UNIVERSITI SAINS MALAYSIA

APEX™

BACHELOR OF ENGINEERING

(HONOURS)(ELECTRONIC ENGINEERING)

2020/2021

School of Electrical and Electronic Engineering

http://ee.eng.usm.my

Bachelor of Engineering (Hons)

Electronic Engineering

School of Electrical and Electronic Engineering

Academic Session 2020/2021

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

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

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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 EAC Standard 2020 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 Fadzil bin Ain
Dean

Professor Ir. Dr. Nor Ashidi bin Mat Isa
Deputy Dean (Academic, Career and International)

Professor Ts. Dr. Shahrel Azmin bin Sundi @ Suandi
Deputy Dean (Research, Innovation and Industry-Community Engagement)

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Programme Chairman
(Electronic Engineering)

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

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

Dr. Mohd Nazri bin Mahmud
Programme Chairman
(Quality & Commercialisation)

Mdm. Normala binti Omar
Senior Assistant Registrar

Mdm. Hajar Zituakmar Mohd Fauzi
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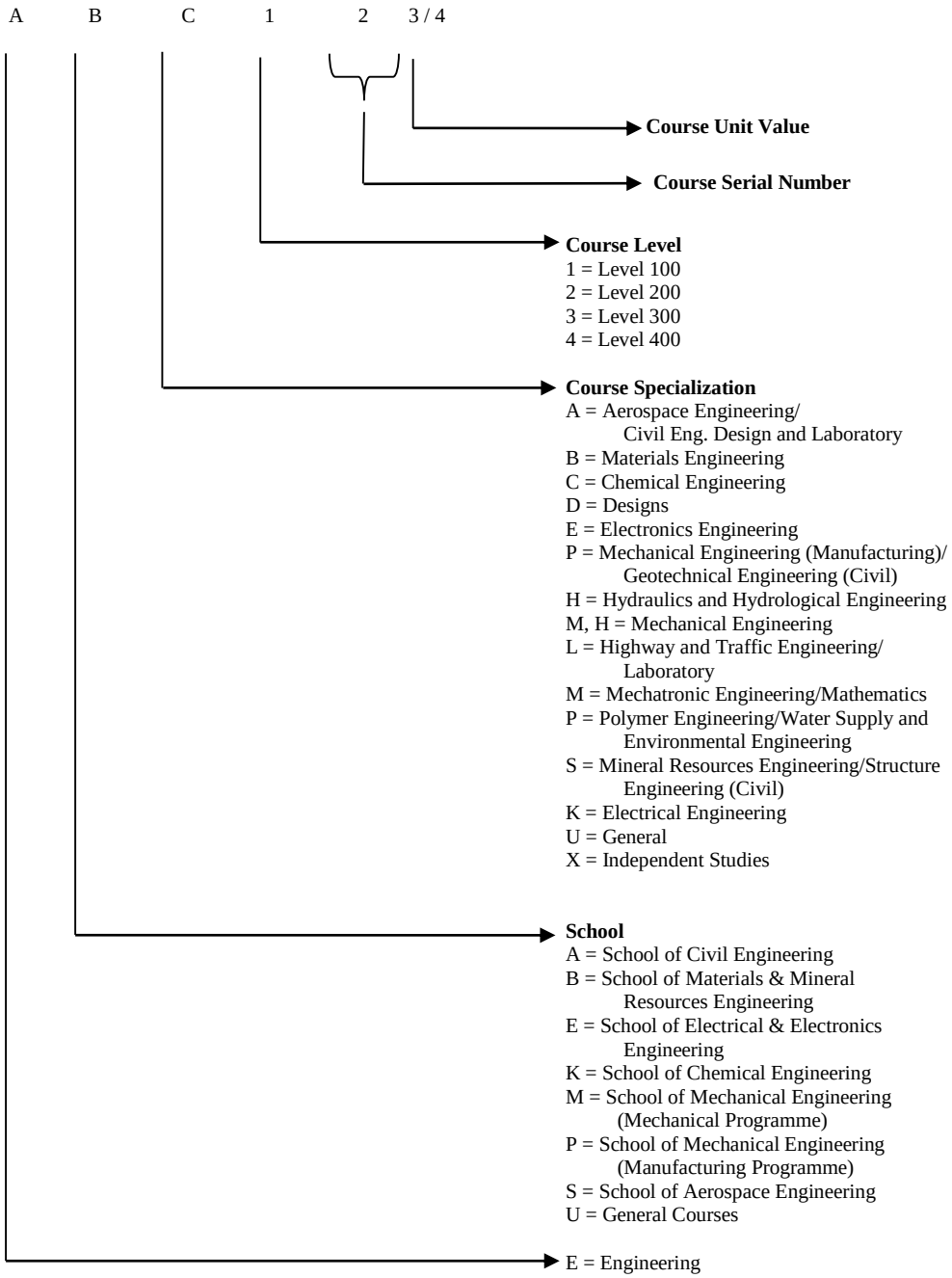
1.6 COURSE CODE

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)		For international students, courses Appreciation of Ethics and Civilisations and Core Entrepreneurship are to be replaced by Malaysian Studies (4 units)
(a) Bahasa Malaysia	2	
(b) English Language	4	
(c) Philosophy and Current Issues	2	
(d) Appreciation of Ethics and Civilisations	2	
(e) Core 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 all core, elective and University Requirement Courses.

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 30%, 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, elective and 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

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

	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
	BCB X10	4	2.67	B-	10.68
	XYZ XX1	3	3.33	B+	9.99
		18			40.99

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

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

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.

<u>The Implementation of KSCP</u>

(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 the Campus 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 ELECTRONIC ENGINEERING PROGRAMME

2.1 BACHELOR DEGREE IN ENGINEERING (HONS) ELECTRONIC ENGINEERING STRUCTURE 2020/2021

	100				200				300				400			
	Semester 1		Semester 2		Semester 3		Semester4		Semester 5		Semester 6		Semester 7		Semester 8	
CORE	EEE105/3 Circuit Theory I	Semester Break	EEE125/3 Basic Circuit Lab	Long Vacation	EEE208/3 Circuit Theory II	Semester Break	EEE226/3 Microprocessor I	Long Vacation	EEE320/3 Microprocessor II	Semester Break	EEE348/3 Introduction to Integrated Circuit Design	EEL303/5 Industrial Training	EEE424/3 Electronic Engineering Design	Semester Break	EEE499/6 Undergraduate Project	
	EEE123/3 Computer Programming for Engineer		EEE130/3 Digital Electronic I		EEE228/3 Signal & System		EEE243/3 Analog Electronics Laboratory		EEE332/4 Communication		EEE354/3 Digital Control Systems		EEE443/3 Digital Signal Processing		EEM421/4 Quality Techniques	
	EBB113/3 Engineering Material		EEE133/3 Electronic Devices & Circuit		EEE231/3 Digital Electronic Lab		EEE270/3 Analog Electronic II		EEE350/3 Control Systems		EEE379/3 Computer System &Multimedia					
	EMM101/3 Engineering Mechanics		EEL102/2 Engineering Practice		EEE232/3 Complex Analysis		EEE276/3 Electromagnetic Theory		EEE378/3 Digital Electronics II		EUP222/3 Engineer In Society					
	EUM113/3 Engineering Calculus		EUM114/3 Advanced Engineering Calculus		EEE241/3 Analog Electronics I		EEK260/3 Electrical Machines		EEE382/3 Probability &Engineering Statistic							
	15		14		15		15		16		12	5	6		10	108
Univ. Req.	LKM400/2: Malay Language IV (for Malaysian Student)		WUS101/2: Core Entrepreneurship (for Malaysian Student)		HFF225/2: Philosophy and Current Issues		HFE224/2: Appreciation of Ethics and Civilisations (for Malaysian Student)		LSP/2 English Language						KO-K/2	15
	LKM100/2: Malay Language I (for International Student)		LSP/2: English Language				SEA205E/4 Malaysian Studies (for International student)								Options/1	
ELECTIVE	Note: Choose ONE Elective course from Semester 6 and any TWO Elective courses from Semester 7										EEE301/4 Semiconductor Device Test & Measurement		EEE430/4 Software Engineering			12
											EEE322/4 Microwave and Radio Frequency Engineering		EEE432/4 Antennas &Propagation			
											EEE344/4 VLSI System		EEE440/4 Modern Communication System			
											EEE355/4 Robotic &Automation		EEE445/4 Analogue Integrated Circuit Design			
											EEE377/4 Digital Communication		EEE449/4 Computer Networks			
													EEE453/4 Control System Design			
Total Unit	17		18/16		17		17/19		18		16	5	14		13	135
	TOTAL MINIMUM UNIT FOR GRADUATION															135

2.2 COURSE – PROGRAM OUTCOME MATRIX (ELECTRONIC ENGINEERING)

Core Courses Offered to Electronic 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[a]	X											
		EMM101	Engineering Mechanics[b]	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								
		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									
		EEE270	Analog Electronic II		X		X	X							
3	1	EEE332	Communication			X					X				
		EEE320	Microprocessor II			X							X		X
		EEE350	Control System		X		X	X							
		EEE382	Probability & Engineering Statistics			X			X						
		EEE378	Digital Electronics II		X		X					X			
	2	EEE379	Computer System & Multimedia			X							X		
		EEE354	Digital Control System		X		X	X							
		EUP222	Engineer in Society[c]						X	X	X			X	
		EEE348	Introduction to Integrated Circuit Design	X							X				
	SB	EEL308	Industrial Training						X			X		X	X
4	1	EEE443	Digital Signal Processing			X	X			X					
		EEE424	Electronic Engineering Design			X			X	X		X	X	X	X
	2	EEE499	Undergraduate Project				X		X				X	X	X
		EEM421	Quality Techniques	X	X	X				X			X	X	
			Elective Courses												
3	2	EEE301	Semiconductor Device Test and Measurement	X	X	X									
		EEE322	RF & Microwave Engineering				X			X					
		EEE344	VLSI System			X		X							
		EEE355	Robotic & Automation			X		X							
		EEE377	Digital Communication			X	X								
4	1	EEE449	Computer Networks			X		X							
		EEE440	Modern Communication System			X	X								
		EEE453	Control System Design			X		X							
		EEE430	Software Engineering		X		X			X					
		EEE432	Antennas & Propagation			X		X							
		EEE445	Design of Integrated Analog Circuit			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 fudamental 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.
EEE270/3	Analogue Electronics II	This course emphasizes on the analysis and design of amplifiers and its frequency response.
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.
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
EEE301/4	Semiconductor Device Test and Measurement	This course provides understanding of semiconductor device test and measurement fundamentals. Among the contents are introduction to test system, test specification and flow design, DC test, AC test, digital and mixed signal test and test data analysis. Practical aspect of semiconductor device test using tester hardware will also be included in the form of laboratory work and projects.
EEE320/3	Microprocessor II	Introducing fundamental architecture, programming and interfacing of microprocessor/microcontroller with external devices. Basic knowledge acquired will enable students to build simple applications of embedded systems.
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.
EEE344/4	VLSI System	This course reviews the basic principles to design and analysis VLSI system based on CMOS technology. It also covers the topics of structure and operation of MOS transistor, inverter, sequential and combinational logic circuit based on CMOS technology.
EEE348/3	Introduction to Integrated Circuit Design	This course provides understanding of integrated circuit fundamentals and design methodologies. The course includes IC design methodology, CMOS technology and fabrication process, semiconductor memories and digital IC design using Verilog HDL.
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.
EEE354/3	Digital Control System	This course teaches techniques to analyze and design of digital control systems.
EEE355/4	Robotics and Automation	This course aims to introduce students to the basic principles of robotics and automation systems, through exposure to basic concepts and components both of these topics. The students, they will get an understanding for the process in designing an automation system which consists of a robotic system. Emphasis on robotic system is important because it is the primary system to a modern automation process. Exposure is also given to the selection and determination of key components for an efficient automation system, via hardware and software approaches.
EEE377/4	Digital Communications	This course introduces the fundamental concepts of Parseval's power and energy theorem for analyzing the digital communication system signals between transmitter and receiver. Then, the course introduces the baseband transmission and receiving techniques. An analytical method called the probability of bit error and the concept of optimum receiver are introduced for analyzing the performance of the baseband receiver. Then various passband modulation and demodulation techniques are introduced. The bandpass transmission signals are analyzed in term of the normalized power, and their performance is analyzed in term of probability of bit error. Finally,

		the concepts of the source and channel coding are presented for robust data transmission.
EEE378/3	Digital Electronic II	This course provides understanding to design and analysis of combinational and sequential digital systems. The course includes Logic Simplification, Logic design Using MSI Components, Logic Design Using Programmable Logic Design, Arithmetic Circuit, Registers & Counters, Finite State Machines (FSM), Multi-Input Multi-Output FSM, FSM Implementation and Algorithmic State Machine (ASM).
EEE379/3	Computer System & Multimedia	This course introduces students to the fundamental concepts of personal computer architecture, computer performance, memory system, input/output, operating system, processor structure and function, parallel architecture, multimedia components and the applications of multimedia.
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, nonlinear regression and non-parametric statistics.
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
EEE424/3	Electronic System Design	The course comprises solving complex engineering problem by designing viable solutions that integrates components in core areas of electrronic engineering and meeting specific needs with appropriate considerations such as sustainability, public health and safety, society, cultural dan environment issues.
EEE430/4	Software Engineering	Software engineering is the application of sound engineering principles in the production of multi-version software by multiple developers. This course primary mission is to discuss some practical aspect of software engineering practices for large scale software development. In particular, this course focuses on the concepts and methods for architectural design of object-oriented software systems. In doing so, fundamental design concepts and design notations are introduced utilizing the Unified Modelling Language (UML). Supervision of a mini project on software development will aid students to gain more understanding of the course content.
EEE432/4	Antenna & Propagation	This course reviews the topics on electromagnetic waves, waveguide, antenna design and analysis. It covers the sub topics of electromagnetic in homogeneous and no homogeneous media, rectangular and cylindrical waveguide, propagation mode, basic sources and types of antenna in reasonable propagation. Important concepts are introduced in the form of practical and necessary analytical techniques are applied to solve system.
EEE440/4	Modern Communication	This course reviews the topics on optical fiber, cellular and satellite communication systems. It covers the topics of system components, channels, operations and performance. Important concepts are introduced, and necessary analytical techniques are applied to solve system problems.

EEE443/3	Digital Signal Processing	This course introduces the topics on discrete-time signal and system ranging from the basic theory until the design of FIR and IIR digital filters. The topics covered are signals, systems, discrete-time system, Z transform, discrete Fourier transform (DFT), Fast Fourier Transform (FFT), structure of discrete-time systems and design of FIR and IIR digital filters.
EEE445/4	Analog Integrated Circuit Design	This course covers the theory, analysis and realization of the analog integrated circuits focusing on CMOS technology. The analysis of the single stage amplifiers, multiple stage and differential amplifiers with the practical laboratory covering the standard layout (e.g. GDS format).
EEE449/4	Computer Networks	This course offers students to learn the concepts of data communications, data-link layer protocols, MAC layer protocols and network topologies.
EEE453/4	Control Systems Design	This course covers the basic concepts of control systems, state-space variables, and state-space modeling of dynamical systems. It also covers design and analysis of control systems using state-space method, system identification, optimal control, and advanced control techniques.
EEE499/6	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 electronic 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.
EEM421/4	Quality Technique	This course encompasses the use of modern quality techniques and to achieve continuous quality improvements of a product or process for the case of manufacturing industries. The knowledge and skills gained can be applied in the various types of manufacturing industries for solving quality-related problems systematically and on the basis of sound data analysis.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