Bachelor of Engineering (Hons)

Electrical Engineering

School of Electrical and Electronic Engineering

Academic Session 2018/2019

USM Vision

Transforming Higher Education for Sustainable Tomorrow

USM Mission

USM is pioneering, transdisciplinary research intensive university that empowers future talents and enables the bottom billions to transform their economic well-being

School of Electrical and Electronic Engineering Mission

To provide quality education and sustainable research that produces professionals with the necessary knowledge, skills and character that is required for the advancement of engineering and technology

STUDENT'S PERSONAL INFORMATION

Full Name	
Identity Card (IC) / Passport No.	
Current Address	
Permanent Address	
Email Address	
Telephone No. (Residence)	
Mobile Phone No. (if applicable)	
School	
Programme of Study	

CONTENT **PAGE**

1.0 SCHOOL OF ELECTRICAL AND ELECTRONIC ENGINEERING

http://ee.eng.usm.my

1.1 INTRODUCTION

Since the academic session of 2000/2001, the School of Electrical and Electronic Engineering offers two study programmes, i.e the Electronic Engineering Programme leading to the Bachelor of Engineering (Honours) (Electronic Engineering) and Electrical Engineering Programme leading to the Bachelor of Engineering (Honours) (Electrical Engineering). As of 2002/2003, another programme has been offered, which is the Mechatronic Engineering Programme leading to the Bachelor of Engineering (Honours) (Mechatronic Engineering). The duration of the three mentioned programmes are four years or eight semesters.

Electronic Engineering

The Electronic Engineering Programme covers Microelectronics, Computers, Communications and Control and Automation.

Microelectronics:

- includes Design and Analysis of Electronic Circuits, Digital Systems Design, Semiconductors, Electronic Devices and Circuits and various aspects of Integrated Electronics.

Computers:

- includes Computer Organization, Computer Networking, Microprocessor Systems Design, Digital Signal Processing and Software Engineering.

Communications:

- includes Theory of Communication Systems, Antenna and Propagation, Microwave Engineering, Radar and Satellite Communications.

Control and Automation:

- includes Analysis and Design of Control Systems, Robotics and Automation, exposure to the Flexible Manufacturing Systems(FMS) and the industrial sector.

Electrical Engineering

The Electrical Engineering Programme covers Power Generation (both conventional and unconventional methods), Transmission, Distribution and Consumption, Electrical Machines, Analysis, Design, Applications, Power System Stability, High Voltage Engineering, Renewable Energy, Electrical Instrumentation and Measurement, and Power Electronics.

Mechatronic Engineering

The Mechatronic Engineering Programme covers fundamentals of electrical, electronic, mechanical and computer engineering, system and control engineering, mechatronic system and design, sensors and transducers, robotics, machine vision and manufacturing.

1.2 OBJECTIVES AND PHILOSOPHY

The vision of Universiti Sains Malaysia is:-

"Transforming Higher Education for a Sustainable Tomorrow"

The mission of Universiti Sains Malaysia is:-

"USM is pioneering, transdisciplinary research intensive university that empowers future talents and enables the bottom billions to transform their economic well-being"

The mission of the School of Electrical and Electronic Engineering is:-

"To provide quality education and sustainable research that produces professionals with the necessary knowledge, skills and character that is required for the advancement of engineering and technology".

In line with these vision and missions, the offering of the Electronic, Electrical and Mechatronic Engineering programmes were designed to produce Electrical, Electronic and Mechatronic engineers with professional qualifications, skilled and knowledgeable, credible and able to find solutions to various engineering problems through innovative thinking.

Based on this philosophy, the goals of the curriculum of every study programmes have been designed to fulfil the nation's Vision 2020, as well as industrial and current technological advancement needs. Hence, the curriculum has been organized to possess the following characteristics:

- recognized by Board of Engineers Malaysia (BEM), The Institution of Engineers Malaysia (IEM) as well as to be internationally acclaimed
- proper and balanced integration of practical and theoretical aspects
- with a complete choice of many well planned and advanced specialisation
- to develop persons of sound character who are knowledgeable, competent and innovative

With the above characteristics, USM graduates will become graduate engineers of excellence, calibre and able to achieve the high level of professionalism as engineers or researchers in their respective fields.

1.3 IMPLEMENTATION OF OUTCOME BASED EDUCATION (OBE)

Starting from the 2006/2007 academic session, the new intake of students will undergo a set of curriculum known as Outcome Based Education. Briefly, OBE is a method of curriculum design and teaching that focuses on what students can actually do after they are taught.

Under OBE, there are three Programme Educational Objectives (PEOs) as follows:-

Bachelor of Engineering (Honours)
(Electronic Engineering)

1. Graduates who are employed in the Electronic Engineering related fields.
2. Graduates who are innovative, pursue continuous career development, and participate in society related activities.
3. Graduates who have leadership qualities, ethical values and awareness in sustainability issues.

Bachelor of Engineering (Honours)
(Electrical Engineering)

1. Graduates who are employed in the Electrical Engineering related fields.
2. Graduates who are innovative, pursue continuous career development, and participate in society related activities.
3. Graduates who have leadership qualities, ethical values and awareness in sustainability issues.

Bachelor of Engineering (Honours)
(Mechatronic Engineering)

1. Graduates who are employed in the Mechatronic Engineering related fields.
2. Graduates who are innovative, pursue continuous career development, and participate in society related activities.
3. Graduates who have leadership qualities, ethical values and awareness in sustainability issues.

Also under the OBE, each programme should have Programme Outcomes (POs) that describe what students are expected to know and be able to perform or attain by the time of graduation. The School is adopting the POs as stated by Washington Accord and Engineering Accreditation Council in its 2017 EAC Manual as follows:-

PO1- Engineering Knowledge
Ability to apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialisation as specified in WK1 to WK4 respectively to the solution of complex engineering problems.

PO2- Problem Analysis
Ability to identify, formulate, conduct research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences (WK1 to WK4).

PO3- Design/Development of Solutions
Ability to design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations (WK5).

PO4- Investigation
Ability to conduct investigation of complex problems using research-based knowledge (WK8) and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.

PO5-Modern Tool Usage
Ability to create, select and apply appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations (WK6).

PO6- The Engineer and Society
Ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems (WK7).

PO7- Environment and Sustainability
Ability to understand and evaluate the sustainability and impact of professional engineering work in the solutions of complex engineering problems in societal and environmental contexts (WK7).

PO8 – Ethics
Ability to apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice (WK7).

PO9- Individual and Team Work
Ability to function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

PO10- Communication
Ability to 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.

PO11- Project Management and Finance
Ability to demonstrate knowledge and understanding of engineering and management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12- Life Long Learning
Ability to recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

1.4 MAIN ADMINISTRATIVE STAFF

Professor Ir. Dr. Mohd Rizal Arshad
Dean

Professor Ir. Dr. Mohd Fadzil Ain
Deputy Dean (Research, Postgraduate & Networking)

Professor Ir. Dr. Nor Ashidi Mat Isa
Deputy Dean (Academic, Student & Alumni)

Assoc. Prof. Dr. Bakhtiar Affendi Rosdi
Programme Chairman
(Electronic Engineering)

Assoc. Prof. Ir. Dr. Mohamad Kamarol Mohd Jamil
Programme Chairman
(Electrical Engineering)

Assoc. Prof. Ir. Dr. Rosmiwati Mohd Mokhtar
Programme Chairman
(Mechatronic Engineering)

Assoc. Prof. Ir. Dr. Dahaman Ishak
Coordinator
(Quality &Commercialisation)

Mr. Ahmad Zaki Talhah Mohd Zain
Principal Assistant Registrar

Mdm. Normala Omar
Assistant Registrar

1.5 LIST OF ACADEMIC STAFF

Name	Telephone Ext	E-mail
PROFESSORS		
Mohd Fadzil bin Ain, Ir. Dr.	5843	eemfadzil@usm.my
Mohd Rizal bin Arshad, Ir. Dr	6000	eerizal@usm.my

Mohd Zaid bin Abdullah, Dr.	6030	mza@usm.my
Nor Ashidi bin Mat Isa, Ir. Dr.	6003	ashidi@usm.my
Widad bt. Ismail, Dr.	6050	eewidad@usm.my

ASSOCIATE PROFESSORS

Arjuna bin Marzuki, Ir. Dr.	6021	eemarzuki@usm.my
Bakhtiar Affendi bin Rosdi, Dr.	6083	eebakhtiar@usm.my
Dahaman bin Ishak, Ir. Dr.	5810	dahaman@usm.my
Dzati Athiar binti Ramli, Dr	6028	dzati@usm.my
Haidi bin Ibrahim, Dr.	5822	haidi@usm.my
Harsa Amylia binti Mat Sakim, Dr	5821	amylia@usm.my
Junita binti Mohamad Saleh, Dr.	6027	jms@usm.my
Khoo Bee Ee, Dr	6032	beekhoo@usm.my
Mohamad Kamarol bin Mohd Jamil, Ir. Dr	6064	eekamarol@usm.my
Mohd Fadzli bin Mohd Salleh, Dr	6058	fadzlisalleh@usm.my
Norlaili binti Mohd. Noh, Ir. Dr.	6023	eelaili@usm.my
Rosmiwati binti Mohd Mokhtar, Ir. Dr.	6056	eerosmiwati@usm.my
Shahrel Azmin bin Sundi @ Suandi, Dr.	5814	shahrel@usm.my
Syafrudin Masri, Ir. Dr.	6018	syaf@usm.my
Zaini binti Abdul Halim, Dr.	6061	zaini@usm.my

SENIOR LECTURERS

Abdul-Malik Haider Yusef Saad, Dr.	6091	abdulmalik@usm.my
Aeizaal Azman bin Abd Wahab, Dr.	5762	aeizaal@usm.my
Aftanasar bin Md. Shahar, Dr.	6085	afta@usm.my
Ahmad Nazri bin Ali, Mr.	6020	nazriali@usm.my
Anwar Hasni bin Abu Hassan, Dr	6031	eeanwar@usm.my
Azniza binti Abd Aziz, Dr.	6054	azniza@usm.my
Hussein Salem Ali Bin Samma, Dr.	6080	hussein.samma@usm.my
Intan Sorfina binti Zainal Abidin, Dr.	5795	intan.sorfina@usm.my
Mohamad Adzhar bin Md Zawawi,Dr.	6052	adzhar@usm.my
Mohamad Khairi bin Ishak, Dr.	5737	khairiishak@usm.my
Mohamed Fauzi bin Packeer Mohamed, Dr.	6097	fauzi.packeer@usm.my
Mohamed Salem Mohamed Othman, Dr.		salemm@usm.my
Muhammad Ammirrul Atiqi bin Mohd Zainuri, Dr.	5811	ammirrulatiqi@usm.my
Muhammad Nasiruddin bin Mahyuddin, Dr	6099	nasiruddin@usm.my
Mohd Khairunaz bin Mat Desa, Dr	5873	khairunaz@usm.my

Mohd Tafir bin Mustaffa, Dr.	6029	tafir@usm.my
Nor Asiah binti Muhamad, Ir. Dr.	5726	norasiah.m@usm.my
Nor Rizuan bin Mat Noor, Dr.	6077	nrmn@usm.my
Nor Muzlifah binti Mahyuddin, Dr.	5789	eemnmuzlifah@usm.my
Noramalina binti Abdullah, Dr.	6022	eenora@usm.my
Nur Syazreen binti Ahmad, Dr.	6014	syazreen@usm.my
Nur Zatil Ismah binti Hashim, Dr.	6034	zatil.hashim@usm.my
Ooi Chia Ai, Dr	6076	chia.ai@usm.my
Patrick Goh Kuan Lye, Dr.	6033	eepatrick@usm.my
Samer Abdulqadir Al-Gailani, Dr.	5798	samer.algailani@usm.my
Syed Sahal Nazli Alhady bin Syed Hassan, Dr.	6019	sahal@usm.my
Tay Lea Tien, Dr.	6082	tay@usm.my
Teh Jiashen, Dr.	6016	jiashenteh@usm.my
Teoh Soo Siang, Ir. Dr	6081	eeteoh@usm.my
Wan Amir Fuad Wajdi bin Othman, Dr.	6062	wafw_othman@usm.my
Wan Mohd Yusof Rahiman bin Wan Abdul Aziz, Dr	6024	wanrahiman@usm.my
Zuraini bt. Dahari, Dr.	6048	eezuraini@usm.my

LECTURERS

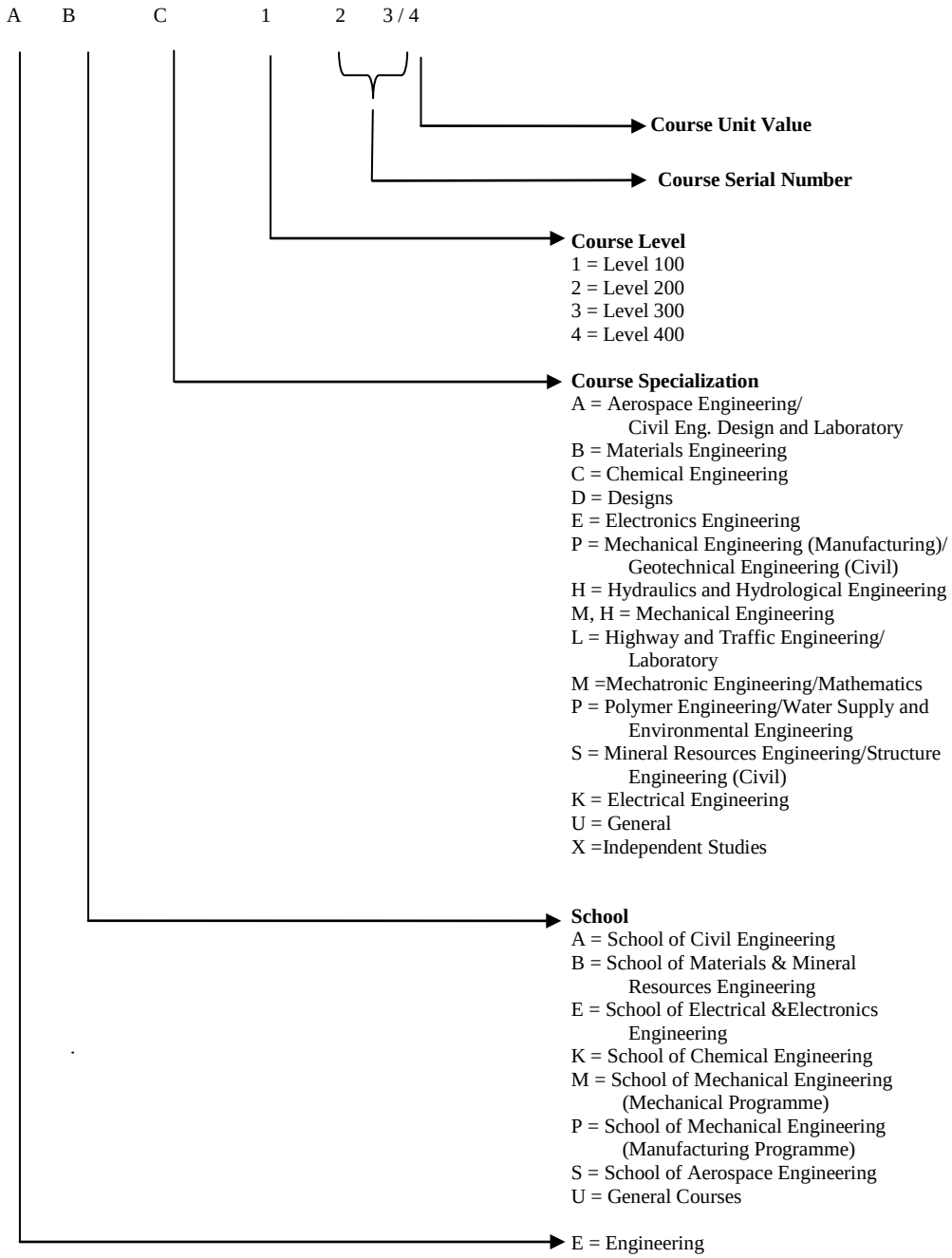
Mohd Nazri bin Mahmud, Dr.	6059	nazriee@usm.my
Mohd Ilyas Sobirin bin Mohd Sazali, Dr.	6079	ilyas.sazali@usm.my
Muhammad Firdaus bin Akbar Jalaludin, Dr.	5842	firdaus.akbar@usm.my

RESEARCH OFFICERS

Hazmarini binti Husin, Mdm.	5758	rini@usm.my
Husna binti Md Yusoff, Mdm.	5813	husna@usm.my
Mohamad Nazir bin Abdullah, Mr.	5802	eemnazir@usm.my
Mohd Nadzri bin Mamat, Mr.	5801	eenadzri@usm.my
Roslina binti Hussin, Mdm.	6025	eeroslina@usm.my
Suardi bin Kaharuddin, Mr.	6057	suardi@usm.my

1.6 COURSE CODE

Each course offered by the respective School is denoted by the following code of ABC 123/4. The alphabets and numbers represent:-



1.7 PROGRAMME STRUCTURE

The Structure of the Engineering Degree Programme is as follows:-

Course	Units	Remarks
(i) CORE	108	
(ii) ELECTIVE	12	Students may select these courses from the list as determined by the respective school
(iii) UNIVERSITY REQUIREMENT	15	
Compulsory (14 units)		
(a) Bahasa Malaysia	2	
(b) English Language	4	
(c) Islamic and Asian Civilisations	2	
(d) Ethnic Relations	2	
(e) Entrepreneurship	2	
(f) Co-curriculum	2	
Optional Course (1 Units)		
(a) Optional	1	

Note: For graduation, students are required to complete at least 135 units, with 'pass' grade for all the courses.

1.8 COURSE OFFERING

Students are required to register for the undergraduate courses in two semesters for each academic session that is Semester 1 and Semester 2. Courses are offered and examined in the same semester. Courses offered are categorized into four levels, via levels 100, 200, 300 and 400, suitable to the requirements of a four-year study programme.

Core Courses

Core course is a compulsory course package which aims at giving a deeper understanding of an area of specialization major. Students need to accumulate 108 units of the core courses which have been identified by each school.

Elective Courses

Students need to accumulate no less than 12 units from the list of courses suggested and acknowledged by the school.

Optional Courses

Optional courses are courses chosen by the students from among those that are outside of their programmes of study.

The main objective of an Optional course is as a substitute course for students who do not take Co-curriculum courses or Skill/Analysis courses.

Audit Courses

In principle, the university allows students to register for any courses on an audit basis for the purpose of enhancing the students' knowledge in specific fields during the duration of their study. However, the units of any such audit courses will not be taken into consideration for graduation purposes.

The registration procedures for courses on an audit basis are as follows:-

(a) Students can register for courses on an audit basis for the purpose of augmenting his/her knowledge in specific fields. Registration for the said course must be within the course registration week.

(b) Only students of active status are allowed to register for courses on an audit basis.

(c) Courses registered for on an audit basis are designated as code 'Y' courses. This designation will be indicated on the relevant academic transcript. A space at the bottom of the academic transcript will be reserved for listing the courses registered for on an audit basis.

(d) Courses registered for on an audit basis will not be taken into consideration in determining the minimum and maximum units of courses registered for.

(e) Students must fulfil all course requirements. Student who register for courses on an audit basis, are not obligated to sit for any examinations pertaining to that course. A grade 'R' will be awarded irrespective as to whether the student had or had not sat for the examination.

Laboratory Work/Practical, Engineering Practice and Industrial Training

Programmes in the School of Engineering place a great emphasis on laboratory work/practical. Laboratory work/practical is an important and essential aspect in most courses. There are also courses that the assessment is based on 100% works in laboratory work/practical. It aims to provide students with a better understanding of the subject matter delivered through lectures.

Students are required to submit laboratory/practical reports which are part of the course work assessment for courses delivered through lectures and the laboratory/practical component only. Attendance is compulsory for all levels of study and students may be barred from taking the written examination if their attendance is unsatisfactory.

Apart from attending classes (lectures and laboratory/practical), students must also undergo the Engineering Practice Course and Industrial Training.

General Objectives of Engineering Practice

(a) To expose to the students about the importance and the link between the theoretical and practical aspects of engineering, and to familiarise them with the environment/theoretical situations in use, available resources and their scarcity so that the academic aspects of a course can be understood better and used more effectively.

(b) To raise awareness of the environment/industrial situations, practices, resources and their scarcity. Therefore, students will have the opportunity to equip themselves to face future challenges in their academic studies as well as in their future training.

The Engineering Practice will be conducted in the following manner:

The training will be conducted on and off campus. There are two levels which are compulsory for all engineering students:

(i) Engineering Practice Course

The Engineering Practice Course is a basic training course on mechanical, manufacturing and electrical engineering. The training includes engineering workshops, introduction to manufacturing processes and electrical circuit. Engineering students will also be exposed to methods of engineering planning and project implementation. The duration of the training is 14 weeks and during this period, students will be supervised by the academic staff on duty.

(ii) Industrial Training

This course is conducted over 10 weeks during the long break after Semester II at level 300. Students are exposed to the actual operations of industries, locally and abroad. It is hoped that students will be able to learn and experience useful knowledge and skills while undergoing training as they have already taken the Engineering Practice Course.

It is hoped that the training will provide students with a good foundation in engineering. This is a 5-unit course and students will be awarded a Pass/Fail grade upon completion.

1.9 GRADUATION REQUIREMENTS

Starting from the Academic Session 2015/2016, the intakes of this session for all programmes offered by the School of Electrical and Electronic Engineering are required to obtain a minimum of Grade C for each course taken.

Students must also fulfil the following requirements to graduate:

(a) Fulfil the minimum residential requirement (8 semesters) during the course of studies.

(b) Fulfil all the credit requirements of the courses and required units for each component (Core, Elective, Option and University Courses).

(c) Obtain an overall CGPA of 2.00 and above for Core courses.

(d) Obtain an overall CGPA of 2.00 and above for all courses.

(e) Achieve a minimum grade C or a grade point of 2.00 for Bahasa Malaysia, English Language courses, Islamic and Asian Civilisations, Ethnic Relations course and Core Entrepreneurship.

1.10 EXAMINATION SYSTEM

Examinations are held at the end of every semester. Students have to sit for the examination of the courses they have registered for. Students are required to settle all due fees and fulfil the standing requirements for lectures/tutorials/practical and other requirements before being allowed to sit for the examination of the courses they have registered for. Course evaluation will be based on the two components of coursework and final examinations. Coursework evaluation includes tests, essays, projects, assignments and participation in tutorials.

1.10.1 Duration of Examination

Evaluated Courses	Examination Duration
2 units	1 hour for coursework of more than 40%
2 units	2 hours for coursework of 40% and below
3 units or more	2 hours for coursework of more than 40%
3 units or more	3 hours for coursework of 40% and below

1.10.2 Barring from Examination

Students will be barred from sitting for the final examination if they do not fulfil the course requirements, such as absence from lectures and tutorials of at least 70%, and have not completed/fulfilled the required components of coursework. Students will also be barred from sitting for the final examination if they have not settled the academic fees. A grade 'X' would be awarded for a course for which a student is barred. Students will not be allowed to repeat the course during the *Courses during the Long Vacation* (KSCP) period.

1.10.3 Grade Point Average System

Students' academic achievement **for registered core and elective courses** will be graded as follows:

Alphabetic Grade	A	A-	B+	B	B-	C+	C	F
Grade Points	4.00	3.67	3.33	3.00	2.67	2.33	2.00	0

Students' academic achievement **for registered university requirement courses** will be graded as follows:

Alphabetic Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
Grade Points	4.00	3.67	3.33	3.00	2.67	2.33	2.00	1.67	1.33	1.00	0.67	0

Students awarded with a grade 'C-' and below for a particular course would be given a chance to improve their grades by repeating the course during the KSCP (see below) or normal semester. Students awarded with a grade 'C' and above for a particular course will not be allowed to repeat the course whether during KSCP or normal semester.

The achievement of students in any semester is based on Grade Point Average (GPA) achieved from all the registered courses in a particular semester. GPA is the indicator to determine the academic performance of students in any semester.

CGPA is the Cumulative Grade Point Average accumulated by a student from one semester to another during the years of study.

The formula to compute GPA and CGPA is as follows:

$$\text{Grade Point Average} = \frac{\sum_{i=1}^{n} U_i M_i}{\sum_{i=1}^{n} U_i}$$

where

n is number of courses taken
U_i is course units for course i
M_i is grade point for course i

Example of calculation for GPA and CGPA:

	Course	Unit	Grade Point (GP)	Grade (G)	Total GP
Semester I	ABC XX1	4	3.00	B	12.00
	ABC XX2	4	2.33	C+	9.32
	BCD XX3	3	1.67	C-	5.01
	CDE XX4	4	2.00	C	8.00
	EFG XX5	3	1.33	D+	3.99
	EFG XX6	2	2.67	B-	5.34
		20			43.66

$$\text{GPA} = \frac{43.66}{20} = 2.18$$

	Course	Unit	Grade Point (GP)	Grade (G)	Total GP
Semester II	ABC XX7	3	1.00	D	3.00
	ABB XX8	4	2.33	C+	9.32
	BBC XX9	4	2.00	C	8.00
	BCBX10	4	2.67	B-	10.68
	XYZ XX1	3	3.33	B+	9.99
		18			40.99

$$\text{GPA} = \frac{40.99}{18} = 2.28$$

$$\text{CGPA} = \frac{\text{Total Accumulated GP}}{\text{Total Accumulated Unit}} = \frac{43.66 + 40.99}{20 + 18} = \frac{84.65}{38} = 2.23$$

From the above examples, the CGPA is calculated as the total grade point accumulated for all the registered courses and divided by the total number of the registered units.

1.10.4 Courses During the Long Vacation *(Kursus Semasa Cuti Panjang)* (KSCP)

KSCP is offered to students who have taken a course earlier and obtained a grade of 'C-', 'D+', 'D', 'D-', 'F' and 'DK' only. Students who have obtained a grade 'X' or 'F*' are not allowed to take the course during KSCP.
The purpose of KSCP is to:

(i) Give an opportunity to students who are facing time constraints for graduation.
(ii) Assist students who need to accumulate a few more credits for graduation.
(iii) Assist "probationary" students to enhance their academic status.
(iv) Assist students who need to repeat a prerequisite course, which is not offered in the following semester.

However, this opportunity is only given to students who are taking courses that they have attempted before and achieved a grade as stipulated above, provided that the course is being offered. Priority is given to final year students. Usually, formal lectures are not held, and teaching is via tutorials.

The duration of KSCP is 3 weeks, i.e. 2 weeks of tutorial and 1 week of examination, all held during the long vacation. The KSCP schedule is available in the University's Academic Calendar.

The Implementation of KSCP

(i) Students are allowed to register for a maximum of 3 courses and the total number of units registered must not exceed 10.

(ii) Marks/grades for coursework are taken from the highest marks/the best grades obtained in a particular course in the normal semester before KSCP. The final overall grade is determined as follows:

Final Grade = The best coursework marks or grade +
Marks or grade for KSCP examination

(iii) GPA calculation involves the **LATEST** grades (obtained in KSCP) and also involves courses taken in the second semester and those repeated in KSCP. If the GPA during KSCP as calculated above is 2.00 or better, the academic status will be active, even though the academic status for the second semester was probation status. However, if the GPA for KSCP (as calculated above) is 1.99 or below, the academic status will remain as probation status for the second semester.

(iv) Graduating students (those who have fulfilled the graduation requirements) in the second semester are not allowed to register for KSCP.

1.10.5 Academic Status

Active Status: Any student who achieves a GPA of 2.00 and above for any examination in a semester will be recognised as ACTIVE and be allowed to pursue his/her studies for the following semester.

Probation Status: A probation status is given to any student who achieves a GPA of 1.99 and below. A student who is under probation status for three consecutive semesters (P1, P2, FO) will not be allowed to pursue his/her studies at the university. On the other hand, if the CGPA is 2.00 and above, the student concerned will be allowed to pursue his/her studies and will remain at P2 status.

1.10.6 Termination of Candidature

Without any prejudice to the above regulations, **the University Examination Council has the absolute right to terminate any student's studies if his/her academic achievement does not satisfy and fulfil the accumulated minimum credits.**

The University Examination Council has the right to terminate any student's studies due to certain reasons (a student who has not registered for the courses, has not attended the examination without valid reasons), as well as medical reasons can be disqualified from pursuing his/her studies.

1.10.7 Examination Results

A provisional result (pass/fail) through theCampus Online portal (campusonline.usm.my) and short message service (SMS) will usually be released and announced after the School Examination Council meeting and approximately one month after the final examination.

Enquiries regarding full results (grade) can be made through the Campus Online portal and short message service (SMS). The results will be released and announced after the University Examination Council meeting and is usually two weeks after the provisional results are released.

Students can print their official semester results document namely 'SEMGRED' through the portal "*Campus Online*" (campusonline.usm.my) during the second week of the following semester.

2.0 BACHELOR OF ELECTRICAL ENGINEERING PROGRAMME

2.1 BACHELOR DEGREE IN ENGINEERING (HONS) ELECTRICAL ENGINEERING STRUCTURE 2018/2019

	100				200				300				400			
	Semester 1		Semester 2		Semester 3		Semester 4		Semester 5		Semester 6		Semester 7		Semester 8	
CORE	EEE105/3 Circuit Theory I	Mid Semester Break	EEE125/3 Basic Circuit Lab	Long Vacation	EEE208/3 Circuit Theory II	Mid Semester Break	EEE226/3 Microprocessor I	Long Vacation	EEE332/4 Communication	Mid Semester Break	EEK360/3 Electrical Laboratory	EEL303/5 Industrial Training	EEK425/3 Electrical Engineering Design	Mid Semester Break	EEK470/4 Electric Power Distribution System	
	EEE123/3 Computer Programming for Engineer		EEE130/3 Digital Electronic I		EEE228/3 Signal & System		EEE243/3 Analog Electronics Laboratory		EEE350/3 Control Systems		EEK372/3 Power System Analysis		EEK 468/3 Electrical Machine & Drives		EEK499/6 Undergraduate Project	
	EBB113/3 Engineering Material		EEE133/3 Electronic Devices & Circuit		EEE231/3 Digital Electronic Lab		EEE276/3 Electromagnetic Theory		EEE382/3 Probability &Engineering Statistic		EEK374/3 Electrical Instrumentations and Measurement					
	EMM101/3 Engineering Mechanics		EEL102/2 Engineering Practice		EEE232/3 Complex Analysis		EEK241/3 Electrical Power Technology		EEK 361/3 Power Electronics		EUP222/3 Engineer In Society					
	EUM113/3 Engineering Calculus		EUM114/3 Advanced Engineering Calculus		EEE241/3 Analog Electronics I		EEK260/3 Electrical Machines		EEK 369/3 High Voltage Engineering							
	15		14		15		15		16		12	5	6		10	108
Univ Req.	LKM400/2: Malay Language		WUS101/2: Core Entrepreneurship		LSP/2: English Language		HTU223/2 Islamic and Asian Civilisations		LSP/2 English Language						KO-K/2	15
							SHE101/2: Ethnic Relations								Options/1	
							SEA 205E/4 Malaysian Studies (for international student)									
ELECTIVE	Note Choose ONE Elective course from Semester 6 and any TWO Elective courses from Semester 7 Student should take elective courses as follow: Option A: All three elective courses are from electrical program Option B: Two elective courses are from electrical program and one elective course is from Electronic or Mechatronic Program										EEE322/4 Microwave and Radio Frequency Engineering		EEK 474/4 Electrical Machine Design			12
											EEK373/4 Advanced Power Electronic		EEK 475/4 Economy And Management Of Power System			
											EEM348/4 Principle of Intelligent System		EEK 477/4 Renewable Energy			
Total Unit	17		16		17		19		18		16	5	14		13	135
	TOTAL MINIMUM UNIT FOR GRADUATION															135

2.2 COURSE – PROGRAMME OUTCOME MATRIX (ELECTRICAL ENGINEERING)

Core Courses Offered to Electrical Engineering Programme				Program Outcomes											
				Engineering knowledge	Problem Analysis	Design/ development of solutions	Investigation	Modern Tool Usage	The Engineer and Society	Environment and Sustainability	Ethics	Individual and Team work	Communication	Project Management and Finance	Lifelong learning
Year	**Sem**	**Code**	**Course**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	1	EUM113	Engineering Calculus	X	X										
		EBB113	Engineering Material	X											
		EMM101	Engineering Mechanics	X	X		X								
		EEE105	Circuit Theory I	X	X										
		EEE123	Computer Programming for Engineers		X	X									X
	2	EUM114	Advanced Engineering Calculus	X	X										
		EEE125	Basic Circuit Lab			X						X	X	X	
		EEE130	Digital Electronic I		X				X						
		EEE133	Electronic Devices & Circuit	X						X					
		EEL102	Engineering Practice			X		X				X	X		
2	1	EEE232	Complex Analysis		X		X								
		EEE231	Digital Electronic Laboratory					X			X	X		X	
		EEE208	Circuit Theory II		X		X			X					
		EEE241	Analog Electronics I	X					X						
		EEE228	Signal and System	X	X										
	2	EEE243	Analog Electronics Laboratory			X		X					X	X	
		EEE226	Microprocessor I			X					X	X			X
		EEE276	Electromagnetic Theory		X				X						
		EEK260	Electrical Machines	X	X	X									
		EEK241	Electrical Power Technology	X	X	X									
3	1	EEE332	Communication			X					X				
		EEE350	Control System		X		X	X							
		EEE382	Probability & Engineering Statistics			X			X						
		EEK369	High Voltage Engineering		X			X		X					
		EEK361	Power Electronics	X	X	X		X							
	2	EEK360	Electrical Laboratory				X				X	X	X	X	
		EEK372	Power System Analysis		X	X		X							X
		EUP222	Engineer in Society	X			X		X		X	X		X	
		EEK374	Electrical Instrumentation & Measurement System	X	X	X		X							
	SB	EEL303	Industrial Training						X			X		X	X
4	1	EEK468	Electrical Machine & Drives		X	X		X							
		EEK425	Electrical Engineering Design			X			X	X		X	X	X	X
	2	EEK499	Undergraduate Project				X		X				X	X	X
		EEK470	Electric Power Distribution System			X				X			X		X
			Elective Courses												
3	2	EEK373	Advanced Power Electronic		X	X		X					X		
		EEE322	RF & Microwave Engineering				X			X					
		EEM348	Principle of Intelligent Systems	X	X			X					X		
4	1	EEK475	Economy & Management of Power System		X				X	X				X	
		EEK477	Renewable Energy	X				X		X					
		EEK474	Electrical Machine Design		X	X		X				X	X		

3.0 COURSE DESCRIPTION

3.1 Level 100

Codes	Courses	Synopsis
EEE105/3	Circuit Theory I	This course is teaching the fundamental of electric circuit and its analysis for DC and AC systems which comprises of topics such as Circuit Variables and Elements, Resistive Circuits, Techniques of Circuit Analysis, Inductance and Capacitance, First-Order Response of RL and RC Circuits, Sinusoidal Steady-State Analysis, AC Power Analysis and Three Phase Circuit.
EEE123/3	Computer Programming for Engineers	This course is fundamental not only to computer related subjects but also to other subjects that require complex calculations and computer simulations. It exposes students to the organization of personal computer, step-by-step procedures, programming terminologies and program commands that are required in solving engineering problems based on computer program using C++ programming language.
EEE125/3	Basic Circuit Laboratory	This course comprises of 15 experiments that will be conducted by the students. The experiments are on multimeter applications, the measurement of voltage, current and resistance in a dc circuit, oscilloscope and function generator, transformer, capacitor, inductor and power measurement in ac circuits, superposition, Thevenin and Norton theorems, diode in series and parallel configuration, to analyze and study the characteristic of BJT.
EEE130/3	Digital Electronic I	This course covers digital electronic systems, major logic devices and combination and sequential logic circuits.
EEE133/3	Electronic Devices & Circuit	This course provides knowledge on semiconductor material and PN junction, diode and its application, operation and biasing techniques for Bipolar Junction Transistor (BJT) and Field Effect Transistor (FET).
EEL102/2	Engineering Practice	This course is divided into three components. The components are on the skill and technique on how to use PSpice and OrCAD software in simulation and design the electrical and electronic circuitry and fabrication technique for Printed Circuit Board (PCB). Domestic wiring and basic welding process are exposed to equip students with fundamental engineering skill.
EBB113/3	Engineering Materials	The course is an introductory course on engineering materials which is divided into two main parts. The first part includes the classifications of engineering materials that determine their applicability, the structure of the materials explained by bonding scheme of different materials, the structure of crystalline solids and introduction to imperfection in solids and diffusion mechanism. The first part also includes the introduction of phase diagram. The second part covers the behaviors and characteristics of engineering materials including mechanical and electrical properties. In general, this introductory materials science and engineering course deals with the different material types (i.e., metals, ceramics, polymers, composites), as well as the various kinds of properties exhibited by these materials (i.e., mechanical, electrical, magnetic, etc.) which intended to equip the students with necessary knowledge on material science and engineering.

EMM101/3	Engineering Mechanics	This course is an introduction to the mechanics of rigid bodies. It is divided into two areas: Statics and Dynamics. In Statics, the student will learn the fundamental concepts and principles of rigid bodies in static equilibrium. In Dynamics, the student will learn the fundamental concepts and principles of the accelerated motion of a body (a particle). Consideration is given on the fundamental of mechanics and structure analysis, including concepts of free body diagram as well as force, moment, couples, kinematic of motion, momentum, impulse, conservation of energy and equilibrium analyses in two and three dimensions.
EUM113/3	Engineering Calculus	This course reviews the topics on calculus of one and multivariable. It also covers the solutions of first and second order ordinary differential equation analytically and numerically.
EUM114/3	Advanced Engineering Calculus	This course covers the topics on linear algebra, Fourier series, partial differential equations, and vector calculus. Numerical techniques for solving systems of linear equations and partial differential equations are also given.

3.2 LEVEL 200

Codes	Courses	Synopsis
EEE208/3	Circuit Theory II	This course covers techniques for analyzing electrical circuits using Laplace and Fourier transforms. It also includes the topics of mutual inductance, frequency response for AC circuits, and two port circuits.
EEE226/3	Microprocessor I	Introducing fundamental architecture and programming of microprocessor and microcontroller. That understanding can be used to build a simple application using the microprocessor and microcontroller.
EEE228/3	Signal and System	This subject gives exposure to students to learn the fundamental of signals and systems from mathematical modeling, analyses methods of analog and digital systems, sampling and modulation processes. In addition, this course also covers the knowledge, analysis and the applications of Fourier systems and Z transform.
EEE231/3	Digital Electronics Laboratory	The course (lab) is divided into 2 modules which are based on the course EEE130 – Digital Electronic I. The first module concentrates on the basic of digital electronics which includes Logic Gate ICs and troubleshooting, Counters, Multiplexers, Flip-Flop, Triggers, Registers and Combinational Logic. The outcome of the first module is to enable students to understand and design simple and basic digital circuits. The knowledge will then be used in the second module where students will be given the tasks on designing more complex combinational and sequential circuits.
EEE232/3	Complex Analysis	This course reviews the topics on complex number, complex function, analytic function, complex differentiation and integration, series expansion and Residue Theorem, as well as complex conformal mapping.
EEE241/3	Analogue Electronics I	This course emphasizes on the analysis of single and multi stage amplifiers.
EEE243/3	Analogue Electronics Laboratory	This course comprises of 14 experiments that will be conducted by the students. The experiments are on Diode, BJT, FET, Op-amp, Power

		Amplifier, filters and rectifiers as well as their applications.
EEE276/3	Electromagnetic Theory	This course deals with the theory and analysis on electromagnetic for electrostatics, magnetostatics and dynamic (time varying). It also covers properties of plane wave propagation and electromagnetics application in system design.
EEK241/3	Electrical Power Technology	This course is offered for students to learn and understand basic principles of electrical power technology such as single-phase and three-phase ac network, electric power generation, power transmission and distribution, power measurements and instrumentation, protection systems, and alternatives energy sources.
EEK260/3	Electrical Machines	This course covers the topics of magnetic circuit fundamental, transformer, dc generator, dc motor, three-phase synchronous motor, three-phase synchronous generator, three-phase and single-phase induction motors.

3.3 LEVEL 300

Codes	Courses	Synopsis
EEE322/4	Microwave and Radio Frequency Engineering	This course provides the introduction, comprehension, application and analysis of RF and Microwave Concept and uses S-parameter Network and other networks. It also includes the introduction on understanding and design of transistor circuit and passive components, filters, amplifiers and microwave source and mixers.
EEE332/4	Communications	This course is offered to provide fundamental knowledge on transmission of analogue and digital information, characteristic of signal sources and the concept of communication channel such as bandwidth. Analogue modulation technique such as AM, FM and PM will be emphasized followed by the noise in communication systems. Introduction on data transmission for digital communication systems including multiplexing and binary modulation such as ASK, FSK and PSK.
EEE350/3	Control Systems	The purpose of this course is to expose the students to transfer functions and mathematical model of physical systems. In addition, students will be exposed to knowledge on dynamics of open- and closed-loop systems in time and frequency domain, analysis techniques and feedback properties.
EEE382/3	Probability & Engineering Statistics	This course reviews the topics on probability, discrete, continuous and bivariate probability distributions, confidence interval and hypothesis for mean and the difference between two population means, simple and multiple linear regressions, non linear regression and non parametric statistics.
EEK360/3	Electrical Laboratory	This course enables students to investigate and simulate electrical power generation, transmission and distribution networks, protection systems and voltage regulation mechanisms. In the process, electrical equipment, characteristics of electrical machines, both single and three-phase transformer, three-phase synchronous generator and motor, single and three-phase AC induction motors, DC motor and generator are introduced for the first time in this course.
EEK361/3	Power Electronics	This course is offered to provide sound knowledge on the power electronics circuits and devices. The course explains in details the ideal

		and practical characteristics of the power diode, thyristor and transistors. Power electronics circuits such as controlled and uncontrolled rectifier, dc-dc converter and ac voltage controller will be covered. Practical design consideration for power electronics circuits such as current and voltage protection and thermal protection will also be explained.
EEK369/3	High Voltage Engineering	This course covers the topics of introduction of high voltage system, electrical breakdown theory, overvoltage phenomena and insulation coordination, protection system, circuit breakers, high voltage generation and measurement.
EEK372/3	Power System Analysis	This course covers the topics of basic principles of electrical power system, parameters and modeling of the generators, transformer, and transmission lines, analysis of electric power flow with various methods such as Newton-Raphson, Gauss Seidel and Fast Decouple methods, analysis of balanced three-phase and unbalanced three-phase fault, system stability of electric power system and calculation of power system analysis using computer programming.
EEK373/4	Advanced Power Electronic	This course is offered for students to learn and understand various kinds of power electronics circuits and their related applications. These include single phase and three phase rectifiers, single phase and three phase AC controllers, inverters, DC choppers and switch mode power supplies.
EEK374/3	Electrical Instrumentations and Measurement	This course is offered to student to learn the principles of electrical measurements and the application of microcontroller in instrumentation. It covers the knowledge on different types of sensors, the principle of measurement for voltage and current, electrical energy, active, reactive and apparent power, power factor, resistance, capacitance, inductance, temperature and thermal conductance. Students will also learn about the design and implementation of microcontroller based system for electrical measurement.
EEM348/4	Principles of Intelligent Systems	This course involves three main areas which are Knowledge-based Systems (KBS) and Fuzzy Systems, Artificial Neural Network and Evolutionary Computation.
EEL303/5	Industrial Training	Industrial attachments give early exposure for students on the life as engineers according to their chosen disciplines. The course primary mission is to allow the students to apply what they learned in the university as well as to gain knowledge on new and upcoming technologies.
EUP222/3	Engineer in Society	This course provides an introduction to the fundamental principles on project and financial management, ethics and laws related to environment and Occupational Safety and Health Act (OSHA), professional practice as well as the 10 commandments of project management. Problem solving through success or failure of actual case studies are reviewed

3.4 LEVEL 400

Codes	Courses	Synopsis
EEK425/3	Electrical Engineering Design	The course is comprised solving complex engineering problem by designing viable solutions that integrates components in core areas of Electrical Engineering and meeting specific needs with appropriate considerations such as sustainability, public health and safety, society,

		cultural and environment issues.
EEK468/3	Electrical Machine & Drives	This course is offered to provide sound knowledge on electrical machines and drives systems. This course will discuss theory, concepts and operation of DC motors and AC motors that are widely used in industry. The control principles and drive of these machines using solid-state power electronics converters, choppers and inverters will also be discussed.
EEK470/4	Electrical Power Distribution System	This course is offered to provide sound knowledge and analysis on about power distribution system which includes the study of;(1) Sub-transmission line and distribution on substation, voltage drop and voltage regulation, K factor and substation grounding, (2)Main distribution system which includes various types of feeders, voltage levels, system growth scheme, uniform and non-uniform radial feeders, (3) Secondary distribution system design including discussion on secondary feeders, voltage levels, secondary networks and economic considerations, (4) Voltage drop and power loss calculation, balanced three-phase and non-three-phase main system and four-wire three-phase multi-grounded system, (5) Voltage regulation of distribution systems and (6) Power distribution system protection.
EEK474/4	Electrical Machine Design	This course is offered to provide sound knowledge and design ideas on engineering materials, magnetic circuits and electromagnetic aspects of electrical machine designs. It also discusses the electrical, mechanical and thermal design constraints, types of windings, arrangements of windings and motor dimensions and sizing. Motor modelling and simulation on a static machine viz. transformer and rotating machine viz. permanent magnet brushless motor will provide detail insights to students on design issues using 2D/3D finite element software.
EEK475/4	Economy & Management of Power System	This course covers the topics of power energy supply economic, economic aspect of power systems, load forecast and energy cost, power system economic operation, power quality, management and reliability of power system.
EEK477/4	Renewable Energy	Renewable energy course provides an introduction to the types of renewable energy, basic features and engineering technology for energy production. The primary focus is on two types of major renewable energy, namely solar PV and wind power. The solar PV section covers the basic theory, fabrication processes, types of PV panels, application, sizing and return of investment. The wind energy section covers the basic fan theory, turbine types, electricity generation and wind power system disadvantages. In addition, an emphasis will also be placed on energy storage technologies, power distribution and renewable energy policy.
EEK499/6	Undergraduate Project	A small-scale research project will be undertaken by every final year student. The aim of the project is to train the student to identify some problems related to electrical engineering and introducing them with the techniques of investigation, solving problems, writing a technical report and presentation of the results in the form of thesis and seminar.