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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

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 instil 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.
FACULTY VISION

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

FACULTY MISSION

The Faculty is committed to pioneer and contribute towards the prosperity of the nation and the world in the field of Electronic Engineering by:

1. promoting knowledge through innovative teaching and learning, research and technical scholarship.
2. developing professional leader with impeccable moral values.
3. generating sustainable development through smart partnership with the community and industry.

FACULTY 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.
PROGRAMME EDUCATIONAL OBJECTIVES

1. To achieve career advancement and to pursue lifelong learning in related areas of electronic engineering work or businesses.
2. To produce solutions to real electronic engineering problems that are practical and sustainable.
3. To display exemplary interpersonal, leadership and social skills.

PROGRAMME OUTCOMES

1. Apply knowledge of mathematics, science, engineering and electronics fundamentals to solve complex engineering problems (Engineering Knowledge).
2. Undertake problem identifications, formulation and analysis of complex engineering problems (Problem Analysis).
3. Design systems, components, or processes to meet desired needs as well as analyze and interpret the results (Design/Development of Solutions).
4. Investigate complex problems using research-based knowledge and research methods to provide valid conclusions (Investigation).
5. Apply appropriate techniques, resources, and modern engineering and IT tools to complex engineering activities (Modern Tool Usage).
6. Assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice (The Engineer and Society).
7. Understand the needs for sustainable development and the impact of engineering solutions on society and environment (Environment and Sustainability).
8. Apply ethical principles and commit to professional ethics, responsibilities and norms of engineering practice (Ethics).
9. Communicate effectively on complex engineering activities with the engineering community and with society at large (Communication).
10. Work effectively as a team member and leader in managing projects in a multidisciplinary environment (Individual and Team Work).
11. Recognize the needs for, and ability to engage in independent and life-long learning as well as identify entrepreneurial and business opportunities in related areas (Life Long Learning).
12. Demonstrate knowledge and understanding of engineering and management principles and apply these to one’s work, as a member and leader in a team, to manage projects and in multidisciplinary environments (Project Management and Finance).
FOREWORD BY THE DEAN

Assalamualaikum wrt.wbt.

All Praise to Allah, the Almighty, the Most Gracious and the Most Merciful. Through His Blessings and Grace, the Faculty of Electronic and Computer Engineering with the cooperation of the University Publisher has managed to successfully publish the faculty’s handbook for the Academic Session of 2015/2016.

Last year, the university took a bold step in reviewing all the engineering programmes and restructures them into broad based programmes which was implemented for the first time in 2014/2015 session. Thus, for the 2015/2016 Academic Session the student intake is purely for the engineering broad based programme, that is, the Bachelor of Electronic Engineering with Honours programme.

This faculty handbook provides the latest information on the academic programmes to be offered in the 2015/2016 Academic Session, the academic curriculum structures, the synopsis and syllabi of all the courses, the academic system applied in the teaching and learning activities and the facilities that support the teaching and learning activities in the faculty.

This handbook also contains general information on the vision, mission, motto, educational objectives and objectives of UTeM and the vision, mission and objectives of the faculty. The Programmes Objectives and the Programmes Outcomes are also included for the students to realize and achieve.

Updated information on the management of the faculty and the members of the academic and support staff in the faculty is included in this handbook for everyone’s reference.

The faculty put great effort to compile and upgrade the handbook with the most accurate data and information. It is hope that this handbook can become an excellent guide to the students in the faculty during their course of studies in UTeM. I would like to thank the faculty publication committee for successfully compiling and publishing this handbook.

On behalf of the faculty, let me take this opportunity to congratulate all the new students for having been offered a place to pursue your studies in UTeM. My best wishes to you and I hope you have a wonderful time while in UTeM. I wish you ever success in your course of studies and in your future endeavour.

Thank you.

Wassalam.

“EXCELLENCE THROUGH COMPETENCY”

PROFESSOR DR. ABDUL RANI BIN OTHMAN
Dean,
Faculty of Electronic and Computer Engineering
Universiti Teknikal Malaysia Melaka
SENIOR ADMINISTRATIVE STAFF

Dean
Professor Dr. Abdul Rani bin Othman

Deputy Dean (Academic)
Dr. Nuruljafar bin Abd. Manap

Deputy Dean (Research & Development)
Dr. Azmi bin Awang Md Isa

Head of Department (Telecommunication Engineering)
Dr. Abdul Majid bin Darsono

Head of Department (Industrial Electronic)
Dr. Mohd Shakir bin Md Saat

Head of Department (Computer Engineering)
Dr. Fauziyah binti Salehuddin

Head of Department (Diploma Studies)
Dr. Hazura binti Haroon

Senior Assistant Registrar
Mohd Hanapiah bin Md Lip

Assistant Registrar
Ernawatie binti Md. Sah
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 22 June 2001 and it started its operation at the temporary premises in Taman Tasik Utama, Ayer Keroh, Melaka.

On 22 December 2004, FKEKK created history 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 arts 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 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 fully implemented in the faculty.

In the previous years, FKEKK offered four undergraduate programmes, viz., Bachelor of Electronic Engineering (Industrial Electronics) with Honours, Bachelor of Electronic Engineering (Computer Engineering) with Honours, Bachelor of Electronic Engineering (Telecommunication Electronics) with Honours, Bachelor of Electronic Engineering (Wireless Communication) with Honours and Diploma in Electronic Engineering.

This year the university has taken a bold step in reviewing all the engineering programmes and restructures them into broad based programmes. FKEKK will be offering Bachelor of Electronic Engineering with Honours in the 2024/2015 Academic Session. However, the various electives available in the curriculum allow a student to choose an option to focus on industrial electronics, computer engineering, telecommunication electronics or wireless communication.

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

- Department of Industrial Electronics
- Department of Computer Engineering
- Department of Telecommunication Engineering
- Department of Diploma Studies
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 students, are equipped with modern audio and visual aids such as computer and LCD projector. There are altogether 18 laboratories and workshops. Besides these, there are 17 student self-study rooms; each room is capable of accommodating 30 students.

All the laboratories are equipped with the latest industrial equipment which are sophisticated enough 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 19 laboratories are listed as below:

- Basic Electronic Laboratory 1 and 2
- Industrial Electronic Laboratory
- Industrial Automation Laboratory
- Electrical Technology Laboratory
- Computer Engineering Laboratory
- Digital Laboratory 1 and 2
- Microprocessor Laboratory
- Basic Communication Laboratory
- Communication Electronics Laboratory
- Microwave Laboratory
- Wireless Communication Laboratory
- FYP and Fabrication Laboratory
- Postgraduate Research Laboratory 1
- Postgraduate Research Laboratory II
- Research Laboratory I
- Research Laboratory II
- Research Laboratory III

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/technician.
LABORATORY BLOCKS

**BLOCK E**
- Level 1: Fundamental Electronic Lab 1 and 2 & Electrical Technology Lab.
- Level 2: Microwave Lab, Research Lab. II & Industrial Electronic Lab.

**BLOCK F**
Ground Floor: Lecturers’ Rooms
- Level 1: Postgraduate Research Lab. I

**BLOCK D**
Ground Floor: FYP & Fabrication Lab.
- Level 1: Basic Communication Lab.
- Level 2: Electronic Communication Lab.

**BLOCK C**
Ground Floor: Computer Engineering Lab. & Research Lab. II
- Level 1: Digital Lab 1 and 2
- Level 2: Microprocessor Lab. & Microelectronic Lab.
COURSE OFFERED

FKEKK offers the Diploma and Degree Programmes as below:

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

COURSE DURATIONS

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

COURSE STRUCTURES

Courses offered are in line to the recommendations from the Engineering Accreditation Council (EAC) of Malaysia. All the subjects 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.
ENTRY REQUIREMENTS FOR THE BACHELOR DEGREE PROGRAMME

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

1. Minimum Entry Requirements For STPM Candidates

   University General Requirements

   A Pass in Sijil Pelajaran Malaysia (SPM) / equivalent with a credit in Bahasa Melayu or credit in Bahasa Melayu July Paper;

   and

   Pass in Sijil Tinggi Persekolahan Malaysia (STPM) with at least CGPA 2.00 and obtained at least:
   ▪ C Grade (NGMP 2.00) in Pengajian Am; and
   ▪ C Grade (NGMP 2.00) in two (2) other subjects.

   and

   Obtained at least Band 2 in the Malaysian University English Test (MUET)

   and

   Faculty Programme Special Requirements

   A pass in Sijil Tinggi Persekolahan Malaysia (STPM) with at least with C Grade (NGMP 2.00) in all of the following subject:
   ▪ Mathematics T / Further Mathematics T / Mathematics S
   ▪ Physics
   ▪ Chemistry
   or
   ▪ Mathematics T / Further Mathematics T / Mathematics S
   ▪ Chemistry
   ▪ Biology and obtained at least credits (4B/ B Gred) in Physics at Sijil Pelajaran Malaysia (SPM) level

   and

   The applicant must not be colour blind and not handicapped that can impair practical work
2. Minimum Entry Requirements for Matriculation Candidates

University General Requirements

A Pass in Sijil Pelajaran Malaysia (SPM) / equivalent with credit in Bahasa Melayu or credit in Bahasa Melayu July Paper;

or

Pass in MOE Matriculation / UM Science Foundation / UiTM Foundation Studies with at least CGPA 2.00;

and

obtained at least Band 2 in the Malaysian University English Test (MUET)

and

Faculty Programme Special Requirements

Obtained at least C Grade (NGMP 2.00) in MOE Matriculation / UM Science Foundation / UiTM Foundation Studies in all following subjects:

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

or

- Mathematics / Engineering Mathematics
- Chemistry / Engineering Chemistry
- Biology and obtained at least credits (B Gred) in Physics at Sijil Pelajaran Malaysia (SPM) level

and

The applicant must not be colour blind and not handicapped that can impair practical work
3. Minimum Entry Requirements for Diploma holders

University Entry Requirements

A Pass Sijil Pelajaran Malaysia Pass (SPM) / equivalent with credit in Bahasa Melayu or credit in Bahasa Melayu July Paper;

and

A Pass in Diploma of other qualification recognized as equivalent by the Government of Malaysia and approved by the IPTA Senate;

or

A pass in Sijil Tinggi Persekolahan Malaysia (STPM) with at least
  - C Grade (CGPA 2.00) in Pengajian Am; and
  - C Grade (CGPA 2.00) in two (2) other subjects.

or

A pass in Matriculation with at least CGPA 2.00

and

obtained at least Band 2 in the Malaysian University English Test (MUET)

and

Faculty Programme Special Requirements

A pass in Diploma 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 during application.

or
A pass in Sijil Tinggi Persekolahan Malaysia (STPM) with at least C Grade (CGPA 2.00) in all the following subjects:

- Pengajian Am
- Mathematics T / Further Mathematics T / Mathematics S
- Physics
- Chemistry

or

- Pengajian Am
- Mathematics T / Further Mathematics T / Mathematics S
- Chemistry
- Biology and obtained at least credits (4B/B Gred) in Physics at Sijil Pelajaran Malaysia (SPM) level

or

A pass in MOE Matriculation / UM Foundation Studies / UiTM Foundation Studies examination with at least C Grade (NGMP 2.00) in all the following subjects:

- Mathematics / Engineering Mathematics
- Physics / Engineering Physics / Engineering Science
- Chemistry / Engineering Chemistry / Electric and Electronic Engineering Studies / Civil Engineering Studies

or

- Mathematics / Engineering Mathematics
- Chemistry / Engineering Chemistry
- Biology and obtained at least credits (B Gred) in Physics at Sijil Pelajaran Malaysia (SPM) level

and

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

4. Malaysian University English Test (MUET)

Students with Band 2 in MUET upon registration for the Bachelor degree course are required to register and resit for MUET and must at least obtain a Band 3 within two years from the date of registration for the course. Students who fail to do so within the two years are not allowed to continue their studies in the following semester.

The university fully encourages students without Band 4 in MUET to register and take the Foundation English Programme (BLHL 1010) subject offered by the university in order to assist them to be more prepared to resit the MUET. Students are required to pay RM100.00 to take the subject.
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

<table>
<thead>
<tr>
<th>SEMESTER I</th>
<th>SEMESTER II</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classes</td>
<td>Classes</td>
<td></td>
</tr>
<tr>
<td>7 weeks</td>
<td>7 weeks</td>
<td></td>
</tr>
<tr>
<td>Semester Break</td>
<td>Semester Break</td>
<td></td>
</tr>
<tr>
<td>1 week</td>
<td>1 week</td>
<td></td>
</tr>
<tr>
<td>Classes</td>
<td>Classes</td>
<td></td>
</tr>
<tr>
<td>7 weeks</td>
<td>7 weeks</td>
<td></td>
</tr>
<tr>
<td>Revision Week</td>
<td>Revision Week</td>
<td></td>
</tr>
<tr>
<td>1 week</td>
<td>1 week</td>
<td></td>
</tr>
<tr>
<td>Final Exam</td>
<td>Final Exam</td>
<td></td>
</tr>
<tr>
<td>2 weeks</td>
<td>2 weeks</td>
<td>18 weeks</td>
</tr>
<tr>
<td>Total</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>18 weeks</td>
<td>18 weeks</td>
<td></td>
</tr>
<tr>
<td>Break Between Semesters</td>
<td>Break Between Semesters</td>
<td>3 weeks</td>
</tr>
<tr>
<td>3 weeks</td>
<td>1 week</td>
<td>13 weeks</td>
</tr>
</tbody>
</table>

OR

<table>
<thead>
<tr>
<th>SPECIAL SEMESTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classes and Exam</td>
</tr>
<tr>
<td>End of Semester Break</td>
</tr>
<tr>
<td>Break Between Semesters</td>
</tr>
<tr>
<td>TOTAL</td>
</tr>
<tr>
<td>52 weeks</td>
</tr>
</tbody>
</table>

TOTAL: 52 weeks
GRADING SYSTEM

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

Table 2: Marks, Grades and Points Awarded

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

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

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

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:

\[ \text{Total Points, } JMN = k_1m_1 + k_2m_2 + \ldots + k_nm_n \]

\[ \text{Total Calculated Credits, } JKK = k_1 + k_2 + \ldots + k_n \]

\[ \text{GPA} = \frac{JMN}{JKK} \]

\[ = \frac{k_1m_1 + k_2m_2 + \ldots + k_nm_n}{k_1 + k_2 + \ldots + k_n} \]

Where:
- \( k_n \) = Credit for \( n \) subject
- \( m_n \) = Points from the \( n \) 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:

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

Where:
- \( JMN_n \) = Total points obtained in \( n \) semester
- \( JKK_n \) = Total credits in \( n \) semester

AWARD

A Bachelor 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 subjects 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 passed MUET with **Band 4** according to the University’s directive.
5. has met all the other University’s requirements.
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 subject 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.

The 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 subjects offered in each semester. For those with good academic standings, they are encouraged to register for all the subjects 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 subjects 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 subject. 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 subject 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.

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 subjects and subject 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 subject 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' subject registration record in order to ensure no subject 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

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 subject registration, add/drop of subjects, subject 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.
BACHELOR OF ELECTRONIC ENGINEERING WITH HONOURS
INTRODUCTION

Starting this Academic Year, UTeM has 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.

CURRICULUM STRUCTURE

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 subjects offered are Engineering Mathematics, Computer Programming, Electrical and Electronic Engineering Fundamentals and subjects 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 subjects. These subjects 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 128 credits 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.

**CAREER PROSPECT**

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.
## COURSE CURRICULUM FOR BACHELOR OF ELECTRONIC ENGINEERING WITH HONOURS

### Semester 1

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**Special Semester**

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**Note:**

* To be taken by International Students Only

**Category:** W: University Compulsory Subjects, P: Common Core Subjects, K: Program Core Subjects, E: Elective Subjects
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<th>Year 2</th>
<th>Year 3</th>
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### Subject List Based on Categories

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<td>Principles of Electrical and Electronics</td>
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<td>Principles of Instrumentation and Measurement</td>
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**Note:**

* University compulsory subjects for International Students only
OPTION FOR ELECTIVE SUBJECTS

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<td>Select ONE(1) subject either from the chosen Programme Specialization Electives or from any Programme Specialization Electives or from any Engineering Programme Specialization Electives</td>
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</tbody>
</table>

Example: BENC 4463 + BENC 4473 + BENC 4483 + BENC 4493
or
BENC 4463 + BENC 4473 + BENC 4493 + BENT 4813
Or
BENC 4473 + BENC 4483 + BENC 4493 + 1 Elective Subject from FKE or FKM or /FKP
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 Electronics 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 as shown in Table 1.

Table 1

<table>
<thead>
<tr>
<th>Degree Awarded</th>
<th>Choice of Field Elective</th>
<th>Field of Registration with BEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor of Electronic Engineering with Honours [BENG]</td>
<td>Industrial Electronics</td>
<td>Electronic Engineer</td>
</tr>
<tr>
<td></td>
<td>Computer Engineering</td>
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</tr>
<tr>
<td></td>
<td>Wireless Communication</td>
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<tr>
<td></td>
<td>Telecommunication Electronics</td>
<td></td>
</tr>
</tbody>
</table>
Syllabus Summary
For the
Bachelor of Electronic Engineering Programmes
### UNIVERSITY COMPULSORY SUBJECTS (W)

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BKKX xxx1</td>
<td>Co-Curriculum 1 and 2</td>
</tr>
<tr>
<td>BLHW 1702*</td>
<td>Islamic and Asian Civilization (TITAS)*</td>
</tr>
<tr>
<td>BLHL 1012**</td>
<td>Malay Language Communication**</td>
</tr>
<tr>
<td>BLHW 2403</td>
<td>Technical English</td>
</tr>
<tr>
<td>BLHW 2712*</td>
<td>Ethnic Relations*</td>
</tr>
<tr>
<td>BLHW 2752**</td>
<td>Malaysian Culture**</td>
</tr>
<tr>
<td>BLHW 3403</td>
<td>English For Professional Communication</td>
</tr>
<tr>
<td>BLHL xxx2</td>
<td>Third Language</td>
</tr>
<tr>
<td>BLHC 4032*</td>
<td>Critical and Creative Thinking*</td>
</tr>
<tr>
<td>BLHW 1742**</td>
<td>Malaysian Studies**</td>
</tr>
<tr>
<td>BPTW 4012</td>
<td>Technology Entrepreneurship</td>
</tr>
</tbody>
</table>

**Note:**
- * University compulsory subjects to be taken by local students
- ** University compulsory subjects to be taken by international students

Please refer to the Pusat Bahasa dan Pembangunan Insan (PBPI) Handbook for the synopsis and the detail syllabus for above subjects.
COMMON CORE SUBJECTS (P)

BMFG 1113: ENGINEERING MATHEMATICS

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

References

BEK 1133: PRINCIPLES OF ELECTRIC AND ELECTRONICS

Synopsis
This course will discuss about the basic principles of electrical and electronics; introductions to electric elements, symbols and components, KCL, KVL, Node and Mesh in solving DC series and parallel circuit. Introduction to magnetism, electromagnetism and AC characteristics. Introduction to semiconductors, atomic structures, energy band, P-type and N-type. Study on structure, principle and application of diode, BJT and Op-Amp circuits.

References

BMFG 1213: ENGINEERING MATERIALS

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

References

BEK 1233: PRINCIPLES OF INSTRUMENTATION AND MEASUREMENT

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

References
BMCG 1013: DIFFERENTIAL EQUATIONS

Synopsis
This course is intended to introduce the concept and theories of differential equations. Second order linear differential equations with constant coefficients will be solved by using the methods of undetermined coefficient, variation of parameters and Laplace transform. Fourier series in relation to periodic functions will be discussed. An introduction to the solution and application of partial differential equations with boundary value problems using the method of separation of variables and Fourier series will also be discussed.

References

BITG 1233: COMPUTER PROGRAMMING

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

BENG 1413: DIGITAL ELECTRONICS

Synopsis
This subject comprises of several topic such as number systems and codes, logic gates and Boolean algebra, combinational logic circuits, MSI logic circuits and flip flops, integrated circuit logic families and Introduction to Finite State Machine (FSM).

References

BMCG 1523: ENGINEERING GRAPHICS AND CAD

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

**BENG 2142: STATISTICS**

**Synopsis**
Topics covered: Data description and Numerical Measures, Probability, Random Variables and Probability Distributions, Sampling Distributions, Estimation, Hypothesis Testing, Simple Linear Regression

**References**

**BEKG 2433: ELECTRICAL SYSTEMS**

**Synopsis**
This is an introductory subject for students on the fundamental knowledge of electrical power system. The students will be taught on the physics of electrical power system, which includes the theory and analysis of electromagnetism, followed by power concepts & equations (single and three phase), power factor & power factor corrections, single and three-phase system and per-unit calculation. There will also topics on characteristics for static and rotating electric machine principles, including AC, DC, synchronous, induction motor and transformer. Furthermore, students will be introduced to the concepts on the electric power system network (generation, transmission and distribution) and various power generation system and energy sources. The students will also learn on basic characteristics and performance of electrical transmission line and distribution system.

**References**

**BEKG 2452: NUMERICAL METHODS**

**Synopsis**
Topics covered: Errors; Solution of Nonlinear Equations; Solution of Linear Systems; Interpolation and Curve Fitting; Eigenvalues and Eigenvectors; Numerical Differentiation; Numerical Integration; Solution of Ordinary Differential Equations; Solution of Partial Differential Equation; Introduction to SCILAB and its application in the numerical computations.

**References**
BENU 3005: INDUSTRIAL TRAINING

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.

BMFG 4623: ENGINEERING ECONOMY AND MANAGEMENT

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

BENU 4131: ENGINEERING SEMINAR

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

BENU 4972: PSM I

Synopsis
This course represents the first part of the final year project. Students should produce a project proposal and start work on their project before the end of the semester. Projects can be either the development of useful software or electronic hardware. Projects can also take the form of case studies or solving industrial problems encountered by the students during their industrial training.

BENG 4322: ENGINEER AND SOCIETY

Synopsis
This course covers topics on: Role of engineer in nation building, evaluation of engineering, national development role of engineers in society, laws related to public safety, health & welfare, future engineers, professionalism and codes of ethics, definition of professionalism, understanding engineering as a profession, ethical theories, IEM and BEM code of ethics. Ethical problem solving techniques analysis of issues in ethical problems, line drawing, flow charting, learn to handle conflicting problems. Occupational Safety and Health legislation and management. Rights and responsibilities of engineers. Quality from engineering perspective. Carrier guidance and project management.

References

BENU 4984: PSM II

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.

**PROGRAMME CORE SUBJECTS (K)**

**BENG 1132: ENGINEERING PRACTICE**

**Synopsis**
This subject will be offered during the special semester at the end of second year. The topics covered are standard industrial practice, industrial safety and health regulation (OSHA), component soldering and soldering, printed circuit board design and fabrication, simulation tools, component circuit and troubleshooting. Students will also expose to the plan preventive maintenance, quality control and project management's topics. Besides that, for the first 3 weeks of the course, students will undergo multi engineering courses offered by mechanical, manufacturing and electrical engineering faculty.

**References**
[1] Environmental, Safety and Health Engineering, Gayle Woodside, WILEY, 1997

**BENC 2413: DIGITAL SYSTEMS**

**Synopsis**
This subject comprises of several topics such counters, shift registers, finite state machine, memory devices, programmable logic devices and basic computer architecture, basic microprocessors, buses.

**References**

**BENG 2713: CIRCUIT THEORY I**

**Synopsis**

**References**

**BENE 2123: FUNDAMENTAL OF ELECTRONICS**

**Synopsis**
This course will discuss on: Introduction to Multisim; **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 regulator; **Bipolar Junction Transistor (BJT):** construction and operation of BJT, BJT characteristics and measurement technique, limits of operation, $\beta_{dc}$ & $\alpha_{dc}$, DC biasing - DC load lines; **Field Effect Transistor (FET):** construction & operation of FET, FET characteristics & diagram, Shockley's equation, DC biasing – DC load line; **Metal oxide semiconductor field-effect transistor (MOSFET):** construction & operation of MOSFET dc characteristic.

References


**BENG 2211: ELECTRONIC ENGINEERING LAB 1**

**Synopsis**
This course covers topics in BENM 2133 Digital System, BENE 2153 Analog Electronics and BENT 2123 Signals and Systems with the following items:

Asynchronous and Synchronous Counter
Finite State Machine
Shift Register
Common-Emitter BJT Amplifiers
Common-Source JFET Amplifiers
Op-Amp Applications
Transients In Inductors, Charging And Discharging Capacitors
Transients In R-L-C Circuits
Band-Pass Filter

References


**BENG 2423: MICROPROCESSOR TECHNOLOGY**

**Synopsis**
Topics covered in this subject includes the introduction to microprocessor-based system, the internal and software model of the microprocessor, the assembly language programming design and development, the microprocessor device specification and its related configuration, and also the design configuration of the memory and input/output system interfacing.

References


**BENG 2723: CIRCUIT THEORY II**

**Synopsis**
This subject will discuss about 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 and Bode Plot, series and parallel resonance and filters.

References

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**FACULTY OF ELECTRONIC AND COMPUTER ENGINEERING**

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**BENE 2133: ANALOG ELECTRONICS**

**Synopsis**

**References**

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**BENC 3443: MULTIMEDIA TECHNOLOGY AND APPLICATION**

**Synopsis**
This subject prepares the students with basic concept of multimedia, technology and the importance of multimedia application. This subject 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 the topics introduction to multimedia technology, graphic and image data representations, audio technology, video technology and multimedia systems.

**References**

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**BENG 2431: ELECTRONIC ENGINEERING LAB 2**

**Synopsis**
This course covers topics in Digital Systems and Microprocessor Technology with the following items: Basic and Combinational Logic Gates, Asynchronous and Synchronous Counter, Finite State Machine, Microprocessor Training Board and Applications of ARM Processor.

**References**

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**BENE 3143: ELECTRONIC SYSTEM DESIGN AND ANALYSIS**

**Synopsis**
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, SCR, UJT, PUT Circuits, RC phase shift oscillator, Wien bridge oscillator, tuned oscillator, crystal oscillator, 555 timers, active filters , filter design criteria, higher order Butterworth and switched capacitor filters.

**References**
BENT 3743: ELECTROMAGNETIC FIELDS AND WAVES

Synopsis
This course will discuss on:
Vector analysis: Vector algebra, coordinate system and transformation, vector calculus; Electrostatics: Electrostatic fields, Gauss Law, Poisson’s equation, electric fields in material space, electrostatic boundary;
Magnetostatics: Magnetostatic fields, Stokes Theorem, Biot-Savart Law, Gauss Law, magnetic forces, material and devices; Waves: Maxwell’s equations, Faraday’s Law, time-varying electromagnetic field, electromagnetic wave propagation.

References

BENG 3211: ELECTRONIC ENGINEERING LAB 3

Synopsis
This course covers topics in BENE 2133 Analog Electronics and BENE 3143 Electronic System Design and Analysis. Among the topics that will be covered in this course are; regulated power supply, filters design, and amplifier design.

References:

BENT 3753: COMMUNICATION PRINCIPLES

Synopsis

References

BENE 3223: CONTROL PRINCIPLES AND SYSTEMS

Synopsis
Introduction to control system, frequency domain modeling, Laplace transform, transfer function, electric network transfer function, translational mechanical system, rotational mechanical system transfer function, time domain modeling, general state space representation, transfer function and state space conversion, time response, poles, zeros and system response, First and Second order systems, under-damped system, reduction of multiple subsystems, block diagrams, feedback systems, signal flow graphs, Mason’s rule, Routh-Hurwitz criterion and Gain Adjustment compensator design.
References


BENG 4733: DIGITAL SIGNAL PROCESSING

Synopsis

This course consists of topics: Introduction to DSP, discrete-time signals and systems, spectrum of representation of discrete-time signals, discrete Fourier transform, difference equations and discrete-time systems, z-transform and its applications, analysis and design of digital filters and random signal processing.

References

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

ELECTIVE SUBJECTS (E)

BENC 4463: MICROCONTROLLER TECHNOLOGY

Synopsis
Topics covered in this subject includes the introduction to microcontroller-based system, the internal architecture of the microcontroller, the programming design and development software, the design configuration and peripheral interfacing of the application system, the development of specific microcontroller application, and the integration of software and hardware subsystems.

References

BENE 4233: INDUSTRIAL CONTROL

Synopsis
This course will discuss about Introduction to Industrial Control: the classification of industrial control systems, the components of control system and its characteristics, Discrete Control Elements and Ladder Diagram: control circuits, line or ladder diagram, power relay, and logic gates and ladder diagram, Programmable Logic Controller (PLC): introduction to PLC, background and development of PLC, PLC hardware, ladder diagram programming for OMRON PLCs: ladder instructions, logic block instructions, branching instructions line, controlling bit status, and other instructions, Discrete Sensors: introduction to sensors in industries, contact arrangement, limit switches, actuators, no-touch sensors, inductive proximity sensors, capacitive proximity sensors, and photoelectric sensors, GRAFCET: introduction to GRAFCET, the needs of GRAFCET, fundamental symbols in GRAFCET, combinational symbols in GRAFCET, control symbols in GRAFCET, evolutionary of GRAFCET (simultaneous sequence), rules of GRAFCET, and relationship between GRAFCET and PLC ladder diagram, Proportional-Integral-Derivative (PID) Controller: introduction to PID controller, the three-term controller, the characteristics of P, I, and D controllers, P controller, PI controller, PD controller, and PID controller, Data Acquisition (DAQ) and Control: definition of DAQ and control, fundamentals of DAQ, DAQ and control systems configuration, and DAQ for sensors and control systems in computer-integrated manufacturing (CIM) environments.

References
BENT 4773: TELECOMMUNICATION SYSTEM ENGINEERING

Synopsis

References

BENT 4783: WIRELESS COMMUNICATION SYSTEMS

Synopsis

References

BEN 4473: DIGITAL INTEGRATED CIRCUIT DESIGN

Synopsis
This course covers several aspects of digital integrated circuit design. Starting with MOSFET equations, we will delve into several areas of digital circuit design, including recent changes in circuit design approaches. We will cover different design styles, memory design, as well as board level design concepts.

References
BENE 4333: ARTIFICIAL INTELLIGENCE

Synopsis
Introduction to artificial intelligence system, Introduction to Fuzzy Logic, Fuzzy set and Fuzzy system, Fuzzy Logic control system, and application, Introduction to Neural Network, McCulloch-Pitts Neuron, Hebb Neural Network, Perceptrons, gradient decreasing studying algorithm, nonlinear optimization, adding back error algorithm, basic radius function, application and neural network simulation.

References

BENT 4813: DATA COMMUNICATION AND NETWORKING

Synopsis

References
Pattern Recognition, Feature Selection and Dimensionality Reduction.

References

BENE 4243: INDUSTRIAL AUTOMATION

Synopsis
Topics covered are: Introduction to Industrial Automation & Control, Common Process variables, measurements and control, Mechanics and control of mechanical manipulator, coordinate mapping and transformation, forward kinematics, inverse kinematics.

References

BENT 4823: DIGITAL COMMUNICATION SYSTEM

Synopsis

References

BENT 4833: ANTENNA AND WAVE PROPAGATION

Synopsis
Topics covered: Introduction and Fundamentals of Antenna; Antenna principle: basic antenna operation, necessary condition for radiation, Basic antenna parameters: radiation pattern, radiation power density, radiation intensity, directivity and gain, antenna reciprocity, antenna efficiency, radiation efficiency, half-power beamwidth, beam efficiency, bandwidth, polarization, input impedance, the Friss formula. Antenna Solution using Maxwell Equation: Maxwell Equation, Hertzian antenna, radiation, near-field and far-fields region, radiation from
wires, **Broadband Antenna**: yagi-uda antenna, heliks antenna, **Array Antenna**: array antenna application, array factor, radiation pattern for array antenna, **Microwave Antenna**: horn antenna, parabolic antenna, micro-strip antenna, **Matching and feeding networks**: quarter-wave transformer, series section transformer, feed point location, delta- and T-match, baluns.

**Introduction to antenna measurement**: Near-Field/ Far Field Methods, **Basic Antenna Parameters Measurements**: Radiation Pattern: Instrumentation, Amplitude Pattern, Gain Measurements, Directivity Measurements, Polarization Measurement:Linear and Circular Polarization, Co and Cross-polar Measurements, **Introduction to Radio wave Propagation**: Definition of Path Loss, Rays and wave-front, Characteristic Impedance of Free Space, Critical Frequency and Critical Angle, Virtual Height, Maximum usable Frequency, Skip Distance and Skip Zone, Free Space Path Loss, Fading And Fade Margin, Friis transmission formula, Concept of Ground, Sky and Space wave, **Mobile Radio Propagation**: Reflections, Ground Reflection Model, Diffraction, Fresnel Zone, Scattering, Link Budget, Fading, Multipath Propagation.

**References**

**BEN 4343: POWER ELECTRONICS AND DRIVE**

**Synopsis**
Overview of power electronics fundamentals: General introduction and concepts; Applications and prospects; power switches; switching and related issues (drivers, waveform generators, losses etc); modeling and simulation of AC to DC conversion, DC to DC Conversion, DC to AC Conversion. The introduction to drives is also covered where the speed control of DC motor and induction motor will be discussed in detail.

**References**

**BEN 4843: OPTOELECTRONICS**

**Synopsis**
This module runs for the topics such as Review of Light Properties: Reflection and Refraction, Plane Waves, Polarisation, Concept of Coherence, Principle of Superposition. Light Propagation in Optical Fibre: Fibre Types, Acceptance Angle, Refractive Index, Numerical Aperture, Skew Rays, Total Internal Reflection, Phase and Group Velocity, Snell’s Law, TE and TM modes, Single and Multimode Waveguides, Step Index Fibre, Graded Index Fibre. Laser Fundamentals: Emission and Absorption of Radiation, Population Inversion, Optical Feedback and Gain, Cavity Modes, Single-Mode Operation, Frequency Stabilisation, Mode Locking Techniques, Q-Switching, DBR
and DFB Lasers, Class of Non-Semiconductor Lasers. Optical Sources: semiconductor concepts - energy bands, semiconductor statistics; bandgap and E-k diagrams; optical emission from semiconductors - the p-n junction; principle of laser diode; heterostructure laser diodes; elementary laser diode characteristics; quantum well devices; vertical cavity surface emitting lasers; optical laser amplifiers; the light emitting diodes - surface emitter LEDs, edge emitter LEDs, super luminescent LEDs, LED characteristics, modulation bandwidths (electrical and optical). Optical Detection: detector performance parameters, characteristics of noise, detection techniques (incoherent and coherent detections), thermal detectors, photodetectors, p-n junction and p-i-n photodiodes, avalanche photodiodes, speed of response, detector array devices. Fibre Optic Components and Applications: optical fibre directional couplers (coupling principle and power exchange, practical parameters of a coupler, fabrication techniques and applications), fibre polarisers and polarisation controllers, fibre Bragg gratings (coupled mode theory, spectral response, fabrication techniques, applications in fibre optic communication and sensing), single-mode optical fibre sensors (Mach-Zehnder interferometric sensors and fibre optic rotation sensors), fibre optic switches, and microelectromechanicals systems (MEMS) optical switches.

References

BENT 4853: RADIO NAVIGATION SYSTEM

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

References
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