership and teamwork skills as well as develop communication and life-long learning skills.
6. To develop technopreneurship and managerial skills amongst graduates.
7. To instill an appreciation of the arts and cultural values and awareness of healthy life styles amongst graduates.

Objectives

1. To become a creative and innovative learning and knowledge organization that offers practice and application oriented academic programmes in the fields of engineering and technology.
2. To lead in research, development, innovation, commercialization and consultancy activities based on the needs of the industry.
3. To produce competent graduates with high moral values who will be the preferred choice by the industry.
4. To have competent and highly qualified staff with vast practical experiences.
5. To play an effective role as the main impetus to the industrial development of the nation.
6. To establish cooperation and smart partnership between the university and the industries.
7. To provide infrastructure and conducive environment to generate and maintain excellence.
8. To implement comprehensive and extensive usage of ICT in both academic activities and management of the university.

CARTA ORGANISASI

FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER (FKEKK)



Vision, Mission and Objectives of FKEKK

FKEKK's Vision

To become a reputable world-class centre of excellence in Electronic Engineering.

FKEKK's Mission

To produce highly competent electronic engineers through world class higher technical education based on application-oriented teaching, learning and research with smart university-industry partnership in line with national aspirations.

FKEKK's Objectives

1. To produce electronic engineers who are responsible to the Creator, the nation and the society.
2. To provide the best and updated courses in Electronics, Computer and Telecommunication Engineering.
3. To create an excellent culture in research, development, innovation and consultancy.
4. To ensure excellent co-operation and relationship between the faculty and the industries.
5. To produce competent graduates who are capable of competing globally.
6. To publish excellent and beneficial academic materials for the nation.
7. To provide up-to-date facilities and equipment for teaching and learning.
8. To provide relevant facilities and equipment for teaching, learning, research and development.

Foreword by the Dean

بسم الله الرحمن الرحيم

Assalamualaikum wrt.wbt.

All Praise to Allah, the Almighty, the Most Gracious and the Most Merciful.

Welcome to the Faculty of Electronic and Computer Engineering, UTeM.

Congratulations and thank you for being part of the Faculty. We are committed to providing the excellence educational and learning experience for our students. Currently, there are over 1100 undergraduates, postgraduates and research students in the Faculty. Teaching and learning is empowered by 93 experienced and reputable academicians, and also, supported by 37 administrative and technical staffs.

At the Faculty, we set a very high standards for our students. Therefore, the programmes offered in the faculty are industrial-driven. All our programmes have obtained full accreditation by Engineering Accreditation Council (EAC) and MQA, which leads to be highly recognized by the industries.

To-date, the Faculty has produced 4331 graduates since 2001. Our graduates are in great demand by the industries. In 2019, more than 75% of our graduates have been employed upon their graduation day.

Good study habits are vital in undertaking an engineering course. Strategy and planning very important for consistent study, right from the beginning of each semester. All engineering students have ready access to lecturers and professors, and to the faculty management office and support staffs to help solve problems related to their studies. In particular, the academic advisors are available to assist students at all times.

My best wishes to all and I hope you would take the opportunity to pave your way for more interaction and exchanges with your fellow classmates and lecturers while in UTeM. I wish you success in your studies and in your future endeavour.

ASSOCIATE PROFESSOR DR. MASRULLIZAM BIN MAT IBRAHIM
Dean,
Faculty of Electronic and Computer Engineering
Universiti Teknikal Malaysia Melaka

ACADEMIC HANDBOOK SESSION 2022/2023

FOR BACHELOR DEGREE AND DIPLOMA PROGRAMMES

2.0

FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

2.1 Introduction

In the year 2000, Kolej Universiti Teknikal Kebangsaan Malaysia (KUTKM), the first technical university was launched, and it became the 14th public university in Malaysia. The Faculty of Electronic and Computer Engineering (FKEKK) was among the various faculties officially established on 22nd June 2001, and it started its operation at the temporary premises in Taman Tasik Utama, Ayer Keroh, Melaka.

On 22nd December 2004, FKEKK created hist ory by being the first faculty to move its operation to the main campus in Durian Tunggal. FKEKK was able to provide the most conducive environment for effective learning, in terms of modern physical buildings and the latest state of the art equipment and facilities.

In early February 2007, the rebranding of KUTKM to Universiti Teknikal Malaysia Melaka (UTeM) took place and from then on UTeM had played a significant role in producing competent and capable graduate engineers recognized globally highly sought after by international and national companies.

FKEKK plays a very important role in producing electronic engineers with strong basic knowledge in science, mathematics and electronic engineering. The students are given all the opportunity to acquire technical expertise which is achieved through outcome-based education.

The university had taken a bold step in reviewing all the engineering programmes and restructured them into broad-based programmes. Moreover, the various electives available in the curriculum allow a student to choose an option to focus on, either in industrial electronics, computer engineering, telecommunication electronics or wireless communication.

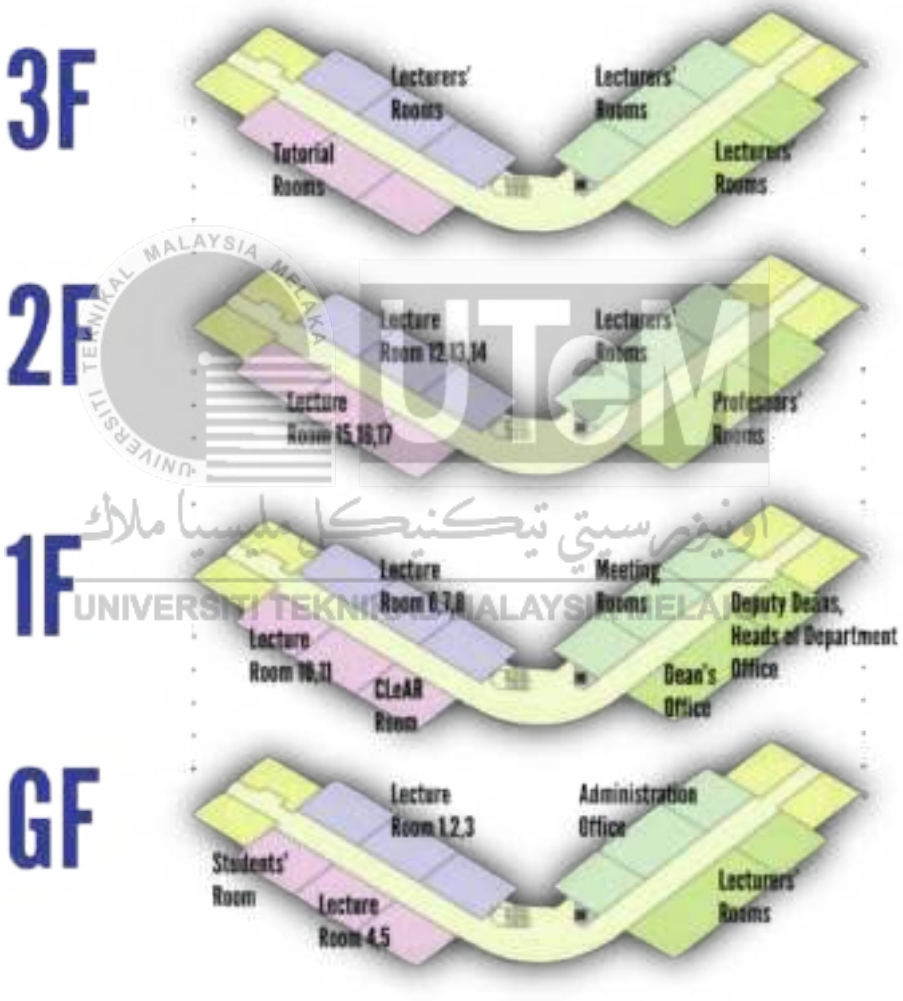
In line with the Industrial Revolution 4.0 initiatives, a new programme called Bachelor of Computer Engineering with Honours is offered, starting from 2019/2020 Academic session. The programme is conducted in such manners as to provide graduates with extensive knowledge and expertise in the field of computer engineering to meet the needs of the market and industry.

FKEKK is headed by a dean who is assisted by three deputy deans and three heads of department. The departments in the faculty are:

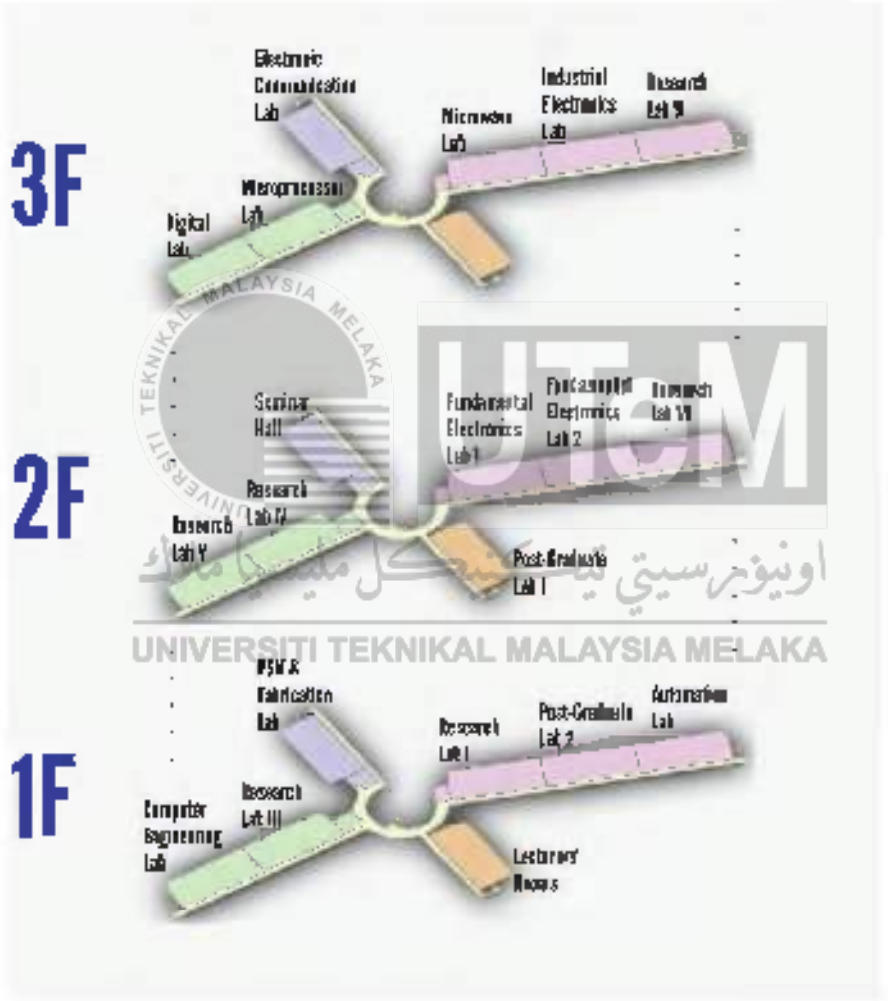
- Department of Electronic Engineering
- Department of Computer Engineering
- Department of Diploma Studies

Follow us at our official social media: -
Facebook: @FKEKKUTeM
Instagram: @fkekk_utem

2.2 Administration and Academic Blocks



2.3 Laboratory Blocks



2.4 Facilities

FKEKK is equipped with the latest facilities with the aim of providing a comfortable and conducive environment for the process of learning and teaching to take place effectively and efficiently.

All the lecture rooms, each with a capacity to hold 60 stud ents, are equipped with modern audio and visual aids such as computer and LCD projector. There are altogether 18 laboratories and workshops.

Faculty also provided dedicated room for collaborative learning called CLeAR Room. The room is equipped with modern learning devices such as iPads, large LCD screen with stable WiFi connection for seamless interactivity during learning session. In addition, the faculty also setup a room called BYOD (Bring-Your-Own-Device) that gives opportunity for students to bring their own devices to the class and engage in blended learning classes.

All the laboratories are equipped with the latest industrial equipment which are sophisticated with the objective of producing highly skilled graduates who will be of great demand by the industries. The laboratories are equipped on the rational of providing an attractive ratio of two students working on one workstation or equipment, providing the students the opportunity to gain enough exposure and learning through each experiment.

Each laboratory is further equipped with computers and internet facilities to facilitate the teaching and learning process as well as report and project writing.

Overall, FKEKK's 18 laboratories are listed as follows:

1. Fundamental Electronic Laboratory 1
2. Fundamental Electronic Laboratory 2
3. Industrial Electronic Laboratory
4. Communication Electronic Laboratory
5. Industrial Automation Laboratory
6. Computer Engineering Laboratory
7. Digital Laboratory
8. Microprocessor Laboratory
9. Microwave Laboratory
10. FYP and Fabrication Laboratory
11. Postgraduate Laboratory I
12. Postgraduate Laboratory II
13. Research Laboratory I
14. Research Laboratory II
15. Research Laboratory III
16. Research Laboratory IV
17. Research Laboratory V
18. Research Laboratory VI

All the above laboratories are equipped with the state-of-the-art facilities and simulation software to enable the students to make analytical comparison studies on practical and simulated outcomes or results. Each laboratory is taken charge by a lecturer and assisted by an assistant engineer.

2.5 Courses Offered

FKEKK offers the Diploma and Degree Programmes as follows:

- Bachelor of Electronic Engineering with Honours
- Bachelor of Computer Engineering with Honours
- Diploma in Electronic Engineering

Courses offered are in line to the recommendations from the Engineering Accreditation Council (EAC) of Malaysia and MQA. All the courses in a program have their respective learning outcomes to ascertain that the program outcomes are attained. The students' theoretical knowledge is acquired through individual and group activities that include lecture sessions incorporating interactive learning, problem-based learning and cooperative learning. Theoretical knowledge is enhanced and reinforced during laboratory sessions that include elements of analysis and design in the experiments.

Self-directed learning and group learning are very much encouraged especially during the laboratory sessions, problem-based learning, computer oriented studies, individual and group assignments, engineering practice, industrial training and the final year project which is related to electronic engineering.

Assessment on the success of the students is based heavily on individual performance such as tests, individual assignments, undertaking project that includes development, oral presentation and report, and the final examination. Group assessment is mainly taken from laboratory reports, group assignments and presentations.

The Bachelor Degree duration is a minimum of 4 years and a maximum of 6 years. The Diploma programme duration is 3 years.

2.6 Entry Requirements

2.6.1 Bachelor of Electronic Engineering with Honours & Bachelor of Computer Engineering with Honours

The candidate for Bachelor of Electronic Engineering and Bachelor of Computer Engineering in FKEKK must have the following qualifications:

1. **CANDIDATES FROM KPM TECHNICAL MATRICULATION**

Obtained at least CGPA 2.50 in Matriculation/Foundation;

and

Obtained at least Grade C (2.00) in Matriculation/Foundation in each of the following subjects:-

- Mathematics
- Engineering Physics
- Engineering Chemistry/ Electrical and Electronic Engineering Studies/ Civil Engineering Studies

and

The applicant must not be colour blind and not handicapped that can impair practical work.

2. CANDIDATES FROM MATRIKULASI SAINS KPM / ASASI SAINS UM / ASASI UiTM

Obtained at least CGPA 2.50 in Matriculation/Foundation;

and

Obtained at least Grade C (2.00) in Matriculation/Foundation in each of the following subjects:-

- Mathematics
- Physics
- Chemistry

or

- Mathematics
- Chemistry
- Biology and obtained at least credit (Grade B) in Physics in Sijil Pelajaran Malaysia (SPM)

and

The applicant must not be colour blind and not handicapped that can impair practical work.

3. CANDIDATES FROM ASASI KEJURUTERAAN UiTM

Obtained at least CGPA 2.50 in Matriculation/Foundation;

and

Obtained at least Grade C (2.00) in Matriculation/Foundation in each of the following subjects:-

- Mathematics
- Physics
- Chemistry

and

The applicant must not be colour blind and not handicapped that can impair practical work.

4. CANDIDATES FROM STPM SAINS

Obtained at least CGPA 2.50 in STPM;
and

Obtained at least Grade C (2.00) in Matriculation/Foundation in each of the following subjects:-

- Mathematics (M) / Mathematics (T)
- Physics
- Chemistry

or

- Mathematics (M) / Mathematics (T)
- Chemistry
- Biology and obtained at least credit (Grade 4B/B) in Physics in Sijil Pelajaran Malaysia (SPM)

and

The applicant must not be colour blind and not handicapped that can impair practical work.

5. CANDIDATES FROM DIPLOMA (SCIENCE CATEGORY)

Pass a **Diploma in Engineering** with at least **CGPA 3.00** in a related field from a recognized institution and approved by the University's Senate;

and

Credit exemption is subjected to the discretion and approval by the Faculty;

and

Passed / completed studies at Diploma level prior to the application's dateline.

and

The applicant must not be colour blind and not handicapped that can impair practical work.

or

Pass a **Diploma in Technology Engineering** with at least **CGPA 3.30** in a related field from a recognized institution and approved by the University's Senate;

and

Credit exemption is subjected to the discretion and approval by the Faculty;

and

Passed / completed studies at Diploma level prior to the application's dateline.

and

The applicant must not be colour blind and not handicapped that can impair practical work.

2.6.1 Diploma in Electronic Engineering

Fulfilled the University's General Requirement with at least FOUR (4) credit (Grade C) in each of the following subjects: -

- Mathematics
- Additional Mathematics
- Physics; and

Either ONE (1) of the following subjects:

- Chemistry
- Biology
- Science
- Additional Science
- Teknologi Kejuruteraan
- Pengajian Kejuruteraan Elektrik dan Elektronik
- Lukisan Kejuruteraan
- Pendidikan Seni Visual / Reka Cipta

and

Pass, with at least Grade E, in English subject.

and

The applicant must not be colour blind and not handicapped that can impair practical work.

2.7 Academic System

The academic system of this University is based on the semester system which is a common practice in all the Institutions of Higher Education in Malaysia. The Academic Handbook explains the Procedures and University Academic Rules enforced.

Table 1: A Typical Academic Year

SEMESTER I			
Classes	7 weeks		
Semester Break	1 week		
Classes	7 weeks		
Revision Week	1 week		
Final Examination	2 weeks		
Total	18 weeks		
Break Between Semesters	3 weeks		
SEMESTER II			
Classes	7 weeks		
Semester Break	1 week		
Classes	7 weeks		
Revision Week	1 week		
Final Examination	2 weeks		
Total	18 weeks	**OR**	
End of Semester Break	13 weeks	Break Between Semesters	1 week
		SPECIAL SEMESTER	
		Classes and Examination	8 weeks
		End of Semester Break	4 weeks
TOTAL	**52 weeks**	**TOTAL**	**52** weeks

2.8 Grading System

A student's achievement for each course is based on the grades which are illustrated in Table 2.

Table 2: Marks, Grades and Points Awarded

Marks	Grade	Points	Achievements
80 – 100	A	4.0	Distinction
75 – 79	A-	3.7	Distinction
70 – 74	B+	3.3	Merit
65 – 69	B	3.0	Merit
60 – 64	B-	2.7	Merit
55 – 59	C+	2.3	Pass
50 – 54	C	2.0	Pass
47 – 49	C-	1.7	Conditional Pass
44 – 46	D+	1.3	Conditional Pass
40 – 43	D	1.0	Conditional Pass
00 – 39	E	0.0	Fail

2.8.1 Academic Status

A student's achievement is evaluated based on GPA and CGPA. A student's academic status will be provided at the end of each semester as shown in Table 3.

Table 3: Academic Status Classification

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

2.82 Academic Achievement

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

Grade Point Average (GPA)

GPA is the grade point average obtained in a particular semester. It is based on the following calculations:

Total Points, $JMN = k_1 m_1 + k_2 m_2 + \cdots k_n m_n$

Total Calculated Credits, $JKK = k_1 + k_2 + \cdots k_n$

$$GPA = \frac{JMN}{JKK} = \frac{[k_1 m_1 + k_2 m_2 + \cdots k_n m_n]}{[k_1 + k_2 + \cdots k_n]}$$

where : k_n = Credit for subject
m_n = Points from the subject

Cumulative Grade Point Average (CGPA)

CGPA is the cumulative grade point average obtained for the semesters that have been completed. It can be calculated as follows:

$$CGPA = \frac{[JMN_1 + JMN_2 + \cdots JMN_n]}{[JKK_1 + JKK_2 + \cdots JKK_n]}$$

where: JMN_n = Total points obtained in semester
JKK_n = Total credits in semester

2.8.3 Award

A Bachelor or Diploma Degree shall be awarded if all the following conditions are fulfilled. A student:

1. must get Good status (KB) in the final semester.
2. has passed all the courses required as listed in the course curriculum.
3. has applied for the award of the degree, approved by the faculty and certified by the Senate.
4. has met all the other University's requirements.

2.9 Academic Advisory System

The Academic Advisory System was introduced from the beginning when the faculty first started. Fully aware that the academic semester system implemented in the university is very different as compared to the system followed by students in the schools or in the matriculation colleges, the Academic Advisory System is implemented to provide the platform for students to seek advice and guidance to manage their studies while in the university. In the semester system, the students have the freedom to determine their academic load course according to their ability but within the conditions stipulated by the faculty and academic regulations. As such students need to plan their studies most suitable and appropriate for themselves. To assist the students, each student is assigned an Academic Advisor who is an academic staff member, well-versed in the Academic System. The Academic Advisor plays a pivotal role as a mentor, advisor, referee and friend in helping the students in their studies and other academic activities.

2.9.1 Academic Advisory System and Its Importance

One prominent aspect of the Academic Advisory System is the assignment of Academic Advisors to students ought to be proper advice and guidance to the students in the followings:

1. It is not compulsory for the students to take all the courses offered in each semester. For those with good academic standings, they are encouraged to register for all the courses offered but for those with average academic standing, they are advised to take less academic load, a maximum of 12 credits only for those with conditional academic standing, to improve their academic standings for the next semester. Thus, the students need to plan their studies and register the appropriate courses in each semester according to their ability.

2. The semester system is a flexible education system to cater for students with mixed academic capability of excellent students, average students and not so fast learners. The difference between them is for each and everyone to complete their studies successfully within the prescribed time. The Academic Advisory System will help each student the opportunity to design a study plan to complete the studies successfully.

3. The semester system is a modular system employing the concept of intensive learning and continuous assessment. Therefore, it is imperative for students to adapt with this learning environment and fully utilized the system.

4. In addition of having to adapt to the semester system, the students are also faced with other problems such as cultural shock, time management, self-management and also other personal problems especially for those who are staying away from their parents for the first time.

5. As the students progress along, due to their academic standings, even if they are from the same cohort, they may not be together for a certain course. In other words, most students may not be together in the same group throughout their studies, and this can be difficult for them to conduct peer groups and course discussions effectively.

6. Therefore, to assist the students so that they can adapt to the university environment and at the same time get the full benefit of the semester system, the faculty assigns academic staff members to become academic advisors to take care of around 15 – 20 students each, acting as mentors to provide guidance, encouragement and advice to the students. It is the Academic Advisor's role to see that the students are given the proper advice, guidelines, action to take, motivation and encouragement from the day of the registration until the students' graduation from university.

2.9.2 The roles and responsibilities of the Academic Advisor

1. Helps students to understand and follow the semester system, academic rules and university examination rules.

2. Guides students in preparing their study charts while in the university, for instance in deciding the total credit hours to be taken in a particular semester and study duration.

3. Advises the students in relation to the choice of courses and course registration as well as the add/drop process, based on the students' academic performance and ability.

4. Monitors students' performance and provides counselling for them to make changes in their study plan where necessary.

5. Recommends students to take the necessary steps and appropriate action when the students encounter problems that rendered the necessity to do course withdrawal or/and study deferment.

6. Monitors and keeps records of the students' personal profile and academic achievement as well as the students' problems, and inform the faculty when necessary.

7. Reviews and administers students' course registration record in order to ensure no course is left out. This is necessary when it is time to verify the students for the conferment of the degree.

8. Holds meetings with their students during the first week of each semester and subsequently every now and then throughout the semester to facilitate and update on the well-being and welfare of the students. The academic advisor has to devote adequate time meetings in a group or on individual basis when necessary.

2.9.3 The roles and responsibilities of the Students

1. Read and understand fully the academic rules & regulations of the University Academic System.

2. Take the necessary actions at the required time such as course registration, add/ drop of courses, course withdrawal and study deferment.

3. Monitor and take the necessary actions on personal academic achievement and performance.

4. Take the initiative to meet the academic advisor to update on personal profile, academic performance and personal problems encountered.

2.10 Electronic and Computer Student Society (EcCESS)

Electronic and Computer Student Society (EcCESS), Universiti Teknikal Malaysia Melaka (UTeM) is one of the student society under the monitoring of Faculty of Electronic and Computer Engineering, UTeM.

Follow us at our official social media: -

1. Facebook: @EcCESSFKEKK
2. Instagram: @eccessfkekk

2.10.1 Objectives

1. To expose students on organizational management.
2. To inculcate students towards leadership and future potential on various fields.
3. To be the moderator between FKEKK's students and the Faculty's or UTeM's management.
4. To organize activities and programs that can be an added-value to the students' marketability.
5. To consolidate togetherness among FKEKK's students.

2.10.2 Activities

2.11 Professional Certification Preparatory Courses

The University reckoned that the offered academic program should be unique, relevant to the needs of the industries and provide added values to the graduates; thus increasing their marketability. To achieve this, the University has agreed to introduce Professional Certification Preparatory Course within all his bachelor degree program. The objectives of this course:

- To increase student competency in skills that are relevant to his / her future career;
- To increase 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 onwards. The students are expected to choose, register and complete one (1) professional certification preparatory course before the end of their study. The Faculty will be offering several courses from which the students can choose from at the start of each semester. It will be on the first come first serve basis.

The current list of professional certification preparatory courses offered by the Faculty are as follow:

2.11.1 BENG 1010: MOTOROLA EMBEDDED WIRELESS COMMUNICATION CERTIFICATION COURSE

The ability of our smart devices (e.g. smartphone, tablet) to automatic rotate the view of the screen with respect to the way we hold them heavily rely on the equipped sensors. However, different smart devices with the use of same sensor might give you wonder or awful experience (too sensitive or react to slow to the angle change) if the embedded software which inform the Android or iOS to rotate the screen did not went through proper design of experiment (DoE) process. In this Motorola M-WiCOM certification course, participant will firstly design the required sensor signal pre-conditioning circuit to interface with ARM microprocessor running embedded Linux. The embedded software running in the ARM microprocessor will be developed to acquire the sensor signal and DoE process will be carried out to make sure the requirement of the user process is met. Participant will also learn how to make use of LTE wireless module to send out alert (push to cloud, SMS) in real-time according to the defined user process. The duration of this course is 5 days.

2.11.2 BENG 1020: SMC PLC PNEUMATIC CERTIFICATION COURSE

A programmable logic controller (PLC) is a microprocessor-based system that use a programmable memory to implement specific function such as logic, sequencing, timing, counting and arithmetic. It can be used to control analog or digital input/output modules, various

types of machines or processes. This course exposes the participants to the structure and operation of PLC, the hardware of configuration of PLC, program writing and programming of PLC and the selection of PLC. The duration of this course is 5 days.

2.11.3 BENG 1030: LEVEL 1 TRIZ CERTIFICATION COURSE

TRIZ is the Russian acronym for the "Theory of Inventive Problem Solving". It is a systematic problem solving method based on logic and data, not intuition or spontaneous creativity of individuals or groups. It is based on the study of patterns of problems and solutions. TRIZ provides repeatability, predictability, and reliability due to its structure and algorithmic approach. It improves an individual's or team's ability to solve problems. This course aims to elevate the expertise level to international standard and put the students with the TRIZ practitioners at major companies such as Samsung, Intel, Siemens, General Electric, Procter & Gamble, etc. At the end of the course, participants should be able to identify problems and solutions repeated across industries and sciences; identify patterns of technical evolution repeated across industries and sciences; innovate using scientific effects outside the field from where the original problem was found. The duration of this course is 5 days.

2.11.4 BENG 1040: FIBER OPTIC TECHNOLOGY COMPETENCY CERTIFICATION PREPARATORY COURSE

Optical fiber is a telecommunication backbone for a worldwide communication system. It provides high speed of broadband service. This professional course is designed to provide participants with technical concept of optical fiber communication technology and principles, perform activities such as fiber splicing, testing, and troubleshooting practices widely accepted in the fiber optic industries. Participants also will learn how to design an optical communication system using a design software. The duration of this course is 4 days.

2.11.5 BENG 1050: IBM CERTIFIED SPECIALIST - SPSS STATISTICS LEVEL 1 V2 PREPARATORY COURSE

For decades IBM SPSS has provided powerful and interactive tools for data scientists and statisticians, applicable in almost all industries, including the electronics industry. It addresses the complete analytical process, from planning to data collection, analysis, reporting and deployment. The aim of this course is to help participants prepare for the IBM Certified Specialist - SPSS Statistics Level 1 v2 examination. The achievement of the IBM SPSS Statistics certification demonstrates to your industrial colleagues and employers your expertise and capability in the analytics platform. At the end of the course participants would be able to use IBM SPSS for predictive analysis, statistical research and market research. Participants will also see how easy it is to get data into IBM SPSS Statistics so that they could focus on analyzing the information. The course contents include operations/running IBM SPSS Statistics, reading and defining data, understanding and describing data, data management, data transformations, editing and exploring statistical outputs and performing basic inferential statistics using methods such as chi-square, correlations, regression and T-Test. Our target participants are anyone with little or no experience in using any statistical package for data analysis and are considering to be a Certified Specialist of IBM SPSS Statistics Level 1 v2. The duration of this course is 4 days.

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3.0

BACHELOR OF ELECTRONIC ENGINEERING WITH HONOURS

3.1 Introduction

Starting from 2014, UTeM had decided to implement all the engineering programmes along the broad-based curriculum structure. The Bachelor of Electronic Engineering with Honours offered by the faculty is a broad-based course which combines engineering science, mathematics, electrical and electronic engineering fundamentals and develops in students the mastery of electronic engineering principles and applications to solve electronic engineering problems, including the complex ones. All the students will undergo three years of common curriculum upon which they can decide a programme with emphasis on computer engineering, industrial electronics, telecommunication electronics or wireless communication in the final year. The broad-based programme will provide the solid foundation in theoretical understanding of electronic engineering to allow students to undertake problem analysis and identifications, formulation and generate appropriate solutions in the broad field of electrical and electronic engineering. The curriculum helps to hone the generic skills of the students and prepare them the opportunities to perform research, present their findings, implement and provide engineering solutions.

The programme is designed in an integrated manner to build up the students' engineering expertise from fundamentals to addressing of specific engineering challenges with the opportunity to develop specialization in focused areas of interest. The programme is implemented with a blend of theory and practice, with team-based assignments and projects running alongside with lectures.

All the programmes offered by the faculty have been accredited by the relevant professional institutions and are qualified to register with the Board of Engineers Malaysia as the first step towards becoming a professional engineer.

3.2 Curriculum

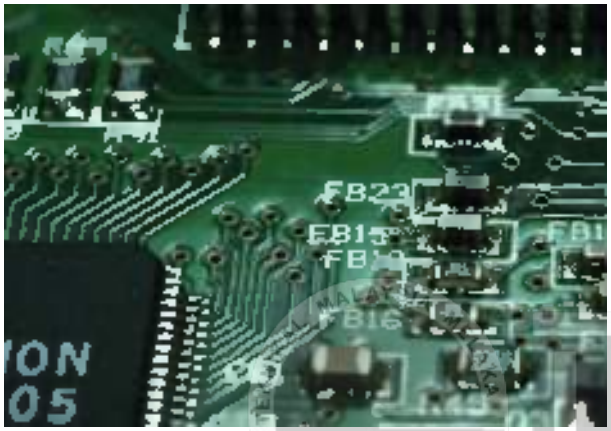
Year 1 is more of a reinforcement year for the students who have been given the opportunity to begin their journey towards becoming electronic engineers. The courses offered are Engineering Mathematics, Computer Programming, Electrical and Electronic Engineering Fundamentals and courses that fortified moral values and co-curriculum. In second and third year, the students have to study the Bachelor of Electronic Engineering common and programme core courses. These courses are carefully selected to fulfil the body of knowledge, the formal educational requirements of graduate engineers, which is closely monitored and assessed by the Engineering Accreditation Council of Malaysia. Apart from that, the students are required to undergo a minimum of 10 weeks industrial training during the Special Semester of Year 3. This exercise provides the students the opportunity to experience and learn the reality of working life besides seeking more knowledge and networking.

In the final year, the students have the opportunity to choose which areas of interest they want to focus in. For those who prefer industrial electronics, they can choose electives listed under that particular specialization. Likewise for the other specializations of computer engineering, telecommunication electronics and wireless communications, the students are given the opportunity to have their preferences. The students are also required to carry out a Bachelor Degree project that is related to field of specialization. The purpose of the project is to provide the students to display their ability to apply engineering knowledge to solve complex engineering problems utilizing components, design systems and processes, undertaking problem identifications, formulation and analysis of complex problems encountered.

A total of 135 credits for local students and 137 credits for internationals students are required for the Bachelor of Electronic Engineering to be awarded upon successfully completed the programme.

An Electronic Engineering degree graduate from FKEKK, UTeM has an immense range of careers to choose from. The multi-faceted approach in conducting the programme provides the graduates the knowledge, confidence and attributes to enter the workforce with analytical and communication skills, making a significant contribution to the development of the engineering field and to the nation.

3.3 Career Prospects



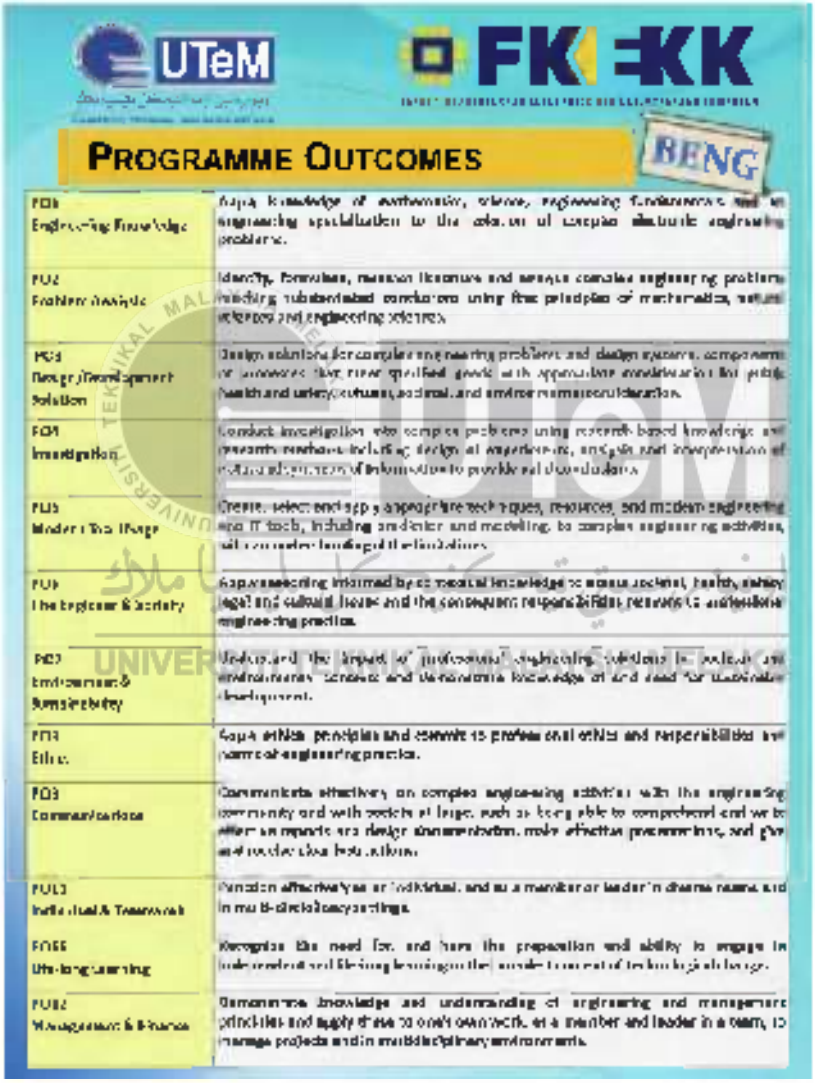
Career prospect for FKEKK graduates is extremely good. Graduates from this course can be employed in the fields of electronic engineering as industrial electronic engineers, computer engineers, telecommunication engineers and wireless communication engineers and other numerous related engineering professions. They can be engineers in the industrial automation systems, industrial electronic, control systems, electronic instrumentation, computerised system in manufacturing and production industries, plant engineers in industries, manufacturing computer product such as computers and computer peripherals, system engineers in industries manufacturing computer based product, telecommunication systems and wireless communication systems.

Graduates who have special interest in the academic fields can become academicians such as lecturers and researchers in institutions of higher education, the universities and research centres and agencies. Upon being qualified as professional engineers, they can practice locally as well as in countries who are members of the Washington Accord.

Graduates who choose not to become employee can be self-employed and opt to be involved in business and become successful entrepreneurs in their areas of expertise.

3.4 Programme Objectives

3.5 Programme Outcomes

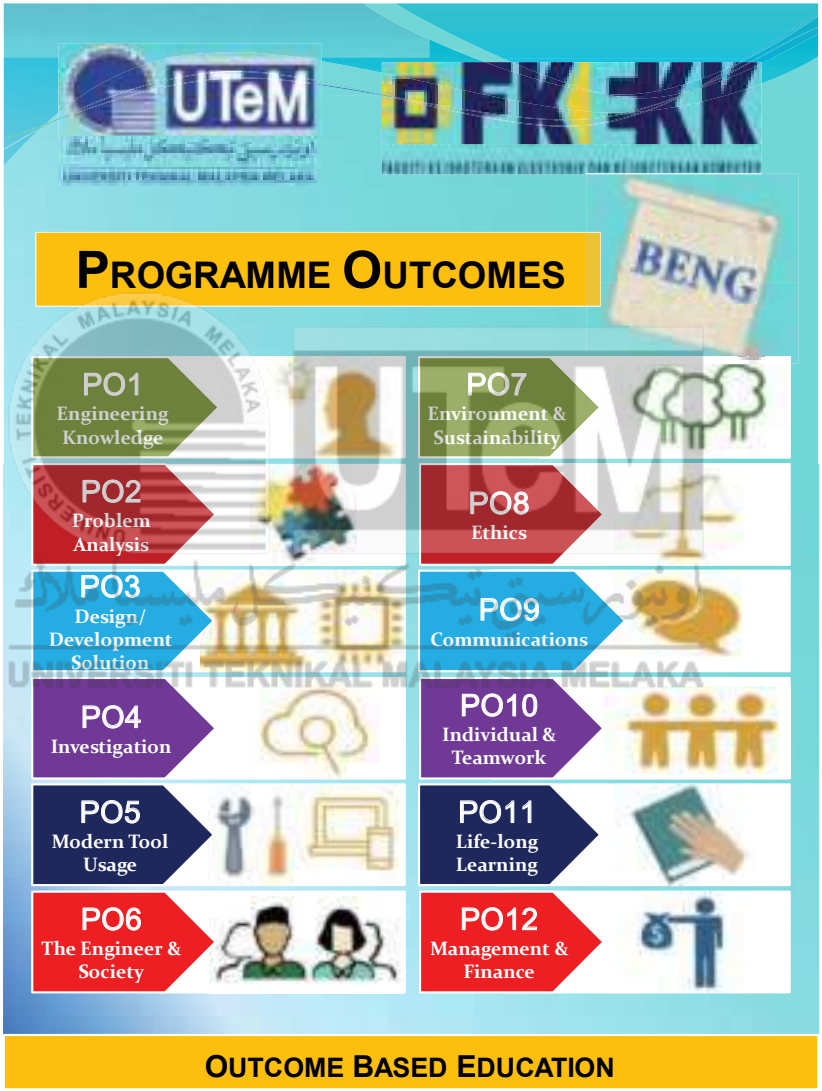


UTeM FKEKK

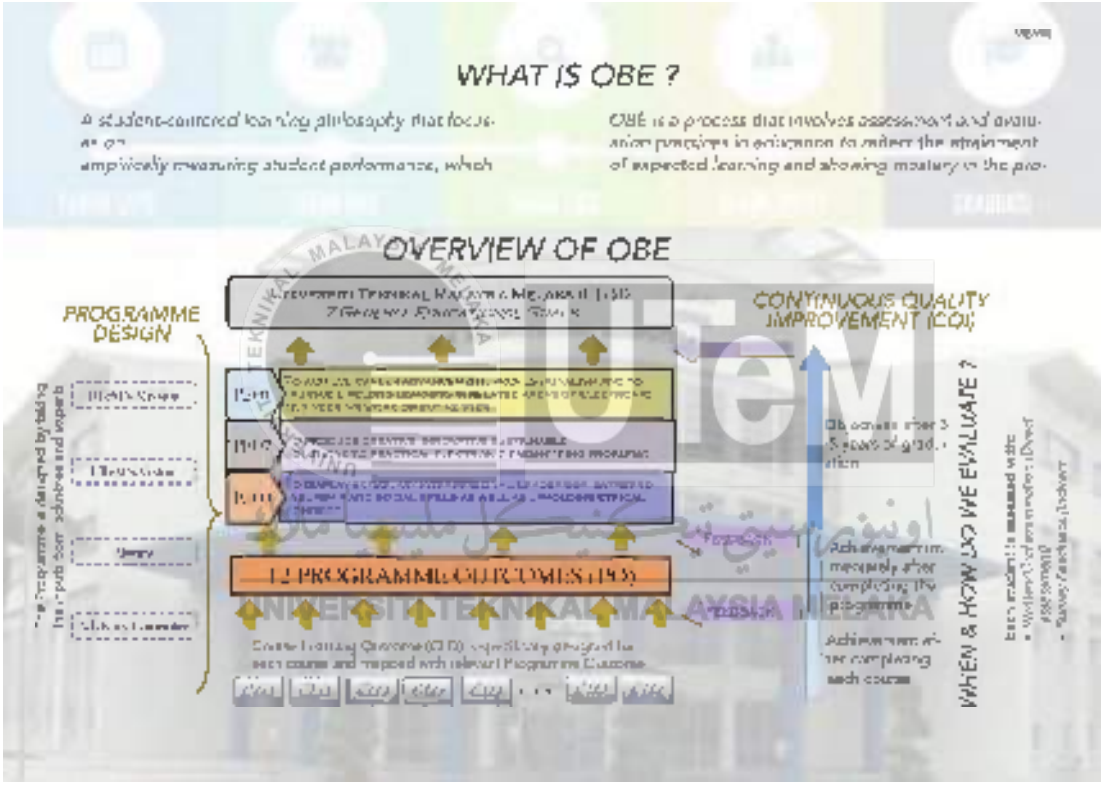
PROGRAMME OUTCOMES BENG

PO1 Engineering Knowledge	Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialisation to the solution of complex electronic engineering problems.
PO2 Problem Analysis	Identify, formulate, research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3 Design/Development Solution	Design solutions for complex engineering problems and design systems, components or processes that meet specified goals with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
PO4 Investigation	Conduct investigation into complex 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.
PO5 Modern Tool Usage	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.
PO6 The Engineer & Society	Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
PO7 Environment & Sustainability	Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate knowledge of and need for sustainable development.
PO8 Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO9 Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO10 Individual & Teamwork	Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
PO11 Life-long Learning	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.
PO12 Management & Finance	Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

3.5.1 Programme Outcomes



3.6 Outcome Based Education (OBE)



3.7 Curriculum Structure

Semester 1

CODE	COURSE	CREDIT	CATEGORY
BLHW 1762	Philosophy and Current Issues	2	W
BKKX xxx1	Co-Curriculum I	1	W
BLLW 1442	English for Academic Purposes	2	W
BMFG 1313	Engineering Mathematics 1	3	P
BEKG 1123	Principles of Electrical and Electronics	3	P
BMFG 1213	Engineering Materials	3	P
BEKG 1233	Principles of Instrumentation and Measurement	3	P
	TOTAL	17	

Semester 2

CODE	COURSE	CREDIT	CATEGORY
BKKX xxx1	Co-Curriculum II	1	W
BMCG 1013	Differential Equations	3	P
BITG 1233	Computer Programming	3	P
BENG 1413	Digital Electronics	3	P
BMCG 1523	Engineering Graphics and CAD	3	P
BENG 1132	Engineering Practice	2	K
BLLW 1XX2	Language Electives	2	E
	TOTAL	17	

Semester 3

CODE	COURSE	CREDIT	CATEGORY
BLHW 2772/ BLHW 2752*	Appreciation of Ethics and Civilization/Malaysian Culture	2	W
BEKG 2443	Engineering Mathematics 2	3	P
BEKG 2433	Electrical Systems	3	P
BENC 2413	Digital System	3	K
BENT 2713	Circuit Theory 1	3	K
BENE 2123	Fundamental of Electronics	3	K
BENG 2211	Electronic Engineering Lab 1	1	K
	TOTAL	18	

Semester 4

CODE	COURSE	CREDIT	CATEGORY
BLLW 2152	Academic Writing	2	W
BENG 2143	Engineering Statistics	3	P
BENC 2423	Microprocessor Technology	3	K
BENT 3733	Signals and Systems	3	K
BENT 2723	Circuit Theory 2	3	K
BENE 2133	Analogue Electronics	3	K
BENG 2431	Electronic Engineering Lab 2	1	K
	TOTAL	18	

Semester 5

CODE	COURSE	CREDIT	CATEGORY
BTMW 4012	Technology Entrepreneurship	2	W
BENG 4322	Engineer and Society	2	P
BENT 3753	Communication Principles	3	K
BENC 3443	Multimedia Technology and Applications	3	K
BENE 3143	Electronic System Design and Analysis	3	K
BENT 3743	Electromagnetic Fields and Waves	3	K
BENG 3211	Electronic Engineering Lab 3	1	K
	TOTAL	17	

Semester 6

CODE	COURSE	CREDIT	CATEGORY
BLLW 3462	English for Professional Interaction	2	W
BMFG 4623	Engineering Economy and Management	3	P
BENU 3863	Integrated Design Project	3	P
BENT 4733	Digital Signal Processing	3	K
BENE 3223	Control Principles and Systems	3	K
BENG 3761	Electronic Engineering Lab 4	1	K
BLHx xxx2	General Elective	2	E
	TOTAL	17	

Special Semester

CODE	COURSE	CREDIT	CATEGORY
BENU 3005	Industrial Training	5	P
	TOTAL	5	

Semester 7

CODE	COURSE	CREDIT	CATEGORY
BENU 4972	Bachelor Degree Project 1	2	P
BENU 4131	Engineering Seminar	1	P
BENE 4333	Artificial Intelligence	3	K
BENG 4711	Electronic Engineering Lab 5	1	K
BENX xxx3	Engineering Elective 1	3	E
BENX xxx3	Engineering Elective 2	3	E
	TOTAL	13	

Semester 8

CODE	COURSE	CREDIT	CATEGORY
BENU 4984	Bachelor Degree Project 2	4	P
BENC 4453	Computer Architecture	3	K
BENX xxx3	Engineering Elective 3	3	E
BENX xxx3	Engineering Elective 4	3	E
	TOTAL	13	
	GRAND TOTAL	135	

Note:

* To be taken by International Students Only

Category: W: University Compulsory Courses, P: Common Core Courses, K: Program Core Courses, E: Elective Courses

3.7.1 *List for Elective Courses*

OPTION FOR ENGINEERING ELECTIVE COURSES

	Select THREE(3) courses based on specialization			
	Computer Engineering	**Industrial Electronics**	**Telecommunication Engineering**	**Wireless Communication**
Programme Specialization Electives	**BENC 4463** Microcontroller Technology	**BENE 4233** Industrial Control	**BENT 4773** Telecommunication System Engineering	**BENT 4783** Wireless Communication System
	BENC 4473 Digital Integrated Circuit Design	**BENE 4243** Industrial Automation	**BENT 4793** Microwave Engineering	**BENT 4813** Data Communication and Networking
	BENC 4483 Computer Vision and Pattern Recognition	**BENE 4253** IC Design and Process	**BENT 4823** Digital Communication System	**BENT 4833** Antenna and Wave Propagation
	BENC 4513 Embedded Software Design	**BENE 4343** Power Electronics and Drives	**BENT 4843** Optoelectronics	**BENT 4853** Radio Navigation System
	BENG 4753 Special Topic in Electronic Engineering			
Engineering Programme Specialization Electives	**BEKP 4853 Renewable Energy**			
	BMFP 4323 Lean Six Sigma			
Open Electives	**Select ONE(1) course either from the chosen Programme Specialization Electives or from any Programme Specialization Electives or from any Engineering Programme Specialization Electives**			

OPTION FOR LANGUAGE AND GENERAL ELECTIVE COURSES

No.	Code	Courses
Language Elective		
1.	BLLW 1172	Bahasa Melayu Komunikasi 1/ Malay 1*
2.	BLLW 1212	Bahasa Arab 1/ Arabic 1
3.	BLLW 1222	Bahasa Mandarin 1/ Mandarin 1
4.	BLLW 1232	Bahasa Jepun 1/ Japanese 1
5.	BLLW 1242	Bahasa Korea 1/ Korean Language
6.	BLLW 1252	Bahasa Jerman 1/ German 1

**Compulsory for International Student*

No.	Code	Courses
General Elective		
1.	BLHC 4031	Pemikiran Kritis dan Kreatif/ Critical and Creative Thinking
2.	BLHW 4022	Kemahiran Perundingan/ Negotiation Skills
3.	BLHW 1032	Psikologi Industri dan Organisasi/ Industrial and Organizational Psychology
4.	BLHC 4012	Komunikasi Keorganisasian/ Organizational Communication
5.	BLHW 1722	Falsafah Sains dan Teknologi/ Philosophy of Science and Technology

3.7.2 Specialization

Students who register for the Bachelor of Electronic Engineering program may specialize either in Industrial Electronics, Computer Engineering, Telecommunication Electronics or Wireless Communication as shown in Table 1.

All the undergraduate programs offered by the Faculty of Electronic and Computer Engineering are accredited and recognized by the Board of Engineers Malaysia (BEM). Graduates from the Bachelor of Engineering programs above may apply to register with the Board of Engineers Malaysia, as graduate engineer in the engineering fields.

Table 4

Degree Awarded	Choice of Field Elective	Field of Registration with BEM
Bachelor of Electronic Engineering with Honours [BENG]	Industrial Electronics	Electronic Engineer
	Computer Engineering	
	Telecommunication Electronics	
	Wireless Communication	

3.8 Syllabus Summary for the Bachelor of Electronic Engineering Programme

3.8.1 University Compulsory Courses (W)

UNIVERSITY COMPULSORY COURSES (W)

BKKX xxx1	Co-Curriculum 1 and 2
BLHL 1xx2	Language Electives
BLLW 1442	English for Academic Purposes
BLHW 1762	Philosophy and Current Issues
BLLW 2152	Academic Writing
BLHW 2752*	Malaysian Culture*
BLHW 2772	Appreciation of Ethics and Civilization
BLLW 3462	English for Professional Interaction
BLHX xxx2	General Electives
BTMW 4012	Technology Entrepreneurship

Note:
* University compulsory courses to be taken by international students

PLEASE REFER TO **CENTRE FOR LANGUAGE LEARNING (CeLL)** AND **INSTITUTE OF TECHNOLOGY MANAGEMENT AND ENTREPRENEURSHIP (IPTK)** HANDBOOK FOR THE SYNOPSIS AND THE DETAILS SYLLABUS FOR ABOVE COURSES.

3.8.2 Common Core Courses (P)

BEKG 1123: PRINCIPLES OF ELECTRICAL AND ELECTRONICS

Learning Outcomes

1. Explain the basic principles of electrical and electronics components, terminologies, configuration, laws and rules. [PO1, WK1-4]
2. Apply appropriate circuit analysis methods to solve DC (resistive) circuits problems. [PO1, WK1-4]
3. Analyze circuits containing semiconductor devices. [PO1, WK1-4]

Synopsis

This course is intended to equip students with the basic principles of electrical and electronics for DC circuits. It begins by discussing the concept of electric circuit and its elements together with fundamental laws such as Ohm's Law, Kirchoff's Law. Next, the methods used to analyze a circuit is taught, beginning with voltage and current divider, and wye-delta transformations before continuing to more complex methods such as Kirchoff's Current Loop (KCL), Kirchoff's Voltage Loop (KVL), nodal and mesh analysis. After this, the course shifts to learning about the basics of semiconductor materials. Three elements will be studied, the diode, Bipolar Junction Transistor (BJT) and Operational Amplifiers (Op-Amp). The study will involve understanding each element's structure, basic operation, and circuit application.

References

[1] Charles K. Alexander and Matthew N. O. Sadiku, Fundamentals of Electric Circuits, McGraw Hill, 6th Ed. (2016).
[2] Robert L. Boylestad and Louis Nasheslsky, Electronic Devices and Circuit Theory, Pearson, 11th Ed. (2014).
[3] Thomas L. Floyd, Electronic Devices, Pearson, 10th Ed. (2018).
[4] Allan R. Hambley, Electrical Engineering Principles & Application, Pearson, 6th Ed. (2014)
[5] Electric Circuits, James W. Nilsson, Susan A. Riedel, Pearson, 11th Ed. (2018).
[6] Engineering Circuit Analysis, William H. Hayt, Jack E. Kemmerly, Steven Durbin, 9th Ed. (2018).
[7] Introductory Circuit Analysis, Robert L. Boylestad,13th Ed. (2016).

BEKG 1233: PRINCIPLES OF INSTRUMENTATION AND MEASUREMENT

Learning Outcomes

1. Describe the principle, various terms and standards in measurement. [PO1, WK1-4]
2. Explain the principle of measurement devices. [PO1, WK1-4]
3. Apply the suitable bridge techniques to measure component values such as resistance, inductance and capacitance. [PO1, WK1-4]
4. Explain the operation, function and applications of the transducers/sensors. [PO1, WK3]

Synopsis

This subject introduces the electronic measurement fundamental including the units and dimensions, standards, type of errors, and error statistic and calculation, measurement characteristic, noise and calibration. Follow by the Introduction to the working principle of permanent magnet moving coil (PMMC) for DC and AC meters, and for the construction of ammeter, voltmeter, ohmmeter, and generally an analogue multi-meter with various measurement ranges. In addition, oscilloscope as an instrument for acquiring and interpreting AC signals is also in the picture. Besides that, bridge circuits as the basic element for designing an instrument is also being discussed, which includes Wheatstone, Maxwell, Hay, Wein and Schering's bridges for measuring resistance, inductance and capacitance as well as acquiring measurement data from sensors. The final part of this subject covers resistive, capacitive and inductive sensors for measuring temperature, mechanical stress, pressure and flow.

References

[1] H.S. Kalsi. Electronic Instrumentation and Measurement, 4th Edition, McGraw Hill, 2019.
[2] Alan S. Morris, Reza Langari. Measurement and Instrumentation: Theory and Application, 2nd Edition, Academic Press, Elsevier, 2016.
[3] William C. Dunn. Fundamentals of Industrial Instrumentation and Process Control, McGraw Hill, 2018.

BEKG 2433: ELECTRICAL SYSTEMS

Learning Outcomes

1. Explain the concepts of the electric power system components (generation, transmission and distribution) and various power generation system and energy sources. [PO1, WK1-4]
2. Analyze the basic principle of electrical system (single and three-phase system) including power factor corrections. [PO1, WK1-4]
3. Apply the per-unit calculation to analyze electrical power system of different voltage levels. [PO2, WK1-4]
4. Analyze the characteristics for electric machine principles, including AC Synchronous generator and transformer. [PO2, WK1-4]
5. Analyze the characteristics and performance of electrical transmission line and distribution system. [PO2, WK1-4]

Synopsis

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

References

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

BEKG 2443: ENGINEERING MATHEMATICS 2

Learning Outcomes

1. Describe the fundamental concepts of multivariable functions, multiple integrals and vector calculus. [PO1, WK1-4]
2. Solve the mathematical problems that involve function of several variable, multiple integrals and vector calculus. [PO1, WK1-4]
3. Apply the knowledge of advanced engineering mathematics to deal with the engineering problems. [PO1, WK1-4]

Synopsis

The outcome of this course is to deliver the multivariable calculus knowledge which support for the learning of engineering related courses. 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. The understanding of these topics are very crucial in the world of communication.

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., 2017. Engineering Mathematics, 5th Edition, Pearson Higher Ed, USA.
[3] Anton, H., Bivens, I., and Davis, S., 2010. Calculus Multivariable, 8th edition. John Wiley & Sons, USA.
[4] Stewart, J., 2021. Calculus, 9th Edition. Cengage Learning, USA.
[5] Colley S. J., 2021. Vector Calculus 5th Edition. Pearson, Boston.

BENG 1413: DIGITAL ELECTRONICS

Learning Outcomes

1. Describe the number system, basic concept and terminology of digital circuits that form complex electronic systems. [PO1, WK1-4]
2. Analyze the basic digital circuits based on combinational and sequential components. [PO2, WK1-4]

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 Fundamental. 11th Edition, Prentice Hall, 2015.
[2] Tocci, Ronald; Widmer, Neal; Moss, Greg. Digital Systems, Global Edition, 2017.

BENG 2143: ENGINEERING STATISTICS

Learning Outcomes

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. [PO1, WK1-4]
2. Analyze engineering data using descriptive statistics. [PO2, WK1-4]
3. Deduce statistical inference for engineering problems by using the techniques of estimation, hypothesis testing and regression. [PO2, WK1-4]

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, one-way 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 statistical knowledge with a software application to ensure that they are well-prepared for 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, 9th Edition, John Wiley & Sons, 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, Brooks Cole, 2015.

BENG 4322: ENGINEER AND SOCIETY

Learning Outcomes

1. Apply ethical principles and commitment, to professional ethics, responsibilities and norms of engineering practice. [PO8, WK7]
2. Apply reasoning informed by contextual knowledge to assess health, safety and legal issues and its subsequent responsibilities, relevant to professional practice. [PO6, WK7]
3. Understand the needs for sustainable development and the impact of engineering solutions on society and environment. [PO7, WK7]

Synopsis

This course will discuss issues that are related to the engineering profession. It will cover topics such as personal ethics, professional ethics, code of ethics, ethics dealing with human relations, professionalism, BEM, IEM, regulations on professional conduct, route to professional status, engineers as an employee or employer, decision making, ethical considerations, competence of practicing engineering, safety issues, and related laws, health issues in the profession, safety and health management systems, accountability, general liability, engineer's legal liability specified in contract law, the environment, sustainability, etc. These issues will be examined and applied on daily contextual situations based on the existing laws, manuals, guidelines and case studies.

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.
[5] Jose A. Cruz-Cruz and William Frey, Engineering Ethics Modules for Ethics Across The Curriculum, OpenStax-CNX, 2014.

BENU 3005: INDUSTRIAL TRAINING

Learning Outcomes

1. Apply appropriate techniques and technical knowledge which relevant for student field of study. [PO1, WK1-4]
2. Demonstrate the ability to adapt with working environment and practice working efficiently and ethically. [PO8, WK7]
3. Display soft skill especially communication skill at all level. [PO9]
4. Work effectively as an individual, team members and as a leader as well. [PO10]
5. Acquire new knowledge, life-long learning and aware to new technology. [PO11]

Synopsis

All degree students will be placed in appropriate local industries or government corporations for 10 weeks normally in the special semester of their third year of study. Student will be exposed to real life working environment relevant to their field of study.

Reference

[1] Industrial Training Guide Book, UTeM.
[2] FKEKK Handbook, UTeM.
[3] EAC Guideline.

BENU 3863: INTEGRATED DESIGN PROJECT

Learning Outcomes

1. Design solutions by synthesizing electronic engineering knowledge that will solve complex electronic engineering problem in accordance to relevant standards. [PO3, WK5]
2. Utilize modern engineering and IT tools in facilitating solution to complex electronic engineering problems with an understanding of the limitations. [PO5, WK6]
3. Evaluate the impact of the design product, component or processes in term of safety, environmental and sustainability factors. [PO7, WK7]
4. Demonstrate effective teamwork skills in completing the IDP. [PO10]
5. Apply project management and financial knowledge effectively in completing the IDP. [PO12]

Synopsis

This course covers a complete design cycle, from start to finish, that encompasses problem identification and definition, system design settings, specifications and implementation, system testing and verification of project designed, proper documentation and deployment. Students work in group of four or five and at the end of the course the group is expect to complete a system design that provides solutions to an engineering problem identified at the beginning and worked upon during the course of studies. Students work under the supervision of assigned supervisors and are assessed on a regular basis and at specific milestones as indicated. The project must be endorsed by the supervisors taking into account the complexity of the problem and solutions. The students are expected to achieve the learning outcomes by providing solutions to an engineering problem, taking into account good engineering practice such as working as a team and meeting specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. At the end of the course, each group is expected to submit a technical report, provide an oral presentation as well as conduct a system demonstration on the project developed.

References

[1] R. G. Kaduskar, V. B. Baru, Electronic Product Design, 2nd Edition, Wiley India, 2013.
[2] John X. Wang, Green Electronics Manufacturing: Creating Environmental Sensible Products, CRC Press, 2012.
[3] Bogdan M. Wilamowski and J. David Irwin, The industrial Electronics Handbook, 2nd Edition, CRC Press, 2011.
[4] Charles Lessard and Joseph Lessard, Project Management for Engineering Design, Morgon & Claypool Pub, 2007.
[5] Charles B. Fleddermann, Engineering Ethics, 4th Edition, Prentice Hall, 2011.

BENU 4131: ENGINEERING SEMINAR

Learning Outcomes

1. Identify the professional engineering knowledge, practices and responsibilities. [PO6, WK7]
2. Collect and sort relevant information with regards to the given technical talk. [PO9, WK7]
3. Discuss current engineering issues and practices that impacting engineering professionals. [PO11, WK7]

Synopsis

The main purpose of this course is to expose the students to common practices in engineering within the industry and instill the passion for life-long learning process. Speakers are invited from both industries and academic society's related to current development from professional engineering issues in related engineering fields. The faculty's alumni are also invited to brief about their career development after graduation as a form of motivation for the students.

BENU 4972: BACHELOR DEGREE PROJECT 1

Learning Outcomes

1. Apply engineering knowledge to determine the objectives for the project, which relates to the work done before that includes basic theory as well as the approach to be used. [PO1, WK1-4]
2. Apply ethical principles and commit to professional conduct during project execution & presentation. [PO8, WK7]
3. Communicate effectively through formal engineering report presentation both orally and in writing. [PO9]
4. Able to work independently towards completion with minimal supervision during the entire project. [PO10]
5. Engage in independent search and synthesis of technical information from reliable sources. [PO11]
6. Ability to plan and manage project activities and estimate cost. [PO12]

Synopsis

This module is the preliminary part of the Bachelor Degree final year's project. Students should, but not only limiting to, produce a project proposal. Students should also commence their preliminary research and development work before the end of the semester. The preliminary work can be for instance simulation of circuit design, modelling and development of simple electronic circuit to test the concept. The Final Year Projects are not limited to laboratory based or faculty project but the students are also encouraged to consider industrial case studies or solving industrial problems which the students have faced during their internship across different industries related to electronic engineering.

BENU 4984: BACHELOR DEGREE PROJECT 2

Learning Outcomes

1. Analyze the problem statement of the project & identify a possible solution. [PO2, WK1-4]
2. Design and develop solutions to complex engineering problem to meet desired needs. [PO3, WK5]
3. Investigate, analyse and interpret the result of complex engineering problems using proper research method to provide valid conclusions. [PO4, WK8]
4. Apply appropriate modern techniques and proper use of engineering tools to solve complex engineering problems. [PO5, WK6]
5. Evaluate the project design and solution in term of environment and sustainability. [PO7, WK7]
6. Apply ethical principles and commit to professional conduct during project execution & presentation. [PO8, WK7]
7. Communicate effectively through formal engineering report presentation both orally and in writing. [PO9]
8. Able to work independently towards completion with minimal supervision during the entire project. [PO10]

Synopsis

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

BITG 1233: COMPUTER PROGRAMMING

Leaning Outcomes

1. Identify the fundamental principles of problem solving, programming techniques and structures in program development. [PO1, WK1-4]
2. Explain the principles of problem solving and programming techniques to solve given problems. [PO3, WK5]
3. Construct computer program codes by applying suitable programming structures and techniques. [PO5, WK6]

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++: 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.

BMCG 1013: DIFFERENTIAL EQUATIONS

Leaning Outcomes

1. Describe the basic concept of first and second order differential equations, Laplace Transform and Fourier series. [PO1, WK1-4]
2. Select an appropriate technique to solve problems involving differential equations. [PO1, WK1-4]
3. Apply the concept of differential equations in solving engineering problems. [PO2, WK1-4]

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.
[3] Edwards C. H., Penny D.E. & Calvis D. (2016). Differential Equations and Boundary Value Problems, 5th Edition. Pearson Education Inc.
[4] Polking J., Boggess A. and Arnold D. (2014). Differential Equations with Boundary Value Problems. Pearson Education Inc.
[5] Zill D.G. & Wright S.W. (2013). Differential Equations with Boundary-Value Problems, 8th Edition. Brooks/Cole.

BMCG 1523: ENGINEERING GRAPHICS AND CAD

Learning Outcomes

1. Explain the engineering graphics fundamentals. [PO1, WK1-4]
2. Construct technical drawing using manual sketching and computer aided design. [PO2, WK1-4]
3. Communicate by using engineering drawings. [PO5, WK6]

Synopsis

The course will provide students with an understanding of the importance of engineering graphics as a communication tool among engineers. Student will be exposed to the engineering graphics fundamentals of manual sketching, geometric dimensioning and tolerancing, graphic projections, sectioning and engineering drawings. Students will develop visualization skills by constructing technical drawings using manual sketches and computer aided design (CAD) software. The course consists of both lecture and practical session where students will be guided in presenting and interpreting engineering drawings correctly.

References

[1] Dix, M. & Riley, P., 2014, Discovering AutoCAD 2014, Prentice Hall, New York.
[2] Giesecke, F. E., Mitchell, A., Spencer, H. C., Hill, I. L., Dygdon, J. T. and Novak, J. E., 2011, Technical Drawing, 14th Ed., Prentice Hall, New York.
[3] Frederick, E. G. & Mitchell, A., 2008, Technical Drawing and Engineering Drawing, 14th Ed., Prentice Hall.

BMFG 1213: ENGINEERING MATERIALS

Learning Outcomes

1. Explain the basic concepts of engineering materials in terms of interatomic bonding and crystal structure. [PO1, WK1-4]
2. Analyze the properties of engineering materials based on its structure. [PO2, WK1-4]
3. Describe the processing methods for engineering materials. [PO2, WK1-4]

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 1313: ENGINEERING MATHEMATICS 1

Learning Outcomes

1. Describe the fundamental concepts of matrices, eigenvalues and eigen vector, complex numbers, interpolation, differentiation, integration and vector-valued functions. [PO1, WK1-4]
2. Solve the mathematical problems that involve matrices, eigenvalues and eigenvector, complex numbers, interpolation, differentiation, integration and vector-valued functions by using an appropriate technique. [PO1, WK1-4]
3. Apply the knowledge of engineering mathematics to deal with the engineering problems. [PO1, WK1-4]

Synopsis

The outcome of this course is to deliver fundamental knowledge of mathematics in order to support the learning of engineering related courses. This course is a blend of analytical and numerical approaches that mainly focusing on the matrices, nonlinear equations, eigenvalues and eigen vectors, complex numbers, interpolation, differentiation, integration and vector valued functions.

References

[1] James, G., Modern Engineering Mathematics, 6th Edition, Pearson, 2020.
[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., Advanced Engineering Mathematics, 11th Edition, John Wiley, 2019.
[5] Guo W., Advanced Mathematics for Engineering and Applied Sciences. Pearson, 2015.

BMFG 4623: ENGINEERING ECONOMY AND MANAGEMENT

Learning Outcomes

1. Explain the principles and terminology of engineering economy, concepts of time value of money and element of cost. [PO12]
2. Apply the concepts, principle and techniques in engineering economy using engineering economy factor and interest rate. [PO12]
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). [PO2, WK1-4]
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. [PO4, WK8]
5. Evaluate the project risk in engineering project. [PO10]

Synopsis

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

References

[1] Blank, L and Tarquin, A. Engineering Economy,7th Edition, McGraw Hill,2012.
[2] Whitman D. and Terry R. (2012) Fundamentals of Engineering Economics and Decision Analysis Morgan& Claypool Publishers.
[3] W.G Sullivan, E.M Wicks, C.P. Koelling “Engineering Economy”. Prentice Hall International 14th Ed., 2009
[4] Hartman, Joseph c. (2006) Engineering Economy and the Decision making Process. Prentice Hall.

3.8.3 Programme Core Courses (K)

BENC 2413: DIGITAL SYSTEMS

Learning Outcomes

1. Analysis of digital system consisting of finite state machine, counter and register. [PO2, WK1-4]
2. Design complex digital systems for combinational and sequential logic circuit using Hardware Description Language (HDL). [PO3, WK5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

This course will discuss about issues that are related to the digital system and application in engineering field. It will cover topics such as flip-flops, counters, shift registers, sequential logic design applying Finite State Machine, Hardware Description Language (HDL) for combinational and sequential logic circuit. These topics are very important to student in learning digital system and the application that involved for the system.

References

[1] Thomas L.Floyd, Digital Fundamentals,11th Edition, Prentice Hall, 2014.
[2] Ronald J.Tocci, Digital Systems : Principles and Applications, 12th Edition, Pearson Prentice Hall, 2016.
[3] William J. Dally, Digital Design Using VHDL: A Systems Approach 1st Edition, Cambridge University Press, 2016.
[4] M. Morris R. Mano, Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog, 6th Edition, Pearson, 2017.
[5] Mohamed Khalil Hani, RTL Digital System with Verilog, Universiti Teknologi Malaysia, 2014.

BENC 2423: MICROPROCESSOR TECHNOLOGY

Learning Outcomes

1. Write, debug and analyse the assembly language programming of microprocessor-based systems. [PO2, WK1-4]
2. Design electronic circuits that realize microprocessor-based systems. [PO3, WK5]
3. Communicate effectively through effective report writing and oral presentation. [PO9]

Synopsis

This course covers the concept, hardware and programming of the ARM processor ARM Cortex-M3. The topics that will be covered include the introduction to the microprocessors, assembly language programming, and hardware interfacing design between the microprocessor to memory and input/output devices. Evolution of Microprocessor from architectures, peripheral and up to memory-map system design will also be learned in this course. At the end of this course, students should be able to develop a simple microprocessor-based project of integration software and hardware.

References

[1] Ata Elahi. ARM Assembly Language with Hardware Experiments. Springer, 2015.
[2] Muhammad Tahir, Kashif Javed. ARM Microprocessor Systems: Cortex-M Architecture, Programming, and Interfacing. CRC Press, 2017.

BENC 3443: MULTIMEDIA TECHNOLOGY AND APPLICATION

Learning Outcomes

1. Apply the theory of multimedia data representation and multimedia standards in designing multimedia applications. [PO1, WK1-4]
2. Design multimedia applications based on given specifications and requirements. [PO3, WK5]
3. Construct multimedia application by using latest multimedia software and authoring tools. [PO5, WK6]

Synopsis

This course prepares the students with basic concept of multimedia, technology and the importance of multimedia application. This course also introduces the students to techniques and tools related with the creation of multimedia application and explore the current issues related to multimedia technology. It covers topics introduction to multimedia technology, multimedia data processing and compression, graphic and image representation, audio technology, video technology and multimedia systems. Throughout the course, students will develop the essential skills in producing professional multimedia applications such as mobile applications, computer games, web pages and interactive ebooks.

References

[1] Vic Costello, Multimedia Foundations: Core Concepts for Digital Design, Routledge; 2nd edition, 2016.
[2] Kyle Baldwin, Multimedia Technologies: Designs, Tools and Applications, Willford Press, 2019.

BENC 4453: COMPUTER ARCHITECTURE

Learning Outcomes

1. Determine the critical functions and the main processor architecture of a computer hardware including its memory and storage. [PO1, WK1-4]
2. Analyze the functions of an operating system, the software development process and other related components. [PO2, WK1-4]

Synopsis

The outcome of this course is to deliver the fundamental of computer architecture. The course begins with the topics about the introduction about computer that includes system on chip architecture, Raspberry Pi, Harvard and von Neumann architecture. The students will understand how computer system work, both internally (ALU, control unit, registers, etc.) and externally (I/O interfaces, networking, etc.). Such understanding will enable the graduates to make intelligent decisions when confronted with computer-related problems at their workplace. The knowledge and skills gained in this course will also enable the graduates to further their studies in the field of computer architecture, organization, and design. Then, students will be exposed to the detailed topics on electronic memory, arm processor and programming process. In addition, the operating systems including history, basics of OS, kernel, firmware and OS for Raspberry Pi. Finally, students will learn the final topic about wired and wireless Ethernet which are widely used in computer communication and networking process.

References

[1] E. Upton, J. Duntemann, R. Roberts, B. Everard, and T. Mamtora, Learning Computer Architecture with Raspberry Pi: John Wiley & Sons, 2016.
[2] Stallings, William, Computer Organization and Architecture: Designing for Performance, 10th Edition, Pearson Education, 2016.
[3] Hammacher Carl, Vranesic Zvonko, Zaky Safwat, Naraig Manjikian, Computer Organization and Embedded Systems, 6th Edition, 2011.

BENE 2123: FUNDAMENTAL OF ELECTRONICS

Learning Outcomes

1. Explain the principle knowledge of semiconductor materials, the characteristics and applications of electronic devices. [PO1, WK1-4]
2. Analyze the electronic circuit problems using appropriate theory. [PO2, WK1-4]

Synopsis

This course will discuss on Bohr Atomic Model: valency, periodic table of elements, trivalent, tetravalent and pentavalent elements, movement electrons in solid: conductor, insulator and semiconductor, band theory: energy bands, conduction bands and forbidden bands. Doping, p and n materials, pn junction. Diode equation, dynamics resistance, diode equivalent circuits, Silicon Semiconductor Diodes: characteristics and measurement of forward & reverse biased, composite characteristics and load line analysis, clipping, clamping & simple rectifier (half & full) circuits, zener diodes characteristics, and simple regulators., Bipolar Junction Transistor (BJT): construction and operation of BJT, BJT characteristics and measurement technique, limits of operation, βdc & αdc, DC biasing - DC load lines, Field Effect Transistor (FET): construction & operation of FET, FET characteristics & diagram, Shockley's equation, DC biasing – DC load line and Metal oxide semiconductor field-effect transistor (MOSFET): construction & operation of MOSFET dc characteristic. This subject will expose the students to applications in the industry related to semiconductor devices such as transistors operation, design and analysing of DC biasing configurations.

References

[1] Boylestad R., Nashelsky L., "Electronic Devices and circuit Theory", 11th Edition, Prentice Hall Inc., 2018.
[2] Floyd, "Electronic Devices", 9th Edition, Prentice Hall, 2012.
[3] Harold D. Holbrook, Walter J. Seeley, "Basic Electronics", Elsevier Science, 2013.
[4] Westcott, S. and Westcott, J.R., "Basic Electronics: Theory and Practice", Stylus Publishing, LLC, 2017.
[5] Jean Riescher Westcott , "Basic Electronics: Theory and Practice", Mercury Learning & Information, 2014.

BENE 2133: ANALOGUE ELECTRONICS

Learning Outcomes

1. Analyze the gain and the frequency response of single stage and multistage audio amplifiers using both BJT, FETs and MOSFET including analysis at mid-band, low and high frequencies as well as Op-Amp circuits and differential amplifier. [PO2, WK1-4]
2. Design single stage or multistage amplifiers of BJT, FETs and MOSFET as well as Op-Amp circuits. [PO3, WK5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

The outcome of this course is to deliver knowledge, understanding and application of the analogue electronic circuits. The course begins with the analysis of BJT Transistor modelling, CE, CC and CB configuration, BJT small amplifier analysis including FET and MOSFET. In addition, Frequency response, bode plot and the stability of the circuit will be discussed. Apart from that, amplification circuit technique such as cascade, cascode, Darlington, Multistage Amplifiers, Differential amplifier circuit, Feedback Amplifiers and not least Operational amplifiers: inverting, non-inverting, summing and buffer amplifiers. Students also will be exposed to design amplifier circuit for the project assignment. This subject will also expose the students to current application in the industry such as a very low signal amplification through instrument amplifier and noise elimination through filters.

References

[1] P. Scherz and S. Monk, Practical Electronics for Inventer, 4th Edition. McGraw Hill, 2016.
[2] Thomas L. Floyd, Electronic Devices, 10th Edition, 2017.
[3] Thomas L. Floyd and S. Wetterling, Laboratory Exercises for Electronic Devices, 10th Edition, 2017.
[4] R. Bolystad and L. Nashelsky L., Electronic Devices and Circuit Theory, 11th, Prentice Hall Inc., 2015.
[5] A. Aminian and M. Kazimierchuk, Electronic Devices - A Design Approach, Prentice Hall Inc., 2015.
[6] S. Salivahanan and N. Suresh Kumar, Electronics Devices and Circuits, 4th Edition. McGraw Hill, 2016.

BENE 3143: ELECTRONIC SYSTEM DESIGN AND ANALYSIS

Learning Outcomes

1. Analyze electronics system such as power supplies, power amplifiers, oscillators, waveform generators, filters and ADC/DAC circuits. [PO2, WK1-4]
2. Design circuits for electronic systems such as power supplies, power amplifiers, oscillators, waveform generators, filters and ADC/DAC circuits. [PO3, WK5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

The outcome of this course is to deliver knowledge, understanding and application of the electronics system. This course will cover regulated power supply, ripple voltage, filters and voltage regulation, regulators, introduction to switching regulator, discrete, integrated circuit regulator, amplifier class A, AB, B and C, RC phase shift oscillator, Wien bridge oscillator, tuned oscillator, crystal oscillator, 555 timers, active filters, filter design criteria, higher order Butterworth, switched capacitor filters, data conversion, analog-digital converter (ADC) and digital-analog converter (DAC). This subject will expose students to current applications in the industry such as electronic circuit in signal processing and conditioning system.

References

[1] Thomas L. Floyd, “Electronic Devices (Conventional Current Version) (What's New in Trades & Technology)” Pearson, 2017 (Textbook).
[2] Stephan J. G. Gift and Brent Maundy, “Electronic Circuit Design and Application”, Springer, 2020.

BENE 3223: CONTROL PRINCIPLES AND SYSTEMS

Learning Outcomes

1. Analyze control system problem using appropriate tools to achieve the given specifications. [PO2, WK1-4]
2. Design appropriate controllers for electrical and/or mechanical control systems to achieve the given specifications. [PO3, WK5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

The outcome of this course is to deliver current technology and knowledge of control principles and systems. The course begins with the topics about the introduction to control field continued by modeling systems in both frequency and time domains. It involves model derivation of electrical network, translational and rotational mechanical systems. Then, students will be exposed to the topic related to time response analysis of the first and second order system and the impact of zeros and poles in control analysis. Further, student will learn how to minimize complex multiple sub-system by blocks diagrams technique and signal flow graphs; Mason's rules formula continued by investigating the stability of the control system by Routh- Hurwitz criterion. Finally, student will be exposed related to control design techniques through a Bode Plot analysis and Gain Adjustment compensator, Pole-placement controller and PID controller which are beneficial knowledge in industrial and academic control platform.

References

[1] Norman S. Nise, Control System Engineering, Addison Wesley Publishing, 7th edition 2015.
[2] Richard C. Dorf and Robert H. Bishop, "Modern Control Systems 13th edition", Prentice Hall, 2017.
[3] Gene F. Fransklin, J. David Powell & Abbas Emami - Naeini, "Feedback Control of Dynamic Systems", 8th Edition, Pearson, 2018.

BENE 4333: ARTIFICIAL INTELLIGENCE

Course Learning Outcomes

1. Analyze the implementation of artificial Intelligence techniques such as fuzzy logic algorithm, neural network and machine learning in problem solving. [PO2, WK1-4]
2. Design an intelligent system to achieve predetermined spesifications. [PO3, WK5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

This course will discuss about topics that are related to the Artificial Intelligence (AI) in domestic and engineering industry. In this course, the students will be exposed to the overview, history, why AI is needed and application areas involved. Then Fuzzy Logic will be presented where the topics covered are introduction to Fuzzy Logic, Fuzzy set and Fuzzy logic Control System and it's latest application such as fuzzy logic in expert systems and energy conversion. Next, Neural Network (NN) will be covered with Introduction to NN or how the brain work, the neuron as a simple computing element, biological motivations: McCulloch and Pitts neuron, Hebbian learning, peceptron, multilayer neural networks, hidden layer of NN, and back propagation. Eventually students will visit Machine Learning that covers Supervised Learning, Discriminative Algorithms, and Generative learning algorithms. Several tools in Machine Learning are going to be explained as well such as Gaussian discriminant analysis, Naive Bayes, Support vector machines. unsupervised learning, clustering, K-means, mixture of Gaussians, Factor analysis, PCA (Principal components analysis), and ICA (Independent components analysis). These topics will be implemented for industry and domestic such as autonomous controller and manufacturing applications.

References

[1] S. J. Russel, Artificial Intelligence: A Modern Approach, 3rd Edition, Pearson 2015.
[2] J. Smith, Machine Learning Systems, Design that Scale, Manning, 2018.
[3] T.J.Ross, Fuzzy Logic With Engineering Applications, 3rd Edition, Wiley, 2015.

BENG 1132: ENGINEERING PRACTICE

Learning Outcomes

1. Apply knowledge of engineering fundamentals to various basic modules of electronics towards solving complex engineering problems. [PO1, WK1-4]
2. Apply appropriate techniques, resources and modern engineering and IT tools to complex engineering activities. [PO5, WK6]

Synopsis

The outcome of this course is to deliver current technology and application in engineering practice. The course begins with the topic regarding the Occupational Safety and Health Administration that include the history, background function as well as the OSH regulation in Malaysia. Then, students will be exposed to the simulation tools, Multisim simulator that used to simulate analogue and digital circuit. In addition, the use of instrumentation such as multimeter, function generator, DC power supply and oscilloscope will also be taught in this course. Apart from that, students will learn the technique of soldering and de-soldering of electronic component on the strip board. Finally, students will learn the PCB design and fabrication which allow them to design the PCB using PROTEUS software before transfer into PCB layout. UV etching technique will be used in this PCB fabrication process. Then, student will perform their mini project where they are required to design and construct the PCB board. All of these topics will develop the engineering skills among students that will be utilized in electrical and electronic manufacturing field.

References

[1] Environmental, Safety and Health Engineering, Gayle Woodside, WILEY, 1997.
[2] Handbook of International Electrical Safety Practices, Peri, WILEY, 2011.
[3] EMC and the Printed Circuit Board: Design, Theory and Layout Made Simple, Mark.I, WILEY, 2004.
[4] Industrial Bioseparations: Principles and Practice, Daniel Forciniti, WILEY, 2008.

BENG 2211: ELECTRONIC ENGINEERING LAB 1

Learning Outcomes

1. Investigate experimental results using appropriate experimental methods and provide critical analysis and discussion. [PO4, WK8]
2. Apply appropriate techniques, manipulate and analyze experimental data to solve complex engineering problems. [PO5, WK6]
3. Demonstrate good communication, leadership and team working skills through experimental work. [P09]
4. Demonstrate information management skills by providing relevant theory principles for the experiments and address the problem with the potential solutions which engage in independent and life-long learning. [PO11]

Synopsis

This course covers topics in BENC 2413 Digital System, BENT 2713 Circuit Theory 1 and BENE 2123 Fundamental of Electronics with the following items:

1. Combinational Logic Circuit
2. Counter
3. Sequential Circuit
4. DC analysis: Ohm's Law & Kirchoff Laws
5. Superposition Theorem
6. Thevenin & Norton's Theorem
7. Diode Applications
8. BJT Characteristics
9. Field Effect Transistor (FET)

References

[1] Kalsi, H.S., "Electronic Instrumentation", 3rd edition, McGraw Hill Education, 2017.
[2] D. Sundararajan, "Introductory Circuit Theory", Springer Nature., 2019.
[3] Floyd, "Electronic Devices, electron Flow version", 10th Edition, Prentice Hall, 2018.
[4] Mohammad A. Karim, Xinghao Chen, "Digital Design: Basic Concepts and Principles", CRC Press, 2017.

BENG 2431: ELECTRONIC ENGINEERING LAB 2

Learning Outcomes

1. Investigate experimental results using appropriate experimental methods and provide critical analysis and discussion. [PO4, WK8]
2. Apply appropriate techniques, manipulate and analyze experimental data to solve complex engineering problems. [PO5, WK6]
3. Demonstrate good communication, leadership and team working skills through experimental work. [P09]
4. Demonstrate information management skills by providing relevant theory principles for the experiments and address the problem with the potential solutions which engage in independent and life-long learning. [PO11]

Synopsis

This course covers topics in BENT 2723 Circuit Theory 2, BENE 2133 Analog Electronics, BENC 2423 Microprocessor Technology, and BENT 3733 Signals and Systems with the following items: AC circuits, step response of RLC circuits, introduction to microprocessor based system with arithmetic, literals and memory access system, and signal representation using Fourier series and transform.

References

[1] Floyd, “Electronic Devices”, Tenth Edition, Prentice Hall, 2018.
[2] Charles Alexander, Matthew Sadiku, “Fundamentals of Electric Circuits”, McGraw-Hill Education, 6th Edition, 2016.
[3] Demetrios P. Kanoussis, “Electric Circuits”,vol. 1, Golden Ratio Publications, 2015.
[4] Ata Elahi. ARM Assembly Language with Hardware Experiments. Springer, 2015.
[5] Boylestad R. L, “Introductory Circuit Analysis”, 12th Edition, Pearson, 2014.
[6] N. N Bhargava, D.C. Kulshreshtha, S. C. Gupta, “Basic Electronics and Linear Circuits”, Tata McGraw-Hill Education, 2013.
[7] Boylestad R., Nashelsky L., “Electronic Devices and Circuit Theory”, 11th Edition, Prentice Hall, 2013.
[8] Harold D. Holbrook, Walter J. Seeley, “Basic Electronics”, Elsevier Science, 2013.
[9] Radu Muresan. Embedded System Development and Labs for ARM, 2005.

BENG 3211: ELECTRONIC ENGINEERING LAB 3

Learning Outcomes

1. Investigate experimental results using appropriate experimental methods and provide critical analysis and discussion. [PO4, WK8]
2. Apply appropriate techniques, manipulate and analyze experimental data to solve complex engineering problem. [PO5, WK6]
3. Demonstrate good communication, leadership and team working skills through experimental work. [PO9]
4. Demonstrate information management skills by providing relevant theory principles for the experiments and address the problem with the potential solutions which engage in independent and life-long learning. [PO11]

Synopsis

This course covers topics in BENE 3143 Electronic System Design and Analysis, and BENT 3753 Communication Principles, with the following items: Power Supply, Power Amplifiers, Wein Bridge Oscillator, Active Filters, Amplitude Modulation ED Trainer, Frequency Modulation ED Trainer, Frequency Shift Keying, PAM Mux and Demux.

References

[1] Bolystad, R., Nashelsky L., "Electronic Devices and Circuit Theory", 11th Ed., Prentice Hall Inc., 2013.
[2] Ali Aminian, Maren Kazimierchuk, "Electronic Devices - A Design Approach", Prentice Hall Inc., 2004.
[3] Donald A. Neamen, "Microelectronics – Circuit Analysis and Design", 4th Ed., McGraw Hill., 2009.
[4] Marc T. Thompson, "Intuitive Analog Circuit Design – A Problem-Solving Approach Using Design Case Studies", Elsevier, 2006.
[5] Giovanni Saggio, "Principles of Analog Electronics". CRC Press, 2014.
[6] John G. Proakis, Masoud Salehi, "Fundamentals of Communication Systems", 2nd Ed., Pearson Education, 2014.
[7] Louis Frenzel, "Principles of Electronic Communication Systems", 4th Ed., McGraw-Hill, 2015.
[8] Rodger E. Ziemer, Principles of Communications", 7th Ed., John Wiley & Sons, 2014.
[9] Wayne Tomasi, "Advanced Electronic Communications Systems", 6th Ed., Pearson Education, 2013.
[10] Dhanshetti Sanjay, "Communication System", Dhanshetti, 2015.

BENG 3761: ELECTRONIC ENGINEERING LAB 4

Learning Outcomes

1. Investigate experimental results using appropriate experimental methods and provide critical analysis and discussion. [PO4, WK8]
2. Measure experimental performance using fundamental electronic equipment. [PO5, WK6]
3. Present experimental findings in the form of standard engineering reports. [PO9]
4. Demonstrate information management skills by providing relevant theory principles for the experiments and address the problem with the potential solutions which engage in independent and life-long learning. [PO11]

Synopsis

This course covers topics in BENE 3223 Control Principles and Systems, and BENT 3753 Digital Signal Processing with the following items:

1. Transfer Function and System Response
2. Sampling of continuous-time signals
3. State Space Representation
4. Discrete Fourier Transform (DFT)
5. Reduction of Multiple Subsystem
6. Z-transform
7. System Response (Frequency Response)
8. Digital filter design

References

[1] Norman S. Nise, “Control System Engineering”, Addison Wesley Publishing, 6th Edition, 2011.
[2] Katsuhiko Ogata, “Modern Control Engineering 5th Edition”, Pearson, 2010.
[3] Richard C. Dorf and Robert H. Bishop, “Modern Control Systems 11th Edition”, Prentice Hall, 2008.
[4] K.Deergha Rao, M.N.S. Swamy, “Digital Signal Processing: Theory and Practice”, Springer Verlag, Singapore, 2018.
[5] Michael Parker, “Digital Signal Processing 101 2nd Edition Everything You Need to Know to Get Started”, Newnes, 2017.
[6] L. Tan, J. Jiang, “Digital Signal Processing: Fundamentals and Applications”, 3rd Ed., Academic Press, London, 2019.
[7] A. Antoniou, “Digital Filter: Analysis, Design, and Signal Processing Applications”, 2nd Edition, MCGraw Hill, Ohio, 2018.
[8] C. Therrien, M. Tummala, “Probability and Random Processes for Electrical and Computer Engineering”, CRC Press, Boca Raton, 2018.

BENG 4711: ELECTRONIC ENGINEERING LAB 5

Learning Outcomes

1. Investigate experimental results using appropriate experimental methods and provide critical analysis and discussion. [PO4, WK8]
2. Apply appropriate techniques, manipulate and analyze experimental data to solve complex engineering problems. [PO5, WK6]
3. Present experimental findings in the form of standard engineering reports. [PO9]
4. Demonstrate information management skills by providing relevant theory principles for the experiments and address the problem with the potential solutions which engage in independent and life-long learning. [PO11]

Synopsis

This course covers topics from two engineering electives (depending on students selected track). Every elective will cover FOUR (4) experiments, set up to strengthen the fundamental theory of the course. Electives covered in this course are:

BENC 4463 MICROCONTROLLER TECHNOLOGY
BENC 4473 DIGITAL INTEGRATED CIRCUIT DESIGN
BENE 4233 INDUSTRIAL CONTROL
BENE 4243 INDUSTRIAL AUTOMATION
BENT 4773 TELECOMMUNICATION SYSTEM ENGINEERING
BENT 4793 MICROWAVE ENGINEERING
BENT 4783 WIRELESS COMMUNICATION SYSTEM
BENT 4813 DATA COMMUNICATION AND NETWORKING

At the end of the course, experiments covered in the course will expose the students on the nature of their chosen track; either it is computer engineering, industrial electronics, telecommunication engineering or wireless communication track.

References

[1] Cory Beard and William Stallings, "Wireless Communication Networks and Systems", Pearson, 2015.
[2] John J. Craig, “Introduction to Robotics: Mechanics and Control”, 4th Ed., Pearson, 2017.
[3] Mikell P. Groover, “Automation, Production Systems, and Computer Integrated Manufacturing”, 4th Ed., Pearson Education, 2016.
[4] Rob Toulson and Tim Wilmshurst, “Fast and Effective Embedded Systems Design: Applying the ARM mbed”, 2nd Ed., Newnes, 2016.

BENT 2713: CIRCUIT THEORY 1

Learning Outcomes

1. Classify sinusoidal waveforms and apply circuit analysis techniques to solve basic DC circuit and a terminated two-port network. [PO1, WK1-4]
2. Analyze DC circuit problems through the application of circuit analysis techniques and theorems. [PO2, WK1-4]

Synopsis

This course will introduce Overview of Electrical Engineering. The topics covered are SI Units, Charge and Current, Voltage, Power and Energy and Circuit Elements, Ohm's Law, Nodes, Branches and Loops, Kirchoff's Laws, Series Resistors and Voltage Division, Parallel Resistors and Current Division and Wye-Delta Transformation, Applications, Nodal Analysis, Nodal Analysis with Voltage Sources, Mesh Analysis, Mesh Analysis with Current Sources, Linearity Property, Superposition, Sources Transformation, Thevenin's Theorem, Norton's Theorem and Maximum Power Transfer, Introduction to Sinusoid, Phasor, Phasor relationships for Circuit Elements, Impedance and Admittance, Impedance Combinations, Impedance, Admittance, Hybrid and Transmission Parameters. These fundamental knowledge will be used in electrical circuit analysis.

References

[1] J.David Irwin, R. Mark Nelms, "Basic Engineering Circuit Analysis", 12th Edition, Wiley and Sons, 2021.
[2] James W.Nilsson, Susan A. Rieldel, "Electric Circuits", 10th Edition, Prentice Hall, 2015.
[3] C. K. Alexander and M. N. Sadiku, "Fundamentals of Electric Circuits", 7th Edition, Mc Graw Hill, 2020.

BENT 2723: CIRCUIT THEORY 2

Learning Outcomes

1. Apply knowledge of mathematic and circuit theorems to solve Direct Current (DC) and Alternating Current (AC) electric circuit as well as Alternating Current (AC) power problems. [PO1, WK1-4]
2. Analyze sinusoidal steady-state condition, transient response and frequency response of the circuits. [PO2, WK1-4]

Synopsis

The outcome of this course is to deliver the basic electrical circuit theorem and application in solving DC and AC circuit problems.This course will discuss on capacitors and inductors, series and parallel circuits of capacitors and inductors; first- and second-order circuits, step response of the circuits; steady-state analysis; AC power analysis, average power, RMS values, power factor; frequency response, transfer function and Bode Plot, series and parallel resonance and filters. All of these circuit theorem can be apply in Filter design.

References

[1] J.David Irwin, R. Mark Nelms, “Basic Engineering Circuit Analysis”, 12th Edition, Wiley and Sons, 2021.
[2] James W.Nilsson, Susan A. Rieldel, “Electric Circuits”, 10th Edition, Prentice Hall, 2015.
[3] C. K. Alexander and M. N. Sadiku, “Fundamentals of Electric Circuits”, 7th Edition, Mc Graw Hill, 2020.

BENT 3733: SIGNALS AND SYSTEMS

Learning Outcomes

1. Identify the characteristics and properties of various continuous-time and discrete-time signals and systems. [PO1, WK1- 4]
2. Analyze systems with variety of inputs and responses through Fourier Series, Fourier Transform and Laplace Transform techniques. [PO2, WK1-4]

Synopsis

The outcome of this course is to introduce the basic concepts and techniques for describing and analyzing continuous-time signals and systems. The course begins to study the characteristics and properties of various continuous and discrete-time signals and systems. Then followed by representing periodic signals as a Fourier series and use the Fourier transform and the Laplace transform to analyze continuous-time signals. Students also will be exposed to use MATLAB as a tool for analyzing the behavior of continuous time signals and systems. The applications of the Fourier series, Fourier and Laplace transform in circuits will be covered in this course. The ideas introduced in this course will be useful in understanding further electronic and electrical engineering courses which deal with control systems, communication systems, power systems and digital signal processing.

References

[1] A. V. Oppenheim, A. S. Willsky, Signals and Systems, 2nd Edition, Prentice Hall, 2014.
[2] Charles Alexander, Matthew Sadiku, “Fundamentals of Electric Circuits”, McGraw-Hill Education, 6th Edition, 2016.
[3] Luis Chaparro, “Signals and Systems using MATLAB”, 2nd Edition, Academic Press, 2014.
[4] Gang Li, Liping Chang, Sheng Li, “Signals and Systems: Fundamentals”, Tsinghua University Press, 2015.
[5] M. Abu, S.N. Zabri, R.A. Manap, A.S. Ja'afar, M.M. Yunus, N.F. Azmi, Introduction to Signals and Systems, Penerbit UTeM Press, 2019.

BENT 3743: ELECTROMAGNETIC FIELDS AND WAVES

Learning Outcomes

1. Apply the principles of electrostatic, magnetostatics, time-varying fields and electromagnetic wave propagation. [PO1, WK1-4]
2. Analyze the principles of electrostatic, magnetostatics, time-varying fields and electromagnetic wave propagation. [PO2, WK1-4]

Synopsis

This course will discuss about issues that are related to electromagnetic field and wave. It will cover topics such as 1) Vector analysis: Vector algebra, coordinate system and transformation, vector calculus. 2) Electrostatic: electrostatic fields, Gauss Law, Poisson's equation, electric fields in material space, electrostatic boundary. 3) Magnetostatics: Magnetostatic fields, stokes theorem, biot-savart law, magnetic forces, material and devices. 4) Waves: Maxwell's equations, Faraday's Law, time- varying electromagnetic field, electromagnetic wave propagation. These issues will be examined and applied on assignment.

References

[1] M.N.O. sadiku, Elements of electromagnetic, 8th Edition, Oxford University Press, 2019.

BENT 3753: COMMUNICATION PRINCIPLES

Learning Outcomes

1. Explain basic principles, components of telecommunication system and the effect of noise in telecommunication systems. [PO1, WK1-4]
2. Analyze the design and performances of various digital modulation formats, linear and angle modulation techniques commonly used in telecommunication system. [PO2, WK1-4]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

The outcome of this course is to deliver the principles in the communication system. The course begins with the topics of introduction to Telecommunication that includes the telecommunication model, transmission modes, modulation and demodulation model. Then, students will be exposed to the details in Linear Modulation Process which consists of Amplitude Modulation (AM) principles, AM modulation and transmission, AM Reception and Demodulation. Also, students will look into details on the principles of Single-Sidebands Communications Systems (SSB) that covers the transmission and reception process. Apart form that, students will learn the Angle Modulation (AM) topics that covers details of Frequency Modulation (FM), Phase Modulation (PM), FM/PM Modulation and Transmission, FM/PM Reception and Demodulation, and also FM Stereo. In addition, students will also learn about Noise; source and representation, noise parameters, noise analysis in linear and angle modulation. Finally, students will learn about the Digital Communication topic such as Information Capacity, Hartley and Shannon Limit, Digital Modulation: Amplitude, Frequency and Phase Shift Keying (ASK, FSK and PSK), Digital Transmission: Pulse Modulation, Pulse Code Modulation (PCM), Sampling, Quantization.

References

[1] John G. Proakis, Masoud Salehi, “Fundamentals of Communication Systems”, 2nd Ed., Pearson Education, 2014.
[2] Louis Frenzel, “Principles of Electronic Communication Systems”, 4th Edition, McGraw-Hill, 2015.
[3] Rodger E.Ziemer, Principles of Communications”, 7th Edition, John Wiley & Sons, 2014.
[4] Wayne Tomasi,” Advanced Electronic Communications Systems’, 6th Edition, Pearson Education, 2013.
[5] Dhanshetti Sanjay, “Communication System’, Dhanshetti, 2015.

BENT 4733: DIGITAL SIGNAL PROCESSING

Learning Outcomes

1. Apply digital signal processing concepts in discrete-time signals & systems, spectrum representations, random signals and multimedia applications. [PO1, WK1-4]
2. Analyze the spectrum representation, impulse response, signal flow graph using difference equations, stability determination using z-transform and digital filters design based on basic filter concepts. [PO2, WK1-4]

Synopsis

This course prepared the student to be ready to embark into the world of digital signal processing (DSP) by going through the concepts behind digital signal transformation, filter design and random signals. The topics covered are: discrete-time signals and systems, spectrum of representation of discrete-time signals, discrete Fourier transform, difference equations and discrete-time systems, z-transform and its applications, analysis and design of digital filters, random signals. At the end of the course, the students are also exposed to the use of digital signal processing techniques in audio/video, biomedical and telecommunication applications.

References

[1] K.Deergha Rao, M.N.S. Swamy, Digital Signal Processing: Theory and Practice, Springer Verlag, Singapore, 2018.
[2] Michael Parker, Digital Signal Processing 101, 2nd Edition Everything You Need to Know to Get Started, Newnes, 2017.
[3] L. Tan, J. Jiang, Digital Signal Processing: Fundamentals and Applications, 3rd Ed., Academic Press, London, 2019.
[4] A. Antoniou, Digital Filter: Analysis, Design, and Signal Processing Applications, 2nd Edition, MCGraw Hill, Ohio, 2018.
[5] C. Therrien, M. Tummala, Probability and Random Processes for Electrical and Computer Engineering, CRC Press, Boca Raton, 2018.

3.8.4 Elective Courses (E)

BENC 4463: MICROCONTROLLER TECHNOLOGY

Learning Outcomes

1. Analyze the programming required in operating a specific application system. [PO2, WK1-4]
2. Design and develop a working microcontroller-based system with peripheral device interface. [PO3, WK5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

The outcome of this course is to deliver current technology and application of microcontroller technology. The course begins with the topics on the introduction to microcontroller system, the internal architecture of the microcontroller, the programming design and development software, the design configuration and peripheral interfacing of the application system, the integration of software and hardware subsystems, and the development of system for Internet of Things applications. The subject emphasis on design synthesis on both software and hardware elements towards enabling wide-range of IoT solutions.

References

[1] Noviello C. Mastering STM32. A step-by-step guide to the most complete ARM Cortex-M platform, using a free and powerful development environment based on Eclipse and GCC. Leadpub. 2017.
[2] Agus Kurniawan “Getting Started With STM32 Nucleo Development”, Published by PE Press, 2015.
[3] Rob Toulson, Tim Wilmshurst, Fast and Effective Embedded Systems Design-Applying the ARM mbed, Jonathan Simpson, 2017.
[4] Jason D. Bakos, “Embedded System: ARM programming and Optimization”, Morgan Kaufmann Publication, 2016.

BENC 4473: DIGITAL INTEGRATED CIRCUIT DESIGN

Learning Outcomes

1. Analyze combinational and sequential logic circuits and registers in integrated circuit technology. [PO2, WK1-4]
2. Design logic circuits and registers based on digital circuit modelling. [PO3, WK5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

This course aims to introduce students to basic techniques of integrated circuit (IC) design using hardware description language (HDL) for complex digital circuits. A historical perspective on the evolution of integrated circuit technology is covered. Important issues when designing a circuit are discussed. The basics of combinational and sequential logic design using HDL and logic synthesis tools will be covered in order to help students develop technical skills to design, simulate, analyse and verify digital circuits. Students will learn about combinational and sequential logic circuits design and modelling. Students will also learn about register transfer level abstraction to create high-level representations of a circuit. Various examples from the combinational to the sequential circuit will be covered in this course. End of this course, students will gain required fundamental knowledge in IC design prospects which is crucial especially for semiconductor industry's applications.

References

[1] Brock J. LaMeres, Quick Start Guide to Verilog, Springer, 2019.
[2] Vaibbhav Taraate, Digital Logic Design Using Verilog: Coding and RTL Synthesis, Springer India, 2016.

BENC 4483: COMPUTER VISION AND PATTERN RECOGNITION

Learning Outcomes

1. Apply adequate techniques and analyze the requirement of a computer vision and/or pattern recognition system to meet the desired performance. [PO2, WK1-4]
2. Design a classification system and/or computer vision system which can solve engineering problems with certain performance requirements. [PO3, WK5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

Computer Vision mostly involves processing and analyzing images for applications such as - Object Detection, Segmentation, Vision based learning. Pattern Recognition, on the other hand, is more of a subset of Machine Learning. The projection outcome of this course is to expose the current technology and application with practical real-world complex problems and solution techniques (algorithms) in the field of computer vision and pattern recognition (CVPR). Among the covered topics are: Overview of Computer Vision and Pattern Recognition, Image Representation, Enhancement and Restoration, Features, Segmentation, Classification & Recognition, Stereo & 3D Reconstruction. CVPR has a various application in so many area including biomedical, robotic, control system and many more.

References

[1] E. R. Davies, Computer Vision: Principles, Algorithms, Applications, Learning. Academic Press, 2017.
[2] Reinhard Klette, Concise computer vision an introduction into theory and algorithms. Springer-Verlag London, 2014.
[3] Leonidas Deligiannidis, Fernando G. Tinetti, Emerging Trends in Image Processing, Computer Vision and Pattern Recognition. Elsevier 2016.
[4] Mahmoud Hassaballah, Ali Ismail Awad, Deep Learning in Computer Vision: Principles and Applications. CRC Press, 2020.

BENC 4513: EMBEDDED SOFTWARE DESIGN

Learning Outcomes

1. Describe the concept of embedded software design using the system lifecycle and human-machine interface and communication. [PO2, WK1-4]
2. Design and develop the embedded software by using the suitable toolset, based on the analysis of the user requirement and UML diagrams or other modelling languages. [PO3, WK5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

The applications of embedded systems in different environments (e.g. television, medical equipment, smart phones) differentiate the designs and developments of embedded software from desktop software, especially in terms of user requirements, operating system, real-time system and concurrent system, and software development tools. The aim of this course is not only to learning the concept of the embedded software design but is to experience hands-on practical embedded system software design and development, from modeling the user requirements with modeling languages, designing the embedded applications and to the developing the final embedded system.

References

[1] IEEE Standard Association, "IEEE Std 12207-2008 System and software engineering – Software life cycle processes", 2008.
[2] CMMI Product Team, "CMMI for Development, Version 1.2", August 2008.
[3] Robert C. Martin, James W. Newkirk, Robert S. Koss, "Agile Software Development, Principles, Patterns, and Practices", Pearson Education, 2011.
[4] P.A. Laplante, "Real-Time Systems Design and Analysis; Tools for the Practitioner, 4th Ed.", Wiley-IEEE Press, 2011.
[5] Tony Loton, "UML Software Design with Visual Studio 2010: What you need to know, and no more!", LOTONtech, 2010.
[6] Elecia White, "Making Embedded Systems: Design Patterns for Great Software", O'reilly Media, 2011.
[7] A. Silberschatz, P.B. Galvin, and G. Gagne, "Operating System Concepts, 8th Ed.", J. Wiley & Sons, 2012.
[8] Peter Marwede, "Embedded System Design, 2nd Ed.", Springer, 2010.
[9] Jean J. Labrosse, "MicroC OS II: The Real Time Kernel," Elsevier/Shroff Publishers, 2011.
[10] Rick Rogers, John Lombardo, Zigurd Mednieks & Blake Meike "Android Application Development", O'Reilly 2009.

BENE 4233: INDUSTRIAL CONTROL

Learning Outcomes

1. Analyze and interpret the function and operation of an industrial control system with suitable signal conditioning and transmission, industrial process technique, controller operation and industrial control networks. [PO2, WK1-4]
2. Design and develop signal conditioning circuit, industrial process instrument, controller operation example using Programmable Logic Controller (PLC) ladder diagram, and industrial control networks to solve industrial control problems. [PO3, WK5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

This course introduces industrial control systems which can classified into according to motion or process, open- and closed loop. The elements of industrial control, feedback control, dynamic response of a closed-loop system and Feed-forward control mechanism also will be included. The understanding of P& ID diagram is also covered, which is followed by signal conditioners and transmission of signal with various conversion methods. Isolation circuit and cabling are important to be addressed in ensuring signal integrity. Industrial process technique and instrumentation and its components such as sensors, transducers and actuators will be an important part of the course. Besides that, the controller operation based on analog and digital particularly Programmable Controller (PLC) is included. Industrial control networks is also covered at the end of the course.

References

[1] Curtis D. Johnson, “Process Control Instrumentation Technology”, Eight Edition, Pearson Education Limited, 2014.
[2] William C. Dunn, “Fundamentals of Industrial Instrumentation and Process Control”, McGraw Hill, 2018.
[3] Terry Bartelt, “Industrial Control Electronics: Devices, Systems, and Applications”, 3rd Edition, Thomson Delmar Learning, 2006.
[4] Peng Zhang, “Advanced Industrial Control Technology”, First Edition, Elsevier Inc., 2010.
[5] Dag H. Hanssen, “Programmable Logic Controllers: A Practical Approach to IEC61131-3 Using CODESYS”, John Wiley & Sons, Ltd., 2015.

BENE 4243: INDUSTRIAL AUTOMATION

Learning Outcomes

1. Analyze concepts of automation, basic robotics and its relationship in the manufacturing system. [PO2, WK1-4]
2. Design robotics manipulator according to the desired performance specifications. [PO3, W5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

This course will expose the students to the current robotic applications in the industry. The basic principles of industrial automation and robotics systems are presented with basic concepts and components. The students will also get an understanding for the design process for automation systems that relates to robotic system design. Strong emphasis will be given to students on robotic system due to its importance as the primary element to modern automation process. In addition, exposure is also given to the selection and determination of key components for an efficient automation system, via hardware and software approaches through given assignments work.

References

[1] John Stenerson. Industrial Automation and Process Control. Prentice Hall. 2003
[2] J.J. Craig, Introduction to Robotics: Mechanics and Control, 3rd Edition, Upper Saddle River, NJ, Pearson Prentice Hall, 2005.
[3] Peter Corke, “Robotics, Vision and Control”, Springer, (2013)
[4] Tadej Bajd, Matjaz Mihelji, Marko Munih (2013), Introduction to Robotics, SPRINGER.
[5] Spong, M.W., & Vidyasagar, M., (2006). Robot Modelling and Control, John Wiley.
[6] Markus Vincze & Gregory D. Hager, Robust Vision for Vision-Based Control of Motion, Spie/ IEEE Series, (2003)
[7] Machine Vision, Algorithms and Application, Carsten Steger, Markus Ulrich, Christian Wiedemann, Wiley-VCH, (2008).
[8] Craig, J. J. (1989). Introduction to Robotics, (2nd ed.), Prentice Hall.
[9] Fu, K. S., Gonzalez, R. C., & Lee, C. S. G., (1987). Robotics: Control,Vision, and Intelligence, McGraw-Hill.
[10] Fuller, J. L., (1999). Robotics: Introduction, Programming, and Projects, Prentice Hall.
[11] Spong, M.W., & Vidyasagar, M., (1989). Robot Dynamics and Control, John Wiley.
[12] Tsai, L.W., (1999). Robot analysis: The Mechanics of Serial and Parallel Manipulators, John Wiley.

BENE 4253: IC DESIGN AND PROCESS

Learning Outcomes

1. Analyze IC design technology, structure of CMOS devices, fabrication, operations, characteristics and packaging process. [PO2, WK1-4]
2. Design transistor-level logic and layout for CMOS technology. [PO3, WK5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

This course will expose the students to the current Integrated Circuit (IC) practical design in the industry with topics i.e. **Introduction to IC Design, CMOS Characteristics and Analysis, CMOS Circuits and Logic Design, IC Layout and Design and IC Fabrication and Process Technology. In detail, the areas covered for Introduction to IC Design are** History of microelectronics, IC design hierarchy and roadmap, and IC design technologies (CMOS, Bipolar & BiCMOS). For **CMOS Characteristics and Analysis, several topics are covered such as** Review of MOS transistor, concept of pn junction, IV dan CV charateristics, Non ideal IV, and DC response of CMOS inverter. Next in **CMOS Circuits and Logic Design, students are presented with** Design representations, MOS transistors & switches, and CMOS logic. This is continued with **IC Layout and Design** where design rules and considerations, CMOS inverter layout, stick diagram, Euler path, layout design and mask layout, and multi-cell layout are explained in detail. At the end of the course, they will learn about **IC Fabrication and Process Technology** with Silicon semiconductor manufacturing technology, Semiconductor device fabrication and IC fabrication process and steps, SiO_2 patterning, LOCOS/STI, Basic CMOS technology, and cross section.

References

[1] Massimo Rudan, Physics of Semiconductor Devices, 2nd Ed., Springer International Publishing, 2018.
[2] S. M. Sze, Semiconductor Devices: Physics and Technology, John Wiley & Sons Singapore Pte. Limited, 2012.
[3] B. L. Anderson, R. L. Anderson, Fundamentals of Semiconductor Devices, McGraw Hill, 2008.
[4] J. M. Rabaey, Digital Integrated Circuits: A Design Perspective, Prentice Hall, 2009.
[5] Muhammad H. Rashid, Microelectronic Circuit: Analysis and Design, Cengage Learning, 2010.
[6] Behzad Razavi, Design of Analog CMOS Integrated Circuits, Mc Graw Hill, 2010.

BENE 4343: POWER ELECTRONICS AND DRIVES

Learning Outcomes

1. Solve the calculation and application problems converters and motor drive circuits. [PO2, WK1-4]
2. Design and analyze a suitable converter to meet the operational requirements of an application. [PO3, WK5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

The outcome of this course is to deliver fundamental of power electronics and its application in electrical drives. The course begins with AC to DC conversion which includes basic rectifier with different loads; half-wave rectifiers and full-wave rectifier. Then, it continues with DC to DC conversion which includes non-isolated DC-DC topologies - Buck, Boost, Buck-boost, continuous mode and discontinuous mode operation. Students also learn DC to AC Conversion which includes basic inverter topologies-basic bridge, full bridge, and three-phase; modulation and harmonics issues for square wave, PWM. Latter, the course continues with introduction to drives principles which includes elements in electrical drives, overview of DC and AC drives, torque equations, components of load torque, torque characteristics, and four-quadrant operation. Then, students also learn speed control of DC motor which includes speed control of shunt or separately excited motor and speed control of a series motor. It continues with speed control of induction motor and braking of DC motors. Finally, students can apply the knowledge of this course in various industrial applications such as automotive system, automation system and manufacturing machinery.

References

[1] Daniel W. Hart, Power Electronics, Mcgraw Hill, 2011.
[2] Mohamed A. El-Sharkawi, Fundamentals of Electric Drives, CL-Engineering, 2nd Edition, 2019.
[3] Theodore Wildi, Electrical Machines, Drives and Power Systems, Prentice Hall, 6th Edition, 2006.

BENT 4773: TELECOMMUNICATION SYSTEM ENGINEERING

Learning Outcomes

1. Analyze broadcasting and telecommunication switching system. [PO2, WK1-4]
2. Design a satellite communication system, radar system and optical communication system. [PO3, WK5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

The outcome of this course is to deliver knowledge and understanding of various field of engineering that connected to electronic and telecommunication system . This course discusses about Radio Spectrum: Introduction to Frequency Spectrum, Allocations and International Standard, Broadcasting: TV Broadcasting and Digital Broadcasting System, (DAB and DVB), Mobile Broadcasting System, Satellite TV, Satellite System: Satellites (LEO, MEO, GEO), Ground Station, Propagation Delay, Azimuth, VSAT, Direct Broadcast and Link Budget, Radar System: Introduction, Principles and Applications, Types of Radar, Transmitter and Receiver, Scan and Detection, Distractor, PSTN/ISDN: Circuit and Packet Switching System and Technology, Frame Relay, ATM, DSL, Mobile Switching Centre, WLL, Network Architecture, Telephony Telecommunication Traffic and Optical Communication: History, Advantages, Fiber Optic Types and Classification, Optical Communication System and Transmission Characteristic, Light Propagation, Losses, Light Sources, Detector, Link Budget, Applications. This course will also expose the students to a technical overview of telecommunication networks from a system viewpoint.

References

[1] Song, Jian, Zhixing Yang, and Jun Wang, eds. Digital Terrestrial Television Broadcasting: Technology and System. John Wiley & Sons, 2015.
[2] Ippolito, Louis J. Satellite communications systems engineering. Wiley, 2017.
[3] Singal, Tarsem Lal. Optical Fiber Communications: Principles and Applications. Cambridge University Press, 2016.
[4] Viswanathan, Thiagarajan, and Manav Bhatnagar. Telecommunication switching systems and networks. PHI Learning Pvt. Ltd., 2015.
[5] Sanjay Sharma, Communication Engineering, S.K. Kataria & Sons, New Delhi, 2012.
[6] Hamesh Miekle, Modern Radar System, 2nd Edition, Artech House Inc., 2008.

BENT 4793: MICROWAVE ENGINEERING

Learning Outcomes

1. Analyze the microwave transmission line problems and S-parameters of RF/microwave front-end passive and active devices. [PO2, WK1-4]
2. Design the passive and active RF/microwave components to fulfil the desired specifications. [PO3, WK5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

This course will introduce students to the broad area of RF & microwave engineering. This course will cover topics introduction to RF and Microwave Engineering, waveguides transmission lines, planar transmission lines, impedance matching and tuning, microwave network analysis, microwave filter, microwave amplifier, power divider and coupler. It covers the basic concepts and skills typically expected of a well-qualified entry-level engineer in the RF & microwave field.

References

[1] David M. Pozar, “Microwave Engineering”, 5th Edition, John Wiley & Sons, 2015.
[2] Ahmad Shahid Khan “Microwave Engineering: Concept and Fundamentals” CRC Press, 2017.
[3] M Sudhakar & Vandana Khare, “Microwave Engineering”, S. Chand Publishing, 2016.
[4] Frank Gustrau, “Microwave Engineering: Fundamentals of Wireless Communications”, John Wiley & Sons, 2012.
[5] Raghvendra Patidar, “Microwave Engineering-I”, Neelkanth Publishers Ltd., 2013.

BENT 4823: DIGITAL COMMUNICATION SYSTEM

Learning Outcomes

1. Analyze various baseband and passband digital signalling techniques in bandlimited AWGN channel. [PO2, WK1-4]
2. Design a digital communication system by taking into considerations the noise performance and channel bandwidth requirement. [PO3, WK5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

The outcome of this course is to deliver knowledge and understanding of the current and future digital communication system. The course begins with topic on Pulse Signaling and Baseband Digital Signaling in which the introduction to digital communication systems, apart from the definitions of information, channel capacity and entropy will be described. Various types of pulse modulation techniques such as Pulse amplitude modulation, pulse width modulation, pulse position modulation, are also covered. The basics of digital implementation are then covered in Sampling theorem, sample-and-hold, time-division multiplexing, pulse code modulation (PCM), quantization noise, companding, Line coding, intersymbol interference, Nyquist theorem, differential PCM, delta modulation, overload noise, adaptive delta modulation and also time division multiplexing. Next, the topic on Principles of Passband Signaling and Digital Modulation Techniques will be discussed. This includes Passband Transmission model, ASK, FSK, PSK, DPSK, M-ary modulation, continuous phase FSK, MSK together with coherent and non-coherent demodulation. Then, the Performance of Digital Communication will be measured based on the studies of the statistical properties of noise especially Gaussian noise. This continues with the detection of binary signals in Gaussian noise and the usage of error function in determining the probability of error calculation. One of the most important topics in digital communication is Synchronisation. Various types of synchronisation will be covered such as Carrier Phase Estimation: Maximum-Likelihood, Phase-Locked Loop, and Symbol Timing Estimation: Maximum-Likelihood and Non-Decision Directed Estimation. After that, the topic on Multiplexing and Multiple Access such as FDMA, TDMA, CDMA and SDMA will be described together with their Performance Comparison, Multiple Access System and Architecture. Lastly, the course will explain the chapter on Spread Spectrum. The details to be covered are Pseudonoise Sequences, Direct-Sequence Spread Spectrum Systems, Frequency Hopping Systems, Synchronization, and Jamming Considerations. This course will also expose the students to the current implementation of both wired and wireless digital communication by telecommunication operators such as digital data transmission etc.

References

[1] Grami, Ali. Introduction to Digital Communications. Academic Press, 2015.
[2] Bernard Sklar and Fred Harris, Digital Communications: Fundamentals and Applications, 3rd Edition, Prentice Hall, 2019.
[3] Ling, Fuyun. Synchronization in digital communication systems. Cambridge University Press, 2017.
[4] L.W. Couch II, Digital and Analog Communication Systems, 8th Edition, Prentice Hall, 2013.
[5] Ian Glover and Peter M. Grant, Digital Communications, 3rd Edition, Prentice Hall, 2010.

BENT 4843: OPTOELECTRONICS

Learning Outcomes

1. Analyze optoelectronics component specification and characteristics. [PO2, WK1-4]
2. Design optoelectronics components for communication applications. [PO3, WK5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

The outcome of this course is to provide thorough knowledge, understanding and application of basic laws and phenomena in the area of optoelectronics. This course will review the properties of light and discuss the light propagation in optical fibre including Acceptance Angle, Refractive Index, Numerical Aperture, Skew Rays, Total Internal Refrection, Phase and Group velocity, Snell's Law, TE and TM Modes, Single and Multimode Waveguide, Step Index Fibre and Graded Index Fiber. In addition, the transmission characteristics of optical fibre will be investigated in terms of signal attenuation in optical fiber, absorption, scattering losses, radiative losses, signal distortion, modal dispersion and intramodal dispersion. Both optical sources and detectors will be also introduced. Apart from that, fibre optic components and applications will be characterized and analyzed. Students will be exposed to optoelectronic-based project assignment. This course will also equip the students with the knowledge of design criteria for various types of optoelectronic devices, helping them to meet the demand of growing semiconductor optoelectronic industry.

References

[1] Abdul Al-Azzawi, "Photonics: Principles and Practices", 2017
[2] John P. Dakin,Robert G. W. Brown, "Handbook of Optoelectronics, 2nd Edition: Applied Optical Electronics", vol.3, 2017.
[3] Alan Rogers, "Essentials of Photonics", 2nd Edition, 2017.
[4] Mohammed Alhaider, "Optical Fiber Communications", Notionpress, 2017.

BENT 4783: WIRELESS COMMUNICATION SYSTEMS

Learning Outcomes

1. Analyze and classify the various standard and model used in wireless communication system. [PO2, WK1-4]
2. Develop a model of wireless communication system and analyze their operation. [PO3, WK5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

The outcome of this course is to deliver knowledge and understanding of the current and future wireless communication system. The course begins with the Introduction to Wireless Communication System, its definition, trend and evolution. Various types of mobile radio communications and other types of wireless systems such as cordless telephone systems, paging systems and cellular telephone systems will be described. Next, the cellular concept especially for terrestrial communications will be covered in detail. Some of the subtopics to be covered are frequency reuse, interference including co-channel and adjacent channel interference, system capacity, channel planning, trunking and Grade of Service, handoff mechanism, and improving coverage & capacity through cell splitting, sectoring, and repeaters. The aspects on propagation are then covered by the topic on Mobile Radio Propagation Models which encompasses Free Space Propagation Model, Ground Reflection Model, basic propagations mechanism – reflection, diffraction – Fresnel Zone, scattering, multipath propagation, link budget, outdoor propagation models – Okumura Model, small scale fading – slow and fast fading, Doppler frequency shift, time delay spread, and propagation path loss. Apart from that, some important multiple access techniques will also be discussed such as Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA) and Orthogonal Frequency-Division Multiple Access (OFDMA). The explanations on various existing and future wireless systems and standards will be done at the last part of the course which covers the evolution of generation standards and applications from 1G to 5G, Global System for Mobile (GSM) - services, features, radio subsystem, channel type, system architecture of generation standards and 3GPP. Students will also be exposed to the design of cellular system and link budget for the assignment. This course will also expose the students to the current implementation of wireless communication by telecommunication operators such as cell planning, wireless services etc.

References

[1] Andreas F. Molisch, Wireless Communications, 2nd Edition, Wiley, 2012.
[2] Jorge Olenewa, Guide to Wireless Communications,4th Edition, Cengage Learning, 2016.
[3] Arumitha Biswas & Mainak Chowdhury, Wireless Communications: Theory and Applications, Cambridge University Press, 2017.
[4] Aditya K. Jagannatham, Principles of Modern Wireless Communication Systems: Theory and Practice, McGraw Hill Education (India) Pvt. Ltd., 2016.
[5] K. Daniel Wong, Fundamentals of Wireless Communication Engineering Technologies, John Wiley & Sons, Inc., 2012.
[6] Simon S. Haykin, Modern Wireless Communications, Pearson,2011.

BENT 4813: DATA COMMUNICATION AND NETWORKING

Learning Outcomes

1. Analyze internetworking; open system interconnection; network routing and topology; network protocols; private and public data network; LAN, MAN and WAN systems. [PO2, WK1-4]
2. Design network routing and topology; and network protocols for data communication and networking. [PO3, W5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

This course will discuss about internetworking which covering introduction to protocol, architecture, and OSI model, packet based data communication networks, open system interconnection, application oriented protocols, session layers, presentation layers, and application layers, network routing and topology: routing, transport, TCP, UDP, topology design. network protocols, TCP/IP, IPv4, IP multicasting, ethernet, token ring, intranet, IPv6.

private and public data network, introduction, characteristics. LAN, MAN, WAN systems: principles, architecture & application. These issues will be examined and applied on current situations based on the existing technology, manuals, guidelines and issues.

References

[1] W. Stallings, Data & Computer Communication 10th Edition, Pearson, 2014
[2] B. A. Forouzan, Data Communications and Networking 5th Edition, Science Engineering & Math, 2012
[3] James F. Kurose, Keith W. Ross, Computer Networking: A Top-down Approach, Pearson, 2013
[4] Gerry Howser, Computer Networks and the Internet: A Hands-On Approach, Springer Nature, 2019.

BENT 4833: ANTENNA AND WAVE PROPAGATION

Learning Outcomes

1. Analyze the principles of antenna, types of antennas, matching concept and types of wave propagations. [PO2, WK1-4]
2. Design and evaluate the matching network and antenna structure to satisfy the desired requirements. [PO3, W5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

This course introduces the basic concept on antenna and propagation fundamentals and shows the application in practical examples. The course covers the basic antenna parameters and antenna analysis using maxwell equation,the design of matching and feeding networks, array antenna, microwave antenna and broadband antenna. Design principles to design various types of antenna will be taught throughout the course. The basic concept of antenna measurements will also be discussed. Finally, students will be exposed to the techniques for estimating the propagation performance of a communication channel in the final topics of this course.

References

[1] C.A. Balanis:"Antenna Theory, Analysis & Design", 4th Edition, John Wiley 2016.
[2] V. J. Fusco, "Foundation of Antenna Theory & Techniques", Pearson Prentice Hall, 2005.
[3] S.R. Saunders, A.A Zavala, "Antennas and Propagation for Wireless Communication Systems", John Wiley, 2007.
[4] T. H. Rappaport, "Wireless Communications: Principle and Practice", Prentice Hall, 2007.
[5] Vladimir I. Koshelev, "Ultrawideband Short-Pulse Radio Systems", Artech House, 2017.

BENT 4853: RADIO NAVIGATION SYSTEM

Learning Outcomes

1. Analyze the structures, characteristics, limitations and usage of various navigation systems. [PO2, WK1-4]
2. Develop errors model in the systems presented by means of reducing the effects of errors when systems are used in practice. [PO3, WK5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

This course will discuss on the Navigation Fundamentals included Geometry of Earth, The Geoid (Mean Sea Level), Ellipsoid, World Ellipsoid (WGS 84), Derivation of Generalized Spherical Coordinates, Dead Reckoning, Best Estimate of Position. Air Navigation: navigation organizational framework, units and converstions, north, lines of position, position fix, requirements for an air navigation system. Relative Navigation Systems: NDB/ADF, VOR, DVOR, TACAN, DME. Absolute Navigation Systems: LORAN-C, INS, Multi-DME. GPS: Principle, Satellite Position Determination, Signal Format, Autocorrelation and Spectral Density, PN Code Generation, GPS Codes, Receivers, GPS Errors.

References

[1] Alexander V. Nebylov Joseph Watson, Aerospace Navigation Systems, John Wiley & Sons, Ltd., 2016.
[2] Sauta O.I., A.Y. Shatrarkov, Shatrakov Y.G.Zavalishin O.I., Principles of Radio Navigation for Ground and Ship-Based Aircrafts, Edition 1, Springer Singapore, 2019.
[3] Peter J.G. Teunissen, Oliver Montenbruck, Springer Handbook of Global Navigation Satellite Systems, Springer International Publishing, 2017.

BMFP 4323: LEAN SIX SIGMA

Learning Outcomes

1. Describe principle of Lean Six Sigma.
2. Apply appropriate tools and techniques of Lean Six Sigma for complex industrial problems.
3. Evaluate the results for each stage in Define-Measure-Analyse-Improve-Control (DMAIC).
4. Construct improvement strategy through the combination of Lean and Six Sigma concept.

Synopsis

Lean management course provides a fundamental thinking of the principle of eliminating production wastes. Understanding the lean thinking is essential in order to success in implementing the lean principles. In the meantime, six sigma approach emphasizes the important of controlling variation in process. As a result, the six sigma approach able to control defects at only 3 pieces per million production quantity. Thus, combination of lean tools & techniques and six sigma approach would be able to enhance productivity and quality.

References

[1] E-book: Marc S., Dara S., Ray Q.C. and Vicky C.G., Topics in Lean Supply Chain Management, Chapter 1: lean, 2nd Edition, world scientific, 2018.
[2] E-book: William M.F., Lean Manufacturing: Tools, Techniques And How To Use Them, CRC Press, 2001.
[3] George, L.M., Lean Six Sigma : Combining Six Sigma Quality With Lean Production Speed, McGraw hill, 2002.

BEKP 4853: RENEWABLE ENERGY

Learning Outcomes

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

Synopsis

The subject 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 subject 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. Last but not least, 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 Simöes, "Integration of Alternative Sources of Energy", John Wiley & Sons, Jan 17, 2006.
[4] S. Shaari, A. Maliki, S. Irwan, N. Zaini, "SEDA Grid-Connected Photovoltaic Systems Design Course", 2014.
[5] MS 1837: 2010 'Installation of Grid-Connected Photovoltaic (PV) System (First Revision).

ACADEMIC HANDBOOK SESSION 2022/2023

FOR BACHELOR DEGREE AND DIPLOMA PROGRAMMES

4.0

BACHELOR OF COMPUTER ENGINEERING WITH HONOURS

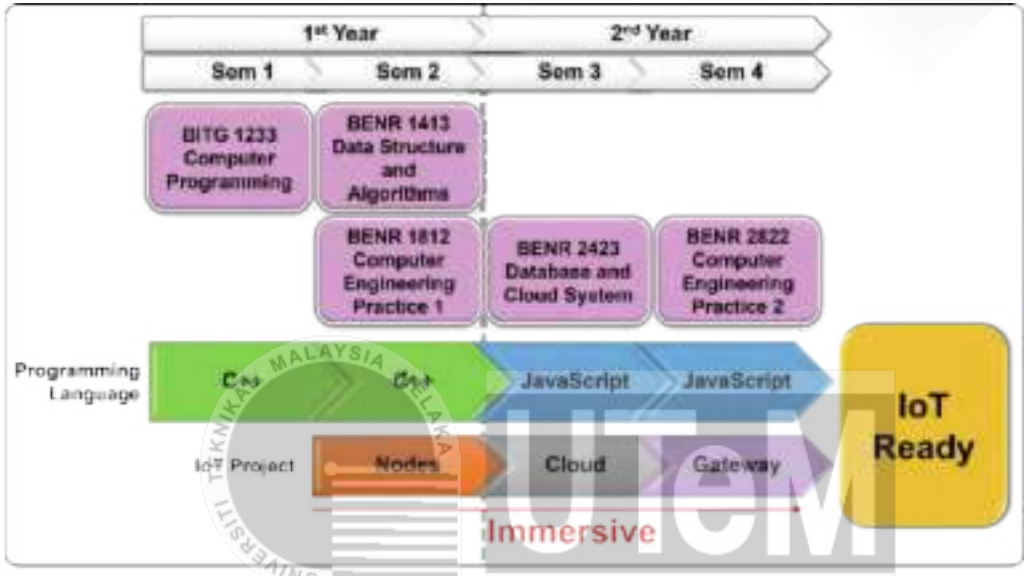
4.1 Introduction

The Bachelor of Computer Engineering with Honours (BENR) offered by the faculty is a broad-based course which combines engineering science, mathematics, computer engineering fundamentals, and develops in students the mastery of computer engineering principles and applications to solve complex computer engineering problems.

4.2 Curriculum

In the first two years of the curriculum is to lay a strong foundation for the student on area of mathematic, electrical and electronics, and computer programming. To further strengthen the competency of the students, two engineering practices (Computer Engineering Practice 1 and Computer Engineering Practice 2) is offered at semester 2 and semester 4. The engineering practice is arranged in such a way as the room for further improving the student programming skills based on the feedback on their previous course as the feedforward CQI.

Bachelor of Computer Engineering programme integrates an Immersive Learning Project where the 3 main elements (Nodes, Cloud and Gateway) of Internet of Things (IoT) is carried out in across 3 semesters, respectively. This immersive approach in first two years of the programme will be the platform for the students in pursuing more specialized topics in third and fourth year including their Integrated Design Project and Bachelor Degree Project.



In the final year, the students have the opportunity to choose which areas of interest they want to focus in. For those who prefer smart embedded system, they can choose electives listed under that particular specialization. Likewise for the other specializations of system on chip and computation intelligence, the students are given the opportunity to have their preferences. The students are also required to carry out a Bachelor Degree project that is related to field of specialization. The purpose of the project is to provide the students to display their ability to apply engineering knowledge to solve complex engineering problems utilizing components, design systems and processes, undertaking problem identifications, formulation and analysis of complex problems encountered.

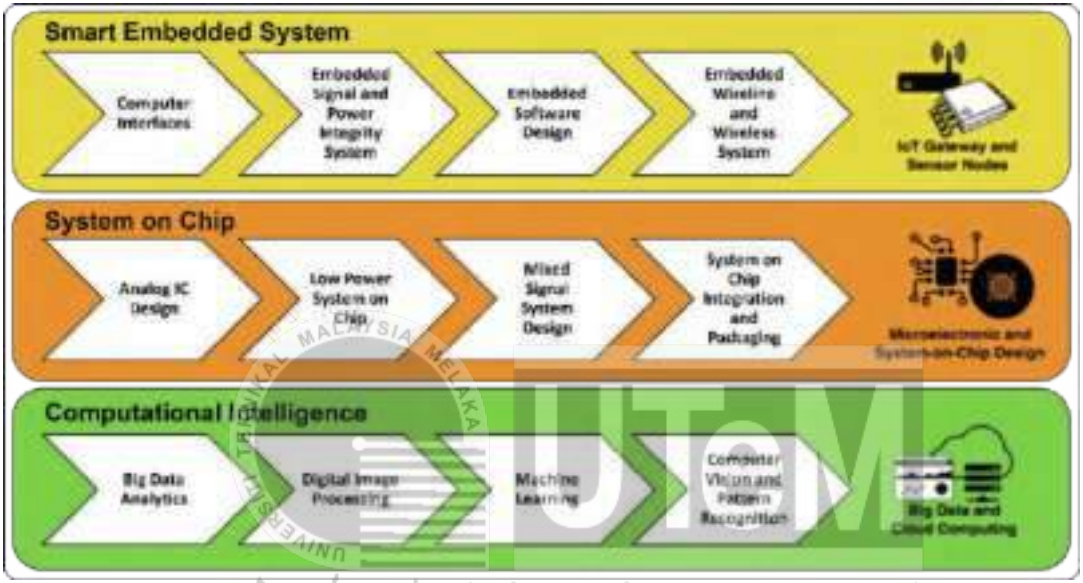
A total of 135 credits are required for the Bachelor of Computer Engineering to be awarded upon successfully completed the programme.

A Computer Engineering degree graduate from FKEKK, UTeM has an immense range of careers to choose from. The multi-faceted approach in conducting the programme provides the graduates the knowledge, confidence and attributes to enter the workforce with analytical and communication skills, making a significant contribution to the development of the engineering field and to the nation.

4.3 Career Path

Three career paths are identified in this programme as the initiative to support the pillars of the Industrial Revolution 4.0, in which the students will be facing by the time of graduation in 5 years time. The carreer paths are Embedded System, System on Chip and Computational Intelligence, originated from the TalentCorp Industry-Academia Collaboration involving major E&E industry such as Motorola Solution, NI, Altera and Siltera. Computer hardware engineers are involved with research, design, develop, and test computer systems and components such as processors, circuit boards, memory devices, networks, and routers. They manage and design the computer hardware and software systems of a company. These skilled individuals may specialize in hardware or software and are often referred to as programmers. Their duties include developing software systems, updating hardware, and designing new equipment.

Other example is Artificial Intelligence engineer that builds AI models using machine learning algorithms and deep learning neural networks to draw business insights, which can be used to make business decisions that affect the entire organization. They use different tools and techniques so they can process data, as well as develop and maintain AI systems.

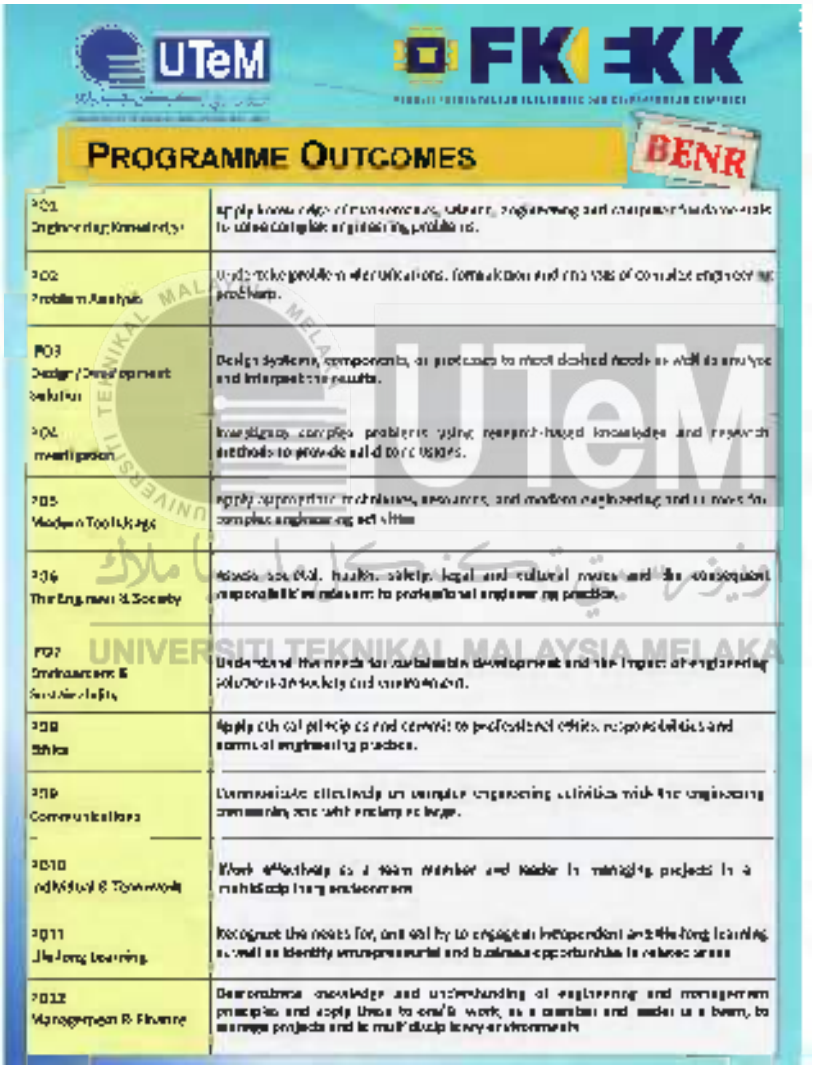


Graduates who have special interest in the academic fields can become academicians such as lecturers and researchers in institutions of higher education, the universities and research centres and agencies. Upon being qualified as professional engineers, they can practice locally as well as in countries who are members of the Washington Accord.

Graduates who choose not to become employee can be self-employed and opt to be involved in business and become successful entrepreneurs in their areas of expertise.

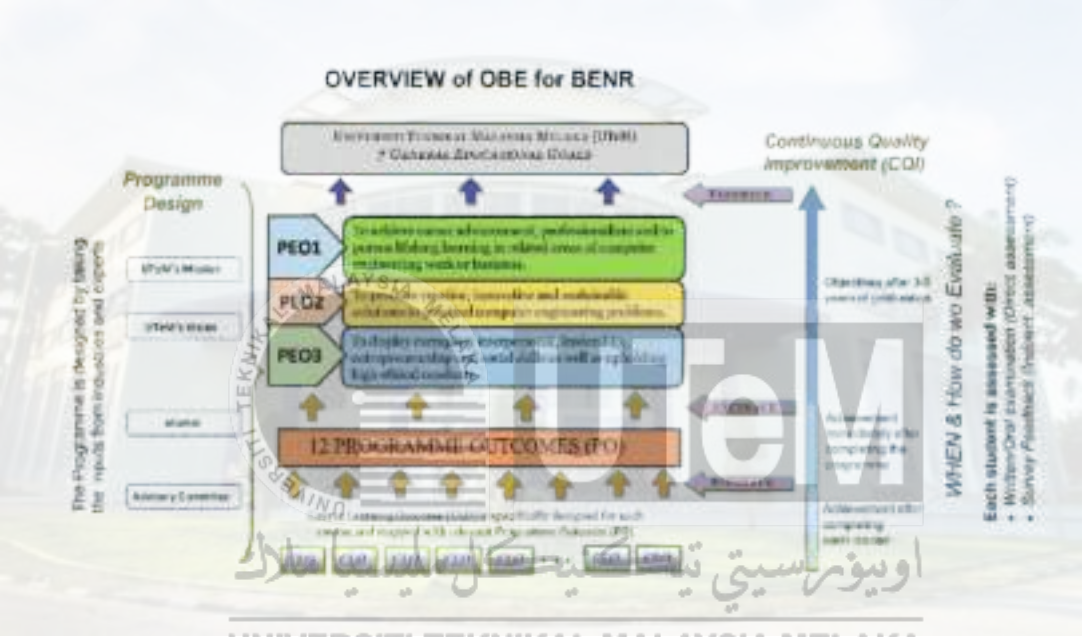
4.4 Programme Objectives

4.5 Programme Outcomes



4.5.1 Programme Outcome

4.6 Outcome Based Education (OBE)



4.7 Curriculum Structure

Semester 1

CODE	COURSE	CREDIT	CATEGORY
BLHW 1762	Philosophy and Current Issues	2	W
BKKX XXX1	Co-Curriculum I	1	W
BENR 1313	Engineering Mathematics	3	P
BITG 1233	Computer Programming	3	P
BENR 1113	Fundamental Electrical and Electronics	3	K
BENR 1123	Logic Circuit	3	K
	TOTAL	15	

Semester 2

CODE	COURSE	CREDIT	CATEGORY
BLLW 1442	English for Academic Purposes	2	W
BKKX XXX1	Co-Curriculum II	1	W
BLHW 2772	Appreciation of Ethics and Civilization	2	W
BENR 1323	Differential Equations	3	P
BENC 2413	Digital System	3	K
BENR 1413	Data Structure and Algorithm	3	K
BENR 1812	Computer Engineering Practice 1	2	K
BLLW 1XX2	Language Electives	2	E
	TOTAL	18	

Semester 3

CODE	COURSE	CREDIT	CATEGORY
BLLW 2152	Academic Writing	2	W
BENR 2333	Linear Algebra and Discrete Mathematics	3	P
BENC 3173	Computer Network and System	3	K
BENR 2143	Analog Electronics and Devices	3	K
BENT 3753	Communication Principles	3	K
BENC 2423	Microprocessor Technology	3	K
BENR 2211	Computer Engineering Lab 1	1	K
	TOTAL	18	

Semester 4

CODE	COURSE	CREDIT	CATEGORY
BENG 2143	Engineering Statictics	3	P
BENR 2023	Computer Organization and Architecture	3	K
BENR 2423	Database and Cloud System	3	K
BENR 3613	VLSI Design	3	K
BENT 3733	Signals and System	3	K
BENR 2221	Computer Engineering Lab 2	1	K
BENR 2822	Computer Engineering Practice 2	2	K
	TOTAL	18	

Semester 5

CODE	COURSE	CREDIT	CATEGORY
BLLW 3462	English for Professional Interaction	2	W
BENR 3133	Electromagnetic	3	K
BENR 3433	Information Security	3	K
BENR 3523	Embedded System Design	3	K
BENR 4713	Artificial Intelligence	3	K
BENR 3231	Computer Engineering Lab 3	1	K
BLHx xxx2	General Electives	2	E
	TOTAL	**17**	

Semester 6

CODE	COURSE	CREDIT	CATEGORY
BENG 4322	Engineer and Society	2	P
BENU 3863	Integrated Design Project	3	P
BENR 3533	Operating System	3	K
BENT 4733	Digital Signal Processsing	3	K
BENC 4473	Digital IC Design	3	K
BENR 3241	Computer Engineering Lab 4	1	K
BENR 3xx3	Elective 1	3	E
	TOTAL	**18**	

Special Semester

CODE	COURSE	CREDIT	CATEGORY
BENU 3005	Industrial Training	5	P
	TOTAL	**5**	

Semester 7

CODE	COURSE	CREDIT	CATEGORY
BTMW 4012	Technology Entrepreneurship	2	W
BENU 4972	Bachelor Degree Project 1	2	P
BENE 3223	Control Principles and Systems	3	K
BENR 4xx3	Elective 2	3	E
BENR 4xx3	Elective 3	3	E
	TOTAL	**13**	

Semester 8

CODE	COURSE	CREDIT	CATEGORY
BENU 4984	Bachelor Degree Project 2	4	P
BMFG 4623	Engineering Economy and Management	3	P
BENR 4153	High Performance Computing	3	K
BENR 4xx3	Elective 4	3	E
	TOTAL	**13**	
	GRAND TOTAL	**135**	

Note:

Category: W: University Compulsory Courses, P: Common Core Courses, K: Program Core Courses, E: Elective Courses

4.7.1 List for Elective Courses

OPTION FOR ENGINEERING ELECTIVE COURSES

	Programme Specialization			
	Elective Courses	**Smart Embedded System**	**System On Chip**	**Computational Intelligence**
Programme Specialization Electives	Elective 1	BENR 3553 Computer Interfaces	BENR 3623 Analog IC Design	BENR 3723 Big Data Analytics
	Elective 2	BENR 4563 Embedded Signal and Power Integrity System	BENR 4643 Low Power System on Chip	BENR 4733 Digital Image Processing
	Elective 3	BENR 4573 Embedded Software Design	BENR 4653 Mixed Signal System Design	BENR 4743 Machine Learning
	Elective 4	BENR 4583 Embedded Wireline and Wireless System	BENR 4633 System on Chip Integration and Packaging	BENR 4753 Computer Vision and Pattern Recognition

OPTION FOR LANGUAGE AND GENERAL ELECTIVE COURSES

No.	Code	Courses
		Language Elective
1.	BLLW 1172	Bahasa Melayu Komunikasi 1/ Malay 1*
2.	BLLW 1212	Bahasa Arab 1/ Arabic 1
3.	BLLW 1222	Bahasa Mandarin 1/ Mandarin 1
4.	BLLW 1232	Bahasa Jepun 1/ Japanese 1
5.	BLLW 1242	Bahasa Korea 1/ Korean Language
6.	BLLW 1252	Bahasa Jerman 1/ German 1

**Compulsory for International Student*

No.	Code	Courses
		General Elective
1.	BLHC 4031	Pemikiran Kritis dan Kreatif/ Critical and Creative Thinking
2.	BLHW 4022	Kemahiran Perundingan/ Negotiation Skills
3.	BLHW 1032	Psikologi Industri dan Organisasi/ Industrial and Organizational Psychology
4.	BLHC 4012	Komunikasi Keorganisasian/ Organizational Communication
5.	BLHW 1722	Falsafah Sains dan Teknologi/ Philosophy of Science and Technology

4.8 Syllabus Summary for the Bachelor of Computer Engineering Programme

4.8.1 University Compulsory Courses (W)

UNIVERSITY COMPULSORY COURSES (W)

BKKX xxx1	Co-Curriculum 1 and 2
BLHL 1xx2	Language Electives
BLLW 1442	English for Academic Purposes
BIPW 1132	Philosophy and Current Issues
BLLW 2152	Academic Writing
BLHW 2752	Malaysian Culture*
BLHW 2772	Appreciation of Ethics and Civilization
BLLW 3462	English For Professional Interaction
BLHX xxx2	General Electives
BTMW 4012	Technology Entrepreneurship

Note:

* University compulsory courses to be taken by international students

PLEASE REFER TO **CENTRE FOR LANGUAGE LEARNING (CeLL)** AND **INSTITUTE OF TECHNOLOGY MANAGEMENT AND ENTREPRENEURSHIP (IPTK)** HANDBOOK FOR THE SYNOPSIS AND THE DETAIL SYLLABUS FOR ABOVE COURSES.

4.8.2 Common Core Courses (P)

BENU 3005: INDUSTRIAL TRAINING

Learning Outcomes

1. Apply appropriate techniques and technical knowledge which relevant for student field of study. [PO1, WK1-4]
2. Demonstrate the ability to adapt with working environment and practice working efficiently and ethically. [PO8, WK7]
3. Display soft skill especially communication skill at all level. [PO9]
4. Work effectively as an individual, team members and as a leader as well. [PO10]
5. Acquire new knowledge, life-long learning and aware to new technology. [PO11]

Synopsis

All degree students will be placed in appropriate local industries or government corporations for 10 weeks normally in the special semester of their third year of study. Student will be exposed to real life working environment relevant to their field of study.

Reference

[1] Industrial Training Guide Book, UTeM.
[2] FKEKK Handbook, UTeM.
[3] EAC Guideline.

BENG 2143: ENGINEERING STATISTICS

Learning Outcomes

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. [PO1, WK1-4]
2. Analyze engineering data using descriptive statistics. [PO2, WK1-4]
3. Deduce statistical inference for engineering problems by using the techniques of estimation, hypothesis testing and regression. [PO2, WK1-4]

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, one-way 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 statistical knowledge with a software application to ensure that they are well-prepared for 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, 9th Edition, John Wiley & Sons, 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, Brooks Cole, 2015.

BENG 4322: ENGINEER AND SOCIETY

Learning Outcomes

1. Apply ethical principles and commitment, to professional ethics, responsibilities and norms of engineering practice. [PO8, WK7]
2. Apply reasoning informed by contextual knowledge to assess health, safety and legal issues and its subsequent responsibilities, relevant to professional practice. [PO6, WK7]
3. Understand the needs for sustainable development and the impact of engineering solutions on society and environment. [PO7, WK7]

Synopsis

This course will discuss issues that are related to the engineering profession. It will cover topics such as personal ethics, professional ethics, code of ethics, ethics dealing with human relations, professionalism, BEM, IEM, regulations on professional conduct, route to professional status, engineers as an employee or employer, decision making, ethical considerations, competence of practicing engineering, safety issues, and related laws, health issues in the profession, safety and health management systems, accountability, general liability, engineerâ€™s legal liability specified in contract law, the environment, sustainability, etc. These issues will be examined and applied on daily contextual situations based on the existing laws, manuals, guidelines and case studies.

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.
[5] Jose A. Cruz-Cruz and William Frey, Engineering Ethics Modules for Ethics Across The Curriculum, OpenStax-CNX, 2014.

BENR 1313: ENGINEERING MATHEMATICS

Learning Outcomes

1. Use the techniques of calculus, multiple integrals, vector-valued functions and vector calculus to solve a mathematical problems. [PO1, WK2]
2. Solve the engineering problems by using an appropriate method in calculus, multiple integrals, vector-valued functions and vector calculus. [PO2, WK2]
3. Perform the given tasks that pertaining to the engineering problems by using the knowledge of calculus and advanced calculus. [PO2, WK2]

Synopsis

This course will discuss about the advanced calculus for engineering students. It will cover the topics as follows: Single variable functions: limits and continuous function, techniques of differentiation and integration. Multivariables functions: limits and continuous function, partial derivatives, the chain rule. Multiple integrals: double integral over rectangle and non-rectangular regions, polar coordinates, triple integral, triple integral in cylindrical coordinates. Vector-valued functions: motion in space, unit tangent vector, unit norml vector, binormal vector, curvature, torsion. Vector Calculus: vector fields, line integral, Green's theorem, curl and divergence, parametric surface and its area, surface integral, Stoke's theorem and divergence theorem. The mathematical techniques discussed in this course will be used in other engineering related subjects.

References

[1] Glyn James, 2015, Modern engineering mathematics, 5th-edition, Pearson Education Ltd.
[2] Croft, A., Davison, R., Hargreaves, M. and Flint, J., 2017. Engineering Mathematics. 5th-edition, Pearson UK.
[3] Stewart, J., 2016. Calculus. 8th-edition. Cengage Learning, USA.

BENR 1323: DIFFERENTIAL EQUATIONS

Learning Outcomes

1. Describe the fundamental concepts of first and second order linear differential equations Laplace transform, Fourier series, Fourier transform and partial differential equations. [PO1, WK2]
2. Solve the mathematical problems that involve first and second order linear differential equations, Laplace transform, Fourier series, Fourier transform and partial differential equations. [PO2, WK2]
3. Apply the knowledge of differential equations to deal with the engineering problems. [PO2, WK2]

Synopsis

This course will discuss about the differential equations for engineering students. It will cover the topics as follows: first and second order linear differential equations, Laplace transform, Fourier series, Fourier transform and partial differential equations.The mathematical techniques discussed in this course will be used in other engineering related subjects.

References

[1] Muzalna M. J., Irmawani J., Rahifa R., Nurilyana A. A. (2018). Module 2: Differential Equations, Penerbit UTeM.
[2] Edwards C. H., Penny D.E. & Calvis D. (2016). Differential Equations and Boundary Value Problems, Fifth Edition. Pearson Education Inc.
[3] Zill, D. G. (2017). Differential Equations with Boundary-Value Problems. Cengage Learning Inc.

BENR 2333: LINEAR ALGEBRA AND DISCRETE MATHEMATICS

Learning Outcomes

1. Describe the fundamental concepts of linear algebra and discrete mathematics topics. [PO1, WK2]
2. Solve the mathematical problems that involve matrices, vector spaces, logic, graph and trees. [PO1, WK2]
3. Apply the knowledge of linear algebra and discrete mathematics to deal with the engineering problems. [PO2, WK2]

Synopsis

This course covers an introduction to linear algebra and discrete mathematics: matrices and system of linear equations, eigenvalues and eigenvectors, vector spaces, solving the problems of linear algebra by using software, logic, graphs and trees.

References

[1] Axler, S (2015), "Linear Algebra Done Right 3rd Ed. 2015 Edition", Springer.
[2] Anton, H. (2013), "Elementary Linear Algebra", 11th Ed.", Wiley.
[3] Kenneth H. Rosen (2011), "Discrete Mathematics and Its Applications", 7th Ed.", McGraw-Hill.
[4] Susanna, S. E. (2010), "Discrete Mathematics with Applications", 4th Ed.", Cengage Learning.

BENU 3863: INTEGRATED DESIGN PROJECT

Learning Outcomes

1. Design solutions by synthesizing electronic engineering knowledge that will solve complex electronic engineering problem in accordance to relevant standards. [PO3, WK5]
2. Utilize modern engineering and IT tools in facilitating solution to complex electronic engineering problems with an understanding of the limitations. [PO5, WK6]
3. Evaluate the impact of the design product, component or processes in term of safety, environmental and sustainability factors. [PO7, WK7]
4. Demonstrate effective teamwork skills in completing the IDP. [PO10]
5. Apply project management and financial knowledge effectively in completing the IDP. [PO12]

Synopsis

This course covers a complete design cycle, from start to finish, that encompasses problem identification and definition, system design settings, specifications and implementation, system testing and verification of project designed, proper documentation and deployment. Students work in group of four or five and at the end of the course the group is expect to complete a system design that provides solutions to an engineering problem identified at the beginning and worked upon during the course of studies. Students work under the supervision of assigned supervisors and are assessed on a regular basis and at specific milestones as indicated. The project must be endorsed by the supervisors taking into account the complexity of the problem and solutions. The students are expected to achieve the learning outcomes by providing solutions to an engineering problem, taking into account good engineering practice such as working as a team and meeting specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. At the end of the course, each group is expected to submit a technical report, provide an oral presentation as well as conduct a system demonstration on the project developed.

References

[1] R. G. Kaduskar, V. B. Baru, Electronic Product Design, Second Edition, Wiley India, 2013.
[2] John X. Wang, Green Electronics Manufacturing: Creating Environmental Sensible Products, CRC Press, 2012.
[3] Bogdan M. Wilamowski and J. David Irwin, The industrial Electronics Handbook, 2nd Edition, CRC Press, 2011.
[4] Charles Lessard and Joseph Lessard, Project Management for Engineering Design, Morgon & Claypool Pub, 2007.
[5] Charles B. Fleddermann, Engineering Ethics, 4th Edition, Prentice Hall, 2011.

BENU 4972: BACHELOR DEGREE PROJECT 1

Learning Outcomes

1. Apply engineering knowledge to determine the objectives for the project, which relates to the work done before that includes basic theory as well as the approach to be used. [PO1, WK1-4]
2. Apply ethical principles and commit to professional conduct during project execution & presentation. [PO8, WK7]
3. Communicate effectively through formal engineering report presentation both orally and in writing. [PO9]
4. Able to work independently towards completion with minimal supervision during the entire project. [PO10]
5. Engage in independent search and synthesis of technical information from reliable sources. [PO11]
6. Ability to plan and manage project activities and estimate cost. [PO12]

Synopsis

This module is the preliminary part of the Bachelor Degree final year's project. Students should, but not only limiting to, produce a project proposal. Students should also commence their preliminary research and development work before the end of the semester. The preliminary work can be for instance simulation of circuit design, modelling and development of simple electronic circuit to test the concept. The Final Year Projects are not limited to laboratory based or faculty project but the students are also encouraged to consider industrial case studies or solving industrial problems which the students have faced during their internship across different industries related to electronic engineering.

BENU 4984: BACHELOR DEGREE PROJECT 2

Learning Outcomes

1. Analyze the problem statement of the project & identify a possible solution. [PO2, WK1-4]
2. Design and develop solutions to complex engineering problem to meet desired needs. [PO3, WK5]
3. Investigate, analyse and interpret the result of complex engineering problems using proper research method to provide valid conclusions [PO4, WK8]
4. Apply appropriate modern techniques and proper use of engineering tools to solve complex engineering problems. [PO5, WK6]
5. Evaluate the project design and solution in term of environment and sustainability. [PO7, WK7]
6. Apply ethical principles and commit to professional conduct during project execution & presentation. [PO8, WK7]
7. Communicate effectively through formal engineering report presentation both orally and in writing. [PO9]
8. Able to work independently towards completion with minimal supervision during the entire project. [PO10]

Synopsis

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

BITG 1233: COMPUTER PROGRAMMING

Leaning Outcomes

1. Identify the fundamental principles of problem solving, programming techniques and structures in program development. [PO1, WK1-4]
2. Explain the principles of problem solving and programming techniques to solve given problems. [PO3, WK5]
3. Construct computer program codes by applying suitable programming structures and techniques. [PO5, WK6]

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++: 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.

BMFG 4623: ENGINEERING ECONOMY AND MANAGEMENT

Learning Outcomes

1. Explain the principles and terminology of engineering economy, concepts of time value of money and element of cost. [PO12]
2. Apply the concepts, principle and techniques in engineering economy using engineering economy factor and interest rate. [PO12]
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). [PO2, WK1-4]
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. [PO4, WK8]
5. Evaluate the project risk in engineering project. [PO10]

Synopsis

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

References

[1] Blank, L and Tarquin, A. Engineering Economy,7th Edition, McGraw Hill,2012.
[2] Whitman D. and Terry R. (2012) Fundamentals of Engineering Economics and Decision Analysis Morgan& Claypool Publishers.
[3] W.G Sullivan, E.M Wicks, C.P. Koelling “Engineering Economy”. Prentice Hall International 14th Ed., 2009
[4] Hartman, Joseph c. (2006) Engineering Economy and the Decision making Process. Prentice Hall.

4.8.3 Programme Core Courses (K)

BENC 2413: DIGITAL SYSTEMS

Learning Outcomes

1. Analysis of digital system consisting of finite state machine, counter and register. [PO2, WK1-4]
2. Design complex digital systems for combinational and sequential logic circuit using Hardware Description Language (HDL). [PO3, WK5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

This course will discuss about issues that are related to the digital system and application in engineering field. It will cover topics such as flip-flops, counters, shift registers, sequential logic design applying Finite State Machine, Hardware Description Language (HDL) for combinational and sequential logic circuit. These topics are very important to student in learning digital system and the application that involved for the system.

References

[1] Thomas L.Floyd, Digital Fundamentals,11th Edition, Prentice Hall, 2014.
[2] Ronald J.Tocci, Digital Systems : Principles and Applications, 12th Edition, Pearson Prentice Hall, 2016.
[3] William J. Dally, Digital Design Using VHDL: A Systems Approach 1st Edition, Cambridge University Press, 2016.
[4] M. Morris R. Mano, Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog, 6th Edition, Pearson, 2017.
[5] Mohamed Khalil Hani, RTL Digital System with Verilog, Universiti Teknologi Malaysia, 2014.

BENC 2423: MICROPROCESSOR TECHNOLOGY

Learning Outcomes

1. Write, debug and analyse the assembly language programming of microprocessor-based systems. [PO2, WK1-4]
2. Design electronic circuits that realize microprocessor-based systems. [PO3, WK5]
3. Communicate effectively through effective report writing and oral presentation. [PO9]

Synopsis

This course covers the concept, hardware and programming of the ARM processor ARM Cortex-M3. The topics that will be covered include the introduction to the microprocessors, assembly language programming, and hardware interfacing design between the microprocessor to memory and input/output devices. Evolution of Microprocessor from architectures, peripheral and up to memory-map system design will also be learned in this course. At the end of this course, students should be able to develop a simple microprocessor-based project of integration software and hardware.

References

[1] Ata Elahi. ARM Assembly Language with Hardware Experiments. Springer, 2015.
[2] Muhammad Tahir, Kashif Javed. ARM Microprocessor Systems: Cortex-M Architecture, Programming, and Interfacing. CRC Press, 2017.

BENC 3173: COMPUTER NETWORK AND SYSTEM

Learning Outcomes

1. Explain the fundamental concepts in computer networks and systems. [PO1, WK1-4]
2. Analyze the mechanism defined by the respective TCP/IP layers (Ethernet, WLAN, IPv4, TCP, UDP, connection establishments, encryption). [PO2, WK1-4]

Synopsis

This course will discuss about the process and protocols involved in computer networking and system based on layers in OSI and TCP IP protocols.

References

[1] Douglas Comer ,Computer Networks And Internets, 6th Edition, Pearson, 2018.
[2] B. A. Forouzan, "Data Communication & Networking", 5th Ed. McGraw Hill, 2017.
[3] J.F. Kurose and K. W. Ross, "Computer Networking a Top-Down Approach", 7th Ed. Pearson, 2016.

BENR 2023: COMPUTER ORGANIZATION AND ARCHITECTURE

Learning Outcomes

1. Explain advanced concepts, structures and functions in computer systems. [PO1, WK1-4]
2. Distinguish the characteristics, addressing modes, and formats of any typical instructions sets as well as evaluating the assembly language program segments to accomplish simple tasks for any given instructions set. [PO2, WK1-4]

Synopsis

This course aims primarily to give the students a general understanding of how computer systems work, both internally (ALU, control unit, registers, etc.) and externally (I/O interfaces, networking, etc.). Such understanding will enable the graduates to make intelligent decisions when confronted with computer-related problems at their workplace. The knowledge and skills gained in this course will also enable the graduates to further their studies in the field of computer architecture, organization, and design.

References

[1] Stalling, William, Computer Organization & Architecture: Designing for performance, 9th Edition, Pearson Education, 2012.
[2] Hammacher Carl, Vranesic Zvonko, Zaky Safwat, Naraig Manjikian, Computer Organization and Embedded Systems, 6th Edition, 2011.
[3] Shuangbao Paul Wang, Robert S.ledley, Computer Architecture and Security: Designing Secure Computer Systems, 1st Edition, John Wiley & Sons, 2012.
[4] Irv Englander, The Architecture of Computer Hardware and System Software: An Information Technology Approach, 4th Edition 2010.

BENC 4473: DIGITAL IC DESIGN

Learning Outcomes

1. Analyze combinational and sequential logic circuits and registers in integrated circuit technology. [PO2, WK1-4]
2. Design logic circuits and registers based on digital circuit modelling. [PO3, WK5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

This course aims to introduce students to basic techniques of integrated circuit (IC) design using hardware description language (HDL) for complex digital circuits. A historical perspective on the evolution of integrated circuit technology is covered. Important issues when designing a circuit are discussed. The basics of combinational and sequential logic design using HDL and logic synthesis tools will be covered in order to help students develop technical skills to design, simulate, analyse and verify digital circuits. Students will learn about combinational and sequential logic circuits design and modelling. Students will also learn about register transfer level abstraction to create high-level representations of a circuit. Various examples from the combinational to the sequential circuit will be covered in this course. End of this course, students will gain required fundamental knowledge in IC design prospects which is crucial especially for semiconductor industry's applications.

References

[1] J. M. Rabaey, A. Chandrakasan, and B. Nikolic , Digital Integrated Circuit, Prenctice Hall, 2002.
[2] Michael D.Ciletti, Advanced Digital Design with the Verilog HDL, Prenctice Hall, 2010.
[3] M.Morris Mano, Digital Design, Fifth Edition, Prentice Hall, 2012.
[4] Mohamed Khalil Hani, RTL Digital System with Verilog, Universiti Teknologi Malaysia, 2014.
[5] Joseph Cavanagh, Digital Design and Verilog HDL Fundamentals, Taylor & Francis Group, 2008.
[6] M.Rafiquzzaman, Fundamentals of Digital Logic and Microcomputer Design, Fifth Edition, Wiley-Hill, 2005.
[7] Vaibbhav Taraate, Digital Logic Design Using Verilog: Coding and RTL Synthesis, Springer India, 2016.
[8] Behzad Razavi, Design of Analog CMOS Integrated Circuits, Mc Graw Hill, 2010.

BENE 3223: CONTROL PRINCIPLES AND SYSTEMS

Learning Outcomes

1. Analyze control system problem using appropriate tools to achieve the given specifications. [PO2, WK1-4]
2. Design appropriate controllers for electrical and/or mechanical control systems to achieve the given specifications. [PO3, WK5]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

The outcome of this course is to deliver current technology and knowledge of control principles and systems. The course begins with the topics about the introduction to control field continued by modeling systems in both frequency and time domains. It involves model derivation of electrical network, translational and rotational mechanical systems. Then, students will be exposed to the topic related to time response analysis of the first and second order system and the impact of zeros and poles in control analysis. Further, student will learn how to minimize complex multiple sub-system by blocks diagrams technique and signal flow graphs; Masonâ€™s rules formula continued by investigating the stability of the control system by Routh- Hurwitz criterion. Finally, student will be exposed related to control design techniques through a Bode Plot analysis and Gain Adjustment compensator, Pole-placement controller and PID controller which are beneficial knowledge in industrial and academic control platform.

References

[1] Norman S. Nise, Control System Engineering, Addison Wesley Publishing, 7th edition 2015
[2] Richard C. Dorf and Robert H. Bishop, “Modern Control Systems 13th edition”, Prentice Hall, 2017
[3] Gene F. Fransklin, J. David Powell & Abbas Emami - Naeini, “Feedback Control of Dynamic Systems”, 8th Edition, Pearson, 2018.

BENR 1113: FUNDAMENTAL ELECTRICAL AND ELECTRONICS

Learning Outcomes

1. Describe the basic electrical and electronics knowledge to solve the series and parallel connections in DC and AC circuits. [PO1, WK1-4]
2. Analyze the principle knowledge of semiconductor properties and devices for Diode. [PO2, WK 1-4]

Synopsis

The outcome of this course is to deliver knowledge, understanding and application of fundamental electrical and electronics. The course begins with the introductory of the electrical syatems. Then, students will be exposed to the Direct Current (DC) circuits and Alternating Current (AC) characteristic. Apart from that, introduction of semiconductors also will be introduced in order to provide great understanding towards modern and advance electronic devices. This course will also expose the students to current application in the electrical and electronics industry.

References

[1] Charles K. Alexander and Matthew N. O. Sadiku, Fundamentals of Electric Circuits, McGraw Hill, 6th Ed. (2017)
[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)

BENR 1123: LOGIC CIRCUIT

Learning Outcomes

1. Describe the number system,basic concept and terminology of digital circuits that form complex electronic systems. [PO1, WK 1-4]
2. Analyze the basic circuits based on combinational and sequential components. [PO3, WK 1-4]

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. This course will also expose the students to current application in the digital electronics industry.

References

[1] Thomas L. Floyd. Digital Fundamental. Eleventh Edition, Prentice Hall, 2015.
[2] Tocci, Ronald; Widmer, Neal; Moss, Greg. Digital Systems, Global Edition, 2017
[3] Roger L. Tokheim. Digital Electronics, Principles and Applications. Eighth Edition, Mc Graw-Hill, 2013.

BENR 1413: DATA STRUCTURE AND ALGORITHM

Learning Outcomes

1. Explain and analyze the concept of data structures, algorithm analysis and efficiency using various data structure algorithms. [PO1, WK1-4]
2. Design and organize tasks using data structure algorithm of the given problems. [PO3, WK5]
3. Perform effectively as individual or in group to complete tasks and assignment. [PO5, WK6]

Synopsis

This course will expose the students to the fundamental knowledge of data structures and algorithm analysis. The topics that will be covered in the course include the introduction to data structures and algorithm analysis, revision of C++ programming language, Array, List, Stack, Queue, Trees, Sorting and Searching algorithms. Apart from the theory, students are asked to apply the data structures and algorithms through a small application that is developed in a team.

References

[1] Michael Main an Walter Savitch, Data Structures and Other Objects Using C++, Fourth Edition, Pearson, 2010.
[2] Jeffrey S. Childs, C++ Classes & Data Structures, Pearson Prentice Hall, 2008.
[3] Jeff Frank M. Carrano, data Abstraction and Problem Solving with C++, Fifth Edition, Addison Wesley, 2007.
[4] Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, Third Edition, Addison Wesley, 2006.
[5] John R. Hubbard, Schaum's Outlines, Data Structures with C+++, McGraw-Hill, 2000.

BENR 1812: COMPUTER ENGINEERING PRACTICE 1

Learning Outcomes

1. Apply fundamental engineering knowledge for basic electronic equipment usage. [PO1, WK1-4]
2. Demonstrate appropriate engineering techniques using modern tools for electronics circuit design and development process. [PO5, WK6]

Synopsis

This course covers FOUR (4) modules: Occupational Safety and Health Administration (OSHA), Instrumentation and Measurement, Introduction to Arduino (Hardware Board & Arduino IDE) and Introduction to PROTEUS Software. This subject also consists of TWO (2) lab tests and ONE (1) Mini Project. The OSHA is to ensure students understand the safety and health at laboratories. The instrumentation and measurement topic is to ensure the students familiarize themselves with the basic electronics equipment. The Introduction to Arduino topic is to let the students to familiarize themselves with Arduino Hardware I/O and Arduino IDE. The topic Introduction to Proteus Software is to let the students to understand about electronics circuit design and development process. The assessment of this course consists of TWO (2) lab tests and ONE (1) Mini Project. Overall, this course will help the students to familiarize themselves with Electronics Equipment, Arduino Hardware and IDE Software and Project Development.

References

[1] R. K. Rajput, "Electronic Measurements and Instrumentation", S.Chand & Co., 2009.
[2] Jonathan Oxer and Hugh Blemings, "Practical Arduino: Cool Projects for Open Source Hardware", Springer-Verlag, 2009.
[3] Simon Monk, "30 Arduino Projects for the Evil Genius", McGraw-Hill, 2010.

BENR 2143: ANALOG ELECTRONICS AND DEVICES

Learning Outcomes

1. Analyze single stage and multistage amplifiers at mid-band, low and high frequencies. [PO2, WK1-4]
2. Design and measure the response of single stage audio amplifiers using BJT, FETs and Op-Amp circuits. [PO3, WK1-4]

Synopsis

This course introduces the concept of Bipolar Junction Transistor (BJT), Field Effect Transistor (FET), Metal Oxide semiconductor field-effect transistor (MOSFET). Also covered is the BJT Transistor modelling, CE,CC and CB configuration, BJT small amplifier analysis, FET small-signal analysis, Frequency response, Bode plot and Operational amplifiers.

References

[1] Giovanni Saggio, Principles of Analog Electronic, CRC Press, 2014.
[2] Floyd, Electronic Devices, 9th Edition, Prentice Hall, 2012.
[3] Donald A. Neamen, Microelectronics Circuit Analysis and Design, Fourth Edition, McGraw Hill, 2009.

BENR 2211: COMPUTER ENGINEERING LAB 1

Learning Outcomes

1. Investigate experimental results using appropriate experimental methods and provide critial analysis and discussion. [PO4, WK8]
2. Apply appropriate techniques, manipulate and analyze experimental data to solve complex engineering problems. [PO5, WK6]
3. Demonstrate ethical principles and professional ethics and responsibilities in laboratory work and report writing. [PO8, WK7]
4. Demonstrate information management skills by providing relevant theory principles for the experiment and address the problem with the potential solutions which engage in independent and life–long learning. [PO11]

Synopsis

This course covers topics in BENC 2423 Microprocessor Technology, BENR 2713 Analog Electronics and Devices and BENC 3173 Computer System and Network with the following items: Ethernet based Local Area Network (LAN), Network Routing Setting and Packet Analysis, Optimized Network Engineering Tools (OPNET), ARM Microprocessor, Literals and Memory Access, Arithmetic Instructions, Diode Applications, BJT Characteristics, Field Effect Transistor (FET).

References

[1] Douglas Comer ,Computer Networks And Internets, 6th Edition, Pearson, 2018.
[2] B. A. Forouzan, “Data Communication & Networking”, 5th Ed. McGraw Hill, 2017.
[3] Ata Elahi. ARM Assembly Language with Hardware Experiments. Springer, 2015
[4] Muhammad Tahir, Kashif Javed. ARM Microprocessor Systems: Cortex-M Architecture, Programming, and Interfacing. CRC Press, 2017.
[5] R. Bolystad and L. Nashelsky L., Electronic Devices and Circuit Theory, 11th, Prentice Hall Inc., 2015.
[6] A. Aminian and M. Kazimierchuk, Electronic Devices - A Design Approach, Prentice Hall Inc., 2015

BENR 2221: COMPUTER ENGINEERING LAB 2

Learning Outcomes

1. Investigate experimental results using appropriate experimental methods and provide critial analysis and discussion. [PO4, WK8]
2. Apply appropriate techniques, manipulate and analyze experimental data to solve complex engineering problems. [PO5, WK6]
3. Demonstrate the values of engineering practice and ethical behavior. [PO8, WK7]
4. Demonstrate information management skills by providing relevant theory principles for the experiments and address the problem with the potential solutions which engage in independent and life-long learning. [PO11]

Synopsis

This course covers topics in BENR 2023 Computer Organization and Architecture, BENR 2423 Database and Cloud, and BENR 3613 VLSI Design with the following items: simulation and assembly language,upgrading a simple hypothetical computer,stack pointer, database development and management with SQL, windows Azure SQL database query & deployment of applications to the cloud, CMOS inverter schematic, CMOS layout design and design of CMOS combinational logic.

References

[1] Stalling, William, Computer Organization & Architecture: Designing for performance, 9th Edition, Pearson Education, 2012.
[2] Hammacher Carl, Vranesic Zvonko, Zaky Safwat, Naraig Manjikian, Computer Organization and Embedded Systems, 6th Edition, 2011.
[3] Chao, Lee. (2013). Cloud Database Development And Management. Auerbach Publications.
[4] Ramez Elmasri, Shamkant B. Navathe (2015). Fundamentals of Database Systems, 7th Edition,Pearson Education Limited, ISBN 978-0133970777.
[5] Chandrakasan, Anantha P., William J. Bowhill, and Frank Fox. Design of high-performance microprocessor circuits. Wiley-IEEE press, 2000.

BENR 2423: DATABASE AND CLOUD SYSTEM

Learning Outcomes

1. Explain the major components of a modern database including cloud-based storage management system. [PO1, WK1-4]
2. Describe entity relational model in designing database system using standard modelling language. [PO3, WK1-4]
3. Apply database programming language in interaction, manipulation and optimization of database system. [PO5, WK6]

Synopsis

This course will introduce modern database system that includes relational model, physical design of database and cloud storage management system. Database programming language using SQL (Structured Query Language) in key techniques such as query, transaction management and optimization are emphasized as well. Recent cloud management system includes disk group management and database security are also included. Optimization in cloud computing involves maximizing throughput and ensure consistency across servers and clusters via database management tools. A standard data model language using UML (Unified Modelling Language) to describe database design. The course will expose the students to identify which type of SQL/NoSQL database to use and evaluate the specificiations based on the task requirements.

References

[1] Chao, Lee. (2013). Cloud Database Development And Management. Auerbach Publications.
[2] Ramez Elmasri, Shamkant B. Navathe (2015). Fundamentals of Database Systems, 7th Edition, Pearson Education Limited, ISBN 978-0133970777.
[3] Caesar Wu, Rajkumar Buyya (2015). Cloud Data Centers and Cost Modeling: A Complete Guide To Planning, Designing and Building a Cloud Data Center, Morgan Kaufmann imprint of Elsevier, ISBN 978-0128014134.
[4] Nitin Vengurlekar, Prasad Bagal (2013). Database Cloud Storage: The Essential Guide to Oracle Automatic Storage Management, McGraw-Hill, ISBN 978-0071790154.
[5] Michael Blaha (2013). UML Database Modeling Workbook,Technics Publications, ISBN 978-1-9355045-1-1The Institution Of Engineer, "*Engineering Professionalism and Ethics*" 4th Ed, 1995.

BENR 2822: COMPUTER ENGINEERING PRACTICE 2

Learning Outcomes

1. Apply fundamental engineering knowledge for basic python programming usage. [PO1, WK1-4]
2. Demonstrate appropriate engineering techniques using modern tools for algorithm development process. [PO5, WK6]

Synopsis

This is an introduction course to Python programming for beginners. It starts with basic concepts of programming, and is carefully designed to define all terms when they are first used and to develop each new concept in a logical progression. Larger pieces, like recursion and object-oriented programming are divided into a sequence of smaller steps and introduced over the course of several chapters. The course end with how to wrap the useful programming libraries (C/C++) with the python binding.

References

[1] Allen, Downey. "Think Python: How to think like a computer scientist 2nd edition" (2016).
[2] The RealPython.com Tutorial Team, “A Practical Introduction to Python 3”, (2020).

BENR 3133: ELECTROMAGNETIC

Learning Outcomes

1. Understand the fundamental principle of Electromagnetic. [PO1, WK1-4]
2. Apply the fundamental theories in design issues of high speed printed circuit board (PCB). [PO2, WK1-4]

Synopsis

This course introduces necessary fundamental of Electromagnetic (EM) topics namely Electrostatic fields (Gauss's Law and Poisson's equation), Magnetostatic fields (Ampere's and Biot-Savart Laws), Time-varying EM fields (Faraday's Law and Maxwell equation) and EM wave propagation whereby the fundamental theories will be used to understand the application of EM for high speed printed circuit board (PCB) design in issues such as clock design, grounding, component placement (compact multiple wireless systems on board), trace routing, chassis construction, and cabling (wireline).

References

[1] M.N.O. Sadiku, Elements of electromagnetic, 8th Edition, Oxford University Press, 2019.
[2] C. R. Paul, Introduction to Electromagnetic Compatibility, John Wiley & Sons, Inc., 1992.
[3] J. Song, D. R. Voltmer and E. Wheeler, A required EMC Course for Computer Engineering Undergraduates, International Symposium on Electromagnetic Compatibility, EEE Xplore, 2005.

BENR 3231: COMPUTER ENGINEERING LAB 3

Learning Outcomes

1. Investigate experimental results using appropriate experimental methods and provide critial analysis and discussion. [PO4, WK8]
2. Apply appropriate techniques, manipulate and analyze experimental data to solve complex engineering problems. [PO5, WK6]
3. Demonstrate the values of engineering practice and ethical behavior. [P08, WK7]
4. Demonstrate information management skills by providing relevant theory principles for the experiments and address the problem with the potential solutions which engage in independent and life-long learning. [PO11]

Synopsis

This course covers topics in BENR 3433 Information Security, BENR 4713 Artificial Intelligence and BENR 3523 Embedded System Design. Among the topics that will be covered in this course are; transposition and vigenere chipper, cryptography,remote access tools, fuzzy logic, neural network, ARM mbed & STM 32F411RE nucleo board, MEMS sensors, WiFi module and IoT dashboard.

References

[1] W. Stallings (2015). Network Security Essentials: Applications and Standards, 6th Edition, Prentice Hall, Inc, ISBN 978-0134527338.
[2] Charles P. Pfleeger, Shari L. Pfleeger, Jonathan Margulies (2015). Security in computing, 5th Edition, Prentice Hall International, Inc., ISBN 978-0134085043.
[3] S. J. Russel, Artificial Intelligence: A Modern Approach, 3rd Edition, Pearson 2015
[4] J. Smith, Machine Learning Systems, Design that Scale, Manning, 2018
[5] John Catsoulis, “Embedded Systems Vol 2: Real-Time Interfacing to ARM Cortex-M Microcontroller-4th ed.”, Jonathan W. Valvano, 2014.
[6] Jason D. Bakos, “Embedded System: ARM programming and Optimization”, Morgan Kaufmann Publication, 2016.

BENR 3241: COMPUTER ENGINEERING LAB 4

Learning Outcomes

1. Investigate experimental results using appropriate experimental methods and provide critical analysis and discussion. [PO4, WK8]
2. Measure experimental performance using fundamental electronic equipment. [PO5, WK6]
3. Demonstrate the values of engineering practice and ethical behavior. [PO8, WK7]
4. Demonstrate information management skills by providing relevant theory principles for the experiments and address the problem with the potential solutions which engage in independent and life-long learning. [PO11]

Synopsis

This course covers topics in BENC 4473 Digital Integrated Circuit Design, BENT 4733 Digital Signal Processing and BENR 3533 Operating System. Students will be exposed to the detail topics in these courses and carrying out the lab experiments with the following areas: combinational circuit design with Xilinx Vivado, arithmetic circuit and logic circuit, signal representation using Fourier series and transform,embedded system toolchain &FreeRTOS task creation, Free RTOS Interrupt& Signaling and Mbed OS Interrupt Handling& Mutex.

References

[1] M.Morris Mano, Digital Design, Fifth Edition, Prentice Hall, 2012.
[2] Mohamed Khalil Hani, RTL Digital System with Verilog, Universiti Teknologi Malaysia, 2014.
[3] K.Deergha Rao, M.N.S. Swamy, Digital Signal Processing: Theory and Practice, Springer Verlag, Singapore, 2018.
[4] Michael Parker, Digital Signal Processing 101 2nd Edition Everything You Need to Know to Get Started, Newnes, 2017.
[5] Jim Cooling. Real-time Operating Systems: Book 1 - The Theory (The engineering of real-time embedded systems). Lindentree Associates, 2017.
[6] Silberschatz, Abraham. *Operating System Concepts Essentials*, Wiley, 2014.

BENR 3433: INFORMATION SECURITY

Learning Outcomes

1. Explain and elaborate information security as risk management and the implication of hostile users and misuse cases. [PO1, WK1-,4]
2. Analyze issues that are related to strategy and tactical design in information security. [PO2, WK1-4]

Synopsis

Throughout this course, student will learn well-known computer crime that involves security breaches and denial of service (DoS). Major types of attacks by cybercriminals including malware such as viruses, worms, Trojan horses, key loggers and ransomware. Various security mechanism, including their reliability and tradeoffs. Evolution of cryptography algorithms in information security. Basic types of cryptographic functions; hash, secret key and public key. Symmetric algorithm by focussing on design and implementation issues. Implementation of transport layer security (TLS) as secured network indicator. Denial of service attack method such as distributed and amplified attacks. Trusted computing approach using secure storages, trusted hardware and biometric system. Tradeoffs of security implemetation cost, information value and circumvention difficulty.

References

[1] W. Stallings (2015). Network Security Essentials: Applications and Standards, 6th Edition, Prentice Hall, Inc, ISBN 978-0134527338.
[2] Charles P. Pfleeger, Shari L. Pfleeger, Jonathan Margulies (2015). Security in computing, 5th Edition, Prentice Hall International, Inc., ISBN 978-0134085043.
[3] D. Gollmann (2011). Computer Security, 3rd Edition, John Wiley & Sons, Inc, ISBN 978 0470741153
[4] William Stallings (2017), Cryptography and Network Security: Principles and Practice, 7th Edition, Pearson International Edition, ISBN 978-0134444284.
[5] Mark Stamp (2011), Information Security: Principles and Practices, 2nd Edition, John Wiley & Sons, ISBN 978-0470626399.

BENR 3523: EMBEDDED SYSTEM DESIGN

Learning Outcomes

1. Analyzes the embedded system peripheral and interface requirement to propose a reliable solution. [PO2, WK1-4]
2. Design, simulate and construct an embedded system solution and analyze the overall design performance. [PO3, WK5]

Synopsis

This subject focus on the ARM technology microprocessor architecture and its dedicated development board. Some of the topics include: Overview of Embedded System, characteristics & application areas, introduction to computer systems & architectures, introduction to assembler-level software and high-level language programming for Embedded Systems, introduction to Embedded System hardware, application-level embedded system design concepts in industrial electronics.

References

[1] John Catsoulis, "Embedded Systems Vol 1: Introduction to ARM Cortex-M Microcontroller-4th ed.,", Jonathan W. Valvano, 2014.
[2] John Catsoulis, "Embedded Systems Vol 2: Real-Time Interfacing to ARM Cortex-M Microcontroller-4th ed.", Jonathan W. Valvano, 2014.
[3] Jason D. Bakos, "Embedded System: ARM programming and Optimization", Morgan Kaufmann Publication, 2016.

BENR 3533: OPERATING SYSTEM

Learning Outcomes

1. Distinguish and evaluate the need of real-time operating system from other systems. [PO2, WK1-4]
2. Implement the embedded real-time operating system principles. [PO3, WK5]

Synopsis

Thorough understanding of the principles behind the structure and operation of real-time operating systems: The functionality of operating system will be covered at the beginning of the subject. Fundamental of concurrent system (e.g. Task/Process/Threads, Time-slicing and Process states, Context switching, Interprocess communication (interrupt vs pooling), Scheduling, the use of semaphore for process synchronization and the creation of critical section, potential deadlock), will then be covered. The required timing analysis of how an embedded real time operating system (RTOS) meets the required hard real time constraints will be covered at the end of the subject. Embedded Linux where most of the real-time system is based on, as well as the Linux command set will be used for the assignment of this subject.

References

[1] Jim Cooling. Real-time Operating Systems: Book 1 - The Theory (The engineering of real-time embedded systems). Lindentree Associates, 2017.
[2] Silberschatz, Abraham. Operating System Concepts Essentials, Wiley, 2014.
[3] Siewert, S. and Pratt, J. Real-time Embedded Components and Systems: With Linux and RTOS, Mercury Learning and Information 2016.
[4] Wind River Education. Wind River Linux Real-Time Essentials (PREEMPT_RT), Wind River, 2015.

BENR 3613: VLSI DESIGN

Learning Outcomes

1. Formulate and analyze the CMOS digital electronics circuits, including logic components and interconnects between them. [PO2, WK1-4]
2. Design CMOS circuits that realize specified digital functions. [PO, WK5]

Synopsis

This course will cover basic theories and techniques of digital VLSI design in CMOS technology. List of course topics for VLSI Design include Introduction to IC; MOS Transistor theory; Circuit characterization and analysis; CMOS circuits and logic design; CMOS logic and layout; CMOS design rules, static and dynamic logic structures; Circuit Simulation and testing; VLSI Architecture.

References

[1] Sarrafzadeh, Majid, and Chak-Kuen Wong. An introduction to VLSI physical design. McGraw-Hill Higher Education, 1996.
[2] Chandrakasan, Anantha P., William J. Bowhill, and Frank Fox. Design of high-performance microprocessor circuits. Wiley-IEEE press, 2000.
[3] Weste, Neil HE, and Kamran Eshraghian. Principles of CMOS VLSI design. Vol. 188. New York: Addison-Wesley, 1985.

BENR 4153: HIGH PERFORMANCE COMPUTING

Learning Outcomes

1. Learn compilation, debugging, and profiling techniques for the use of high performance computing clusters and related hardware. [PO1, WK1-4]
2. Formulate deep neural network computing acceleration with modern high performance computing architecture. [PO2, WK1-4]

Synopsis

Application of high performance computing (e.g. scientific computing, fault tolerance MapReduce of big data application, machine learning & deep learning) as well as modern hardware architecture concept for high performance computing will be firstly introduced in this subject. The requirement of developing scalable software, to be deployed over multi-integrated-core computing platform, for both computing and data parallelizatioin strategy in high performance computing will be studied next. The synchronization mechanism for effective computing parallization as well as issue of lantency vs throughput to achieve the theoretical hardware maximum computing operation will then be covered. Modern tools to profile the performance of the developed high performance computing application will be practiced.

References

[1] Kirk, David B., and W. Hwu Wen-Mei. Programming massively parallel processors: a hands-on approach. Morgan kaufmann, 2016.
[2] Farber, Rob. Parallel Programming with OpenACC. Newnes, 2016.
[3] J. Sanders and E. Kandrot, CUDA by example: an introduction to general-purpose GPU programming. Addison-Wesley Professional, 2010
[4] Kaeli, David R., et al. Heterogeneous Computing with OpenCL 2.0. Morgan Kaufmann, 2015.

BENR 4713: ARTIFICIAL INTELLIGENCE

Learning Outcomes

1. Analyze the implementation of AI using machine learning techniques and deep learning in problem solving. [PO2, WK1-4]
2. Design an intelligent system to achieve predetermined specifications by applying the elements of design and principles of design. [PO3, WK5]

Synopsis

Artificial intelligence (AI) is a research field that studies how to realize the intelligent human behaviors on a computer. The ultimate goal of AI is to make a system that can learn, plan, and solve problems autonomously.

Topics to be covered include:

- agent, searching (Heuristic search and adversarial search), learning
- logic and reasoning methods (knowledge representation) from a computational perspective
- probabilistic models (Reasoning under uncertainty), perception and cognition
- applications in mathematical modeling, text understanding, robotics, engineering

References

[1] S. Russell, P. Norvig, Artificial Intelligence: A Modern Approach, 3rd Edition, Pearson, 2014.
[2] M. Negnevitsky, Artificial Intelligence: A Guide to Intelligent Systems, 3rd Edition, Addison-Wesley, 2011.
[3] George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Addison-Wesley 2009.

BENT 3753: COMMUNICATION PRINCIPLES

Learning Outcomes

1. Explain basic principles, components of telecommunication system and the effect of noise in telecommunication systems. [PO1, WK1-4]
2. Analyze the design and performances of various digital modulation formats, linear and angle modulation techniques commonly used in telecommunication system. [PO2, WK1-4]
3. Communicate effectively through effective report writing or oral presentation. [PO9]

Synopsis

The outcome of this course is to deliver the principles in the communication system. The course begins with the topics of introduction to Telecommunication that includes the telecommunication model, transmission modes, modulation and demodulation model. Then, students will be exposed to the details in Linear Modulation Process which consists of Amplitude Modulation (AM) principles, AM modulation and transmission, AM Reception and Demodulation. Also, students will look into details on the principles of Single-Sidebands Communications Systems (SSB) that covers the transmission and reception process. Apart form that, students will learn the Angle Modulation (AM) topics that covers details of Frequency Modulation (FM), Phase Modulation (PM), FM/PM Modulation and Transmission, FM/PM Reception and Demodulation, and also FM Stereo. In addition, students will also learn about Noise; source and representation, noise parameters, noise analysis in linear and angle modulation. Finally, students will learn about the Digital Communication topic such as Information Capacity, Hartley and Shannon Limit, Digital Modulation: Amplitude, Frequency and Phase Shift Keying (ASK, FSK and PSK), Digital Transmission: Pulse Modulation, Pulse Code Modulation (PCM), Sampling, Quantization.

References

[1] John G. Proakis, Masoud Salehi, “Fundamentals of Communication Systems”, 2nd Ed, Pearson Education, 2014.
[2] Louis Frenzel, “Principles of Electronic Communication Systems”, 4th Edition, McGraw-Hill, 2015.
[3] Rodger E.Ziemer, Principles of Communications”, 7th Edition, John Wiley & Sons, 2014.
[4] Wayne Tomasi,” Advanced Electronic Communications Systems’, 6th Edition, Pearson Education, 2013.

[5] Dhanshetti Sanjay, "Communication System', Dhanshetti, 2015.

BENT 3733: SIGNALS AND SYSTEMS

Learning Outcomes

1. Identify the characteristics and properties of various continuous-time and discrete-time signals and systems. [PO1, WK1- 4]
2. Analyze systems with variety of inputs and responses through Fourier Series, Fourier Transform and Laplace Transform techniques. [PO2, WK1-4]

Synopsis

The outcome of this course is to introduce the basic concepts and techniques for describing and analyzing continuous-time signals and systems. The course begins to study the characteristics and properties of various continuous and discrete-time signals and systems. Then followed by representing periodic signals as a Fourier series and use the Fourier transform and the Laplace transform to analyze continuous-time signals. Students also will be exposed to use MATLAB as a tool for analyzing the behavior of continuous time signals and systems. The applications of the Fourier series, Fourier and Laplace transform in circuits will be covered in this course. The ideas introduced in this course will be useful in understanding further electronic and electrical engineering courses which deal with control systems, communication systems, power systems and digital signal processing.

References

[1] A. V. Oppenheim, A. S. Willsky, Signals and Systems, 2nd Edition, Prentice Hall, 2014.
[2] Charles Alexander, Matthew Sadiku, "Fundamentals of Electric Circuits", McGraw-Hill Education, 6th Edition, 2016.
[3] Luis Chaparro, "Signals and Systems using MATLAB", 2nd ed., Academic Press, 2014.
[4] Gang Li, Liping Chang, Sheng Li, "Signals and Systems: Fundamentals", Tsinghua University Press, 2015.
[5] M. Abu, S.N. Zabri, R.A. Manap, A.S. Ja'afar, M.M. Yunus, N.F. Azmi, Introduction to Signals and Systems, Penerbit UTeM Press, 2019.

BENT 4733: DIGITAL SIGNAL PROCESSING

Learning Outcomes

1. Apply digital signal processing concepts in discrete-time signals & systems, spectrum representations, random signals and multimedia applications. [PO1, WK1-4]
2. Analyze the spectrum representation, impulse response, signal flow graph using difference equations, stability determination using z-transform and digital filters design based on basic filter concepts. [PO2, WK1-4]

Synopsis

This course prepared the student to be ready to embark into the world of digital signal processing (DSP) by going through the concepts behind digital signal transformation, filter design and random signals. The topics covered are: discrete-time signals and systems, spectrum of representation of discrete-time signals, discrete Fourier transform, difference equations and discrete-time systems, z-transform and its applications, analysis and design of digital filters, random signals. At the end of the course, the students are also exposed to the use of digital signal processing techniques in audio/video, biomedical and telecommunication applications.

References

[1] K. Deergha Rao, M.N.S. Swamy, Digital Signal Processing : Theory and Practice, Springer Verlag, Singapore, 2018.
[2] Michael Parker, Digital Signal Processing 101 2nd Edition Everything You Need to Know to Get Started, Newnes, 2017.
[3] L. Tan, J. Jiang, Digital Signal Processing: Fundamentals and Applications, 3rd Ed., Academic Press, London, 2019.
[4] A. Antoniou, Digital Filter: Analysis, Design, and Signal Processing Applications, 2nd Edition, MCGraw Hill, Ohio, 2018.
[5] C. Therrien, M. Tummala, Probability and Random Processes for Electrical and Computer Engineering, CRC Press, Boca Raton, 2018.

4.8.4 Elective Courses (E)

BENR 3553: COMPUTER INTERFACES

Learning Outcomes

1. Analyze the design of modern microprocessor system architecture to work with PCI Express, USB peripherals and ARM Advanced Microcontroller Bus Architecture (AMBA). [PO2, WK1-4]
2. Design the bus commands, protocols, and various programming aspects required to deploy the interfaces for embedded system project. [PO3, WK5]

Synopsis

Students will be exposed to various high end and widely used embedded system bus protocols (PCIe, USB, and ARM AMBA). Project-oriented laboratories which focused on implementation detail of the embedded system bus protocols will provide students with the hands-on experience on the industry applications of those buses.

References

[1] Hohl, William, and Christopher Hinds. ARM Assembly Language: Fundamentals and Techniques. Crc Press, 2016.
[2] J. Axelson, USB Complete: The Developer's Guide. Lakeview Research LLC, 2015.
[3] M. Jackson et al. PCI Express Technology 3.0. Mindshare Press, 2012.
[4] R. Budruk, A. Don, and S. Tom. PCI Express System Architecture. Addison-Wesley Professional, 2004.

BENR 3623: ANALOG IC DESIGN

Learning Outcomes

1. Analyze high frequency concepts of single stage amplifiers, voltage and current reference circuits and noise characteristics associated with differential amplifiers. [PO2, WK1-4]
2. Design of analog integrated circuits with emphasis on the feedback circuits at the transistor level. [PO3, WK5]

Synopsis

This subject is a general introduction to analogue integrated circuit design. It will cover the following areas: use of I_{DS} equations in circuit calculations; use of large signal models to calculate and design transistor biasing; use of small signal models to calculate gain-bandwidth, transfer functions; the operation & use of analogue circuit building blocks; current sources/sinks, simple amplifiers, differential stages, output stages, basic op-amp design, gain and phase margin, stability, compensation, more advanced op-amp concepts, effects on performance caused by temperature changes, etc. parasitic components and their importance for circuit modelling; sources of noise and distortion in MOS analogue circuits.

References

[1] Paul R. Gray, Paul J. Hurst, Stephen H. Lewis, Robert G. Meyer, Analysis and Design of Analog Integrated Circuits, 5th Edition, Wiley, 2009.
[2] Behzad Razavi, “Design of Analog CMOS Integrated Circuits”, Tata McGraw Hill, 2001
[3] Willey M.C. Sansen, “Analog design essentials”, Springer, 2006.
[4] Grebene, “Bipolar and MOS Analog Integrated circuit design”, John Wiley & sons,Inc., 2003.
[5] Phillip E.Allen, Douglas R.Holberg, “CMOS Analog Circuit Design”, Second edition, Oxford University Press, 2002

BENR 3723: BIG DATA ANALYTICS

Learning Outcomes

1. Apply the concepts of big data analytics in solving various applications using statistical and predictive analytics tools. [PO2, WK1-4]
2. Design a big data applications by exploring the steps including data collection, model evaluation, security and performance. [PO3, WK5]

Synopsis

This course introduce basic techniques and principles of big data analytics process to improve the access, security and performance of big data which include statistical and machine learning to transform the hypotheses into a predictions. The topics covered are: basic principles of big data and data collection, analyzing, building a predictive models, network infrastructure, performance and security. At the end of the course, the students are also exposed to the use of statistical analysis and predictive language tools such as R and rapid miner in such example as business intelligence, decision making, classifications and predictions.

References

[1] Brett Lantz, Machine Learning with R: Expert Techniques for Predictive Modelling, Packt Publishing, 3rd edition, 2019.
[2] Joao Moreira, Andre Carvalho and Tomas Horvath, A General Introduction to data Aanalytics, Wiley-Interscience, 1st edition, 2018.
[3] Jared P. Lander, R for Everyone: Advanced Analytics and Graphics, Addison-Wesley Professional, 2nd edition, 2017.
[4] Viswa Viswanathan, Data Analytics with R: A hands-on Approach, 2nd edition, Infivista Inc, 2015.

BENR 4563: EMBEDDED SIGNAL AND POWER INTEGRITY SYSTEM

Learning Outcomes

1. Analyze the power integrity value in DC and AC circuit. [PO2, WK1-4]
2. Design the High Speed Printed Circuit Board (HSPCB) using signal integrity and power integrity. [PO3, WK5]

Synopsis

This subject covers the theory, basic knowledge, calculation and analysis of embedded signal integrity and power integrity in handling the High Speed Printed Circuit Board (HSPCB) in industries. At the beginning of Chapter 1, students will exposure to the definition of SI and PI, EMC and relation between its in handling HSPCB. The charateristics of Transmission Line (TL) and interconnecting traces on PCB, calculation an determination of critical length, Intrinsic Impedance, parameter involve and type of TL in PCB, Termination of a TL, Issue on PCB, Reflection Coefficient, Termination Technique will be cover in Chapter 2. Differential signal is involve in Chapter 3 that included of principle and advantages of differential signaling, benefits of DS, how to enhance HR, better noise immunity and how to reduce spin count. Chapter 4 will cover the topic of Power Integrity in DC Analysis while Power Integrity in AC Analysis is cover in Chapter 5.

References

[1] J Ted Dibene II, Fundamentalvof Power Intergrity for Computer Platforms and Systems, John Wiley & Sons, 2014.
[2] Stephen C, Thiearauf. Understanding Signal Intergrity, Artech House, 2011.
[3] Vishram S. P, Woong H. R, Myoung J. C, Power Intergrity for I/O Interfaces: With Signal Intergrity/Power Intergrity Co-Design, Prentice Hall, 2011.
[4] Eric Bogatin, Signal and Power Integrity – Simplified, Prentice Hall, 2009

BENR 4573: EMBEDDED SOFTWARE DESIGN

Learning Outcomes

1. Analyze embedded software development techniques for debugging and simulation to develop a firmware using standard embedded software engineering method. [PO2, WK1-4]
2. Design an embedded software with object-oriented as well as function-oriented approach. [PO3, WK5]

Synopsis

Modern embedded software engineering processes (e.g. Lean software for startup, business process improvement with Capability Maturity Model Integration (CMMI) model) and their applications will be firstly covered in this subject. Modern embedded user interface (UI) and user experience (UX) design will be practiced and validated with the use of XCode and Swift programming language for embedded device programming. The modern embedded software engineering aspects and its product life cycle will be covered in this subject.

References

[1] Klein, Laura, Build Better Products: A Modern Approach to Building Successful User-Centered Products Rosenfeld Media, 2016.
[2] Klein, Laura, UX for Lean Startups. O'Reilly Media, Incorporated, 2013.
[3] CMMI Product Team, CMMI for Development, Version 1.3 Improving processes for developing better products and services, August 2010.
[4] Randy Scovil, Learning to build iOS APPS with SWIFT A Hands-on Guide to Swift App Development, Addison-Wesley Professional, 2016.

BENR 4583: EMBEDDED WIRELINE AND WIRELESS SYSTEM

Learning Outcomes

1. Analyze compensation techniques on channel and component impairment. [PO2, WK1-4]
2. Design embedded wireline/wireless communication system protocols. [PO3, WK5]

Synopsis

To introduce wireless technologies, digital communications concept, channel/component impairment with respective compensation techniques and its applications.

References

[1] Zarrinkoub, Houman. Understanding LTE with MATLAB: from mathematical modeling to simulation and prototyping. John Wiley & Sons, 2014.
[2] M, Rice, Digital communications: a discrete-time approach, Pearson Education, 2009.
[3] Salehi, J. G. P. M. Digital Communications 5e, 2008.
[4] Lin, Shu, and Daniel J. Costello. Error control coding. Vol. 2. Englewood Cliffs: Prentice Hall, 2004.
[5] Jiang, Yuan. A practical guide to error-control coding using Matlab. Artech House, 2010.
[6] Heiskala, Juha, and John Terry Ph D. OFDM wireless LANs: A theoretical and practical guide. Sams, 2001.
[7] Cvijetic, Milorad, and Ivan Djordjevic. Advanced optical communication systems and networks. Artech House, 2013.
[8] Chiueh, Tzi-Dar, and Pei-Yun Tsai. OFDM baseband receiver design for wireless communications. John Wiley & Sons, 2008.
[9] Chiueh, Tzi-Dar, Pei-Yun Tsai, and I-Wei Lai. Baseband receiver design for wireless MIMO-OFDM communications. John Wiley & Sons, 2012.
[10] Cho, Yong Soo, et al. MIMO-OFDM wireless communications with MATLAB. John Wiley & Sons, 2010.

BENR 4633: SYSTEM ON CHIP INTEGRATION AND PACKAGING

Learning Outcomes

1. Analyze the major architecture and trade-offs of single chip and embedded systems. [PO2, WK1-4]
2. Design an integrated application in system on chip. [PO3, WK5]

Synopsis

This subject offers two focused areas of study, one emphasizing the system on chip integration, and the microelectronics packaging that bridges the device or system to the external world and enables its functionality. System on Chip (SoC) integration: Introduction to a SoC and an embedded system, understand the major architectures and trade-offs concerning performance, cost and power consumption of single chip and embedded systems. Packaging: Introduction to microelectronics packaging, electrical considerations, advanced analysis methods, mechanical, optical and thermal considerations aspects of package design and reliability, material considerations, DOE/SPC for Semiconductor Processing.

References

[1] Van Zant, Peter, and P. Chapman. Microchip Fabrication: A Practical Guide to Semiconductor Processing. Vol. 5. New York: McGraw-Hill, 2000.
[2] Nishi, Yoshio, and Robert Doering, eds. Handbook of Semiconductor Manufacturing Technology. CRC Press, 2000.
[3] May, Gary S., and Costas J. Spanos. Fundamentals of Semiconductor Manufacturing and Process Control. John Wiley & Sons, 2006.

BENR 4643: LOW POWER SYSTEM ON CHIP

Learning Outcomes

1. Analyze the classification required in determining the circuit performance in terms of clock, flip flop, power distribution and deep submicron interconnect. [PO2, WK1-4]
2. Design the System-on-Chip architecture. [PO3, WK5]

Synopsis

This course will cover system on chip design including design methodology, IP design and platform-based design. This course will also cover various important elements for chip design such as sequential circuit, clock tree, low power design, power distribution and deep submicron interconnect.

References

[1] Keating, Micheal, et al. Low power methodology manual: for system-on-chip design. Springer Publishing Company, Incorporated, 2007.
[2] Rajsuman, Rochit. System-on-a-chip: Design and Test. Artech House, Inc., 2000.
[3] Voros, Nikolaos S., and Konstantinos Masselos, eds. System level design of reconfigurable system-on-chip. Heldeberg: Springer, 2005.

BENR 4653: MIXED SIGNAL SYSTEM DESIGN

Learning Outcomes

1. Analyse the mixed signal building blocks and be able to relate the results back to the fundamentals and the circuit topology. [PO2, WK1-4]
2. Design and simulate different architectures basic mixed signal circuits. [PO3, WK5]

Synopsis

This subject is a general introduction to mixed signal system design. It will cover the following areas: sample and hold circuits; switched-capacitor circuits; data converter fundamentals including analog-to-digital (ADC) and digital-to-analog (DAC) converter parameters and characteristics; Nyquist rate of ADC converters; Nyquist rate of DAC converters; oversampling converters; outlook of more mixed signal building blocks.

References

[1] Razavi, “Design of analog CMOS integrated circuits”, McGraw Hill, Edition 2002.
[2] Razavi, “Principles of data conversion system design”, Wiley IEEE Press, 1st Edition, 1994.
[3] Jacob Baker, “CMOS Mixed-Signal circuit design”, IEEE Press, 2009.
[4] Gregorian, Temes, “Analog MOS Integrated Circuit for signal processing”, John Wiley & Sons, 1986.
[5] Baker, Li, Boyce, “CMOS: Circuit Design, layout and Simulation”, PHI, 2000.
[6] Franco Maloberti, "Data Converters", Springer, 2007.

BENR 4733: DIGITAL IMAGE PROCESSING

Learning Outcomes

1. Analyze the fundamental of image processing including image reconstruction, image manipulation, image compression to solve a computer vision problems. [PO2, WK1-4]
2. Design an application using image processing algorithm in embedded system device. [PO3, WK5]

Synopsis

This course prepared the student to not to only understanding the fundamental basic of image processing but also cover the technic on implementation of the image processing algorithm into the embedded system. The topic cover are fundamental digital image processing, image enhancement and restorating in frequency and spatial domain, color image processing, wavelet and multiresolution processing for image compression, morphological image processing,image segmentation and representation, and object recognition. Student will be exposed in using mathematical computational toosl to evaluate some image processing algorithm and will be thought on how to embed the code in the embedded sustem device.

References

[1] Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing: 4th Ed., Pearson; 4 edition (March 30, 2017)
[2] Arsath Natheem, Digital Image Processing using MATLAB: ZERO to HERO Practical Approach with Source Code (Handbook of Digital Image Processing using MATLAB), Independently published (December 17, 2017)
[3] Adam Taylor, Image Processing with Xilinx Devices Kindle Edition, February 16, 2018,
[4] Ashwin Pajankar, Raspberry Pi Image Processing Programming: Develop Real-Life Examples with Python, Pillow, and SciPy, Apress; 1st ed. edition (March 22, 2017)

BENR 4743: MACHINE LEARNING

Learning Outcomes

1. Analyze the machine learning technique to solve various classification and regression problems. [PO2, WK1-4]
2. Design a solution using machine learning technique to solve various classification and regression problems. [PO3, WK5]

Synopsis

Effective machine learning techniques will be covered in this subject. Machine learning uses three types of techniques: supervised learning, unsupervised learning and reinforcement learning. Supervised learning includes classification and regression techniques. The methods for classification are support vector machines, discriminant analysis, naïve bayes, nearest neighbor and neural networks. For regression, the methods are linear regression, ensemble methods and decision trees. Unsupervised learning for clustering techniques covers hidden markov model, k-means, fuzzy C-means and Gaussian mixture. This subject also covers reinforcement learning.

Detailed syllabus:

- Basic concepts in machine learning.
- support vector machines
- discriminant analysis
- naïve bayes.
- nearest neighbor.
- Neural networks.
- linear regression.
- ensemble methods
- decision trees
- hidden markov model
- k-means
- fuzzy C-means
- Gaussian mixture

Students will be exposed to practice implementing the techniques introduced in building smart systems, text understanding, computer vision, brain-computer interface, audio, and other areas through assignments.

References

[1] Ethem Alpaydin. Introduction to Machine Learning. Second Edition, 2004.
[2] Bishop. Pattern Recognition And Machine Learning. Springer 2006.
[3] Tom Mitchell. Machine Learning. McGrawHill 1997.
[4] Kevin P. Murphy. Machine Learning: A Probabilistic Perspective, MIT Press 2012.

BENR 4753: COMPUTER VISION AND PATTERN RECOGNITION

Learning Outcomes

1. Analyze adequate technique to solve computer vision and pattern recognition problems. [PO2, WK1-4]
2. Design a computer vision and pattern recognition system which can solve and meet engineering problems requirement. [PO3, WK5]

Synopsis

Topics covered: Overview of Computer Vision and Pattern Recognition, Image and Image Representation, Image Analysis & Enhancement, Feature Detection and Segmentation, Image Restoration, Feature Analysis and Pattern Recognition, Feature Selection and Dimensionality Reduction.

References

[1] R. Szeliski, Computer Vision: Algorithms and Applications, Springer, 2010.
[2] S. E. Umbaugh, Digital Image Processing and Analysis: Human and Computer Vision Applications with CVIPtools, CRC Press, 2011.
[3] R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd Edition, Prentice Hall, 2008.
[4] S. Theodoridis, Pattern Recognition, 4th Edition, Academic Press, 2009.

ACADEMIC HANDBOOK SESSION 2022/2023

FOR BACHELOR DEGREE AND DIPLOMA PROGRAMMES

5.0 DIPLOMA IN ELECTRONIC ENGINEERING

5.1 Introduction

Malaysia has been recognized as one of the major exporting countries of semiconductor devices and the leading manufacturers of electronic equipment in the last few decades. Continuous development in the field of electronics and widespread application of computers has brought a significant impact on the development of the electronics industry in the country.

Industrial electronic manufacturing includes consumer products such as computers, audio-video equipment, optical drives, communication devices, and mobile phones. In nonelectronic-based industries, electronic systems are also needed as a complement in the production process of products such as the oil refining industry, the automobile industry and production of rubber-based industries.

In the process of enhancing the competitiveness of the Malaysia industries, human capital that is knowledgeable and skilled in electronic engineering is very important and necessary. Diploma in Electronic Engineering (DEN) graduates will be able to meet the needs of technical workforce and can work as assistant engineers, capable of assisting in providing creative and innovative solutions in electronic engineering problems. In addition, the DEN graduates with outstanding academic performance will have the opportunity to further their studies at degree level.

5.2 Career Prospects

Employment opportunities for graduates of the Diploma in Electronic Engineering (DEN) are particularly bright. Graduates can work as assistant engineers in government agencies, multinational companies, small and medium industries, as well as manufacturing and production industries. In addition, graduates can also engage in sales and marketing. Graduates who have excellent academic performance can also proceed to a higher-level degree.

5.3 Programme Objectives

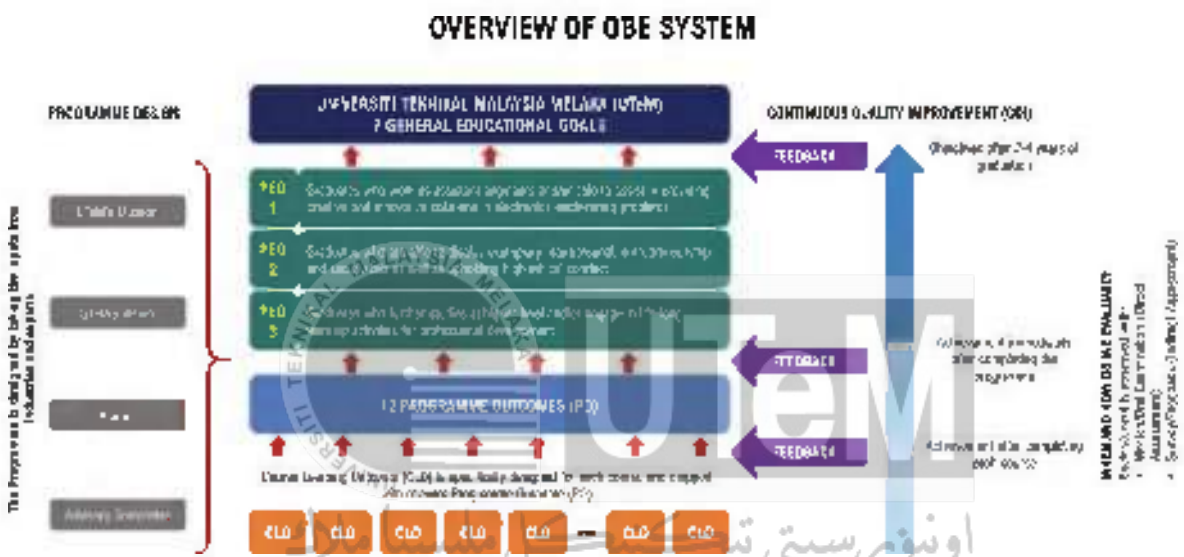
Programme Educational Objectives (PEO) are specific goals consistent with the mission and vision of the Institute of Higher Learning (IHL), are responsive to the expressed interest of programme stakeholders, and describe the expected achievements of graduates in their career and professional life a few years after graduation.

The Diploma in Electronic Engineering (DEN) programme aims to produce graduates who:

5.4 Programme Outcomes

Upon graduation, the students of Diploma in Electronic Engineering (DEN) programme are expected to attain the following attributes in the practice-oriented learning environment:

5.5 Outcome Based Education (OBE)



5.6 Curriculum

The Diploma in Electronic Engineering (DEN) programme curriculum courses have been designed to convey sufficient knowledge towards students' intellectual development, practical skills, soft skills and attributes as stipulated in the PO statements. Combinations of courses complement the PO attainment throughout the years of study.

The DEN programme begins with a short semester where students will learn three compulsory university's courses; Foundation English, Appreciation of Ethics and Civilizations, and Leadership. These courses are intended to prepare students to participate in the electronic engineering curriculum, which is taught in English and also to bring awareness of the moral values of the engineering technician workforce in the future.

Students will enter Semester 1 of Year 1 of their studies in the next semester. Courses offered will prepare the students towards the field of electronic engineering such as Algebra, Physics Fundamentals, Engineering Drawing and Computer Programming as well as basic course related to electronics such as Electrical Principles. Students will also attend the Electronic Workshop & Domestic Wiring course, which contains practical work on basic electronic components and equipment and domestic wiring. Students will be exposed to safety and health issues in engineering technician fields in the Safety and Health in Engineering course.

In the second semester of Year 1, students will attend more electronics related courses such as Electronic Principles, Electrical Circuits, Logic Circuit and ECADD. Students will also be equipped with the knowledge and experience in soldering and designing electronic circuits on printed boards in PCB Design & Fabrication Workshop course. At the end of the workshop, each student is required to complete a small project to justify the skills acquired during the workshop.

Students will undergo a short semester in the third semester in Year 1, where 3 courses will be offered; English for Marketability, Fundamentals of Entrepreneurship Enculturation and Engineering Mathematics.

During the first year of study, courses related to communication and co-curricular activities are offered, in addition to the technical courses, to equipped them with essential communication skills. This is to ensure that the DEN programme will produce graduates who are not only skilled in the technical field but also have excellent communication skills and high moral values.

In the second year, apart from the core courses such as Electronics, Signal and Network, Digital System, Microcontroller, Electronic Instrumentations, Control Principles and Communication Principles, students will also have the opportunity to choose two from three elective courses offered in the second semester. The elective courses are Computer Engineering, Industrial Automation and Telecommunication Engineering. The students will also be required to utilize the knowledge and experience they have gained so far to execute a project on electronic circuits in the Diploma Project course. The project should be completed within one semester and will be assessed by the lecturer and evaluation panel in a formal presentation.

In order to expose the students to the real working environment, they are required to undergo industrial training for 16 weeks in the final semester, which is the first semester of the third year. The students will get a training placement in industries throughout Malaysia and supervised by the lecturers and supervisors of the industry. The experience gained during the industrial training will complement the knowledge they acquired throughout the programme.

5.6.1 Curriculum Structure

YEAR 1

Semester 0

CODE	COURSE	CREDIT	CATEGORY
DLLW 1112	Foundation English	2	W
DLHW 2772	Appreciation of Ethics and Civilizations	2	W
DLHW 1742	Leadership	2	W
	TOTAL	**6**	

Semester 1

CODE	COURSE	CREDIT	CATEGORY
DKKX XXX1	Co-Curriculum I	1	W
DENH 1142	Algebra	2	P
DENH 1303	Physic Fundamentals	3	P
DENT 1213	Electrical Principles	3	P
DENC 1223	Computer Programming	3	P
DMCG 1523	Engineering Drawing	3	P
DENE 1311	Electronic Workshop & Domestic Wiring	1	P
DENE 1112	Safety and Health in Engineering	2	P
	TOTAL	**18**	

Semester 2

CODE	COURSE	CREDIT	CATEGORY
DKKX XXX1	Co-Curriculum II	1	W
DLLW 2122	English for Effective Communication	2	W
DENH 1152	Calculus	2	P
DENE 1323	Electronic Principles	3	P
DENT 1233	Electrical Circuits	3	P
DENC 1433	Logic Circuits	3	P
DENC 1532	Electronic Computer Aided Design (ECADD)	2	P
DENE 1421	PCB Design & Fabrication Workshop	1	P
	TOTAL	**17**	

Semester 3

CODE	COURSE	CREDIT	CATEGORY
DLLW 3132	English for Marketability	2	W
DTMW 1012	Fundamentals of Entrepreneurship Enculturation	2	W
DENH 2163	Engineering Mathematics	3	P
	TOTAL	**7**	

YEAR 2

Semester 1

CODE	COURSE	CREDIT	CATEGORY
DENH 2173	Differential Equations	3	P
DENE 2333	Electronics	3	P
DENT 2253	Signal and Network	3	P
DENC 2443	Digital Systems	3	P
DENC 2453	Microcontroller	3	P
DENE 2133	Electronic Instrumentations	3	P
	TOTAL	**18**	

Semester 2

CODE	COURSE	CREDIT	CATEGORY
DENE 3153	Control Principles	3	P
DENT 2543	Communication Principles	3	P
DENE 2244	Diploma Project	4	P
*DENC 3363	Computer Engineering	3	E
*DENE 3363	Industrial Automation	3	E
*DENT 3563	Telecommunication Engineering	3	E
	TOTAL	**16**	

Note: *Choose any TWO (2) Elective course only.

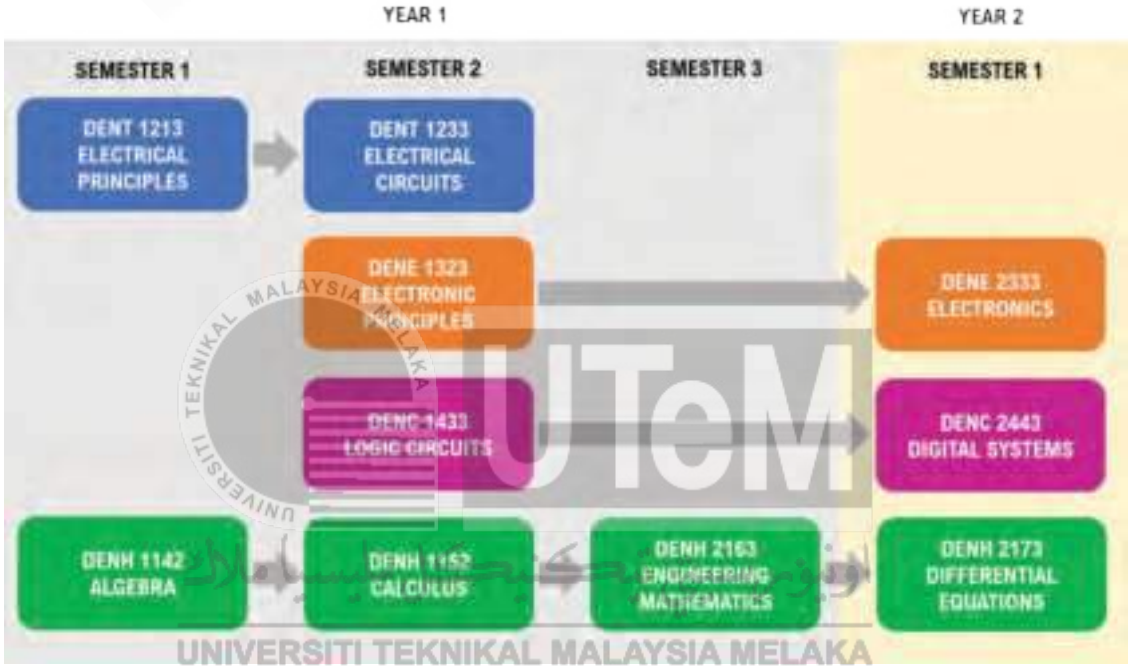
YEAR 3

Semester 1

CODE	COURSE	CREDIT	CATEGORY
DENU 3158	Industrial Training	8	P
	TOTAL	**8**	
	GRAND TOTAL	**90**	

Category: W: University Compulsory Courses P: Core Program Courses E: Elective Courses

5.6.2 Sequential Courses



5.7 Syllabus Summary for the Diploma in Electronic Engineering Programme

5.7.1 University Compulsory Courses (W)

DKKX 1XX1	Co-Curriculum 1
DKKX 2XX1	Co-Curriculum 2
DLLW 1112	Foundation English
DLHW 1742	Appreciation of Ethics and Civilizations
DLLW 2122	English for Effective Communication
DLHW 2772	Leadership
DLLW 3132	English for Marketability
DTMW 1012	Fundamentals of Entrepreneurship Enculturation

PLEASE REFER TO THE **CENTRE FOR LANGUAGE LEARNING (CeLL), INSTITUTE OF TECHNOLOGY MANAGEMENT AND ENTREPRENEURSHIP (IPTK)** AND **FACULTY OF TECHNOLOGY MANAGEMENT AND TECHNOPRENEURSHIP (FPTT)** ACADEMIC HANDBOOK FOR SYNOPSYS AND SYLLABUS SUMMARY FOR THE ABOVE COURSES.

5.7.2 Common Core Courses (P)

FIRST YEAR: SEMESTER 1

DENH 1142: ALGEBRA

Learning Outcomes

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

1. Apply fundamental concepts of functions and graphs, polynomials, matrices, trigonometry and complex number. [PO1, DK2-DK3]
2. Solve the mathematical problems that involve matrices, nonlinear equation, polynomials, trigonometry and complex number by using an appropriate technique. [PO1, DK2-DK3]
3. Report assignments in groups effectively. [PO9]

Synopsis

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

References

[1] Michael Sullivan et al., “Algebra & Trigonometry”, 10th Edition, Pearson, 2016.
[2] Ron Larson, “Algebra & Trigonometry”, 7th Ed, Cengage Learning, 2015.
[3] Kuldeep Singh, “Engineering Mathematics through Applications”, International Edition, Palgrave Macmillan, 2011.
[4] Michael Artin, “Algebra”, 2nd Edition, Pearson Education, 2014.
[5] Nathan Jacobson, “Basic Algebra I”, Courier Corporation, 2012.

DENH 1303: PHYSIC FUNDAMENTALS

Learning Outcomes

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

1. Describe the basic concepts in physics. [PO1, DK1-DK2]
2. Apply the physics concept systematically in electronics engineering. [PO2, DK1-DK3]
3. Demonstrate lab procedure in handling physic experiment/simulation through lab session. [PO5, DK6]
4. Perform experiments/assignments individually or in groups effectively. [PO9]

Synopsis

The topics covered in this course are Mechanics: Physical Quantities and Measurements, Kinematics of Linear Motion, Circular Motion, Force and Newton's laws, Momentum and Impulse, Work, Energy and Power, Circular Motion, Gravitation, Rotation of A Rigid Body, Moment of Inertia. Wave: Simple Harmonic Motion (SHM), Mechanical Waves and Sound Wave. Properties of Matter: Density and Specific Gravity, Hydrostatics, Elasticity, Viscosity. Thermodynamics: Temperature and Heat Transfer, Theory Kinetic of Gases. Light: Reflection and Refraction of Light.

References

[1] Giancolli DC, Physics for Scientists and Engineers with Modern Physics, 4th Ed. Pearson Prentice Hall 2009
[2] Raymond A. Serway, John W.Jewett, Physics for Scientists and Engineers With Modern Physics, 9th Ed, Cengage learning 2014
[3] Giambatista A., Richardson B.M and Richardson R.C., College Physics, 4th Edition. Mc-Graw Hill, 2013.
[4] Walker J.S., Physics, 5th Edition, Pearson, 2016.

DENT 1213: ELECTRICAL PRINCIPLES

Learning Outcomes

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

1. Explain basic electrical principles, AC & DC condition and the concept of electromagnetism. [PO1, DK2-DK3]
2. Analyze the electrical circuit problem using circuit analysis theory and techniques. [PO2, DK2-DK3]
3. Construct simple electric circuits through lab sessions. [PO5, DK6]
4. Report findings orally or in writing by performing assignments effectively. [PO10]

Synopsis

This course discusses the basic principles of electrics and electronics such as introduction to electrical elements, concept of voltage and current, and Ohm's and Kirchoff's Laws. Students will learn to analyse series and parallel circuits for both direct current (DC) and alternating current (AC). Students will also learn to analyse series and parallel capacitance and inductance circuits in DC and AC. The course will also cover magnetic and electromagnetism theories, devices and laws such as Lenz's and Faraday's law.

References

[1] Thomas Floyd, David Buchla, "Principles of Electric Circuits: Conventional Current Version", 10th Edition, Pearson Education, 2019.
[2] Charles Alexander, Matthew Sadiku, "Fundamentals of Electric Circuits", McGraw-Hill Education, 7th Edition, 2020.
[3] Demetrios P. Kanoussis, "Electric Circuits", Vol. 1, Golden Ratio Publications, 2015.
[4] Herbert W Jackson, "Introduction to Electric Circuits", 9th Edition, Oxford University Press, 2015.
[5] Boylestad R., Nashelsky L., "Electronic Devices and Circuit Theory", 11th Edition, Prentice Hall Inc., 2015.

DENC 1223: COMPUTER PROGRAMMING

Learning Outcomes

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

1. Explain the fundamental principles and algorithms of C programming language. [PO1, DK2-DK4]
2. Develop programming to solve small to medium scale programming problems. [PO3, DK5]
3. Construct well-structured and reliable program in C language through lab sessions. [PO5, DK6]
4. Report findings orally or in writing by performing assignments effectively. [PO10]

Synopsis

The course begins with an introduction to computer programming. It will then focus on C programming language, where students will learn basic structure, identifiers and keywords, data type, variable, constant, operators, and input and output operations. The course will cover essential topics that will enable the students to have a good grasp in computer programming such as control technique, functions, arrays, derived types and pointers.

References

[1] Michael A. Vine, "C Programming For The Absolute Beginner", 3rd Edition, Thomson Course Technology, 2015.
[2] Stephen G. Kochan, "Programming In C", 4th Edition, Addison-Wesley Professional, 2014.
[3] Rohit Upadhyay, "Learn C Language", 3rd Edition, Apl Scientific, 2015.
[4] Jeri R.Hanly And Elliot B.Koffman, "Problem Solving And Program Design In C", 8th Edition, Pearson, 2015.
[5] Paul Deitel And Harvey Deitel, "C How To Program", 8th Edition, Pearson, 2016.

DMCG 1523: ENGINEERING DRAWING

Learning Outcomes

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

1. Acquire and apply fundamental knowledge of engineering drawing. [PO1, DK3-DK4]
2. Produce geometric, orthographic, isometric, section cut and detail drawing using manual technique or CAD. [PO5, DK6]
3. Communicate effectively through the applications of engineering drawing. [PO10]

Synopsis

The course will provide students with an understanding of the importance of engineering drawing as a communication tool among engineers. Student will be exposed to the engineering graphics fundamentals of manual sketching, geometric dimensioning and tolerancing, graphic projections, sectioning and engineering drawings. Students will develop visualization skills by constructing technical drawings using manual sketches and computer aided design (CAD) software. The course consists of both lecture and practical session where students will be guided in presenting and interpreting engineering drawings correctly.

References

[1] Dix, M. & Riley, P., 2014, Discovering AutoCAD 2014, Prentice Hall, New York.
[2] Giesecke, F. E., Mitchell, A., Spencer, H. C., Hill, I. L., Dygdon, J. T. and Novak, J. E., 2011, Technical Drawing, 14th Ed., Prentice Hall, New York.
[3] Jensen, C., & Jay D. H., 2007, Engineering Drawing and Design, 7th Ed., Glencoe and McGraw Hill, New York.
[4] Frederick, E. G. & Mitchell, A., 2008, Technical Drawing and Engineering Drawing, 14th Ed., Prentice Hall.
[5] James D. Bethune, 2013, Engineering Graphics with AutoCAD 2014, Prentice Hall.

DENE 1311: ENGINEERING WORKSHOP & DOMESTIC WIRING

Learning Outcomes

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

1. Apply active and passive electronic components in electrical circuit. [PO2, DK3-DK4]
2. Construct domestic electrical wiring according to approved standards. [PO5, DK6]
3. Demonstrate safety and health procedures in working environment. [PO6, DK7]
4. Practice the right work attitude in any given task. [PO8, DK7]

Synopsis

This workshop starts with an introduction to Safety and Health (OSHA); safety measures at workplace and Job Safety Analysis (JSA), safety and health practices in workshop and laboratory sessions. Next, students are exposed to measuring and testing methods of electrical components; structure, characteristic, unit and symbol of resistor, diode, capacitor, transistor, inductor, transformer, IC, fuse and relay in electronic circuits. Students will also learn about troubleshooting techniques and involve in workshop on active and passive components. The workshop will also cover application of electronic equipment such as multimeter, function and signal generators, AC/DC power supply and oscilloscope. In the last topic, students will practice single-phase 240V electrical domestic wiring.

References

[1] Boylestad & Nashelsky, “Electronic Devices and Circuit Theory”, 11th Edition, Prentice Hall, 2012.
[2] Mahesh B. Patil, “Basic Electronic Devices and Circuits”, PHI Learning Pvt. Ltd, 2013.
[3] “Bengkel Kejuruteraan”, FKEKK, UTeM 2008.
[4] David L. Goetsch, “Occupational Safety and Health for Technologists, Engineers, and Managers”, Pearson Education, 2014.
[5] Seppo Väyrynen, Kari Häkkinen, Toivo Niskanen, “Integrated Occupational Safety and Health Management: Solutions and Industrial Cases”, Springer, 2014.

DENE 1112: SAFETY AND HEALTH IN ENGINEERING

Learning Outcomes

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

1. Demonstrate understanding and commit to professional ethics, related to Occupational Safety and Health knowledge, practices and responsibilities. [PO8, DK7, LOD4, C3]
2. Evaluate the sustainability and impact of engineering work in the solution of well-defined engineering problems in societal and environmental contexts. [PO7, DK7, LOD4, C6]
3. Demonstrate relevant task related to engineering safety and health issues and practices in engineering safety standards and regulations. [PO6, DK7]

Synopsis

Students will be exposed to topics related to safety and health issues in related to engineering technician fields. PBL, project and presentation of case study by the student with a given topic of safety and health will also be included.

References

[1] Mark A. Friend and James P. Kohn, Fundamentals of Occupational Safety and Health, Bernan Press, 7th Edition (2018).
[2] Phil Huges and Ed Ferett, Introduction to Health and Safety at Work, Butterworth-Heinemann, 5th Edition (2011).
[3] Roger L. Brauer, Safety and Health for Engineers, Wiley-Interscience, 2nd Edition (2005).
[4] Louis J. Diberardinis, Handbook of Occupational Safety and Health, Wiley-Interscience; 2nd Edition (1998).
[5] OSHA Field Safety and Health Manual, https://www.osha.gov/OshDoc/Directive_pdf/ADM_04-00-001.pdf

FIRST YEAR: SEMESTER 2

DENH 1152: CALCULUS

Learning Outcomes

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

1. Define the concept of single variable functions such as limits, continuity, differentiation, integration and trigonometric functions. [PO1, DK2, LOD1, C1]
2. Apply various techniques of differentiation and integration to solve the engineering problems. [PO1, DK2-DK3]
3. Perform assignments/case studies individually or in groups effectively. [PO9]

Synopsis

This course will discuss limit and its properties, differentiation including Chain Rule, Differentiation of Trigonometric Function, Logarithmic Function, Exponential Function, Implicit Differentiation, Parametric Differentiation, Application of Differentiation, Forward, Backward and Central Differencing of First and Second Derivatives for Normal and High Accuracy. It then continued with the topic of integration, exponential, logarithmic and inverse functions. This course serves to give the students a good understanding of the basic concept of derivative and integration in solving application related to science, mathematics and engineering problems.

References

[1] J. Stewart, Calculus, 8th Edition, Thomson Learning, 2016
[2] Briggs, Cochran and Gillett “Calculus for Scientist and Engineers”, Pearson Education, 2013.
[3] Frank Ayers, Jr. and Mendelson, E., “Schaum’s Outlines Calculus” 6th Edition, New Work: McGraw-Hill, 2012.
[4] George B. Thomas, Jr., “Thomas Calculus”, 14th Edition, Pearson Education, Inc, 2017.
[5] Abd Wahid Md Raji, Hamisan Rahmat, Ismail Kamis, Mohd Nor Mohamad and Ong Chee Tiong, “The First Course of Calculus for Science and Engineering Students”, 2nd Edition, Penerbit UTHM, 2016.

DENE 1323: ELECTRONIC PRINCIPLES

Learning Outcomes

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

1. Explain the properties of semiconductor and operations, characteristics and applications of diode. [PO1, DK3]
2. Apply the BJT and FET parameters and characteristics to analyze dc operating transistor circuits and voltage regulator circuits. [PO2, DK2-DK3]
3. Construct simple electronic circuit in laboratory session. [PO5, DK6]
4. Investigate experimental results based on standard test and measurements. [PO4]

Synopsis

This course discusses about the structure and material of semiconductor, the diode characteristics and applications such as half-wave & full-wave rectifiers, clamping and clipping function and Zener diode. It then followed by DC biasing transistor of BJT (common-base, common-emitter & common collector) and FET transistor (DC biasing; common-source, common-drain & common-gate). The application of BJT, FET, and IC in voltage regulator circuits is also discussed at the end of this course.

References

[1] Boylestad R., Nashelsky L., “Electronic Devices and Circuit Theory”, 11th Edition, Prentice Hall, 2013.
[2] Floyd, “Electronic Devices”, 10th Edition, Prentice Hall, 2018.
[3] Harold D. Holbrook, Walter J. Seeley, “Basic Electronics”, Elsevier Science, 2013.
[4] Jean Riescher Westcott, “Basic Electronics: Theory and Practice”, 2nd Edition, Mercury Learning & Information , 2015.
[5] N. N Bhargava, D. C. Kulshreshtha, S. C. Gupta, “Basic Electronics and Linear Circuits”, Tata McGraw-Hill Education, 2013.

DENT 1233: ELECTRICAL CIRCUITS

Learning Outcomes

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

1. Explain the fundamental of basic laws and two port networks. [PO1, DK3]
2. Apply circuit analysis and theorems to solve circuit problems. [PO2, DK2-DK3]
3. Construct DC and AC electric circuits through lab sessions. [PO5, DK6]
4. Investigate experimental results based on standard test and measurements. [PO4]

Synopsis

The course begins with nodal and mesh analysis of DC circuit analysis. The course will cover essential circuit theorems such as source transformation, superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer, delta-to-wye and wye-to-delta conversions. Students will also be exposed to first-order circuits such as source-free RC and RL circuits. Apart from DC circuit analysis, this course will also introduce the concept of sinusoids and phasors in AC circuits. It then continued by two-port networks application, transformer's concept and basic principles of power system

References

[1] Charles Alexander, Matthew Sadiku, "Fundamentals of Electric Circuits", McGraw-Hill Education, 7th Edition, 2021.
[2] Floyd, "Principles of Electric Circuits", 10th Edition, Pearson Education, 2020.
[3] Demetrios P. Kanoussis, "Electric Circuits",vol. 1, Golden Ratio Publications, 2015.
[4] Herbert W. Jackson, "Introduction to Electric Circuits", 9th Edition, Oxford University Press, 2015.
[5] Boylestad R., Nashelsky L., "Electronic Devices and Circuit Theory", 11th Edition, Prentice Hall, 2013.

DENC 1433: LOGIC CIRCUITS

Learning Outcomes

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

1. Apply the concept related to digital system. [PO2, DK3]
2. Design combinational circuits utilizing Boolean expression, logic minimization and logic gates. [PO3, DK5]
3. Manipulate logic gates, logic expression and logic minimization in combinational logic circuits through lab sessions. [PO5, DK6]
4. Investigate experimental results based on standard test and measurements. [PO4]

Synopsis

This course starts with the introduction to digital concepts such as the digital quantity, digital waveform, digital and logic circuits, and parallel and serial transmission. Then, students will be exposed to number systems and operations that consists of number conversion, binary codes, binary mathematical operation, signed numbers representation, one's and two's complement and two's complement arithmetic. The course will also cover combinational logic gates that involve Boolean constants and variables, truth table, Boolean theorems, Demorgan's theorems, and parity generator and checker. This is followed by logic expression and minimization for simplifying logic circuits, designing combinational logic circuits and Karnaugh Map method simplifications. Students will also learn combinational logic circuits and applications such as logic gates, adders, comparator, decoder and encoder. The last topic will introduce students to integrated circuit technology such as CMOS and TTL circuits.

References

[1] Albert P. Malvino and Donald P. Leach, "Digital Principles and Applications", 8th edition, McGraw Hill, 2015.
[2] Thomas L. Floyd, "Digital Fundamentals", 11th ed, Prentice Hall, 2014.
[3] Ronald J. Tocci, "Digital Systems, Principles and Applications", 11th edition, Prentice Hall, 2013.
[4] Roger L. Tokheim, "Digital Electronics: Principles and Applications", McGraw Hill, 2013.
[5] J. Gibson, "Electronic Logic Circuits", 3rd edition, Routledge, 2013.

DENC 1532: ECADD

Learning Outcomes

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

1. Explain the electrical and electronic circuit characteristics using ECADD tools such as Multisim, Proteus and MATLAB. [PO1, DK3]
2. Display simulation result using ECADD tools through lab session. [PO5, DK6]
3. Report findings orally or in writing by performing experiments or assignments effectively. [PO10]

Synopsis

In this course, students will be exposed to several ECADD software such as Multisim, Proteus and MATLAB. Students will learn to use Multisim for digital circuit simulation and Proteus for analog circuit simulation. MATLAB will be used for signal processing where students will learn computing and plotting with MATLAB, scripting files, editor/debugger, and MATLAB Simulink toolbox.

References

[1] Syafeeza et al. “Electronics Computer Aided Design” Penerbit Universiti, UTeM, 2010.
[2] Holly Moore, “MATLAB for Engineers”, 4th edition, Prentice Hall, 2013.
[3] David Báez López, Felix Guerrero-Castro, et al., “Advanced Circuit Simulation Using Multisim Workbench”, Morgan & Claypool Publishers, 2012.
[4] David Baez-Lopez and Felix E. Guerrero-Castro, “Circuit Analysis with Multisim, 1st ed, Morgan and Claypool Publisher, 2011.

DENE 1421: PCB DESIGN & FABRICATION WORKSHOP

Learning Outcomes

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

1. Demonstrate techniques of soldering and desoldering according to IPC standard. [PO5, DK6]
2. Fabricate electronic circuit on printed circuit board (PCB). [PO3, DK5]
3. Conduct investigation of the functionality of fabricated PCB. [PO4]
4. Report findings orally or in writing by performing assignments effectively. [PO10]

Synopsis

This workshop starts with soldering and desoldering technique, IPC standard and Safety and Health of handling electronic assemblies. The students are then introduced to PCB design using Proteus software, circuit design, ISIS simulation and ARES. Students will also be exposed to PCB fabrication, drilling process and components installation. The practical tasks include the conversion from schematic to PCB layout using Proteus and PCB fabrication using UV etching technique.

References

[1] H (Ted) Smith, “Quality Hand Soldering and Circuit Board Repair”, 6th Edition, Delmar, 2012.
[2] Mark. I. Montrose, “EMC Made Simple: Printed Circuit Board and System Design”, Montrose Compliance Services, 2014.
[3] “Bengkel Kejuruteraan”, FKEKK, UTeM 2008.
[4] Richard Buttars, “Printed Circuit Board Assembly”, Richard Buttars, 2014.
[5] Mark. I. Montrose, “Printed Circuit Board Design Techniques for EMC Compliance”, Wiley-Interscience-IEEE, 2000.

FIRST YEAR: SEMESTER 3

DENH 2163: ENGINEERING MATHEMATICS

Learning Outcomes

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

1. Solve the problem of limits and continuity, partial derivative, total differential, implicit differentiation, local extreme of multivariable function, integration of multivariable function and vector function. [PO2, DK2-DK3]
2. Apply various techniques of differentiations, integrations and vector valued functions. [PO2, DK2-DK3]
3. Perform assignments/case studies individually or in groups effectively. [PO9]

Synopsis

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

References

[1] Hass, J.R., Heil, C.E. and Weir M.D., "Thomas' Calculus Multivariable", 14th Edition, Pearson, 2018.
[2] Anton H.,Bivens, I.C. and Davis S. "Calculus", 11th Edition, John Wiley, 2017.
[3] James Stewart "Multivariable Calculus", 9th Edition, Cengage Learning, 2021.
[4] John Bird, "Engineering Mathematics", 9th edition, Routledge, 2021.
[5] Y. Dasril, "Engineering Mathematics Module", 2015., FKEKK.

SECOND YEAR: SEMESTER 1

DENH 2173: DIFFERENTIAL EQUATIONS

Learning Outcomes

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

1. Apply the knowledge of ordinary differential equations and partial differential equations. [PO2, DK2-DK3]
2. Solve particular engineering problem by using the knowledge of ordinary differential equations and partial differential equations. [PO2, DK2-DK4]
3. Perform assignments individually or in groups effectively. [PO9]

Synopsis

This course will discuss about the classification of differential equations, first order ordinary differential equations, second order ordinary differential equations, Laplace transform, Fourier series and partial differential equations. The syllabuses are developed to expose students on the fundamental concept of differential equations.

References

[1] Y. A. Cengel, W. J. Palm III, “Differential equations for engineers and scientists”, McGraw Hill, 2013.
[2] Zill D.G. & Wright S.W., “Differential equations with Boundary Value Problems” Eighth Edition. Brooks/Cole.2013.
[3] Polking J., Boggess A. and Arnold D., “Differential equations with Boundary Value Problems”, Pearson Education Inc, 2014.
[4] J David Logan, “Applied Partial Differential Equations”, 3rd Edition. Springer, 2014.
[5] Edward C. H., Penny D.E. & Calvis D. “Differential equations with Boundary Value Problems”, Eight Edition. Pearson Education Inc, 2016.

DENE 2333: ELECTRONICS

Learning Outcomes

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

1. Demonstrate the small signal BJT and FET amplifier, the characteristics of an operational amplifier and voltage regulator circuit [PO2, DK2-DK4]
2. Design active filter circuit for various electronic applications [PO3, DK5]
3. Construct small signal amplifier and voltage regulator circuit through laboratory session [PO5, DK6]
4. Investigate experimental results based on standard test and measurements. [PO4]

Synopsis

The course begins with an introduction to amplifier, small signal BJT transistor amplifiers and FET transistor amplifiers. The course will also cover the basic operation, the characteristics of an operational amplifier and the application of operational amplifier in voltage regulator and active filter circuit. The students will also be exposed to design active filter circuit using operation amplifier.

References

[1] Boylestad R., Nashelsky L., “Electronic Devices and Circuit Theory”, 11th Edition, Prentice Hall, 2014.
[2] Floyd, T.L.“Electronic Devices”, Ninth Edition, Prentice Hall, 2014.
[3] Harold D. Holbrook, Walter J. Seeley, “Basic Electronics”, Elsevier Science, 2013.
[4] Jean Riescher Westcott , “Basic Electronics: Theory and Practice” , Mercury Learning & Information , 2014.
[5] N. N Bhargava, D.C. Kulshreshtha, S. C. Gupta, “Basic Electronics and Linear Circuits”, Tata McGraw-Hill Education, 2013.

DENT 2253: SIGNAL AND NETWORK

Learning Outcomes

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

1. Distinguish various types of signal in a network. [PO1, DK2-DK3]
2. Solve the signal transformation through Fourier Series, Fourier Transform and Laplace Transform. [PO2, DK2-DK4]
3. Display transformation method in signal and circuits through lab sessions. [PO5, DK6]
4. Investigate experimental results based on standard test and measurements. [PO4]

Synopsis

The course starts with signal and system definition, continuous and discrete signal, signal operations, signal characteristics and types of signals. Next, students will be exposed to Fourier series, phase and amplitude spectrum and Parseval theorem. Students will also learn about Fourier transform, step and delta function, and energy and power spectrum. In addition, Laplace Transform and inverse Laplace Transform characteristics will also be explored to enable students to do circuit analysis using Laplace Transform.

References

[1] Wasyl Wasylkiwskyj, “Signals and Transforms in Linear Systems Analysis”, Springer Science & Business Media, 2013.
[2] Charles Alexander, Matthew Sadiku, “Fundamentals of Electric Circuits”, McGraw-Hill Education, 6th Edition, 2016.
[3] A. Anand Kumar, “Signals and Systems”, 3rd Edition, PHI Learning Pvt. Ltd, 2013.
[4] Luis Chaparro, “Signals and Systems using MATLAB”, 2nd ed., Academic Press, 2014.
[5] Gang Li, Liping Chang, Sheng Li, “Signals and Systems: Fundamentals”, Tsinghua University Press, 2015.

DENC 2443: DIGITAL SYSTEMS

Learning Outcomes

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

1. Apply the concept of latches and filp-flops in digital system [PO2, DK2-DK4]
2. Design counters, finite state machine and shift registers using flip-flops [PO3, DK5]
3. Explain the types of programmable logic devices [PO1, DK3-DK4]
4. Construct basic digital system application through lab sessions [PO5, DK6]

Synopsis

In this course, students will be exposed to several topic such as the operation of basic and gated latches, edge triggered and master-slave flip-flops (S-R, J-K, T and D flip-flops), designing asynchronous and synchronous binary counter, finite state machine, design of sequential circuit, shift registers functions and applications.

References

[1] Ronald J. Tocci, “Digital Systems, Principles and Applications”, 12th Edition, Prentice Hall, 2018.
[2] Thomas L. Floyd, “Digital Fundamentals”, 11th Ed, Prentice Hall, 2015.
[3] Roger L. Tokheim, “Digital Electronics: Principles and Applications”, McGraw Hill, 2013.
[4] Albert P.Malvino and Donald P.Leach,“Digital Principles and Applications”, 8th Edition, McGraw Hill, 2015.
[5] Anand Kumar, “Fundamentals of Digital Circuits”, 3rd Edition, PHI Learning Pvt. Ltd, 2014.

DENC 2453: MICROCONTROLLER

Learning Outcomes

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

1. Differentiate the concepts of microprocessor and microcontroller system, and their peripherals. [PO2, DK3-DK4]
2. Develop the microcontroller applications program using various programming techniques. [PO3, DK5]
3. Organize the operation between microcontroller and its input/output devices interfacing through lab sessions. [PO5, DK6]
4. Report findings orally or in writing by performing experiments/assignments effectively. [PO10]

Synopsis

The outcome of this course is to deliver the fundamental of microcontroller and introduce the student with current microcontroller technology and application. This course begins with the introduction to the fundamental concept of the computer system - where the students are expected to clearly define the architecture of microcontroller. Then the course continues with brief explanation on the different components in microcontroller system - memory organization, registers, oscillators, timer and ports. Apart of that, the concept of pipelining, clock cycle, instruction cycle, interrupts are also included. Additionally, the students will be introduced with the microcontroller programming concepts - by using both assembly and C language. Finally, the course also embedded with the project where the students are expected to develop real application with Internet-of-Things concept using the microcontroller development board. The course is critical in industry as most of automation system/machine usually controlled by microcontroller or embedded processing system.

References

[1] M. A. Mazidi, R. D. McKinlay, D. Causey, “PIC Microcontroller and Embedded Systems: Using Assembly and C for PIC18”, MicroDigitalEd, 2nd edition August 16, 2016.
[2] Rafiquzzaman M, “Microcontroller Theory and Applications with the PIC18F”, Willey, 2017.
[3] Michael Margolis, “Arduino Cookbook”, O'Reilly Media, Inc, USA, 2016.
[4] Lucio Di Jasio, “Programming 16-bit PIC Microcontrollers in C”, 2nd Edition, Newnes, 2014.
[5] Martin P. Bates, “Interfacing PIC Microcontroller: Embedded Design by Interactive Simulation”, 2nd Edition, Newmes, 2013.

DENE 2133: ELECTRONIC INSTRUMENTATIONS

Learning Outcomes

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

1. Explain basic principles, technique, components of an electronic instrumentation system and standard in measurement. [PO1, DK3]
2. Apply the instrumentation techniques and the working principles of specified transducers. [PO2, DK2-DK3]
3. Construct application circuit for specified transducers. [PO3, DK5]
4. Investigate experimental results using laboratory instrumentation equipment based on standard test and measurements. [PO4]

Synopsis

The course discusses about units and dimensions, standards, errors, static characteristics, noise and calibration in measurement. It covers most on the measurement devices such as galvanometers, ammeters, voltmeters and wattmeter as well as Wheatstone Bridge, Kelvin Bridge, bridge-controlled circuit, oscilloscope and function generator. It also introduces traducers for instrumentation application.

References

[1] H S Kalsi, 'Electronic Instrumentation', 4th Edition, Tata McGraw-Hill, 2019.
[2] Northrop R.B., 'Introduction to Instrumentation and Measurement', 3rd Edition, CRC Press, 2014.
[3] Michael Collier, Jade Zheng, 'Electronic Instrumentation and Measurement: Theory and Applications', CreateSpace Independent Publishing Platform, 2014.
[4] S. Kamakshaiah, Pannala Krishna Murthy, J. Amarnath, 'Electrical Measurements and Measuring Instruments', I. K. International Pvt Ltd, 2011.
[5] Alan S. Morris, Reza Langari, 'Measurement and Instrumentation: Theory and Application', Academic Press, 2012.

SECOND YEAR: SEMESTER 2

DENE 3153: CONTROL PRINCIPLES

Learning Outcomes

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

1. Construct mathematical model for simple electrical and mechanical systems using transfer function and state space method. [PO1, DK2-DK4]
2. Demonstrate the reduction of multiple subsystems to a single transfer function. [PO1, DK3-DK4]
3. Classify system stability for control systems using Routh-Hurwitz criterion. [PO2, DK3-DK4]
4. Display the response of a control system using appropriate software. [PO5, DK6]
5. Perform experiments/assignments individually or in groups effectively. [PO9]

Synopsis

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

References

[1] Norman S. Nise, “Control System Engineering”, 8th edition, Addison Wesley Publishing, 2019.
[2] Katsuhiko Ogata, “Modern Control Engineering”, 5th edition, Prentice Hall, 2010.
[3] Hajime Akashi, Imai Hiroyuki, “Control Engineering Exercise”, 22th Edition, Kyoritsu Publishing, 2014 [in Japanese].

DENT 2543: COMMUNICATION PRINCIPLES

Learning Outcomes

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

1. Explain basic principles, components and modulation/demodulation techniques of telecommunication systems. [PO1, DK3-DK4]
2. Demonstrate the effect of noise and usage of Smith Chart to set impedance matching in telecommunication systems. [PO2, DK3-DK4]
3. Measure the performance of telecommunications system through experiments in lab sessions. [PO5, DK6]
4. Perform experiments/assignments individually or in groups effectively. [PO9]

Synopsis

This course begins with the introduction to telecommunication, where students will learn about transmission modes, power measurements, electromagnetic frequency spectrum, bandwidth and information capacity. Next, students will be exposed to amplitude modulation (AM), frequency modulation (FM), digital modulation and noise in telecommunication systems. The course will also cover transmission line, VSWR and transmission lines impedance matching.

References

[1] John G. Proakis, Masoud Salehi, “Fundamentals of Communication Systems”, 2nd Ed, Pearson Education, 2014.
[2] Louis Frenzel, “Principles of Electronic Communication Systems”, 4th Edition, McGraw-Hill, 2015.
[3] Rodger E. Ziemer, “Principles of Communications ”, 7th Edition, John Wiley & Sons , 2014.
[4] Wayne Tomasi “Advanced Electronic Communications Systems”, 6th ed, Pearson Education, 2013.
[5] Dhanshetti Sanjay, “Communication System”, Dhanshetti, 2015.

DENE 2244: DIPLOMA PROJECT

Learning Outcomes

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

1. Construct solutions to well-defined engineering problem to meet specified needs. [PO3, DK5]
2. Conduct investigation of solutions to well-defined engineering problem using standard tests and measurements. [PO4]
3. Utilize appropriate modern tools and proper engineering techniques to solve well-defined engineering problems. [PO5, DK6]
4. Demonstrate the understanding of sustainability and impact of engineering technician work to the environment and society. [PO7, DK7]
5. Apply ethical principles and commit to professional conduct during project execution & presentation. [PO8, DK7]
6. Able to work independently towards completion with minimal supervision during the entire project. [PO9]
7. Communicate effectively through formal engineering report presentation both orally and in writing. [PO10]
8. Plan and manage project activities and cost estimation. [PO11]
9. Engage in independent search for technical information from various sources. [PO12]

Synopsis

This course allows students to investigate and implement project based on hardware or combination of hardware and software. Student should perform literature review in order to produce a project proposal. This course emphasis on design and development of solutions for well-defined problem using engineering techniques and tools. Various processes involve in this course such as circuit construction, simulation of circuit design, modelling, producing printed circuit board, component assembly, soldering, troubleshooting and testing. At the end of the semester, students are required to submit a project report in a given format and deliver a presentation.

References

[1] Diploma Project Guideline, FKEKK, 2019.

THIRD YEAR: SEMESTER 1

DENU 3158: INDUSTRIAL TRAINING

Learning Outcomes

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

1. Display ability to apply suitable techniques, resources and tools in engineering activities [PO5, DK6]
2. Demonstrate the right work attitude in completing the task given [PO8, DK7]
3. Work effectively in individually or in group adapt readily to real-life working environment [PO9]
4. Report activities orally and in writing [PO10]
5. Identify elements of entrepreneurship in related field [PO11]
6. Identify new skills and be aware of current technologies [PO12]

Synopsis

All diploma students will be placed in appropriate local industries or government corporations for 16 weeks normally in the final semester of their third year of study. Students will be exposed to real life working environment relevant to their field of study

References

[1] Industrial Training Guidebook, UTeM.
[2] FKEKK Handbook, UTeM

5.7.3 Elective Courses (E)

DENC 3363: COMPUTER ENGINEERING

Learning Outcomes

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

1. Explain the architecture of computer hardware and different types and functions of operating system. [PO1, DK3-DK4]
2. Demonstrate the technologies of computer networking and data communications with relations to Internet-of-Things (IoT). [PO2, DK3-DK4]
3. Assemble and install a complete computer system, operating system, and networking setup through lab session. [PO5, DK6]
4. Investigate experimental results based on standard test and measurements. [PO4]

Synopsis

This course will discuss about the breadth and depth of computer system that encompass both software and hardware elements. Students will be introduced to the history of computers, categories of computers, example of computer usage, its application in society, and current computing technology. Computer Organization and Architecture are explained that include Central Processing Unit (CPU), memory, expansion slots and adaptor cards, ports, I/O devices, and storage media. Operating System functions are described with stand-alone utility programs. Computer communications, computer network, network architectures, network topologies are learned with regards to Internet-of-Things perspective. Finally, computer security risks, information privacy, ethics and society are exposed for the awareness of the students. This course will equip the students with vast knowledge of computer engineering field that will help them to pursue advanced studies in computer engineering field.

References

[1] Alan Evans, Kendall Martin, & Mary Anne Poatsy, “Technology in Action”, 14th Edition, Prentice Hall 2017.
[2] Deborah Morley and Charles S. Parker, “Understanding Computers: Today and Tomorrow”, 16th Edition, Cengage Learning, 2016.
[3] Misty E. Vermaat, Susan L. Sebok, and Steven M. Freund, “Discovering Computers, Essentials”, USA, Cengange Learning, 2014.

DENE 3363: INDUSTRIAL AUTOMATION

Learning Outcomes

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

1. Explain the concept of industrial automation system, discrete sensors, pneumatics actuators, Flexible Manufacturing System (FMS) and robotics in industrial control environment. [PO1, DK3-DK4]
2. Apply the control programming using Programmable Logic Controller (PLC) that will perform a specified operation. [PO2, DK3-DK4]
3. Construct the experiments using Programmable Logic Control (PLC) with several industry applications. [PO5, DK6]
4. Investigate experimental results based on standard test and measurements. [PO4]

Synopsis

This course will discuss the fundamental of automation in the first chapter that covers basic concepts and terminology, impact of automation system in manufacturing, and advantages & disadvantages of automation in manufacturing. The second chapter will cover Programmable Logic Controller (PLC) which consists of PLC architecture and operation, ladder diagram and mnemonics, PLC timer and counter, and the industrial applications. Construction and principle of operation of sensors (position and proximity sensors) and pneumatic (valve and actuator, solenoid and electrical ladder diagram) and hydraulic will be introduced in the third chapter. Subsequently, Industrial Robotics which consists of anatomy and related attributes, robot control systems, and applications of robots are covered in the fourth chapter. Finally, concepts of Flexible Manufacturing System 200 (FMS200), the function of each station and an overall system, will be covered in the final chapter of this course.

References

[1] Mikell P. Groover. Automation, Production Systems, and Computer-Integrated Manufacturing, 4th Edition, Pearson, 2014.
[2] John J. Craig, Introduction to Robotics: Mechanics and Control, 3rd Ed. Pearson. 2014.
[3] Terry Bartelt. Industrial Automated Systems Instrumentation and Motion Control, Delmar, 2011.
[4] B.R. Mehta, Y. Jaganmohan Reddy. Industrial Process Automation Systems: Design and Implementation. Butterworth-Heinemann, 2014.
[5] Douglas M. Considine, Glenn D. Considine. Standard Handbook of Industrial Automation. Springer Science & Business Media, 2012.

DENT 3563: TELECOMMUNICATION ENGINEERING

Learning Outcomes

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

1. Explain about basic concept of communications system, digital communication, antenna and waveguide, basic concept of telephony and switching system. [PO1, DK3-DK4]
2. Analyze the operation parameters of satellite systems. [PO2, DK3-DK4]
3. Construct various communication link through lab sessions. [PO5, DK6]
4. Investigate experimental results based on standard test and measurements. [PO4]

Synopsis

The course begins with the basic principles of communications system with the emphasis on digital communication such as digital modulation and digital encoding. Next, students will be exposed to four important topics in telecommunication engineering. In Satellite System, students will learn about Kepler's Law, satellite orbits and frequency allocation. Optical Fiber Communications will cover single and multimode fiber, light propagation, and light sources and detectors. In Antenna and Waveguide, students will be exposed to types of antenna and waveguide and basic antenna operation. Finally, Telephony System will cover functions of a telephone set, switching system and telephone network

References

[1] John Dunlop, "Telecommunications Engineering", 3rd Edition,John Springer US, 2014.
[2] Thiagarajan Viswanathan, Manav Bhatnagar, "Telecommunication Switching Systems and Networks", 2nd Edition, PHI Learning Pvt. Ltd, 2015.
[3] Wayne Tomasi "Advanced Electronic Communications Systems", 6th Edition, Pearson Education, 2013.
[4] Sanjay Sharma, "Communication Engineering", S.K. Kataria & Sons, New Delhi, 2012.
[5] Andreas F. Molisch, "Wireless Communications", 2nd Edition, Wiley IEEE Press, 2012.

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