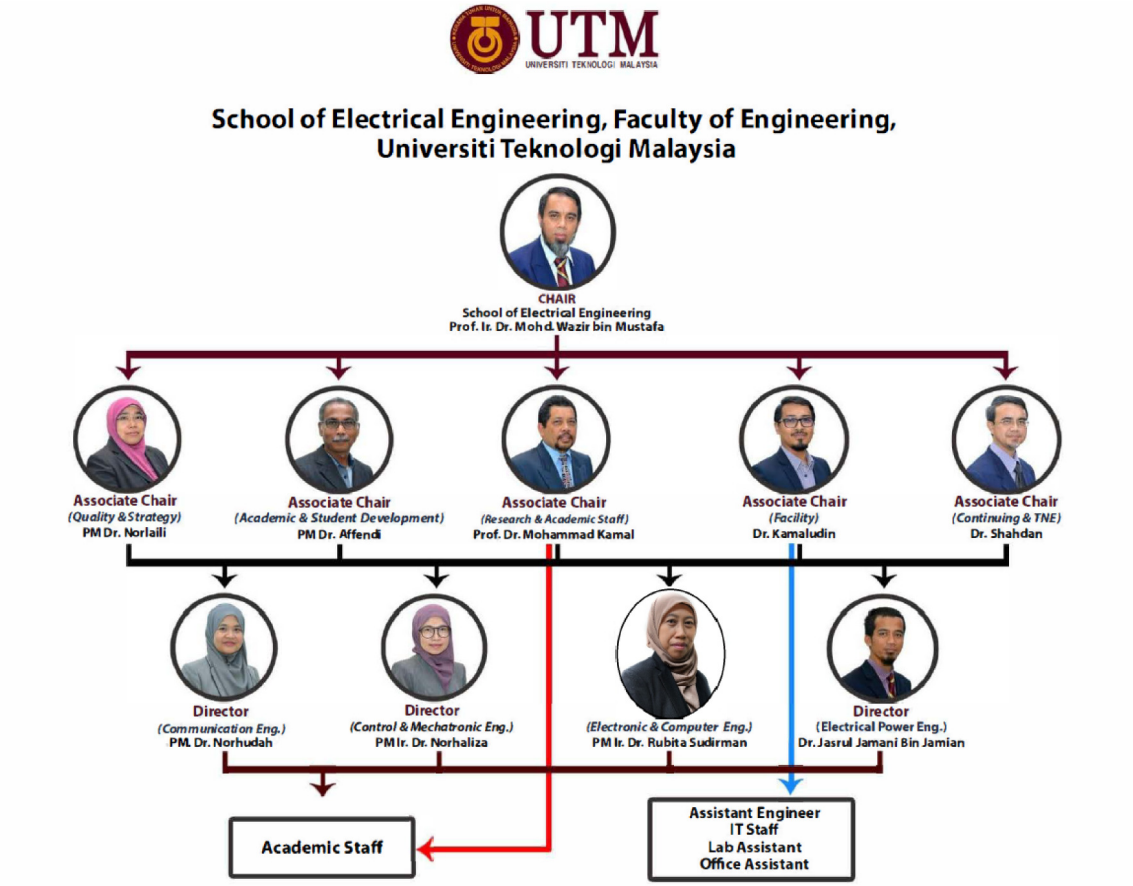

SKE
SCHOOL OF
ELECTRICAL ENGINEERING

ADMINISTRATION TEAM



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BACHELOR OF ELECTRICAL ENGINEERING WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Electrical Engineering with Honours is offered either on a full-time or part-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru while the part-time programme is offered at various learning centres throughout Malaysia. The duration of study for the full-time programme is subjected to the student's entry qualifications and lasts between four (4) years to a maximum of six (6) years.

The programme is offered on full-time basis and is based on a 2-Semester per academic session. Generally, students are expected to undertake courses equivalent to between fifteen (15) to eighteen (18) credit hours per semester. Assessment is based on courseworks and final examinations given throughout the semester.

General Information

<table>
<tr><td colspan="2">1. Awarding Institution</td><td colspan="2">Universiti Teknologi Malaysia</td></tr>
<tr><td colspan="2">2. Teaching Institution</td><td colspan="2">Universiti Teknologi Malaysia</td></tr>
<tr><td colspan="2">3. Programme Name</td><td colspan="2">Bachelor of Electrical Engineering with Honours</td></tr>
<tr><td colspan="2">4. Final Award</td><td colspan="2">Bachelor of Electrical Engineering with Honours</td></tr>
<tr><td colspan="2">5. Programme Code</td><td colspan="2">SEEEH</td></tr>
<tr><td colspan="2">6. Professional or Statutory Body of Accreditation</td><td colspan="2">Board of Engineers Malaysia (BEM)</td></tr>
<tr><td colspan="2">7. Language(s) of Instruction</td><td colspan="2">English and Bahasa Melayu</td></tr>
<tr><td colspan="2">8. Mode of Study (Conventional, distance learning, etc)</td><td colspan="2">Conventional</td></tr>
<tr><td colspan="2">9. Mode of operation (Franchise, self-govern, etc)</td><td colspan="2">Self-governing</td></tr>
<tr><td colspan="2">10. Study Scheme (Full Time/Part Time)</td><td colspan="2">Full Time</td></tr>
<tr><td colspan="2">11. Study Duration</td><td colspan="2">Minimum : 4 yrs
Maximum : 6 yrs</td></tr>
<tr><td rowspan="2">Type of Semester</td><td colspan="2">No. of Semesters</td><td colspan="2">No of Weeks/Semester</td></tr>
<tr><td>Full Time</td><td>Part Time</td><td>Full Time</td><td>Part Time</td></tr>
<tr><td>Normal</td><td>8</td><td>-</td><td>18</td><td>-</td></tr>
<tr><td>Short</td><td>4</td><td>-</td><td>10</td><td>-</td></tr>
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Course Classification

Bachelor of Electrical Engineering with Honours - SEEEH

No.	Classification	Credit Hours	Percentage
i.	University Courses a. General b. Language c. Entrepreneurship d. Co-Curriculum	 23 8 2 3	26.3%
ii.	School/Programme Core	86	62.8%
iii.	Programme Electives	15	10.9%
	Total	**137**	**100%**
A	Engineering Courses a) Lecture/Project/Laboratory b) Workshop/Field/Design Studio c) Industrial Training d) Final Year Project	 89 - 6 6	73.7%
	Total Credit Hours for Part A	**101**	
B	Related Courses a) Applied Science/Mathematic/Computer b) Management/Law/Humanities/Ethics/Economy c) Language d) Co-Curriculum	 15 10 8 3	26.3%
	Total Credit Hours for Part B	**36**	
	Total Credit Hours for Part A and B	**137**	100%
	Total Credit Hours to Graduate	**137 credit hours**	

Award Requirements

To graduate, students must:

- Attain a total of not less than 137 credit hours (SEEE) with a minimum CGPA of 2.0.
- Complete Professional Skills Certificates (PSC).

Programme Educational Objectives (PEO)

After having exposed to 3 to 5 years working experience, our graduates should become professionals who demonstrate the following competencies:

Code	Intended Educational Objectives
PEO1	Become Electrical Engineers who are competent, innovative, and productive in addressing customer needs.
PEO2	Grow professionally with proficient soft skills.
PEO3	Demonstrate high standards of ethical conduct, positive attitude, and societal responsibilities.

Programme Learning Outcomes (PLO)

After having completed the programme, graduates should be able to demonstrate the following competencies:

Code	Programme Learning Outcomes
PLO1	Ability to apply knowledge of mathematics, science and electrical engineering to the solution of complex engineering problems.
PLO2	Ability to perform research-based analysis, conduct experiments and interpret data for complex engineering problems.
PLO3	Ability to identify, formulate, conduct research literature to analyse complex engineering problems using engineering knowledge.
PLO4	Ability to apply engineering practice and use modern engineering, and IT tools for complex engineering problem with an understanding the limitations of the technology.
PLO5	Ability to design solutions for complex engineering problems and design systems and processes that meet specified needs with appropriate consideration for public health and safety, culture, society, and environment.
PLO6	Ability to articulate ideas, communicate effectively, in writing and verbally, on complex engineering activities with the engineering community and with society at large.
PLO7	Ability to function effectively as an individual, as a member or as a leader in diverse teams.

PLO8	Ability to recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PLO9	Ability to comprehend the impact of global and contemporary issues, the role of engineers on society including, health, safety, legal and cultural issues, and the consequent responsibilities relevant to professional engineering practices and engineering problems.
PLO10	Ability to comprehend and evaluate the sustainability and impact of professional engineering work in the solutions of complex engineering problems in societal and environmental contexts.
PLO11	Ability to grasp and execute responsibility professionally and ethically in professional engineering practices.
PLO12	Ability to demonstrate knowledge and understanding of engineering and management principles, and economic decision-making to manage projects in multidisciplinary environments.

PROFESSIONAL SKILLS CERTIFICATE (PSC)

New PSC courses are introduced to new and current students starting from Session 2020/2021. Students are required to undertake and pass Five (5) Professional Skills Certificate (PSC) courses of UTM Institute for Life Ready Graduate (UTM ILeague). These courses are offered and managed by School of Professional and Continuing Education (SPACE) in collaboration with Schools or Faculties. Students are required to register the courses through SPACE Website.

List of PSC courses are as follows:

No.	PSC COURSE	OFFERED AND MANAGED BY SPACE IN COLLABORATION WITH
COMPULSORY COURSES		
1	Design Thinking for Entrepreneur	UTM Excite
2	Talent and Competency Management	UTM Career Centre (UTMCC)
3	English Communication Skills for Graduating Students (ECS)	Language Academy
ELECTIVE COURSES		
4	Occupational Safety, Health & Environment (OSHE) (*Compulsory to all FE students*)	Faculty of Engineering (FE)
5.	Choose ONE elective course from the following list: 1. Data Analytics for Organization 2. Construction Measurement (Mechanical & Electrical Works) 3. Professional Ethics and Integrity 4. Other electives courses offered in future	Schools or Faculties at UTM

COURSE MENU

Bachelor of Electrical Engineering with Honours - SEEEH

YEAR 1: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 1012	Introduction to Electrical Engineering	2	
SEEE 1013	Electrical Circuit Analysis	3	
SECP 1103	C Programming Techniques	3	
SSCE 1693	Engineering Mathematics I	3	
UHLB 1112	English Communication Skills	2	
UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	
UHIS 1022 OR UHMS 1182	Philosophy and Current Issues OR Appreciation of Ethics and Civilizations (for International Students)		
	TOTAL CREDIT	15	
	CUMULATIVE CREDITS	15	

YEAR 1: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 1022	Introduction to Scientific Programming	2	
SEEE 1073	Electronic Devices and Circuits	3	SEEE 1013
SEEE 1223	Digital Electronics	3	
SEMU 2113	Engineering Science	3	
SSCE 1793	Differential Equations	3	
UHIS 1022	Philosophy and Current Issues (for Local Students)	2	
UHLM 1012	Malay Language for Communication 2 (International Students)		
	TOTAL CREDIT	16	
	CUMULATIVE CREDITS	31	

YEAR 2: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 2073	Signals and Systems	3	
SEEE 2133	Electronic Instrumentation and Measurement	3	
SEEE 2423	Fundamentals of Electrical Power Systems	3	SEEE 1013
SSCE 1993	Engineering Mathematics II	3	SSCE 1693
UHMT 1012	Graduate Success Attribute	2	
UHLB 2122	Academic Communication Skills	2	
	TOTAL CREDIT	16	
	CUMULATIVE CREDITS	47	

YEAR 2: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 2263	Digital Systems	3	SEEE 1223
SEEE 2523	Electromagnetic Field Theory	3	SSCE 1993
SEEE 2742	2nd Year Electronic Design Laboratory	2	
SSCE 2193	Engineering Statistics	3	
UBSS 1032	Introduction to Entrepreneurship	2	
UHLB 3132	Professional Communication Skills	2	
UKQF 2**2	Elective of Co-Curricular Service Learning	2	
	TOTAL CREDIT	17	
	CUMULATIVE CREDITS	64	

YEAR 3: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 3133	System Modeling and Analysis	3	SEEE 2073
SEEE 3223	Microprocessor	3	SEEE 1223
SEEE 3533	Communication Principles	3	SEEE 2073
SEEE 3732	Common 3rd Year Laboratory	2	
SEEE 4443	Power System Analysis	3	SEEE 2423
SSCE 2393	Numerical Methods	3	
	TOTAL CREDIT	17	
	CUMULATIVE CREDITS	81	

YEAR 3: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 3143	Control System Design	3	SEEE 3133
SEEE 3742	Specialized 3rd Year Laboratory	2	
SEEE 4423	Power System Engineering	3	SEEE 4443
SEEE 4433	Power Electronics and Drives	3	SEEE 2423
SEEE 4463	High Voltage Technology	3	SEEE 4443
UHL* 1112	Elective of Foreign Language	2	
UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	
	TOTAL CREDIT	17	
	CUMULATIVE CREDITS	98	

YEAR 3: SEMESTER 3			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 4926	Practical Training	6	
	TOTAL CREDIT	6	
	CUMULATIVE CREDITS	104	

YEAR 4: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SHMS 4542	Engineering Management	2	
SEEE 4633	Electrical Machines	3	SEEE 2423
SEEE 4723	Capstone Project	3	
SEEE 4812	Final Year Project Part I	2	
SEE* 4**3 / SEE*5**3	Field Elective 1 / PRISMS Elective 1	3	
SEE* 4**3 / SEE*5**3	Field Elective 2 / PRISMS Elective 2	3	
	TOTAL CREDIT	16	
	CUMULATIVE CREDITS	120	

YEAR 4: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 4012	Professional Engineering Practice	2	
SEEE 4824	Final Year Project Part II	4	SEEE 4812
SEE* 4**3 / SEE*5**3	Field Elective 3 / PRISMS Elective 3	3	
SEE* 4**3 / SEE*5**3	Field Elective 4 / PRISMS Elective 4	3	
SEE* 4**3	Field Elective 5	3	
UHIT 2302	Science and Technology Thinking	2	
	TOTAL CREDIT	17	
	CUMULATIVE CREDITS	137	

FIELD ELECTIVES- POWER ENGINEERING			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 4453	Power System Control	3	SEEE 4423
SEEE 4613	High Voltage Testing and Calibration	3	SEEE 4463
SEEE 4643	Control and Design of Power Electronic System	3	SEEE 4433
SEEE 4653	Photovoltaic and Wind Energy Systems	3	SEEE 4433

SEEE 4663	Electricity for Sustainable Energy	3	SEEE 4423
SEEE 4673	Electricity Market (Electrical Energy Market)	3	SEEE 4443
SEEE 4683	Power System Design and Operation	3	SEEE 4443

FIELD ELECTIVES- CONTROL ENGINEERING			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 4113	Modern Control Theory	3	SEEE 3143
SEEE 4153	Digital Control Systems	3	SEEE 3143
SEEE 4173	Industrial Process Control	3	SEEE 3143
SEEI 3133	Industrial Instrumentations and Applications	3	SEEE 2133
SEEI 4173	Advanced Transducers and Sensors	3	SEEI 3133
SEEI 4313	PLC and SCADA System Design	3	SEEE 3143
SEEI 4363	Industrial Control Network	3	SEEE 3143
SEEM 4173	Artificial Intelligence	3	

FIELD ELECTIVES- ELECTRONIC ENGINEERING			
Code	**Course**	**Credit**	**Pre-requisite**
SEEL 3613	Semiconductor Materials Engineering	3	SEEE 1073
SEEE 3263	Electronic System	3	SEEE 1073
SEEL 4223	Digital Signal Processing 1	3	SEEE 2073
SEEL 4273	CAD with HDL	3	SEEE 2263
SEEL 4283	Analog CMOS IC Design	3	SEEE 1073
SEEL 4373	IC Testing Techniques	3	SEEE 2263 SEEL 4283
SEEL 4743	Basic Digital VLSI Design	3	SEEE 2263

FIELD ELECTIVES- COMMUNICATION ENGINEERING			
Code	**Course**	**Credit**	**Pre-requisite**
SEET 3573	Microwave Engineering	3	SEEE 3533
SEET 3583	Digital Communication Systems	3	SEEE 3533

SEET 3623	Data Communication and Networks	3	SEEE 3533
SEET 4523	Optical Communication Systems	3	SEEE 3533
SEET 4533	Wireless Communication Systems	3	SEET 3573
SEET 4543	RF Microwave Circuit Design	3	SEET 3573
SEET 4593	Acoustic Engineering	3	SEEE 3533
SEET 4613	Antenna Theory and Design	3	SEET 3573
SEET 4623	Network Programming	3	SEET 3623

SEEE Elective Courses for PRISM (CHOOSE MAXIMUM 4)			
Code	Course	Credit	Pre-requisite
SEEE 5533	Power Electronics Systems	3	
SEEE 5583	High Voltage and Electrical Insulation	3	
SEEE 5603	Power System Analysis and Computational Method	3	
SEEE 5633	Power System Devices and Apparatus	3	
SEEL 5123	Advanced Microprocessor System	3	
SEEL 5173	Advanced Digital System Design	3	
SEET 5313	Communications and Computer Networks	3	
SEET 5413	Advanced Digital Communication	3	
SEEL 5113	Advanced Nanoelectronics Devices	3	
SEEL 5193	Advanced Analog CMOS IC Design	3	
SEEM 5753	Advanced Instrumentation and Measurement	3	
SEEM 5713	Artificial Intelligence and Applications	3	
SEEM 5703	Control Systems Engineering	3	
SEET 5313	Communications and Computer Networks	3	
SEET 5513	Sustainable Design, Engineering and Management	3	
SEET 5423	Wireless Communication Systems	3	
SEET 5523	Internet of Things Technology	3	

PRISMS ELECTIVE COURSES

For students who intend to enroll into PRISMS programme, refer to the PRISMS Section for a list of related elective courses associated with the postgraduate programmes.

Requirements

Students who are eligible to apply for PRISMS are those with academic qualification who are in Year 3 Semester 2 with cumulative average grade value of CGPA 3.3 and above. Students can apply for PRISMS in Year 3 Semester 2 through the Program Integrasi Sarjana Muda-Sarjana (PRISMS) application form and must be recommended by the Academic Advisor, approved by the Program Director and certified by the Chair of School or Dean of Faculty.

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not allowed to graduate.

Bachelor of Electrical Engineering with Honours - SEEEH

NO.	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (√)IF PASSED
BACHELOR OF ENGINEERING (ELECTRICAL)					
1.	SEEE 1012	Introduction to Electrical Engineering	2	2	
2.	SEEE 1013	Electrical Circuit Analysis	3	3	
3.	SEEE 1022	Introduction to Scientific Programming	2	2	
4.	SEEE 1073	Electronic Devices and Circuits	3	3	
5.	SEEE 1223	Digital Electronics	3	3	
6.	SEEE 2073	Signals and Systems	3	3	
7.	SEEE 2133	Electronic Instrumentation & Measurement	3	3	
8.	SEEE 2263	Digital Systems	3	3	
9.	SEEE 2423	Fundamentals of Electrical Power Systems	3	3	

10.	SEEE 2523	Electromagnetic Field Theory	3	3	
11.	SEEE 2742	2nd Year Electronic Design Lab	2	2	
12.	SEEE 3133	System Modeling & Analysis	3	3	
13.	SEEE 3143	Control System Design	3	3	
14.	SEEE 3223	Microprocessor	3	3	
15.	SKEE 3533	Communication Principles	3	3	
16.	SEEE 3732	Common 3rd Year Laboratory	2	2	
17.	SEEE 3742	Specialized 3rd Year Laboratory	2	2	
18.	SEEE 4012	Professional Engineering Practice	2	2	
19.	SEEE 4423	Power System Engineering	3	3	
20.	SEEE 4433	Power Electronics and Drives	3	3	
21.	SEEE 4443	Power System Analysis	3	3	
22.	SEEE 4463	High Voltage Technology	3	3	
23.	SEEE 4633	Electrical Machines	3	3	
24.	SEEE 4723	Capstone Project	3	3	
25.	SEEE 4812	Final Year Project Part I	2	2	
26.	SEEE 4824	Final Year Project Part II	4	4	
27.	SEEE 4926	Practical Training	6	6	
28.	SEE* 4**3 / SEE*5**3	Field Elective 1 / PRISMS Elective 1	3	3	
29.	SEE* 4**3 / SEE*5**3	Field Elective 2 / PRISMS Elective 2	3	3	
30.	SEE* 4**3 / SEE*5**3	Field Elective 3 / PRISMS Elective 3	3	3	
31.	SEE* 4**3 / SEE*5**3	Field Elective 4 / PRISMS Elective 4	3	3	
32.	SEE* 4**3	Field Elective 5	3	3	
33.	SECP 1103	C Programming Techniques	3	3	

34.	SEMU 2113	Engineering Science	3	3	
35.	SHMS 4542	Engineering Management	2	2	
		TOTAL CREDIT OF ENGINEERING COURSES(a)	**101**	**95**	
MATHEMATICS COURSES (Faculty of Science)					
1.	SSCE 1693	Engineering Mathematics I	3	3	
2.	SSCE 1793	Differential Equations	3	3	
3.	SSCE 1993	Engineering Mathematics II	3	3	
4.	SSCE 2193	Engineering Statistics	3	3	
5.	SSCE 2393	Numerical Methods	3	3	
		TOTAL CREDIT OF MATHEMATICS COURSES (b)	**15**	**15**	
UNIVERSITY GENERAL COURSES					
Cluster 1: Appreciation of Philosophy, Value and History (Faculty of Social Sciences and Humanities)					
1.	UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	2	
	UHIS 1022 OR UHMS 1182	Philosophy and Current Issues (for International Students) OR Appreciation of Ethics and Civilizations (for International Students			
2.	UHIS 1022	Philosophy and Current Issues (for Local Students)	2	2	
	UHLM 1012	Malay Language 2 (for International Students)			
Cluster 2: Generic Skills					
1.	UHMT 1012	Graduate Success Attributes	2	2	
2.	UBSS 1032	Introduction to Entrepreneurship	2	2	
Cluster 3: Knowledge Enhancement					
1.	UHIT 2302	The Thought of Science and Technology	2	2	

Cluster 4: Co-Curriculum and Service Learning					
1.	UKQF 2**2	Elective of Co-Curricular Service Learning	2	2	
2.	UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	1	
Cluster 5: Language Skills (Language Academy, Faculty of Social Sciences and Humanities)					
1.	UHLB 1112	English Communication Skills	2	2	
2.	UHLB 2122	Academic Communication Skills	2	2	
3.	UHLB 3132	Professional Communication Skills	2	2	
4.	UHL* 1112	Elective Of Foreign Language	2	2	
		TOTAL CREDIT of UNIVERSITY GENERAL COURSES (c)	**21**	**21**	
		TOTAL CREDIT TO GRADUATE (a + b + c)	**137**	**131**	
OTHER COMPULSORY COURSES - PROFESSIONAL SKILLS CERTIFICATE (PSC). • **Students are required to enrol and pass FIVE (5) PSC courses, in order to be eligible to graduate.** • **Please refer to page FE 8 in the UG Academic Handbook, for more information about PSC courses.**					
COMPULSORY PSC COURSES (Enroll all 4 courses)					
1	GSPX XXXX	Design Thinking for Entrepreneur			
2	GSPX XXXX	Talent and Competency Management			
3	GSPX XXXX	Faculty Engineering Safety Pass (FESP) *MODULE 1 - compulsory for SKM, SKT and SKE students* *MODULE 2 – compulsory for SKA, SC, SKBSK students*			
4	GSPX XXXX	English Communication Skills for Graduating Students (ECS)			
ELECTIVE PSC COURSE (Choose 1 only)					
1	GSPX XXXX	Data Analytics for Organization			
2	GSPX XXXX	Writing			
3	GSPX XXXX	Construction Measurement (Mechanical & Electrical Works)			
4	GSPX XXXX	Professional Ethics and Integrity			
5	GSPX XXXX	More elective courses to be added in future			

COURSE SYNOPSIS

SEEE 1012 : INTRODUCTION TO ELECTRICAL ENGINEERING

This course serves as a general introduction to electrical engineering programmes offered by the School of Electrical Engineering (SEE), Universiti Teknologi Malaysia (UTM). Students undertaking this course will be exposed to attributes of electrical engineers from both academic and practical points of view. Soft skills and knowledge that are necessary in the engineering world will be introduced to the students. The students will have a clearer understanding on the responsibilities of electrical engineers to the society. By exploring contemporary issues, the students would be able to suggest sustainable solutions to the mankind and its environment.

SEEE 1013 : ELECTRICAL CIRCUIT ANALYSIS

This course introduces students to the basic laws, methods of analysis and theorems for direct current, DC and alternating current, AC circuit, such as, Ohms Law, Kirchhoff's Current and Voltage Laws, Mesh and Nodal Analysis and Thevenin's and Norton's Theorems. Based on these, the students are expected to be able to solve for variables in any given DC and AC electric circuits. The students also exposed to the steady-state electrical circuit. Afterwards, the relevant concepts in transient circuit analysis for first and second order circuit are taught to the students. With the knowledge learned, the student would be able to apply the basic laws, theorem and methods of analysis for solving completely with confidence various problems in circuit analysis.

SEEE 1022 : INTRODUCTION TO SCIENTIFIC PROGRAMMING

This course introduces the fundamentals of scientific programming languages and techniques used by engineers to solve engineering problems. Students will be introduced to common scientific programming languages and their comparative advantages and disadvantages. Emphasis is placed on fundamentals of programming, program design, verification and visualization. The goal is to provide the students with the skills in scientific computing, tools, techniques that can be used to solve their own engineering problems. Students will learn to implement algorithms using high level programming language (e.g. MATLAB, Mathematica, FORTRAN). The programming skills acquired in this course will allow students to go beyond what is available in pre-packaged analysis tools, and code their own custom data processing, analysis and visualization for any engineering problem.

SEEE 1073 : ELECTRONIC DEVICES & CIRCUITS

Pre-requisite: SEEE 1013 Electrical Circuit Analysis

This course provides introduction to the basic operating principles and applications of discrete electronic devices and circuits. The course content starts with the fundamental solid-state principles and continues the discussions with the constructions and characteristics of diode, Bipolar Junction Transistor (BJT) and Enhancement Metal Oxide

Semiconductor Field Effect Transistor (E-MOSFET). The application of diodes focuses on the basic power supply circuits whereas the applications of the transistors focus on the small-signal amplifier. The course content ends with an introduction to the operating principles of an ideal operational amplifier (op-amp) and discussion about op-amp circuits, performance and applications. To help the students understand the behaviour of the electronic devices and predict the behaviour of the electronic circuits, this course makes use of Multisim simulation software. The goal of this course is to develop excellent understanding of the devices operation for students to be applied in analogue and digital circuit design.

SEEE 1223 : DIGITAL ELECTRONICS

This course teaches the fundamental principles of digital systems. From the signal concepts and the importance of numbers systems and codes, it then proceeds to logic gates, their relationship to Boolean algebra and the integration of gates to form complex circuits. The course emphasizes on techniques to design, analyse, plan, and implement simple digital systems using gates and MSI circuits. Simulation software Quartus II version 13 will also be introduced to facilitate learning process.

SEEE 2073 : SIGNALS AND SYSTEMS

This course introduces the students the fundamental ideas of signals and system analysis. The signal representations in both time and frequency domains and their effects on systems will be explored. Specifically, the topics covered in the course include basic properties of continuous-time and discrete-time signals, the processing of signals by linear time-invariant (LTI) systems, Fourier series, Fourier and Laplace transforms. Important concepts such as impulse response, frequency response and system transfer functions as well as techniques of filtering and filter design, modulation, and sampling, are discussed and illustrated. This course will serve as a central building block for students in studying information processing in many engineering fields such as control systems, digital signal processing, communications, circuit design, etc.

SEEE 2133 : ELECTRONIC INSTRUMENTATION AND MEASUREMENT

This course introduces students some of the metrological terminologies used in experimental methods, concept of metrology and its application. The course will also provide understanding the concept electrical measurement quantity using analogue and digital instruments. The interfaces of the instruments with embedded sensors and also the quality of the signals acquired are introduced. Besides that, this course also introduces the type of electrical noise and the ways to reduce noise and interference. Finally, the fundamental principle of transducers, transducer operations, characteristic and functions will be discussed. P&ID diagram also introduces to cover the basic process of the system.

SEEE 2263 : DIGITAL SYSTEMS

Pre-requisite: SEEE 1223 Digital Electronics

This course is a continuation from basic digital logic techniques course. The objective of the course is to introduce students to basic techniques to design and implement complex digital systems It emphasizes on techniques to design, analyse, plan, and implement complex digital systems using programmable logic. To facilitate learning process, computer-aided design (CAD) software is used throughout the course. Actual environment problems and solutions are provided.

SEEE 2423 : FUNDAMENTALS OF ELECTRICAL POWER SYSTEMS

Pre-requisite: SEEE 1013 Electrical Circuit Analysis

This course introduces fundamental concepts of electric machines and power system. Students should be able to identify components of the system from the course and describe their basic operations from the course having electromagnetic and circuit concepts learned in previous fundamental courses. These fundamental concepts are further elaborated in applications of electric machines - transformers, direct current machines, synchronous machines and induction machines, power in ac circuits, three-phase system, power system component modeling and analysis. At the end of the course, the students are expected to critically analyze the power system comprising of generation, transmission, and distribution components.

SEEE 2523 : ELECTROMAGNETIC FIELD THEORY

Pre-requisite: SSCE 1993 Engineering Mathematics 2

This course introduces students to some major views and theories in the area of electrostatic, magnetostatic and electromagnetic fields. This elementary electromagnetic field theory is summarized in Maxwell's equations. It is assumed that students already have appropriate mathematical background including multivariable calculus and some familiarity with the basic concepts typically covered in an introductory circuit theory course such as resistance, capacitance and inductance.

SEEE 2742 : 2ND YEAR ELECTRONIC DESIGN LABORATORY

All students will attend three second year laboratories which are the Electrotechnic, Basic Electronic and Digital Electronic Labs. The students will attend a three hour lab per week. The students are expected to complete four experiment topics for each lab in a direct of four week duration. Thus, the student will perform altogether 12 experiments in a semester. All experiments in the laboratories are emphasized on design case for a given complex engineering problem or project. The students will use software simulation tools to assist in their design tasks.

SEEE 3133 : SYSTEM MODELING AND ANALYSIS

Pre-requisite: SEEE 2073 Signals & Systems

This course introduces the students to the fundamental ideas and definitions of control systems, open loop and close loop control systems, transfer functions and transient and steady state responses. Students will be taught how to obtain mathematical models of actual physical systems such as electrical, mechanical and electromechanical systems in the transfer function form. Methods of system representation such as block diagram representation and signal flow graphs will be discussed. The students will also be exposed to techniques of analysing control systems performance and stability in time and frequency domains. Finally, an introduction to the design and analysis of control systems using MATLAB will also be given.

SEEE 3143 : CONTROL SYSTEM DESIGN

Pre-requisite: SEEE 3133 System Modeling and Analysis

The course begins with the root locus designs using root locus procedures and MATLAB. Then, PID controller will be designed using root locus approach. The PID controller and lead-lag compensator will be used to improve the transient and steady state performances in time domain using root locus approach. In frequency domain approach, the Bode plot method will be utilised. The lead, lag and lead-lag compensators are used in improving the performance of the control system using the frequency domain approach. Finally, applications of control engineering in various fields will be studied.

SEEE 3223 : MICROPROCESSOR

Pre-requisite: SEEE 1223 Digital Electronics

This course introduces the principles and applications of microprocessors. Topics emphasized are processor architecture, assembly and HLL language and fundamentals of interfacing in a microprocessor-based embedded system. This course emphasizes on the understanding the fundamentals of microprocessor operation, writing coherent and error-free assembly and HLL language programs, and designing basic interfacing circuits. With the knowledge learned, the student would be able to design microprocessor-based systems using assembly language and HLL programs completely with confidence.

SEEE 3263 : ELECTRONIC SYSTEMS

Pre-requisite: SEEE 1073 Electronic Devices and Circuits

This course covers some topics in functional electronic circuits. The circuits are derived from a diverse electronic circuitry that exists in many electronic instrumentation. The function, the behaviour and the characteristics of the functional circuits are analysed. Design examples are presented to guide students with the necessary knowledge of how to design the functional electronic circuits based on certain predetermined specifications.

SEEE 3533 COMMUNICATION PRINCIPLES

Pre-requisite: SEEE 2073 Signals & Systems

This course introduces the students the basic principles of communication system. The fundamental concepts of analogue modulation in particular amplitude and frequency modulations will be strongly emphasized. Topics include types of modulated waveforms, transmitter and receiver structures, and noise performance. The two most significant limitations on the performance of a communications system; bandwidth and noise will be discussed. The concept of sampling, quantization and line coding techniques in rendering an information signal to be compatible with a digital system are explained prior to the study of coded pulse modulation and pulse code modulation (PCM). The waveforms and spectral analysis of bandpass digital modulations are introduced. The system performance in terms of SNR and bit error rate (BER) will also be covered. Finally, multiplexing, a method to utilize the communication resource efficiently is studied where two main multiplexing techniques will be explored; time-division and frequency-division multiplexing.

SEEE 3732 : COMMON THIRD YEAR LABORATORY

Third Year Laboratory is a required course for third year students in Bachelor of Engineering degree program. This course requires students to conduct twelve experiments in six different laboratories (Basic Power, Basic Machine, Basic Communication, Instrumentation, Microprocessor and Basic Control). The students are grouped into 3-4 students. Each week, they are required to conduct an experiment in the lab within 3 hours. Each group will submit only one short report at the end of each lab session. Each student is assigned to write only one long report based on one experiment that they have conducted for this course. This long report should be submitted within a week after the student performed the assigned experiment.

SEEE 3742 : SPECIALISED 3RD YEAR LAB

3rd Year Laboratory is a required course for third year students in Bachelor of Engineering degree program. This course requires students to conduct four experiments in four different laboratories (Basic Power, Power Electronics, Basic Microwave and Applied Control Lab). This laboratory is conducted as a Project Based approach. The students are grouped into 3-4 students, and they will be given problems to solve that require them to conduct experiments in-lab (3 hours/week) and out-of-lab (equivalent to 2 hour/week) within three weeks. The students are required to solve the given project as a team, design suitable experimental procedures and conduct the experiments, present the problem solutions and submit a report following the IEEE standard journal format.

SEEE 4012 : PROFESSIONAL ENGINEERING PRACTICE

This course introduces and exposes the students to the concepts, theories and the practice of Professional Engineer. It highlights to the students profession of engineering, relevant acts and regulations, engineering code of ethics, engineers' roles and responsibilities, engineering ethics, the impact of the work of engineer on society, and knowledge to cater the needs for sustainable development. In terms of knowledge of accreditation of engineering programme

and the internationalization of engineers, elements of EAC and Washington are also discussed. Based on this knowledge, the students will work on projects to analyze real engineering issues and cases, both individually and in groups.

SEEE 4113 : MODERN CONTROL SYSTEM

Pre-requisite: SEEE 3143 Control System Design

This course introduces students the modern modeling approach of physical system namely state space. Students are introduced to state space modeling and analysis of several forms of state space representation, conversion and similarity transformation. Students are exposed to solution of state space equation, controller and observer design using pole placement method and optimal control system.

SEEE 4153 : DIGITAL CONTROL SYSTEMS

Pre-requisite: SEEE 3143 Control System Design

This course introduces students the basic principles underlying the analysis, synthesis and design of digital control systems. Students are introduced to sampling theorem and discretization of continuous time system, data reconstructions, z-transform, mathematical modeling of discrete-time and digital systems, time domain and various stability analysis methods for discrete-time and digital systems, and on the design of various discrete-time and digital controllers. By adapting the knowledge obtained, students will be able to derive the mathematical model of discrete-time control systems and analyze accurately its stability and the time response, as well as the students will be able to design correctly the suitable digital controller to control the discrete-time systems.

SEEE 4173 : INDUSTRIAL PROCESS CONTROL

Pre-requisite: SEEE 3143 Control System Design

This course introduces process control system application and the wide applicability in the industry. The course initiates with modelling of process plants using fundamental laws of physics and chemistry as well as empirical process modelling. To enhance the performance of an existing process control system, controllers (PID, feedforward, cascade and inferential control) are introduced, designed, tuned and applied. Tuning techniques of Ziegler-Nichols and Cohen-coon are also utilized. Finally, the concept of supervisory, automatic control and data retrieval which relates to IoT in a process plant is introduced. In summary, this course offers students an initial exposure to the process industry and the coveted opportunity to explore more on to endless application.

SEEE 4423 : POWER SYSTEMS ENGINEERING

Pre-requisite: SEEE 4443 Power System Analysis

This course is designed to introduce the necessary concept and application of power system protection; and stability analysis of power system. Topics include, transducer, protection schemes, power system stability and circuit breaker. At the end of the course, the students

are expected to complete a project on the design of a protection system based on an actual power system.

SEEE 4433 : POWER ELECTRONICS AND DRIVES

Pre-requisite: SEEE 2423 Fundamentals of Electrical Power Systems

This course introduces students to the fundamentals of power electronics, which include power semiconductor switches, rectifier (AC-DC), choppers (DC-DC), and inverters (DC-AC). Emphasis will be on the power converter operations and analysis of their steady state performances. The course also exposes students to some basic converters design and the selection of suitable converters for certain application. In addition, the course covers the operation and selection of converters for DC and AC drive systems. At the end of the course student should be able to critically design power converters at given specification using application software.

SEEE 4443 : POWER SYSTEM ANALYSIS

Pre-requisite: SEEE 2423 Fundamentals of Electrical Power Systems

This course introduces students to the applications of power system analysis of a practical power system. Topics include: per-unit system, load flow analysis, symmetrical three-phase faults, symmetrical components and unsymmetrical faults. At the end of the course students are expected to apply the analysis concept in solving the real power system problems.

SEEE 4453 : POWER SYSTEM CONTROL

Pre-requisite: SEEE 4423 Power System Engineering

The course introduces students to the control and operation of a power system and high voltage direct current (HVDC) system. It will discuss the basic principle of SCADA system and its application in power industry, the economic operation of power system under regulated/deregulated environment. The discussion focuses on the control strategies that can be used to generate and deliver power economically and reliably to the power system customers. The course will further discuss on the load frequency control and voltage reactive power control. The course will also introduce the basic operation of converters in HVDC system. At the end of the course, the students are expected to apply the analysis concepts in the operation of power system and HVDC system.

SEEE 4463 : HIGH VOLTAGE TECHNOLOGY

Pre-requisite: SEEE 4443 Power System Analysis

High voltage engineering is an important area in power system. The students will be exposed to the concept and theory of insulation breakdown. Key principles of high voltage technology and insulation coordination as well as insulation testing (including high voltage generators) are also covered. Lightning overvoltages due to the naturally occurring atmospheric phenomenon are a nuisance to the network and will be discussed along with switching surges. Various types of electrical discharges, some of which are used for condition monitoring applications, are also

discussed. The student is expected to be able to communicate effectively as well as to design selected high voltage components and subsystems.

SEEE 4613 : HIGH VOLTAGE TESTING AND CALIBRATION

Pre-requisite: SEEE 4463 High Voltage Technology

In this course, the students will be exposed to the needs of testing and calibration, especially in the power system industry. Students will be introduced to concepts and theories related to high voltage and high current generation and measurement. Testing techniques related to transformers, cables and switchgears are explained, along with the calibration methods of high voltage meters and high current clamp meters. Students are also explained on matters that concern the quality of testing and calibration activity such as the traceability and uncertainty of a measurement. At the end of the course, students should be able to understand the importance, techniques involved, setting up and proper conduct of high voltage testing and calibration along with the estimation of measurement uncertainty and reporting the testing result.

SEEE 4633 : ELECTRICAL MACHINES

Pre-requisite: SEEE 2423 Fundamentals of Electrical Power Systems

This course is an extension of the basic power and electric machine course, exclusively offered for the electrical engineering students. The course provides the fundamentals of electric machines, which are synchronous machines, induction machines and DC machines. The course begins with electromechanical energy conversion. Next, students are introduced to principle of operations, constructions and some analysis on steady state performance of the electric machines. The course also introduces special motors and their applications, which includes single-phase induction motors, stepper motors, switch reluctance machines and universal motors. At the end of the course student should be able to perform steady state analysis of electric machines and apply their knowledge to real world applications.

SEEE 4723 : CAPSTONE PROJECT

The course provides students with the opportunity to integrate technical knowledge and generic skills attained in the earlier years. It requires students to conceive, engage and provide solution to a real industry/community problem. The solution is expected to be achieved within the context of an engineering project conducted in a small team (typically three or four students) under the supervision of an academic staff and with optional of industry/community partner as advisor. Topics supplementing this course that include project management tools and practices, organizational structures, engineering standards as well as the social and environmental responsibility of professional engineers are covered in the Professional Ethics and/or Engineering Management courses offered prior to or concurrent with the course.

SEEE 4812 : FINAL YEAR PROJECT 1

The aim of the Final Year Project 1 (FYP1) is to allow the students to demonstrate a wide range of skills learned at the SKE through the design, analysis, testing, and evaluation stages in the project. The students will be exposed in identifying and formulate through literature and develop a project proposal. The final year project will include the concept of sustainable development for the project developed. Students will also learn to estimate project cost and manage time to achieve the project objectives. This will help students to develop important skills in summarizing a research area and understanding the research problems.

SEEE 4824: FINAL YEAR PROJECT 2

Pre-requisite: SEEE 4812 Final Year Project 1

The aim of the Final Year Project 2 (FYP2) is to provide students the opportunity to explore and implement creative and innovative knowledge to solve practical science, mathematical and engineering societal problems. Students are exposed to project management planning and execution. With these skills, it is hoped that the students will gain knowledge and experience in planning, designing and solving problems systematically thus when they graduate, they will be ready to work as reliable and productive engineers.

SEEE 4926: PRACTICAL TRAINING

Students will undergo a practical training lasting for a minimum of 10 weeks at an approved private, government or semi-government agency. The school will release the list of participating agencies. Placement at the respective agency will be initiated by the applications from the students. Approval of the application is at the discretion of the school. Undergraduates are expected to acquire hands on experience not only in the engineering aspects of work, but also to other related matters such as administration, accounting, management, safety, etc. during the industrial training period.

SEEE 4643 : CONTROL AND DESIGN OF POWER ELECTRONIC SYSTEMS

Pre-requisite: SEEE 4433 Power Electronics and Drives

This course covers the knowledge on how to model power electronic converters and design their controller parameters. The course gives a brief explanation on the basic operation of power electronics converters and the necessity of having a feedback control in the system. To design a controller for the converters, averaged models based on state-space and averaged switch are introduced. Then, small-signal models are derived. For controller design, a recap on control theory i.e. open-loop system, closed-loop, phase margin, gain margin and bandwidth will be reviewed. Conventional Proportional-Integral (PI) controller design under voltage mode control (VMC) and current mode control (CMC) strategies will be performed. All the derived models will be implemented in PSPICE/MATLAB software. The course will also introduce the student on the design issues/constraints that may be faced in designing the power converters.

SEEE 4653 : PHOTOVOLTAIC AND WIND ENERGY SYSTEMS

Pre-requisite: SEEE 4433 Power Electronics and Drives

This course covers the fundamental knowledge on two popular renewable energy systems, namely photovoltaic (PV) and wind energy systems. A brief introduction will be given on the renewable sources of energy. In photovoltaic energy system, the characteristic of PV generation will be described. It follows with the integration of PV array with power electronic converters for energy harvesting. In addition to that, maximum power point tracking which acts as a controller to the PV system will be reviewed. Then, several examples of PV energy system design will be discussed. The PV systems include stand-alone and grid-connected system. At the second stage of the course, wind energy system will be introduced. The general classification of wind turbines, function of generators and speed control of wind turbine will be discussed. Then, the typically used topologies of wind energy system will be described. In this course, students will be introduced with academic service learning, which students will pay visit to local schools to share their knowledge on PV energy systems. It will be a fun learning process where students can also contribute back to the community on what they have learned. At the end of the course, the student should be able to understand the fundamental operation and control of PV and wind energy systems.

SEEE 4663 : ELECTRICITY FOR SUSTAINABLE ENERGY

Pre-requisite: SEEE 4423 Power System Engineering

The course is designed to give an overview of energy resources such as conventional and non-conventional energy, with an emphasis on electrical energy system as well as understanding of demand growth, impact on environment and energy sustainability. Students will be introduced the various types of energy resources (RE and conventional); demand side management (DSM) options and energy efficiency (EE) measures includes managing energy used. Students will be asked to model renewable energy characteristics, for instance, photovoltaic I-V and P-V characteristics using C/C++, MATLAB and other appropriate tools. Students will also be exposed to design an energy supply system and justify the best choice based on cost benefit analysis by using HOMER software. At the end of the course students are expected to be able to apply and critically evaluate energy resources potential and demand side management options.

SEEE 4673 : ELECTRICAL ENERGY MARKET

Pre-requisite: SEEE 4443 Power System Analysis

This course introduces the students to the concept of competitive electrical energy market models. At the beginning of the course, the student will learn the difference between the old monopoly electricity market model and the new competitive electricity market model including the advantage and disadvantages of each model. Then the students will learn some of the electricity market models existed in the world in which emphasis will be given on Pool Market and Bilateral Market Model. Some of the technical issues arisen from the deregulated/competitive electricity market will also be covered in this course.

SEEE 4683: POWER SYSTEM DESIGN & OPERATION

Pre-requisite: SEEE 4423 Power System Analysis

This course embodies the basic principles and objectives of fundamentals of power system analysis. The aim is to instil confidence and apply the basic concepts of power system for further study and practice of electric power engineering. The course also provide an in-depth understanding of the way the entire electricity network is build, i.e. from generation, then onto transmission and finally onto the distribution network. At the end of the course, the student should be able to apply the theorems and concepts in power system design and operation. Upon completion of the course, the students would easily fit into the industry having acquired knowledge.

SEEI 4233: NANOTECHNOLOGY AND APPLICATION

In this course, students will be presented with concepts, opportunities and issues related to the nanoscale world. Students will be exposed to the fundamental principles of various equipment used in observing the nanoworld. Next, knowledge related to manipulation, characterization and fabrication of micro and nano objects will be discussed. Then, students will be exposed to the analysis of microfluidic device using finite element analysis (FEA) tool. Finally, students will be exposed to the design and development of microfluidic device using photolithography technique. In the end of the course, students are expected to acquire good understanding and able to analyse the fundamental principles of various equipment used in nanoworld. Students must be able to differentiate between various fundamental working principles used by various nano equipment. Furthermore, students should be able to use FEA and microfabrication tools to design and develop microfluidic device.

SEEI 4313: PLC AND SCADA SYSTEM DESIGN

Pre-requisite: SEEE 3143 Control System Design

This course is divided into parts: (1) Automation and (2) Scada system. This is an advance subject in control engineering for final year electrical engineering students. The main aim is to develop concepts in industrial control engineering to the students. Fundamental concepts in manufacturing and automation, building blocks of automation. Simple modeling and analysis process transducers and controllers, drivers and final control elements. Industrial logic control system, sequence control using electronic logic components and programmable logic controllers (PLC) in simple process, control system and automated control system. SCADA is the process of a plant and / or a method of gathering of data from devices in the field. This the process of collecting data into the actual business, and using it in real time. There are using standard communication protocols (eg IEC 60870, DNP3 and TCP/IP) and hardware and software. Many SCADA applications use PLCs as the RTU of choice,when communicating with field devices. This subject covers the essentials of SCADA and PLC systems, which are often used in close association with each other. A selection of case studies are used to illustrate the key concepts with examples of real world working SCADA and PLC systems in the water, electrical and processing industries.

SEEI 4363 : INDUSTRIAL CONTROL NETWORKS

Pre-requisite: SEEE 3143 Control System Design

The aim of this course is to present basic concepts in industrial control networks to students. It will highlight the basic system of interconnected equipment used to monitor and control the physical equipment in industrial environment. Fundamental concepts in conventional and industrial networks are initially described. Industrial control network components such as PLC, DCS and SCADA are also studied. The hierarchical and architecture of every level in industrial control networks are also discussed. The types of network protocols which are often used in industrial environment at every level are described.

SEEL 3613: Semiconductor Material Engineering

Pre-requisite: SEEE 1073 Electronic Devices and Circuits

The purpose of this course is to provide a basis for understanding the characteristics, operation, and limitations of semiconductor devices. In order to gain this understanding, it is essential to have a thorough knowledge of the basic physics and operation of the semiconductor material. The goal of this course is to bring together crystal structures, quantum mechanics, quantum theory for solids, semiconductor material physics, and fundamental of PN structures. All of these basic components are vital for students to understand the operation of present day and future electronic devices.

SEEL 4223: Digital Signal Processing 1

Pre-requisite: SEEE 2073 Signal and System

This course introduces concepts in digital signal processing. Continuous-time signals and systems will be reviewed. Consecutively, introduction to digital signal processing, basic idea, benefits and applications are presented. Discrete-time signals and systems are described based on signal definition, periodicity, stability, causality, convolution, difference equations, infinite impulse response (IIR), finite impulse response (FIR) and signal flow graphs. Spectrum representation of discrete-time signals will cover sampling theorem, the discrete-time Fourier transform (DTFT) and its properties, and Discrete Fourier Transform (DFT). Another domain presented is Z-transform which consists of topics on derivations, region of convergence, transformation properties, poles and zeros, and inverse z-transform. At the end of the course, analysis and design of digital filters covers filter basics, analog filter prototypes and design of IIR filter and FIR filter.

SEEL 4273: CAD with HDL

Pre-requisite: SEEE 2263 Digital Systems

This course introduces students to the use of computer-aided-design (CAD) tools and hardware description language (HDL) for the design of complex digital systems. Students will use CAD tools to model, design, analyze, synthesize, implement, and verify systems that are specified using the Register Transfer Level (RTL) methodology. Systems verification methods using scripts and testbenches will be introduced. Memory controller design and interfacing will be covered, including the use of RAMs, ROMs, Fifos, and external memory.

SEEL 4283: Analog CMOS IC Design

Pre-requisite: SEEE 1073 Electronic Devices and Circuits

In this course students will be taught the characteristics of MOSFET transistor as a prerequisite of CMOS analog design. It highlights the nonlinearity as an imperfection, which will limit the performance of analog circuits. The course will then proceed to analyse CMOS single ended as well as differential amplifiers. The trademark of analog design, which is the design challenge to fulfil design matrix, will be highlighted. Students will be guided on design principles to meet design specifications with acceptable accuracy. Op Amp design will be addressed towards the end of the course.

SEEL 4373: IC Testing Techniques

Pre-requisite: SEEE 2263 Digital Systems; SEEL 4283 Analog CMOS IC Design

This course introduces students to the techniques of testing a digital circuit and designing a testable digital circuit. Several fault models including single stuck-at fault model will be analyzed in details. Fault simulation methods are covered as well in this course. Test pattern generation and design-for-testability are also introduced to students. In order to facilitate learning process, computer-aided design (CAD) software is used throughout the course. Some practical or almost actual environment problems and solutions are provided.

SEEL 4743: Basic Digital VLSI Design

Pre-requisite: SEEE 2263 Digital Systems

The objective of this course is to introduce students to basic techniques to design and implement digital VLSI system. This course introduces students to VLSI technology. A historical perspective on the evolution of integrated circuit technology is covered. Important issues when designing a VLSI circuit are discussed. MOS transistors are studied in detail, including their characteristics, structure, switch-level behaviour, and current equation. SPICE model of a MOS transistor is also described. The simplest circuit, an inverter, is studied in detail. Its voltage-transfer characteristic, noise margin and how to control the inversion point is investigated. How an IC is fabricated is described. Fabrication processes are elaborated. Layout, design rules and stick diagram are explained. This course teaches how to design circuits. Several logic families will be introduced. Advantages and disadvantages of each logic design style are explained. Delay and power performance of each logic family is also compared. Latch and flip-flop circuits are also covered. Interconnect issues, when various components are connected, are elaborated.

SEEM 4173: ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) involves the development of algorithms derived from human and animal intelligence that have capabilities such as learning, reasoning, generalization, adaptation, reproduction, etc. Nowadays, these techniques are getting popular due to the large number of successful reports of implementations. AI techniques have also made their way into many domestic and industrial products and provided solutions to many difficult engineering problems. In this course, students are exposed to several AI techniques i.e. Artificial Neural Network (ANN), Fuzzy Logic, Genetic Algorithm (GA) and Particle Swarm Optimization (PSO),

and how they are used as a stand-alone approach or in any combination of the methods in solving engineering and non-engineering problems.

SEET 3573: Microwave Engineering

Pre-requisite: SEEE 3533 Communication Principles

To introduce the basic theory of Microwave Engineering, such as transmission line theory, scattering parameters, Smith Chart, and impedance matching. Fundamental microwave devices, such as waveguides and resonators are explained. The students are also introduced to passive and active microwave components such as terminations, couplers, power dividers/combiners, circulators, amplifiers, oscillators, travelling wave tubes, filters, and microwave solid-state devices. Fundamentals in microwave instruments and measurement techniques are introduced.

SEET 3583: Digital Communication System

Pre-requisite: SEEE 3533 Communication Principles

This course provides an introduction to fundamental concepts in digital communication system. Main topics to be covered are baseband pulse transmission, signal space analysis, digital modulation/demodulation, channel coding, source coding, detection methods and evaluation in AWGN channel. Fundamentals on error control coding is also included. Finally, the system trade-off in designing a digital communication system is explored.

SEET 3623: Data Communication and Network

Pre-requisite: SEEE 3533 Communication Principles

The objective of the subject is to enhance the students' knowledge on data communication and computer networks. It explains the basic process of data communication, protocol, interfacing and inter-working between computer networks and switching components in telecommunication system. At the end of the course, the students should be able to understand the system used in representation, distribution, transmission and reception of data in data communication network.

SEET 4533: Wireless Communication Systems

Pre-requisite: SEET 3573 Microwave Engineering

This course introduces students the concept and principle of mobile radio communication and satellite communication system. Topics covered include mobile radio propagation, multiple access, cellular concept, modern wireless communication systems and satellite communication systems.

SEET 4543: RF Microwave Circuit Design

Pre-requisite: SEET 3573 Microwave Engineering

This course introduces students to the concept of designing RF/Microwave circuit in wireless communication system such as filters, amplifiers, oscillators and mixers. The design of the RF/Microwave circuit is based on the discrete components and the S-parameter of the component. The system block diagram is also discussed such as transmitter and receiver function and noise in communication system. The filter design is based on the lump component and the resposnse of the filter such as Butterworth and Chebyshev response. The matching concept is discussed further in the RF/Microwave amplifier and oscillator design using Smith chart. The analysis of the different mixer is also discussed in this subject.Simulation software CST will also introduced to facilitate learning process.

SEET 4593: Acoustic Engineering

Pre-requisite: SEET 3533 Communication Principles

This course embodies the basic principles of fundamentals of acoustics engineering. The aim is mainly to instil confidence and apply the basic concepts, theories and applications in acoustics, noise control, room acoustics and sound system design. The course provides an in depth understanding of the characteristics, propagations, transmission and attenuation of sound waves. Further, noise criteria and control of interfering noise, sound absorption and reflection shall follow. The last part of the course cover on good room acoustics and sound system design for an enclosed room. At the end of the course, the students shall be able to apply the acoustics engineering fundamentals and concept in designing enclosed room for optimum acoustics and sound system.

SEET 4613: Antenna Theory and Design

Pre-requisite: SEET 3573 Microwave Engineering

This course introduces students the concept of antenna, theory and design in telecommunication system. The basic antenna properties such as gain, polarization, directivity, efficiency, and radiation pattern for various types of antenna will be discussed. Several antennas with specific characteristic will be designed using simulation software and analysed. Finally, the antenna measurement setup is introduced and discussed.

SEET 4623: Network Programming

Pre-requisite: SEET 3623 Data Communication and Networks

The objective of this course is to introduce students to the basic of network programming, in the networking implementations. This course will provide the students with understanding of socket programming to interconnect computers in network. The module will cover topics such as treads, input-output streams, handling errors and exceptions in socket programming. By the end of the module, students should have an understanding of interfacing between client and server.

SEEE 5533 : Power Electronics Systems
This course provides an understanding of the principles of power electronic conversion systems and the ability to design power converters for certain applications. The topics covered are: 1. Concepts and prospects of power electronic systems: modern power switches, switching methods, drivers and losses in power electronics system. 2. ac-to dc conversion: rectifier with different loads, performance criteria, line distortion, effects of line inductance/overlap. 3. dc to dc conversion: non-isolated topologies-Buck, Boost, Buck-boost in DCM operation, non-idealities, isolated topologies-Flyback, Full-Bridge, switched-mode power supply, converter control. 4. dc to ac conversion: single-phase, three-phase, PWM and SVM techniques, harmonics elimination and multilevel inverter topologies. The focus is the design of power converters for specific applications such as utility, domestic appliance, electric vehicle and industrial applications.

SEEE 5583 : High Voltage and Electrical Insulation
This course provides an understanding of high voltage phenomena, and to present the concepts of high voltage insulation in power systems networks. The first part of the course describes the concept of electric stress and the phenomena of conduction and breakdown in insulation materials in order to provide the students with a firm knowledge on high voltage phenomena and insulation technology. The second part of the course covers the introduction to dielectric properties of materials, diagnostic testing of insulation, overvoltages and insulation coordination. By adapting this knowledge, students will be able to develop essential technical skills in solving real-world problems involving insulation characteristics with some degree of acceptable conditions. The students will conduct experimental works and/or simulation works to solve engineering problems related to high voltage engineering applications.

SEEE 5603 : Power System Analysis and Computational Method
Basic Power Network Concepts, Power Transmission Lines Transformer and generator and their respective parameters and equivalent circuit models will be reviewed in this course. Students will formulate rigorously power system network model and Bus admittance matrix with appreciate all assumptions made. The application of Bus admittance matrix to Fault Analysis and the application of symmetrical sequence components to unbalanced fault analysis will be covered. Further application of the power system network model and numerical techniques will be used to solve Power Flow analysis using 2 different methods; Newton-Raphson Method and the Decoupled Load Flow. The student is expected to write and develop basic fault analysis and load flow analysis program. The programs will be tested with IEEE test systems with the aim to achieve results comparable with commercial software. Commercial grade professional software will be used to design simple and practical reactive power and voltage control. The concept of Multi-machine transient stability analysis will be covered in the course, in order to understand large scale power system response to any power disturbance.

SEEE 5633 : Power System Devices and Apparatus
This course features relevant apparatuses and devices in the operation of power system. It involves discussions on features and characteristics of power system devices such as synchronous machines, transmission lines, transformers and induction machines. Then, the dynamic aspects of the devices will be covered. Students are then expected to be able to propose a design and perform relevant analysis using computer software on power system

configurations consisting of these devices and apparatuses. By integrating the knowledge, the students will be able to develop technical skills related to design and operation of power system.

SEEL 5123 : Advanced Microprocessor System

This course is about microprocessors in embedded systems. This course extends the students' knowledge of microprocessors by investigating embedded systems design and state-of-the-art 32-bit embedded processors. The student will be familiarized with problems associated with producing hardware and software in high-level language and assembly language for embedded systems. The topics covered include high-level (C/C++ programming) and assembly language programming for embedded microprocessors, memory and peripherals for embedded systems, system development, embedded real-time operating systems and optimizing performance of embedded systems.

SEET 5313 : Communications and Computer Networks

This course will enhance the students' knowledge on communication and computer network. It explains the advance concept of network layers, protocols, interfacing and inter-working between computer networks and network devices in telecommunication systems. The students will be taught with the various possible techniques to understand the modern networks for wired and wireless services.

SEET 5413 : Advanced Digital Communication

This course provides fundamental concepts in the analysis and design of digital communication system. Main topics to be covered are introduction to information theory, signal space analysis, digital modulation/demodulation over AWGN channel, baseband transmission over bandlimited channel, channel coding, error control coding. Finally, the system trade-off in designing a digital communication system in AWGN channel is explored.

SEEL 5113 : Advanced Nanoelectronics Devices

Semiconductors form the basis of most modern electronics systems. This course is designed to provide a basis for understanding the characteristics, operation, and limitations of semiconductor devices. In order to gain this understanding, it is essential to have a thorough knowledge of the physics of the semiconductor material. The goal is to bring together quantum mechanics, the quantum theory of solids, semiconductor material physics, and semiconductor device physics. All of these components are vital to the understanding of both the operation of present day devices and any future development in the field. This course is a continuation to Microelectronics at undergraduate level and introduces advance device concepts.

SEEL 5193 : Advanced Analog CMOS IC Design

This course introduces students to the advanced level of CMOS design in analog circuits. In the beginning, it highlights the operational concept of MOSFET transistors and their nonlinearity characteristics that will limit the performance of analog circuits. The course will then proceed to analyze CMOS single ended as well as differential amplifiers. The advantages and disadvantages between different architectures will be discussed. The trademark of analog design which is the design challenge to fulfill design matrix will be emphasized. Students will

be guided on design principles to meet design specifications with acceptable accuracy. Important sub-modules differential amplifier and op amps will be studied in detail towards the end of the course.

SEEM 5753 : Advanced Instrumentation and Measurement

This course is an introduction to the advanced instrumentation and measurement. Key components studied in details are a review of powerful measurement techniques and basic principles and typical problems of sensor elements, detailed up-to-date reviews of the features of temperature sensors, displacement sensors, flow sensors, level sensors, position sensors, motion sensors and biometrics. This course also provides a detailed knowledge on error and determination of uncertainties in measurement. Besides that, this course introduces the multi sensor, Fusion application, wireless sensor network and Internet of Things. Finally, the basic concepts of safety instrumented system, standards and risk analysis techniques will be discussed.

SEEM 5713 : Artificial Intelligence and Applications

Artificial intelligence (AI) involves the development of algorithms derived from human & animal intelligence that have capabilities such as learning, reasoning, generalization, adaptation, reproduction, etc. Nowadays, these techniques are getting popular due to the large number of successful reports of implementations. AI techniques have also made their way into many domestic & industrial products & provided solutions to many difficult engineering problems. In this course, students are exposed to several AI techniques i.e. Artificial Neural Network (ANN), Fuzzy Logic, Genetic Algorithm (GA) & Particle Swarm Optimization (PSO), & how they are used in solving engineering & non-engineering problems.

SEEM 5703 :Control Systems Engineering

This course introduces the students to the fundamental concepts of control systems engineering. Students will be exposed with techniques of modelling of physical systems involving linear and nonlinear systems including mechanical, electrical and mechatronic systems. Both the frequency domain and time domain (state-space) are covered. Several criteria for performance and stability analyses of control systems will be taught. Modelling and analysis of control system in discrete time for digital control will also be introduced. Student will also be exposed with MATLAB for design, development and analysis of simulation models. Finally, a feedback control system with controller to achieve control system objectives are described. Several case studies of the applications of controllers will be used to enhance the student understanding.

SEET 5313 : Communications and Computer Networks

This course will enhance the students' knowledge on communication and computer network. It explains the advance concept of network layers, protocols, interfacing and inter-working between computer networks and network devices in telecommunication systems. The students will be taught with the various possible techniques to understand the modern networks for wired and wireless services.

SEET 5513 : Sustainable Design, Engineering and Management
The aim is to give students an insight and understanding of the environmental and sustainability challenges that are facing by Communication Engineers and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy, Life Cycle Assessment (LCA) and green technology. Students will also experience conducting case studies and project-based learning encompassing four themes in sustainability which are connecting, conceptualizing, valuing and implementing.

SEET 5423 :Wireless Communication Systems
This course introduces students to introductory and advanced level of wireless communication technologies. In the beginning students will be presented with the concept of wireless communication systems and mobile radio propagation. Students will then be illuminated on MIMO technology in mobile communication. Next, the course will describe on cellular concepts that will include small cell networks. This is followed by details on the overall evolution of mobile communication system. Finally, this course will cover on different multiple access techniques used in wireless communication systems.

SEET 5523 : Internet of Things Technology
The course provides students with a technical background to the Internet of Things (IoT) which includes its concept, architecture and applications. It also gives the underlying communication protocols and technologies. The course has a significant practical element that will be delivered during lab sessions in which students are expected to complete exercises involving system design, device programming and cloud development.

BACHELOR OF ELECTRONIC ENGINEERING WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Electronic Engineering with Honours is offered either on a full-time or part-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru while the part-time programme is offered at various learning centres throughout Malaysia. The duration of study for the full-time programme is subjected to the student's entry qualifications and lasts between four (4) years to a maximum of six (6) years.

The programme is offered on full-time basis and is based on a 2-Semester per academic session. Generally, students are expected to undertake courses equivalent to between fifteen (15) to eighteen (18) credit hours per semester. Assessment is based on courseworks and final examinations given throughout the semester.

General Information

1. Awarding Institution			Universiti Teknologi Malaysia	
2. Teaching Institution			Universiti Teknologi Malaysia	
3. Programme Name			Bachelor of Electronic Engineering with Honours	
4. Final Award			Bachelor of Electronic Engineering with Honours	
5. Programme Code			SEELH	
6. Professional or Statutory Body of Accreditation			Board of Engineers Malaysia (BEM)	
7. Language(s) of Instruction			English and Bahasa Melayu	
8. Mode of Study (Conventional, distance learning, etc)			Conventional	
9. Mode of operation (Franchise, self-govern, etc)			Self-governing	
10. Study Scheme (Full Time/Part Time)			Full Time	
11. Study Duration			Minimum : 4 yrs Maximum : 6 yrs	
Type of Semester	No. of Semesters		No of Weeks/Semester	
	Full Time	Part Time	Full Tme	Part Time
Normal	8	-	18	-
Short	4	-	10	-

Course Classification

Bachelor of Electronic Engineering with Honours - SEELH

No.	Classification	Credit Hours	Percentage
i.	University Courses		
	a) General	23	
	b) Language	8	26.3%
	c) Entrepreneurship	2	
	d) Co-Curriculum	3	
ii.	School/Programme Core	77	56.2%
iii.	Programme Electives	24	17.5%
	Total	**137**	**100%**
A	Engineering Courses		
	a) Lecture/Project/Laboratory	89	
	b) Workshop/Field/Design Studio	0	73.7%
	c) Industrial Training	6	
	d) Final Year Project	6	
Total Credit Hours for Part A		**101**	
B	Related Courses		
	a) Applied Science/Mathematic/Computer		
	b) Management/Law/Humanities/Ethics/Economy	15	26.3%
	c) Language	10	
	d) Co-Curriculum		
		8	
		3	
Total Credit Hours for Part B		**36**	
Total Credit Hours for Part A and B		**137**	100%
Total Credit Hours to Graduate		**137 credit hours**	

Award Requirements

To graduate, students must:

- Attain a total of not less than 137 credit hours (SKEL) with a minimum CGPA of 2.0.
- Complete Professional Skills Certificates (PSC).

Programme Educational Objectives (PEO)

After having exposed to 3 to 5 years working experience, our graduates should become professionals who demonstrate the following competencies:

Code	Intended Educational Objectives
PEO1	Become Electronic Engineers who are competent, innovative, and productive in addressing customer needs.
PEO2	Grow professionally with proficient soft skills.
PEO3	Demonstrate high standards of ethical conduct, positive attitude, and societal responsibilities.

Programme Learning Outcomes (PLO)

After having completed the programme, graduates should be able to demonstrate the following competencies:

Code	Programme Learning Outcomes
PLO1	Ability to apply knowledge of mathematics, science and electrical/electronic engineering to the solution of complex engineering problems.
PLO2	Ability to perform research-based analysis, conduct experiments and interpret data for complex engineering problems.
PLO3	Ability to identify, formulate, conduct research literature to analyse complex engineering problems using engineering knowledge.
PLO4	Ability to apply engineering practice and use modern engineering, and IT tools for complex engineering problem with an understanding the limitations of the technology.
PLO5	Ability to design solutions for complex engineering problems and design systems and processes that meet specified needs with appropriate consideration for public health and safety, culture, society, and environment.
PLO6	Ability to articulate ideas, communicate effectively, in writing and verbally, on complex engineering activities with the engineering community and with society at large.
PLO7	Ability to function effectively as an individual, as a member or as a leader in diverse teams.

PLO8	Ability to recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PLO9	Ability to comprehend the impact of global and contemporary issues, the role of engineers on society including, health, safety, legal and cultural issues, and the consequent responsibilities relevant to professional engineering practices and engineering problems.
PLO10	Ability to comprehend and evaluate the sustainability and impact of professional engineering work in the solutions of complex engineering problems in societal and environmental contexts.
PLO11	Ability to grasp and execute responsibility professionally and ethically in professional engineering practices.
PLO12	Ability to demonstrate knowledge and understanding of engineering and management principles, and economic decision-making to manage projects in multidisciplinary environments.

PROFESSIONAL SKILLS CERTIFICATE (PSC)

New PSC courses are introduced to new and current students starting from Session 2020/2021. Students are required to undertake and pass Five (5) Professional Skills Certificate (PSC) courses of UTM Institute for Life Ready Graduate (UTM ILeague). These courses are offered and managed by School of Professional and Continuing Education (SPACE) in collaboration with Schools or Faculties. Students are required to register the courses through SPACE Website.

List of PSC courses are as follows:

No.	PSC COURSE	OFFERED AND MANAGED BY SPACE IN COLLABORATION WITH
COMPULSORY COURSES		
1	Design Thinking for Entrepreneur	UTM Excite
2	Talent and Competency Management	UTM Career Centre (UTMCC)
3	English Communication Skills for Graduating Students (ECS)	Language Academy
ELECTIVE COURSES		
4	Occupational Safety, Health & Environment (OSHE) (*Compulsory to all FE students*)	Faculty of Engineering (FE)
5.	Choose ONE elective course from the following list: 1. Data Analytics for Organization 2. Construction Measurement (Mechanical & Electrical Works) 3. Professional Ethics and Integrity 4. Other electives courses offered in future	Schools or Faculties at UTM

COURSE MENU

Bachelor of Electronic Engineering with Honours - SEELH

YEAR 1: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 1012	Introduction to Electrical Engineering	2	
SEEE 1013	Electrical Circuit Analysis	3	
SEEE 1022	Introduction to Scientific Programming	2	
SSCE 1693	Engineering Mathematics I	3	
UHMT 1012	Graduate Success Attributes	2	
UHLB 1112	English Communication Skills	2	
UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	
UHIS 1022 OR UHMS 1182	Philosophy and Current Issues OR Appreciation of Ethics and Civilizations (for International Students	2	
	TOTAL CREDIT	16	
	CUMULATIVE CREDITS	16	

YEAR 1: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SECP 1103	C Programming Techniques	3	
SEEE 1073	Electronic Devices and Circuits	3	SEEE 1013
SEEE 1223	Digital Electronics	3	
SSCE 1793	Differential Equations	3	
SEMU 2113	Engineering Science	3	
UHIS 1022	Philosophy and Current Issues (Local Students)	2	
UHLM 1012	Malay Language for Communication 2 (International Students)		
	TOTAL CREDIT	17	
	CUMULATIVE CREDITS	33	

YEAR 2: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 2073	Signal and Systems	3	
SEEE 2133	Electronic Instrumentation and Measurement	3	
SEEE 2423	Fundamentals of Electrical Power Systems	3	SEEE 1013
SSCE 1993	Engineering Mathematics II	3	SSCE 1693
UHLB 2122	Academic Communication Skills	2	
UKQF 2**2	Elective of Co-Curricular Service Learning	2	
	TOTAL CREDIT	16	
	CUMULATIVE CREDITS	49	

YEAR 2: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 2263	Digital Systems	3	SEEE 1223
SEEE 2523	Electromagnetic Field Theory	3	SSCE 1993
SEEE 2742	2nd Year Electronic Design Laboratory	2	
SEEE 3263	Electronic Systems	3	SEEE 1073
SSCE 2193	Engineering Statistics	3	
UBSS 1032	Introduction to Entrepreneurship	2	
	TOTAL CREDIT	16	
	CUMULATIVE CREDITS	65	

YEAR 3: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 3133	System Modelling and Analysis	3	SEEE 2073
SEEE 3223	Microprocessor	3	SEEE 1223
SEEE 3533	Communication Principles	3	SEEE 2073
SEEE 3732	Common 3rd Year Laboratory	2	
SSCE 2393	Numerical Methods	3	
UHL* 1112	Elective of Foreign Language	2	
UKQT 3001	Extra Curricular Experiential Learning (ExCEL)	1	
	TOTAL CREDIT	17	
	CUMULATIVE CREDITS	82	

YEAR 3: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 3143	Control System Design	3	SEEE 3133
SEEL 3742	Specialized 3rd Year Laboratory	2	
SEEL 4223	Digital Signal Processing I	3	SEEE 2073
SEE* ***3	Field Core 1	3	
SEE* ***3	Field Core 2	3	
UHLB 3132	Professional Communication Skills	2	
	TOTAL CREDIT	16	
	CUMULATIVE CREDITS	98	

YEAR 3: SEMESTER 3			
Code	**Course**	**Credit**	**Pre-requisite**
SEEL 4926	Practical Training	6	
	TOTAL CREDIT	6	
	CUMULATIVE CREDITS	104	

YEAR 4: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SHMS 4542	Engineering Management	2	
SEEL 4723	Capstone Project	3	
SEEL 4812	Final Year Project Part I	2	
SEE* 4**3 / SEE*5**3	Field Elective 1 / PRISMS Elective 1	3	
SEE* 4**3 / SEE*5**3	Field Elective 2 / PRISMS Elective 2	3	
SEE* ***3	Field Elective 3	3	
	TOTAL CREDIT	16	
	CUMULATIVE CREDITS	120	

YEAR 4: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 4012	Professional Engineering Practice	2	
SEEL 4824	Final Year Project Part II	4	SEEL 4812
SEE* 4**3 / SEE*5**3	Field Elective 3 / PRISMS Elective 3	3	
SEE* 4**3 / SEE*5**3	Field Elective 4 / PRISMS Elective 4	3	
SEE* ***3	Field Elective 6	3	
UHIT 2302	Science and Technology Thinking	2	
	TOTAL CREDIT	17	
	CUMULATIVE CREDITS	137	

Elective Courses

1. Electronic System Design

Field Core	Course	Credit	Pre-requisite
SEEL 4273	CAD with HDL	2	SEEE 2263
SEEL 4743	Basic Digital VLSI Design	3	SEEE 2263

Field Elective	Course	Credit	Pre-requisite
SEEL 4283	Analog CMOS IC Design	3	SEEE 1073
SEEL 4293	Advanced Digital Signal Processing	3	SEEL 4223
SEEL 4333	Computer Architecture and Organization	3	SEEE 2263
SEEL 4363	Digital Image Processing	3	SEEL 4223
SEEL 4373	IC Testing Techniques	3	SEEE 2263 SEEL 4283
SEEL 4663	Embedded Processor System	3	SEEE 3223 SECP 1103
SEEL 4673	DSP Architectures	3	

2. Microelectronics

Field Core	Course	Credit	Pre-requisite
SEEL 3613	Semiconductor Material Engineering	3	SEEE 1073
SEEL 4743	Basic Digital VLSI Design	3	SEEE 2263

Field Elective	Course	Credit	Pre-requisite
SEEI 4233	Nanotechnology and Application	3	
SEEL 4283	Analog CMOS IC Design	3	SEEE 1073
SEEL 4373	IC Testing Techniques	3	SEEE 2263 SEEL 4283
SEEL 4613	Semiconductor Device Engineering	3	SEEL 3613
SEEL 4623	Solid-State Electronic Devices	3	SEEL 3613

SEEL 4633	Microelectronic Device Fabrication and Characterization	3	SEEL 3613
SEEL 4643	Nanoelectronics	3	
SEEL 4653	Modelling and Simulation of Microelectronic Devices	3	

3. Computer Engineering

Field Core	Course	Credit	Pre-requisite
SEEL 4333	Computer Architecture and Organization	3	SEEE 2263
SEEL 4663	Embedded Processor System	3	SEEE 3223 SECP 1103

Field Elective	Course	Credit	Pre-requisite
SECR 2043	Operating System	3	SECP 1103
SEEL 4213	Software Engineering	3	SECP 1103
SEEL 4273	CAD with HDL	3	SEEE 2263
SEEL 4343	Information Security	3	SEEE 1223
SEEL 4673	DSP Architectures	3	SEEE 2263
SEEM 4173	Artificial Intelligence	3	
SEET 3623	Data Communication and Networks	3	SEEE 3533

4. Medical Electronics

Field Core	Course	Credit	Pre-requisite
SEEL 3503	Physiology and Introduction to Medicine	3	
SEEL 4523	Medical Instrumentation	3	SEEE 2133

Field Elective	Course	Credit	Pre-requisite
SEBB 3313	Biomedical Material	3	
SEEL 4273	CAD with HDL	3	SEEE 2263
SEEL 4513	Clinical Engineering	3	SEEL 3503
SEEL 4533	Biomedical Signal Processing	3	SEEL 4223
SEEL 4543	Biosystem Modelling	3	SEEL 3503

SEEL 4553	Medical Imaging	3	SEEL 4223
SEEL 4563	Biosensors and Transducers	3	SEEE 2133
SEEL 4573	Rehabilitation Engineering	3	

5. Telecommunication Engineering

Field Core	Course	Credit	Pre-requisite
SEET 3573	Microwave Engineering	3	SEEE 3533
SEET 3623	Data Communication and Networks	3	SEEE 3533

Field Elective	Course	Credit	Pre-requisite
SEET 3583	Digital Communication System	3	SEEE 3533
SEET 4523	Optical Communication Systems	3	SEEE 3533
SEET 4533	Wireless Communication Systems	3	SEET 3573
SEET 4543	RF Microwave Circuit Design	3	SEET 3573
SEET 4593	Acoustic Engineering	3	SEEE 3533
SEET 4613	Antenna Theory and Design	3	SEET 3573
SEET 4623	Network Programming	3	SEET 3623
SEET 4633	Coding of Multimedia Signals	3	SEET 3583
SEET 4643	Optical Materials and Sensors	3	SEET 4523
SEET 4653	Measurement and Characterization of Optical Devices	3	SEET 4523
SEET 4663	Optical Network	3	SEET 4523

SEELH Elective Courses for PRISM (CHOOSE MAXIMUM 4)			
Code	Course	Credit	Pre-requisite
SEEL 5123	Advanced Microprocessor System	3	
SEEL 5173	Advanced Digital System Design	3	
SEET 5313	Communications and Computer Networks	3	
SEET 5413	Advanced Digital Communication	3	
SEEL 5113	Advanced Nanoelectronics Devices	3	

SEELH Elective Courses for PRISM (CHOOSE MAXIMUM 4)			
Code	Course	Credit	Pre-requisite
SEEL 5193	Advanced Analog CMOS IC Design	3	
SEEM 5753	Advanced Instrumentation and Measurement	3	
SEEM 5713	Artificial Intelligence and Applications	3	
SEEM 5703	Control Systems Engineering	3	
SEET 5313	Communications and Computer Networks	3	
SEET 5513	Sustainable Design, Engineering and Management	3	
SEET 5423	Wireless Communication Systems	3	
SEET 5523	Internet of Things Technology	3	

PRISMS ELECTIVE COURSES

For students who intend to enroll into PRISMS programme, refer to the PRISMS Section for a list of related elective courses associated with the postgraduate programmes.

Requirements

Students who are eligible to apply for PRISMS are those with academic qualification who are in Year 3 Semester 2 with cumulative average grade value of CGPA 3.3 and above. Students can apply for PRISMS in Year 3 Semester 2 through the Program Integrasi Sarjana Muda-Sarjana (PRISMS) application form and must be recommended by the Academic Advisor, approved by the Program Director and certified by the Chair of School or Dean of Faculty.

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not allowed to graduate.

Bachelor of Electronic Engineering with Honours - SEELH

NO.	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (√) IF PASSED
BACHELOR OF ENGINEERING (ELECTRICAL - ELECTRONICS)					
1.	SEEE 1012	Introduction to Electrical Engineering	2	2	
2.	SEEE 1013	Electrical Circuit Analysis	3	3	
3.	SEEE 1022	Introduction to Scientific Programming	2	2	
4.	SEEE 1073	Electronic Devices and Circuits	3	3	
5.	SEEE 1223	Digital Electronics	3	3	
6.	SEEE 2073	Signal and Systems	3	3	
7.	SEEE 2133	Electronic Instrumentation & Measurement	3	3	
8.	SEEE 2263	Digital Systems	3	3	
9.	SEEE 2423	Fundamentals of Electrical Power Systems	3	3	
10.	SEEE 2523	Electromagnetic Field Theory	3	3	
11.	SEEE 2742	2nd year Electronic Design Lab	2	2	
12.	SEEE 3133	System Modelling & Analysis	3	3	
13.	SEEE 3143	Control System Design	3	3	
14.	SEEE 3223	Microprocessor	3	3	
15.	SEEE 3263	Electronic System	3	3	
16.	SEEE 3533	Communication Principles	3	3	
17.	SEEE 3732	Common 3rd year Laboratory	2	2	
18.	SEEE 4012	Professional Engineering Practice	2	2	
19.	SEEL 3742	Specialized 3rd year Laboratory	2	2	
20.	SEEL 4223	Digital Signal Processing I	3	3	
21.	SEEL 4723	Capstone Project	3	3	
22.	SEEL 4812	Final Year Project Part I	2	2	
23.	SEEL 4824	Final Year Project Part II	4	4	
24.	SEEL 4926	Practical Training	6	HL	
25.	SEMU 2113	Engineering Science	3	3	

26.	SEE* ***3	Field Core 1	3	3	
27.	SEE* ***3	Field Core 2	3	3	
28.	SEE* 4**3 / SEE*5**3	Field Elective 1 / PRISMS Elective 1	3	3	
29.	SEE* 4**3 / SEE*5**3	Field Elective 2 / PRISMS Elective 2	3	3	
30.	SEE* 4**3 / SEE*5**3	Field Elective 3 / PRISMS Elective 3	3	3	
31.	SEE* 4**3 / SEE*5**3	Field Elective 4 / PRISMS Elective 4	3	3	
32.	SEE* 4**3	Field Elective 5	3	3	
33.	SEE* ***3	Field Elective 6	3	3	
34.	SECP 1103	C Programming Techniques	3	3	
35.	SHMS 4542	Engineering Management	2	2	
		TOTAL CREDIT OF ENGINEERING COURSES (a)	**101**	**95**	
MATHEMATICS COURSES (Faculty of Science)					
1.	SSCE 1693	Engineering Mathematics I	3	3	
2.	SSCE 1793	Differential Equations	3	3	
3.	SSCE 1993	Engineering Mathematics II	3	3	
4.	SSCE 2193	Engineering Statistics	3	3	
5.	SSCE 2393	Numerical Methods	3	3	
		TOTAL CREDIT OF MATHEMATICS COURSES (b)	**15**	**15**	
UNIVERSITY GENERAL COURSES					
Cluster 1: Appreciation of Philosophy, Value and History (Faculty of Social Sciences and Humanities)					
1.	UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	2	
	UHIS 1022 OR UHMS 1182	Philosophy and Current Issues (for International Students) OR Appreciation of Ethics and Civilizations (for International Students			
2.	UHIS 1022	Philosophy and Current Issues (for Local Students)	2	2	
	UHLM 1012	Malay Language 2 (for International Students)			
Cluster 2: Generic Skills					

1.	UHMT 1012	Graduate Success Attributes	2	2	
2.	UBSS 1032	Introduction to Entrepreneurship	2	2	
Cluster 3: Knowledge Enhancement					
1.	UHIT 2302	The Thought of Science and Technology	2	2	
Cluster 4: Co-Curriculum and Service Learning					
1.	UKQF 2**2	Elective of Co-Curricular Service Learning	2	2	
2.	UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	1	
Cluster 5: Language Skills (Language Academy, Faculty of Social Sciences and Humanities)					
1.	UHLB 1112	English Communication Skills	2	2	
2.	UHLB 2122	Academic Communication Skills	2	2	
3.	UHLB 3132	Professional Communication Skills	2	2	
4.	UHL* 1112	Elective Of Foreign Language	2	2	
		TOTAL CREDIT of UNIVERSITY GENERAL COURSES (c)	**21**	**21**	
		TOTAL CREDIT TO GRADUATE (a + b + c)	**137**	**131**	
OTHER COMPULSORY COURSES - PROFESSIONAL SKILLS CERTIFICATE (PSC). • **Students are required to enrol and pass FIVE (5) PSC courses, in order to be eligible to graduate.** • **Please refer to page FE 8 in the UG Academic Handbook, for more information about PSC courses.**					
COMPULSORY PSC COURSES (Enroll all 4 courses)					
1	GSPX XXXX	Design Thinking for Entrepreneur			
2	GSPX XXXX	Talent and Competency Management			
3	GSPX XXXX	Faculty Engineering Safety Pass (FESP) *MODULE 1 - compulsory for SKM, SKT and SKE students* *MODULE 2 – compulsory for SKA, SC, SKBSK students*			
4	GSPX XXXX	English Communication Skills for Graduating Students (ECS)			
ELECTIVE PSC COURSE (Choose 1 only)					
1	GSPX XXXX	Data Analytics for Organization			
2	GSPX XXXX	Writing			

3	GSPX XXXX	Construction Measurement (Mechanical & Electrical Works)	
4	GSPX XXXX	Professional Ethics and Integrity	
5	GSPX XXXX	More elective courses to be added in future	

COURSE SYNOPSIS

SEEE 1012 : INTRODUCTION TO ELECTRICAL ENGINEERING

This course serves as a general introduction to electrical engineering programmes offered by the School of Electrical Engineering (SEE), Universiti Teknologi Malaysia (UTM). Students undertaking this course will be exposed to attributes of electrical engineers from both academic and practical points of view. Soft skills and knowledge that are necessary in the engineering world will be introduced to the students. The students will have a clearer understanding on the responsibilities of electrical engineers to the society. By exploring contemporary issues, the students would be able to suggest sustainable solutions to the mankind and its environment.

SEEE 1013 : ELECTRICAL CIRCUIT ANALYSIS

This course introduces students to the basic laws, methods of analysis and theorems for direct current, DC and alternating current, AC circuit, such as, Ohms Law, Kirchhoff's Current and Voltage Laws, Mesh and Nodal Analysis and Thevenin's and Norton's Theorems. Based on these, the students are expected to be able to solve for variables in any given DC and AC electric circuits. The students also exposed to the steady-state electrical circuit. Afterwards, the relevant concepts in transient circuit analysis for first and second order circuit are taught to the students. With the knowledge learned, the student would be able to apply the basic laws, theorem and methods of analysis for solving completely with confidence various problems in circuit analysis.

SEEE 1022 : INTRODUCTION TO SCIENTIFIC PROGRAMMING

This course introduces the fundamentals of scientific programming languages and techniques used by engineers to solve engineering problems. Students will be introduced to common scientific programming languages and their comparative advantages and disadvantages. Emphasis is placed on fundamentals of programming, program design, verification and visualization. The goal is to provide the students with the skills in scientific computing, tools, techniques that can be used to solve their own engineering problems. Students will learn to implement algorithms using high level programming language (e.g. MATLAB, Mathematica, FORTRAN). The programming skills acquired in this course will allow students to go beyond what is available in pre-packaged analysis tools, and code their own custom data processing, analysis and visualization for any engineering problem.

SEEE 1073 : ELECTRONIC DEVICES & CIRCUITS

Pre-requisite: SEEE 1013 Electrical Circuit Analysis

This course provides introduction to the basic operating principles and applications of discrete electronic devices and circuits. The course content starts with the fundamental solid-state principles and continues the discussions with the constructions and characteristics of diode, Bipolar Junction Transistor (BJT) and Enhancement Metal Oxide

Semiconductor Field Effect Transistor (E-MOSFET). The application of diodes focuses on the basic power supply circuits whereas the applications of the transistors focus on the small-signal amplifier. The course content ends with an introduction to the operating principles of an ideal operational amplifier (op-amp) and discussion about op-amp circuits, performance and applications. To help the students understand the behaviour of the electronic devices and predict the behaviour of the electronic circuits, this course makes use of Multisim simulation software. The goal of this course is to develop excellent understanding of the devices operation for students to be applied in analogue and digital circuit design.

SEEE 1223 : DIGITAL ELECTRONICS

This course teaches the fundamental principles of digital systems. From the signal concepts and the importance of numbers systems and codes, it then proceeds to logic gates, their relationship to Boolean algebra and the integration of gates to form complex circuits. The course emphasizes on techniques to design, analyse, plan, and implement simple digital systems using gates and MSI circuits. Simulation software Quartus II version 13 will also be introduced to facilitate learning process.

SEEE 2073 : SIGNALS AND SYSTEMS

This course introduces the students the fundamental ideas of signals and system analysis. The signal representations in both time and frequency domains and their effects on systems will be explored. Specifically, the topics covered in the course include basic properties of continuous-time and discrete-time signals, the processing of signals by linear time-invariant (LTI) systems, Fourier series, Fourier and Laplace transforms. Important concepts such as impulse response, frequency response and system transfer functions as well as techniques of filtering and filter design, modulation, and sampling, are discussed and illustrated. This course will serve as a central building block for students in studying information processing in many engineering fields such as control systems, digital signal processing, communications, circuit design, etc.

SEEE 2133 : ELECTRONIC INSTRUMENTATION AND MEASUREMENT

This course introduces students some of the metrological terminologies used in experimental methods, concept of metrology and its application. The course will also provide understanding the concept electrical measurement quantity using analogue and digital instruments. The interfaces of the instruments with embedded sensors and also the quality of the signals acquired are introduced. Besides that, this course also introduces the type of electrical noise and the ways to reduce noise and interference. Finally, the fundamental principle of

transducers, transducer operations, characteristic and functions will be discussed. P&ID diagram also introduces to cover the basic process of the system.

SEEE 2263 : DIGITAL SYSTEMS

Pre-requisite: SEEE 1223 Digital Electronics

This course is a continuation from basic digital logic techniques course. The objective of the course is to introduce students to basic techniques to design and implement complex digital systems It emphasizes on techniques to design, analyse, plan, and implement complex digital systems using programmable logic. To facilitate learning process, computer-aided design (CAD) software is used throughout the course. Actual environment problems and solutions are provided.

SEEE 2423 : FUNDAMENTALS OF ELECTRICAL POWER SYSTEMS

Pre-requisite: SEEE 1013 Electrical Circuit Analysis

This course introduces fundamental concepts of electric machines and power system. Students should be able to identify components of the system from the course and describe their basic operations from the course having electromagnetic and circuit concepts learned in previous fundamental courses. These fundamental concepts are further elaborated in applications of electric machines - transformers, direct current machines, synchronous machines and induction machines, power in ac circuits, three-phase system, power system component modeling and analysis. At the end of the course, the students are expected to critically analyze the power system comprising of generation, transmission, and distribution components.

SEEE 2523 : ELECTROMAGNETIC FIELD THEORY

Pre-requisite: SSCE 1993 Engineering Mathematics 2

This course introduces students to some major views and theories in the area of electrostatic, magnetostatic and electromagnetic fields. This elementary electromagnetic field theory is summarized in Maxwell's equations. It is assumed that students already have appropriate mathematical background including multivariable calculus and some familiarity with the basic concepts typically covered in an introductory circuit theory course such as resistance, capacitance and inductance.

SEEE 2742 : 2ND YEAR ELECTRONIC DESIGN LABORATORY

All students will attend three second year laboratories which are the Electrotechnic, Basic Electronic and Digital Electronic Labs. The students will attend a three hour lab per week. The students are expected to complete four experiment topics for each lab in a direct of four week duration. Thus, the student will perform altogether 12 experiments in a semester. All experiments in the laboratories are emphasized on design case for a given complex engineering problem or project. The students will use software simulation tools to assist in their design tasks.

SEEE 3133 : SYSTEM MODELING AND ANALYSIS

Pre-requisite: SEEE 2073 Signals & Systems

This course introduces the students to the fundamental ideas and definitions of control systems, open loop and close loop control systems, transfer functions and transient and steady state responses. Students will be taught how to obtain mathematical models of actual physical systems such as electrical, mechanical and electromechanical systems in the transfer function form. Methods of system representation such as block diagram representation and signal flow graphs will be discussed. The students will also be exposed to techniques of analysing control systems performance and stability in time and frequency domains. Finally, an introduction to the design and analysis of control systems using MATLAB will also be given.

SEEE 3143 : CONTROL SYSTEM DESIGN

Pre-requisite: SEEE 3133 System Modeling and Analysis

The course begins with the root locus designs using root locus procedures and MATLAB. Then, PID controller will be designed using root locus approach. The PID controller and lead-lag compensator will be used to improve the transient and steady state performances in time domain using root locus approach. In frequency domain approach, the Bode plot method will be utilised. The lead, lag and lead-lag compensators are used in improving the performance of the control system using the frequency domain approach. Finally, applications of control engineering in various fields will be studied.

SEEE 3223 : MICROPROCESSOR

Pre-requisite: SEEE 1223 Digital Electronics

This course introduces the principles and applications of microprocessors. Topics emphasized are processor architecture, assembly and HLL language and fundamentals of interfacing in a microprocessor-based embedded system. This course emphasizes on the understanding the fundamentals of microprocessor operation, writing coherent and error-free assembly and HLL language programs, and designing basic interfacing circuits. With the knowledge learned, the student would be able to design microprocessor-based systems using assembly language and HLL programs completely with confidence.

SEEE 3263 : ELECTRONIC SYSTEMS

Pre-requisite: SEEE 1073 Electronic Devices and Circuits

This course covers some topics in functional electronic circuits. The circuits are derived from a diverse electronic circuitry that exists in many electronic instrumentation. The function, the behaviour and the characteristics of the functional circuits are analysed. Design examples are presented to guide students with the necessary knowledge of how to design the functional electronic circuits based on certain predetermined specifications.

SEEE 3533 COMMUNICATION PRINCIPLES

Pre-requisite: SEEE 2073 Signals & Systems

This course introduces the students the basic principles of communication system. The fundamental concepts of analogue modulation in particular amplitude and frequency modulations will be strongly emphasized. Topics include types of modulated waveforms, transmitter and receiver structures, and noise performance. The two most significant limitations on the performance of a communications system; bandwidth and noise will be discussed. The concept of sampling, quantization and line coding techniques in rendering an information signal to be compatible with a digital system are explained prior to the study of coded pulse modulation and pulse code modulation (PCM). The waveforms and spectral analysis of bandpass digital modulations are introduced. The system performance in terms of SNR and bit error rate (BER) will also be covered. Finally, multiplexing, a method to utilize the communication resource efficiently is studied where two main multiplexing techniques will be explored; time-division and frequency-division multiplexing.

SEEE 3732 : COMMON THIRD YEAR LABORATORY

Third Year Laboratory is a required course for third year students in Bachelor of Engineering degree program. This course requires students to conduct twelve experiments in six different laboratories (Basic Power, Basic Machine, Basic Communication, Instrumentation, Microprocessor and Basic Control). The students are grouped into 3-4 students. Each week, they are required to conduct an experiment in the lab within 3 hours. Each group will submit only one short report at the end of each lab session. Each student is assigned to write only one long report based on one experiment that they have conducted for this course. This long report should be submitted within a week after the student performed the assigned experiment.

SEEE 4012 : PROFESSIONAL ENGINEERING PRACTICE

This course introduces and exposes the students to the concepts, theories and the practice of Professional Engineer. It highlights to the students profession of engineering, relevant acts and regulations, engineering code of ethics, engineers' roles and responsibilities, engineering ethics, the impact of the work of engineer on society, and knowledge to cater the needs for sustainable development. In terms of knowledge of accreditation of engineering programme and the internationalization of engineers, elements of EAC and Washington are also discussed. Based on this knowledge, the students will work on projects to analyze real engineering issues and cases, both individually and in groups.

SEEI 4233: NANOTECHNOLOGY AND APPLICATION

In this course, students will be presented with concepts, opportunities and issues related to the nanoscale world. Students will be exposed to the fundamental principles of various equipment used in observing the nanoworld. Next, knowledge related to manipulation, characterization and fabrication of micro and nano objects will be discussed. Then, students will be exposed to the analysis of microfluidic device using finite element analysis (FEA) tool. Finally, students will be exposed to the design and development of microfluidic device using

photolithography technique. In the end of the course, students are expected to acquire good understanding and able to analyse the fundamental principles of various equipment used in nanoworld. Students must be able to differentiate between various fundamental working principles used by various nano equipment. Furthermore, students should be able to use FEA and microfabrication tools to design and develop microfluidic device.

SEEL 3503: Physiology and Introduction to Medicine

The course is designed for students with engineering and technical background as an introduction to the basics of anatomy and physiology. The course aims to prepare students with the basic knowledge for better interaction with medical practitioners when performing medical-related work or collaborative research.

SEEL 3613: Semiconductor Material Engineering

Pre-requisite: SEEE 1073 Electronic Devices and Circuits

The purpose of this course is to provide a basis for understanding the characteristics, operation, and limitations of semiconductor devices. In order to gain this understanding, it is essential to have a thorough knowledge of the basic physics and operation of the semiconductor material. The goal of this course is to bring together crystal structures, quantum mechanics, quantum theory for solids, semiconductor material physics, and fundamental of PN structures. All of these basic components are vital for students to understand the operation of present day and future electronic devices.

SEEL 3742 : SPECIALISED 3RD YEAR LAB

3rd Year Laboratory is a required course for third year students in Bachelor of Engineering degree program. This course requires students to conduct four experiments in four different laboratories related to the chosen elective/specialization. The offered electives are Medical Electronics, Computer, Telecommunication, Microelectronics and Electronic System Design. The laboratories involved are Optical Communication, Microprocessor, Bioelectronics, Digital Communication, Microwave, VLSI and Advanced Electronics labs. This laboratory is conducted as a Project Based approach. The students are grouped into 3-4 students, and they will be given problems to solve that require them to conduct experiments in-lab and out-of-lab within three weeks. The students are required to solve the given project as a team, design suitable experimental procedures and conduct the experiments, present the problem solutions and submit a report following the IEEE standard journal format.

SEEL 4213: Software Engineering

Pre-requisite: SECP 1103 C Programming Techniques

This course introduces various issues of system and software engineering. Focus is on software development process, program design, collaborative development and testing, which are the fundamental aspects of software engineering. Special emphasis will be given to object-oriented analysis and design (OOAD) as well as the use of UML in the design activities.

SEEL 4223: Digital Signal Processing 1

Pre-requisite: SEEE 2073 Signal and System

This course introduces concepts in digital signal processing. Continuous-time signals and systems will be reviewed. Consecutively, introduction to digital signal processing, basic idea, benefits and applications are presented. Discrete-time signals and systems are described based on signal definition, periodicity, stability, causality, convolution, difference equations, infinite impulse response (IIR), finite impulse response (FIR) and signal flow graphs. Spectrum representation of discrete-time signals will cover sampling theorem, the discrete-time Fourier transform (DTFT) and its properties, and Discrete Fourier Transform (DFT). Another domain presented is Z-transform which consists of topics on derivations, region of convergence, transformation properties, poles and zeros, and inverse z-transform. At the end of the course, analysis and design of digital filters covers filter basics, analog filter prototypes and design of IIR filter and FIR filter.

SEEL 4273: CAD with HDL

Pre-requisite: SEEE 2263 Digital Systems

This course introduces students to the use of computer-aided-design (CAD) tools and hardware description language (HDL) for the design of complex digital systems. Students will use CAD tools to model, design, analyze, synthesize, implement, and verify systems that are specified using the Register Transfer Level (RTL) methodology. Systems verification methods using scripts and testbenches will be introduced. Memory controller design and interfacing will be covered, including the use of RAMs, ROMs, Fifos, and external memory.

SEEL 4283: Analog CMOS IC Design

Pre-requisite: SEEE 1073 Electronic Devices and Circuits

In this course students will be taught the characteristics of MOSFET transistor as a prerequisite of CMOS analog design. It highlights the nonlinearity as an imperfection, which will limit the performance of analog circuits. The course will then proceed to analyse CMOS single ended as well as differential amplifiers. The trademark of analog design, which is the design challenge to fulfil design matrix, will be highlighted. Students will be guided on design principles to meet design specifications with acceptable accuracy. Op Amp design will be addressed towards the end of the course.

SEEL 4293: Advanced Digital Signal Processing

Pre-requisite: SEEL 4223 Digital Signal Processing 1

This course introduces students to advanced concepts in digital signal processing. Random variables are introduced starting with probability, random variables, probability density function and its operation. Random signal principles are presented with, definition of stationarity and ergodicity, correlation and covariance. The power spectrum of signals is defined together with the relationship with to the correlation function. Linear systems with random inputs are defined in terms of autocorrelation and cross correlation function and power spectrum. Optimum filtering techniques such as matched filter and wiener filter are presented with examples of applications. Linear estimation techniques deal with parameter identification and estimation of

signals. Linear prediction is used for signal modelling and prediction. Towards the end of the course, signal analysis and representation techniques for time-varying signals are presented such as the short-time Fourier transform, Gabor transform and wavelet transform.

SEEL 4333: Computer Architecture and Organization

Pre-requisite: SEEE 2263 Digital Systems

This course introduces students to the fundamental principles of computer architecture and its organization, emphasizing basic hardware/software components and functional architectures of computers. Computer organization and architecture is concerned with the structure and behavior of the various functional modules of the computer; and how they interact to provide the processing needs of the user. In particular, this course covers computer systems ranging from PCs through multiprocessors with respect to hardware design and instruction set architecture. This includes main memory, caches, central processing unit, and pipelines.

SEEL 4343: Information Security

Pre-requisite: SEEE 1223 Digital Electronics

This course covers the basic principles and techniques used to protect information. The area covered begins with description of the various structure of communication systems in practice today, security architecture and models, issues related to legislation and ethics, and physical security. Consequently, the course will cover areas applicable to electronic and communication security with description of the various types of cipher systems followed by its use in authentication. Finally, applications in telecommunication, network and the internet are demonstrated.

SEEL 4363: Digital Image Processing

Pre-requisite: SEEL 4223 Digital Signal Processing 1

This course introduces students to introductory and intermediate levels of image processing techniques. The area of coverage would be the digitization process as a mean to acquire the digital image. Next would be the enhancement and restoration processes which are to improve the quality of the image for next stage processing. Both the spatial domain and frequency domain approaches will be covered. The next stage would be the segmentation process. This is an important step towards advanced level processing. Finally the topic of compression and coding will be covered. MATLAB will be used extensively for better understanding. By adapting this knowledge, students will be able to develop essential technical skills in solving real-world problems involving image processing with some degree of accuracy.

SEEL 4373: IC Testing Techniques

Pre-requisite: SEEE 2263 Digital Systems; SEEL 4283 Analog CMOS IC Design

This course introduces students to the techniques of testing a digital circuit and designing a testable digital circuit. Several fault models including single stuck-at fault model will be analyzed in details. Fault simulation methods are covered as well in this course. Test pattern generation and design-for-testability are also introduced to students. In order to facilitate

learning process, computer-aided design (CAD) software is used throughout the course. Some practical or almost actual environment problems and solutions are provided.

SEEL 4513: Clinical Engineering

Pre-requisite: SEEL 3503 Physiology and Introduction to Medicine

The course introduces major principles of clinical engineering which includes pre-market, market and post-market life-cycle of medical devices, as well as risk and personnel management and also the underlying principles involved in the measurement of certain physiological parameters from some of the complex organ system. Course content focuses on procurement planning, incident investigation, equipment management, productivity, cost effectiveness, information systems integration, and patient safety activities. Students will also be exposed to the related law, standards and regulations for medical devices.

SEEL 4523: Medical Instrumentation

Pre-requisite: SEEE 2133 Electronic Instrumentation and Measurement

This course introduces students to various medical devices that can be found in hospitals and medical institutions. The course also includes discussions on circuits and features for ECG and EEG systems, blood pressure measurements, blood flow measurements, intensive care unit, operating room and elctrosurgery. The function behaviour and characteristics of the biomedical equipment are analysed and the necessary design criteria are discussed. Amplifier design examples are presented to guide students with necessary knowledge of how to control the circuit parameters for behaviours and characteristics so that the circuits can perform to the best of their intended functions.

SEEL 4533: Biomedical Signal Processing

Pre-requisite: SEEL 4223 Digital Signal Processing 1

Manual analyses of biomedical signals has many limitations and very subjective. Therefore, computer analysis of these signals is essential since it can provide accurate and permanent record of diagnosis as well as quantitative measurement. Hence, this course presents methods of digital signal processing for biomedical signals. The course will discuss the fundamental and current approach of biomedical signal processing, the removal of artifacts from biomedical signals, the time domain and frequency domain characterization of the biomedical signals, as well as an introduction to analysis of nonstationary and multicomponent biomedical signals. To complete the biomedical signal processing, an introduction to pattern classification for decision making is also introduced.

SEEL 4543: Bio System Modelling

Pre-requisite: SEEL 3503 Physiology and Introduction to Medicine

The objective of this course is to introduce students to the mathematical model, methods and their biological application, and model of subsystem in human body. This course introduces students to some major views and theories in modeling the subsystem in human body. It is

almost impossible to cover all subsystems in human body. As guidance, topics may include: the maintenance of cell homeotasis, excitation and conduction in nerve fibres, synaptic transmission and the neuromuscular junction, properties of muscles, the lung - physical and mechanical aspects of respiration, volume and composition of body fluids - the kidney, the cardiovascular systems, the heart as a pump, neural control of the heart and circulation, and the autonomic nervous system. The course will also provide practice in carrying out a computer simulation and modeling of bio system using Octave/Scilab/Matlab/Simulink/LabView software.

SEEL 4553: Medical Imaging

Pre-requisite: SEEL 4223 Digital Signal Processing 1

This course introduces and exposes the students to the world of medical imaging technologies. Besides the basic principles, signal and systems, the course is also focusing into some medical image processing and analyses on the image obtained from the various imaging modalities such as X- Ray, CT- Scan , MRI, Nuclear Medicine and Ultrasound.

SEEL 4563: Biosensors and Transducers

Pre-requisite: SEEE 2133 Electronic Instrumentation and Measurement

This course is intended to provide a broad introduction to the field of biosensor and transducer in the bioelectronic industry. Fundamental applications of biosensor theory are discussed, including birecognition, transduction and signal acquisition/processing. Design and fabrication of different types of biosensor are explored, ranging from electrochemical to optical system. Discussions on the current state of the art biosensor technology to enable continuation into advanced/future biosensor and the applications in biomedical, bioenvironmental, food safety and biosecurity are given.

SEEL 4573: Rehabilitation Engineering

Principles and applications of rehabilitative assessment and therapy, with special focus on the use of technology to enhance access and consideration of the continuum of rehab care as an optimization problem. Overview of sensorimotor systems, as related to human performance and usability analysis. Models for access engineering and telerehabilitation, with focus on accessible design strategies, telemonitoring and teletherapy, and wireless and augmentative communication technologies. Rehabilitation biomechanics of interfaces for seated mobility and for manipulation tasks. Innovations in assessment and intervention strategies for neurorehabilitation.

SEEL 4613: Semiconductor Device Engineering

Pre-requisite: SEEL 3613 Semiconductor Material Engineering

The objective of this course is to provide students the physical principles underlying semiconductor device operation and the application of these principles to specific devices. Semiconductors form the basis of most modern electronics systems. It also provide a basis

for understanding the characteristics, operation, and limitations of semiconductor devices. It is essential to have a thorough knowledge of the physics of the semiconductor material. The goal is to bring together quantum mechanics, the quantum theory of solids, semiconductor material physics and semiconductor device physics. All of these components are vital to the understanding of both the operation of present day devices and any future development in the field. By adapting this knowledge, students will be able to develop the required technical skills in solving problems that arise from scaling down of semiconductor devices and in designing new device structures to overcome the challenges. This course is a continuation to Semiconductor Material Engineering course and focuses more on basic and advanced devices.

SEEL 4623: Solid-State Electronic Devices

Pre-requisite: SEEL 3613 Semiconductor Material Engineering

The objective of this course is to introduce students to the basics of semiconductor hetero-structures and their applications for electronic devices. This is a continuation of semiconductor material engineering and electronic device courses. In this course, student will be exposed to the basic theories of hetero-structures and their applications for electronic and opto-electronic devices including memories. Specifically, students are exposed to the major types of gallium arsenide (GaAs) and gallium nitride (GaN)-alloyed semiconductors, their physical properties and their structures which make them suitable for electronic and opto-electronic devices. Heterojunction bipolar transistors and modulation-doped field effect transistors will be used to describe the basic characteristics needed for electronic device operation. Then, semiconductor lasers will be used as an example to explain the required characteristics for opto-electronic devices.

SEEL 4633: Micrelectronic Device Fabrication and Characterization

Pre-requisite: SEEL 3613 Semiconductor Material Engineering

The objective of this course is to introduce students to the basics of semiconductor fabrication and characterization techniques that are relevant for micro devices in the field of electronics. The course will focus on the basic physical phenomenon and underlying technologies that involved in each fabrication process, with an emphasis on modern silicon-based micro device process flow. For device fabrication, students are exposed to mainly the top-down approaches which include wafer preparation, pattern transfer and doping technologies. For device characterization, basic electrical and optical techniques as well as physical characterization using microscopy technologies will be described.

SEEL 4643: Nanoelectronics

The purpose of this course is to provide a basis for understanding nanotechnology as enabling sciences and technology in the field of nanoelectronics. In order to gain insight of this course, it is vital to have a thorough knowledge in basic materials science and solid state physics. The goal of this course is to bring together crystal structures, quantum mechanics, fundamental quantum mechanics expression, molecular electronics, quantum wells, 2-D electron gas and

high electron mobility transistors (HEMT), resonant tunnelling, ballistic transistors and optical devices. All of these quantum devices are significant for students to comprehend the theoretical and practical challenges in designing such devices in order to prolong the scaling of present devices into the future.

SEEL 4653: Modelling and Simulation of Microelectronic Devices

This course offers an introduction to modeling and simulation of microelectronic devices. Today, computer-aided design has become an affordable and in fact necessary tool for designing contemporary devices. The purpose of this course is to provide fundamental device modeling techniques with emphasis on the silicon metal-oxide-semiconductor field-effect-transistor (MOSFET). Examples on modeling carbon-based materials such as carbon nanotubes and graphene are also explored. There are discussions on crystal structure of solid, quantum system, carrier transport properties in 3D, 2D and 1D system. The goal of this course is to provide fundamental concepts and basic tools for transistor-level simulation that can be enhanced for circuit simulation.

SEEL 4663: Embedded Processor System

Pre-requisite: SEEE 3223 Microprocessor; SECP 1103 C Programming Techniques

This course is about microprocessors in embedded systems. This course extends the students' knowledge of microprocessors by investigating embedded systems design and state-of-the-art 32-bit embedded processors. The student will be familiarized with problems associated with producing hardware and software in high-level language. The topics covered include high-level programming for SoC, achieving high-performance in embedded systems through multi-threading over multi-core processors, code optimization, power management and operating system fundamentals. This course has a strong emphasis on hands-on hardware/software development, whereby the student will have to develop a solution on the test development board.

SEEL 4673: DSP Architectures

Pre-requisite: SEEE 2263 Digital Systems

This course introduces students to hardware implementation of digital signal processing (DSP) algorithms. DSP applications typically require high performance at tight space and power constraints. The requirements are best met by implementing DSP algorithms on application specific integrated circuits (ASIC) or field-programmable gate arrays (FPGA). This course exposes students to the modeling of common DSP algorithms, mapping of algorithms to hardware, various architectural styles and implementation issues.

SEEL 4723 : CAPSTONE PROJECT

The course provides students with the opportunity to integrate technical knowledge and generic skills attained in the earlier years. This is to be achieved within the context of an engineering project conducted in a small team (typically three or four students) under the

supervision of an academic staff and with optional of industry partner as advisor. Topics supplementing this course that include project management tools and practices, organizational structures, engineering standards as well as the social and environmental responsibility of professional engineers are covered in the Professional Ethics and/or Engineering Management courses offered prior to or concurrent with the course.

SEEL 4743: Basic Digital VLSI Design

Pre-requisite: SEEE 2263 Digital Systems

The objective of this course is to introduce students to basic techniques to design and implement digital VLSI system. This course introduces students to VLSI technology. A historical perspective on the evolution of integrated circuit technology is covered. Important issues when designing a VLSI circuit are discussed. MOS transistors are studied in detail, including their characteristics, structure, switch-level behaviour, and current equation. SPICE model of a MOS transistor is also described. The simplest circuit, an inverter, is studied in detail. Its voltage-transfer characteristic, noise margin and how to control the inversion point is investigated. How an IC is fabricated is described. Fabrication processes are elaborated. Layout, design rules and stick diagram are explained. This course teaches how to design circuits. Several logic families will be introduced. Advantages and disadvantages of each logic design style are explained. Delay and power performance of each logic family is also compared. Latch and flip-flop circuits are also covered. Interconnect issues, when various components are connected, are elaborated.

SEEL 4812: FINAL YEAR PROJECT 1

The aim of the Final Year Project 1 (FYP1) is to provide students the opportunity to demonstrate their knowledge learned at the FKE through the design and implementation of an engineering project. Students are exposed to identify and formulate research literature in understanding research problems. The final year project proposal will include the concept of sustainable development and project cost estimation. This will help students to learn important skills in solving practical engineering problems by applying a systematic design approach.

SEEL 4824: FINAL YEAR PROJECT 2

Pre-requisite: SEEL 4812 Final Year Project 1

The aim of the Final Year Project 2 (FYP2) is to provide students the opportunity to explore and implement creative and innovative knowledge to solve practical science, mathematical and engineering societal problems. Students are exposed to project management planning and execution. With these skills, it is hoped that the students will gain knowledge and experience in planning, designing and solving problems systematically thus when they graduate, they will be ready to work as reliable and productive engineers.

SEEM 4173: ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) involves the development of algorithms derived from human and animal intelligence that have capabilities such as learning, reasoning, generalization,

adaptation, reproduction, etc. Nowadays, these techniques are getting popular due to the large number of successful reports of implementations. AI techniques have also made their way into many domestic and industrial products and provided solutions to many difficult engineering problems. In this course, students are exposed to several AI techniques i.e. Artificial Neural Network (ANN), Fuzzy Logic, Genetic Algorithm (GA) and Particle Swarm Optimization (PSO), and how they are used as a stand-alone approach or in any combination of the methods in solving engineering and non-engineering problems.

SEET 3573: Microwave Engineering

Pre-requisite: SEEE 3533 Communication Principles

To introduce the basic theory of Microwave Engineering, such as transmission line theory, scattering parameters, Smith Chart, and impedance matching. Fundamental microwave devices, such as waveguides and resonators are explained. The students are also introduced to passive and active microwave components such as terminations, couplers, power dividers/combiners, circulators, amplifiers, oscillators, travelling wave tubes, filters, and microwave solid-state devices. Fundamentals in microwave instruments and measurement techniques are introduced.

SEET 3583: Digital Communication System

Pre-requisite: SEEE 3533 Communication Principles

This course provides an introduction to fundamental concepts in digital communication system. Main topics to be covered are baseband pulse transmission, signal space analysis, digital modulation/demodulation, channel coding, source coding, detection methods and evaluation in AWGN channel. Fundamentals on error control coding is also included. Finally, the system trade-off in designing a digital communication system is explored.

SEET 3623: Data Communication and Network

Pre-requisite: SEEE 3533 Communication Principles

The objective of the subject is to enhance the students' knowledge on data communication and computer networks. It explains the basic process of data communication, protocol, interfacing and inter-working between computer networks and switching components in telecommunication system. At the end of the course, the students should be able to understand the system used in representation, distribution, transmission and reception of data in data communication network.

SEET 4533: Wireless Communication Systems

Pre-requisite: SEET 3573 Microwave Engineering

This course introduces students the concept and principle of mobile radio communication and satellite communication system. Topics covered include mobile radio propagation, multiple access, cellular concept, modern wireless communication systems and satellite communication systems.

SEET 4543: RF Microwave Circuit Design

Pre-requisite: SEET 3573 Microwave Engineering

This course introduces students to the concept of designing RF/Microwave circuit in wireless communication system such as filters, amplifiers, oscillators and mixers. The design of the RF/Microwave circuit is based on the discrete components and the S-parameter of the component. The system block diagram is also discussed such as transmitter and receiver function and noise in communication system. The filter design is based on the lump component and the resposnse of the filter such as Butterworth and Chebyshev response. The matching concept is discussed further in the RF/Microwave amplifier and oscillator design using Smith chart. The analysis of the different mixer is also discussed in this subject.Simulation software CST will also introduced to facilitate learning process.

SEET 4593: Acoustic Engineering

Pre-requisite: SEET 3533 Communication Principles

This course embodies the basic principles of fundamentals of acoustics engineering. The aim is mainly to instil confidence and apply the basic concepts, theories and applications in acoustics, noise control, room acoustics and sound system design. The course provides an in depth understanding of the characteristics, propagations, transmission and attenuation of sound waves. Further, noise criteria and control of interfering noise, sound absorption and reflection shall follow. The last part of the course cover on good room acoustics and sound system design for an enclosed room. At the end of the course, the students shall be able to apply the acoustics engineering fundamentals and concept in designing enclosed room for optimum acoustics and sound system.

SEET 4613: Antenna Theory and Design

Pre-requisite: SEET 3573 Microwave Engineering

This course introduces students the concept of antenna, theory and design in telecommunication system. The basic antenna properties such as gain, polarization, directivity, efficiency, and radiation pattern for various types of antenna will be discussed. Several antennas with specific characteristic will be designed using simulation software and analysed. Finally, the antenna measurement setup is introduced and discussed.

SEET 4623: Network Programming

Pre-requisite: SEET 3623 Data Communication and Networks

The objective of this course is to introduce students to the basic of network programming, in the networking implementations. This course will provide the students with understanding of socket programming to interconnect computers in network. The module will cover topics such as treads, input-output streams, handling errors and exceptions in socket programming. By the end of the module, students should have an understanding of interfacing between client and server.

SEET 4633: Coding of Multimedia Signals

Pre-requisite: SEET 3583 Digital Communication System

This course is an introduction to the coding and processing of digital multimedia signals. It covers current techniques for coding of multimedia signals such as audio, images, and video. Current video compression standards and formats will be discussed and introduced in this course. It focuses on the challenges of mobile video communication and provides methods in solving the issues.

SEET 4643: Optical Materials and Sensors

Pre-requisite: SEET 4523 Optical Communication System

The aim of this course is to introduce students to the theories, concepts, instrumentation and device design for optical sensors. At the beginning, the course prepares students with essential knowledge of materials including the intrinsic dielectric and magnetic properties. The topics are established from the well known Maxwell's equations. Afterward, it explores various forms of optical waveguides, their important parameters and methods of analysis. The course then introduces students to various characterization instrumentations for optical waveguides. Finally, students are exposed to the design process of optical sensing devices for specific sensing applications.

SEET 4653: Measurement and Characterization of Optical Devices

Pre-requisite: SEET 4523 Optical Communication System

Measurement and characterization of optical devices is essential for developing and characterizing today's photonic devices and fiber optic systems. This course brings together the fundamental principles with the latest techniques as a complete resource for the optical and communications engineer developing future optical devices and fiber optic systems. It covers the description and fundamental operation of passive and active devices required for the implementation of optical communication system. The main aspect covered will be the thorough understanding of the various performance parameters and specifications of these devices. The instrumentation covered will be Optical Spectrum analyser (OSA), Power Meter, Tunable Laser Source (TLS), Optical time-domain Reflectometer (OTDR) and optical attenuators. Measurement standards and test procedures adopted by the relevant authorities will also be covered.

SEET 4663: Optical Network

Pre-requisite: SEET 4523 Optical Communication System

The course on Optical Network covers the basic aspects of optical networking, which is the key for today's high-speed data transportation technology. The course introduces several important optical network components (e.g. optical transmitters, detectors, amplifiers, multiplexers, filters, couplers, isolators, wavelength converters and cross-connects) that support the provisioning of high-speed light paths between optical nodes. The course also highlights approaches for ensuring the survivability of provisioned light paths and methods for analysing the topological properties of optical networks.

SEEL 5123 : Advanced Microprocessor System
This course is about microprocessors in embedded systems. This course extends the students' knowledge of microprocessors by investigating embedded systems design and state-of-the-art 32-bit embedded processors. The student will be familiarized with problems associated with producing hardware and software in high-level language and assembly language for embedded systems. The topics covered include high-level (C/C++ programming) and assembly language programming for embedded microprocessors, memory and peripherals for embedded systems, system development, embedded real-time operating systems and optimizing performance of embedded systems.

SEET 5313 : Communications and Computer Networks
This course will enhance the students' knowledge on communication and computer network. It explains the advance concept of network layers, protocols, interfacing and inter-working between computer networks and network devices in telecommunication systems. The students will be taught with the various possible techniques to understand the modern networks for wired and wireless services.

SEET 5413 : Advanced Digital Communication
This course provides fundamental concepts in the analysis and design of digital communication system. Main topics to be covered are introduction to information theory, signal space analysis, digital modulation/demodulation over AWGN channel, baseband transmission over bandlimited channel, channel coding, error control coding. Finally, the system trade-off in designing a digital communication system in AWGN channel is explored.

SEEL 5113 : Advanced Nanoelectronics Devices
Semiconductors form the basis of most modern electronics systems. This course is designed to provide a basis for understanding the characteristics, operation, and limitations of semiconductor devices. In order to gain this understanding, it is essential to have a thorough knowledge of the physics of the semiconductor material. The goal is to bring together quantum mechanics, the quantum theory of solids, semiconductor material physics, and semiconductor device physics. All of these components are vital to the understanding of both the operation of present day devices and any future development in the field. This course is a continuation to Microelectronics at undergraduate level and introduces advance device concepts.

SEEL 5193 : Advanced Analog CMOS IC Design
This course introduces students to the advanced level of CMOS design in analog circuits. In the beginning, it highlights the operational concept of MOSFET transistors and their nonlinearity characteristics that will limit the performance of analog circuits. The course will then proceed to analyze CMOS single ended as well as differential amplifiers. The advantages and disadvantages between different architectures will be discussed. The trademark of analog design which is the design challenge to fulfill design matrix will be emphasized. Students will be guided on design principles to meet design specifications with acceptable accuracy. Important sub-modules differential amplifier and op amps will be studied in detail towards the end of the course.

SEEM 5753 : Advanced Instrumentation and Measurement
This course is an introduction to the advanced instrumentation and measurement. Key components studied in details are a review of powerful measurement techniques and basic principles and typical problems of sensor elements, detailed up-to-date reviews of the features of temperature sensors, displacement sensors, flow sensors, level sensors, position sensors, motion sensors and biometrics. This course also provides a detailed knowledge on error and determination of uncertainties in measurement. Besides that, this course introduces the multi sensor, Fusion application, wireless sensor network and Internet of Things. Finally, the basic concepts of safety instrumented system, standards and risk analysis techniques will be discussed.

SEEM 5713 : Artificial Intelligence and Applications
Artificial intelligence (AI) involves the development of algorithms derived from human & animal intelligence that have capabilities such as learning, reasoning, generalization, adaptation, reproduction, etc. Nowadays, these techniques are getting popular due to the large number of successful reports of implementations. AI techniques have also made their way into many domestic & industrial products & provided solutions to many difficult engineering problems. In this course, students are exposed to several AI techniques i.e. Artificial Neural Network (ANN), Fuzzy Logic, Genetic Algorithm (GA) & Particle Swarm Optimization (PSO), & how they are used in solving engineering & non-engineering problems.

SEEM 5703 :Control Systems Engineering
This course introduces the students to the fundamental concepts of control systems engineering. Students will be exposed with techniques of modelling of physical systems involving linear and nonlinear systems including mechanical, electrical and mechatronic systems. Both the frequency domain and time domain (state-space) are covered. Several criteria for performance and stability analyses of control systems will be taught. Modelling and analysis of control system in discrete time for digital control will also be introduced. Student will also be exposed with MATLAB for design, development and analysis of simulation models. Finally, a feedback control system with controller to achieve control system objectives are described. Several case studies of the applications of controllers will be used to enhance the student understanding.

SEET 5313 : Communications and Computer Networks
This course will enhance the students' knowledge on communication and computer network. It explains the advance concept of network layers, protocols, interfacing and inter-working between computer networks and network devices in telecommunication systems. The students will be taught with the various possible techniques to understand the modern networks for wired and wireless services.

SEET 5513 : Sustainable Design, Engineering and Management
The aim is to give students an insight and understanding of the environmental and sustainability challenges that are facing by Communication Engineers and how these have given rise to the practice of Sustainable Design, Engineering and Management. The objective of this course is to provide a comprehensive overview of the nature and causes of the major environmental problems facing our planet, with a particular focus on energy, Life Cycle Assessment (LCA) and green technology. Students will also experience conducting case

studies and project-based learning encompassing four themes in sustainability which are connecting, conceptualizing, valuing and implementing.

SEET 5423 :Wireless Communication Systems

This course introduces students to introductory and advanced level of wireless communication technologies. In the beginning students will be presented with the concept of wireless communication systems and mobile radio propagation. Students will then be illuminated on MIMO technology in mobile communication. Next, the course will describe on cellular concepts that will include small cell networks. This is followed by details on the overall evolution of mobile communication system. Finally, this course will cover on different multiple access techniques used in wireless communication systems.

SEET 5523 : Internet of Things Technology

The course provides students with a technical background to the Internet of Things (IoT) which includes its concept, architecture and applications. It also gives the underlying communication protocols and technologies. The course has a significant practical element that will be delivered during lab sessions in which students are expected to complete exercises involving system design, device programming and cloud development.

BACHELOR OF ENGINEERING (ELECTRICAL-MECHATRONICS)

PROGRAMME SPECIFICATIONS

The Bachelor of Engineering (Electrical-Mechatronics) is a program with honours that has been established and offered for more than two decades by UTM. The program is a four-year program completed with one year final year project. The programme is offered only at the UTM Main Campus in Johor Bahru. The duration of study is subjected to the student's entry qualifications and lasts between four (4) years to a maximum of six (6) years.

The programme is offered on full-time basis and is based on a 2-Semester per academic session. Generally, students are expected to undertake courses equivalent to between fifteen (15) to eighteen (18) credit hours per semester. Assessment is based on courseworks and final examinations given throughout the semester.

General Information

1. Awarding Institution			Universiti Teknologi Malaysia	
2. Teaching Institution			Universiti Teknologi Malaysia	
3. Programme Name			Bachelor of Engineering (Electrical - Mechatronics)	
4. Final Award			Bachelor of Engineering (Electrical - Mechatronics)	
5. Programme Code			SEEM	
6. Professional or Statutory Body of Accreditation			Board of Engineers Malaysia (BEM)	
7. Language(s) of Instruction			English and Bahasa Melayu	
8. Mode of Study (Conventional, distance learning, etc)			Conventional	
9. Mode of operation (Franchise, self-govern, etc)			Self-governing	
10. Study Scheme (Full Time/Part Time)			Full Time	
11. Study Duration			Minimum : 4 yrs Maximum : 6 yrs	
Type of Semester	No. of Semesters		No of Weeks/Semester	
	Full Time	Part Time	Full Time	Part Time
Normal	8	-	18	-
Short	4	-	10	-

Course Classification

Bachelor of Engineering (Electrical - Mechatronics) - SEEM

No.	Classification	Credit Hours	Percentage
i.	University Courses a) General b) Language c) Entrepreneurship d) Co-Curriculum	 26 8 2 3	28.7 %
ii.	School/Programme Core	88	64.7 %
iii.	Programme Electives	9	6.6%
	Total	**136**	**100%**
A	Engineering Courses a) Lecture/Project/Laboratory b) Workshop/Field/Design Studio c) Industrial Training d) Final Year Project	 83 2 6 6	71.3 %
Total Credit Hours for Part A		**97**	
B	Related Courses a) Applied Science/Mathematic/Computer b) Management/Law/Humanities/Ethics/Economy c) Language d) Co-Curriculum	 17 11 8 3	28.7 %
Total Credit Hours for Part B		**39**	
Total Credit Hours for Part A and B		**136**	100%
Total Credit Hours to Graduate		**136 credit hours**	

Award Requirements

To graduate, students must:

- Attain a total of not less than 136 credit hours (SEEM) with a minimum CGPA of 2.0.
- Complete Professional Skills Certificates (PSC).

Programme Educational Objectives (PEO)

After having exposed to 3 to 5 years working experience, our graduates should become professionals who demonstrate the following competencies:

Code	Intended Educational Objectives
PEO1	Become Electronic Engineers who are competent, innovative, and productive in addressing customer needs.
PEO2	Grow professionally with proficient soft skills.
PEO3	Demonstrate high standards of ethical conduct, positive attitude, and societal responsibilities.

Programme Learning Outcomes (PLO)

After having completed the programme, graduates should be able to demonstrate the following competencies:

Code	Programme Learning Outcomes
PLO1	Ability to apply knowledge of mathematics, science and electrical/electronic engineering to the solution of complex engineering problems.
PLO2	Ability to perform research-based analysis, conduct experiments and interpret data for complex engineering problems.
PLO3	Ability to identify, formulate, conduct research literature to analyse complex engineering problems using engineering knowledge.
PLO4	Ability to apply engineering practice and use modern engineering, and IT tools for complex engineering problem with an understanding the limitations of the technology.
PLO5	Ability to design solutions for complex engineering problems and design systems and processes that meet specified needs with appropriate consideration for public health and safety, culture, society, and environment.
PLO6	Ability to articulate ideas, communicate effectively, in writing and verbally, on complex engineering activities with the engineering community and with society at large.
PLO7	Ability to function effectively as an individual, as a member or as a leader in diverse teams.

PLO8	Ability to recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PLO9	Ability to comprehend the impact of global and contemporary issues, the role of engineers on society including, health, safety, legal and cultural issues, and the consequent responsibilities relevant to professional engineering practices and engineering problems.
PLO10	Ability to comprehend and evaluate the sustainability and impact of professional engineering work in the solutions of complex engineering problems in societal and environmental contexts.
PLO11	Ability to grasp and execute responsibility professionally and ethically in professional engineering practices.
PLO12	Ability to demonstrate knowledge and understanding of engineering and management principles, and economic decision-making to manage projects in multidisciplinary environments.

PROFESSIONAL SKILLS CERTIFICATE (PSC)

New PSC courses are introduced to new and current students starting from Session 2020/2021. Students are required to undertake and pass Five (5) Professional Skills Certificate (PSC) courses of UTM Institute for Life Ready Graduate (UTM ILeague). These courses are offered and managed by School of Professional and Continuing Education (SPACE) in collaboration with Schools or Faculties. Students are required to register the courses through SPACE Website.

List of PSC courses are as follows:

No.	PSC COURSE	OFFERED AND MANAGED BY SPACE IN COLLABORATION WITH
COMPULSORY COURSES		
1	Design Thinking for Entrepreneur	UTM Excite
2	Talent and Competency Management	UTM Career Centre (UTMCC)
3	English Communication Skills for Graduating Students (ECS)	Language Academy
ELECTIVE COURSES		
4	Occupational Safety, Health & Environment (OSHE) (*Compulsory to all FE students*)	Faculty of Engineering (FE)
5.	Choose ONE elective course from the following list: 1. Data Analytics for Organization 2. Construction Measurement (Mechanical & Electrical Works) 3. Professional Ethics and Integrity 4. Other electives courses offered in future	Schools or Faculties at UTM

COURSE MENU

Bachelor of Engineering (Electrical-Mechatronics) - SEEM

YEAR 1: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SSCE 1693	Engineering Mathematics I	3	
SEEE 1012	Introduction to Electrical Engineering	2	
SEEE 1013	Electrical Circuit Analysis	3	
SECP 1103	C Programming Techniques	3	
UHLB 1112	English Communication Skills	2	
UHMS 1182	Appreciation of Ethics and Civilizations (Local Students)	2	
UHIS 1022 OR UHMS 1182	Philosophy and Current Issues OR Appreciation of Ethics and Civilizations (for International Students)		
	TOTAL CREDIT	15	
	CUMULATIVE CREDITS	15	

YEAR 1: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SSCE 1793	Differential Equations	3	
SEEE 1073	Electronic Devices and Circuits	3	SEEE 1013
SEEE 1223	Digital Electronics	3	
SEEM 1113	Engineering Mechanics	3	
SEEM 1502	Computer Aided Engineering Drawing	2	
UHIS 1022	Philosophy and Current Issues (for Local Students)	2	
UHLM 1012	Malay Language for Communication 2 (International Students)		
	TOTAL CREDIT	16	
	CUMULATIVE CREDITS	31	

YEAR 2: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SSCE 1993	Engineering Mathematics II	3	SSCE 1693
SEEE 1022	Introduction to Scientific Programming	2	
SEEE 2073	Signals and Systems	3	
SEEE 2423	Fundamentals of Electrical Power Systems	3	SEEE1013
UHMT 1012	Graduate Success Attributes	2	
UHLB 2122	Academic Communication Skills	2	
UKQF 2**2	Elective of Co-Curriculum Service Learning	2	
	TOTAL CREDIT	17	
	CUMULATIVE CREDITS	48	

YEAR 2: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SSCE 2193	Engineering Statistics	3	
SEEE 2133	Electronic Instrumentation & Measurement	3	
SEEE 2263	Digital Systems	3	SEEE 1223
SEEM 3123	Hydraulic and Pneumatic Systems	3	SEEM 1113
SEEE 2742	2nd Year Electronic Design Lab	2	
UBSS 1032	Introduction To Entrepreneurship	2	
	TOTAL CREDIT	16	
	CUMULATIVE CREDITS	64	

YEAR 3: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SSCE 2393	Numerical Methods	3	
SEEE 3133	System Modeling & Analysis	3	SEEE 2073
SEEE 3223	Microprocessor	3	SEEE 1223
SEEE 3533	Communication Principles	3	SEEE 2073
SEEE 2523	Electromagnetic Field Theory	3	SSCE 1993
SEEE 3732	Common 3rd Year Laboratory	2	
	TOTAL CREDIT	17	
	CUMULATIVE CREDITS	81	

YEAR 3: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SEEE 3143	Control System Design	3	SEEE 3133
SEEE 3263	Electronic Systems	3	SEEE 1073
SEEM 3133	Electrical Motors and Drives	3	
SEEM 4333	Mechatronics System Design	3	
SEEM 3742	Specialized 3rd Year Laboratory	2	
UHLB 3132	Professional Communication Skills	2	
UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	
	TOTAL CREDIT	17	
	CUMULATIVE CREDITS	98	

YEAR 3: SEMESTER 3			
Code	**Course**	**Credit**	**Pre-requisite**
SEEM 4926	Practical Training	6	
	TOTAL CREDIT	6	
	CUMULATIVE CREDITS	104	

YEAR 4: SEMESTER 1			
Code	**Course**	**Credit**	**Pre-requisite**
SEEM 4723	Capstone Project	3	
SEEM 4812	Final Year Project Part I	2	
SEEM 4143	Robotics	3	SSCE 1993
SEEL 4223	Digital Signal Processing I	3	SEEE 2073
SEE* 4**3 / SEE*5**3	Field Elective 1 / PRISMS Elective 1	3	
SHMS 4542	Engineering Management	2	
	TOTAL CREDIT	16	
	CUMULATIVE CREDITS	120	

YEAR 4: SEMESTER 2			
Code	**Course**	**Credit**	**Pre-requisite**
SEEM 4824	Final Year Project Part II	4	SEEM 4812
SEEE 4012	Professional Engineering Practice	2	
SEE* 4**3 / SEE*5**3	Field Elective 2 / PRISMS Elective 2	3	
SEE* 4**3 / SEE*5**3	Field Elective 3 / PRISMS Elective 3	3	
UHIT 2302	Science and Technology Thinking	2	
UHL* 1112	Electives of Foreign Language	2	
	TOTAL CREDIT	16	
	CUMULATIVE CREDITS	136	

Elective Courses

Code	Course	Credit	Pre-requisite
SEEE 4113	Modern Control System	3	SEEE 3143
SEEE 4153	Digital Control Systems	3	SEEE 3143
SEEE 4433	Power Electronic and Drives	3	SEEE 2423
SEEI 3133	Industrial Instrumentations and Applications	3	SEEE 2133
SEEI 4173	Advanced Transducers and Sensors	3	SEEI 3133
SEEI 4223	BioMEMS and Microanalytical Systems	3	SEEI 3133
SEEI 4233	Nanotechnology and Application	3	
SEEI 4313	PLC and SCADA System Design	3	SEEE 3143
SEEI 4323	Advanced Control Theory	3	SEEE 4113
SEEI 4343	System Identification and Estimation	3	SEEE 4113
SEEI 4363	Industrial Control Networks	3	SEEE 3143
SEEL 4213	Software Engineering	3	SECP 1103
SEEM 4133	Machine Vision Systems	3	
SEEM 4153	Robot Technology for Automation	3	SEEM 4143
SEEM 4173	Artificial Intelligence	3	
SEEM 4223	Embedded Systems	3	SEEE 3223
SEET 4633	Coding of Multimedia Signals	3	SEET 3583
SEEM 4163	Autonomous Robot	3	SEEM 4143
SEEM 4123	Industrial Engineering	3	

SEEM Elective Courses for PRISM (CHOOSE MAXIMUM 3)			
Code	Course	Credit	Pre-requisite
SEEM 5753	Advanced Instrumentation and Measurement	3	
SEEM 5713	Artificial Intelligence and Applications	3	
SEEM 5703	Control Systems Engineering	3	