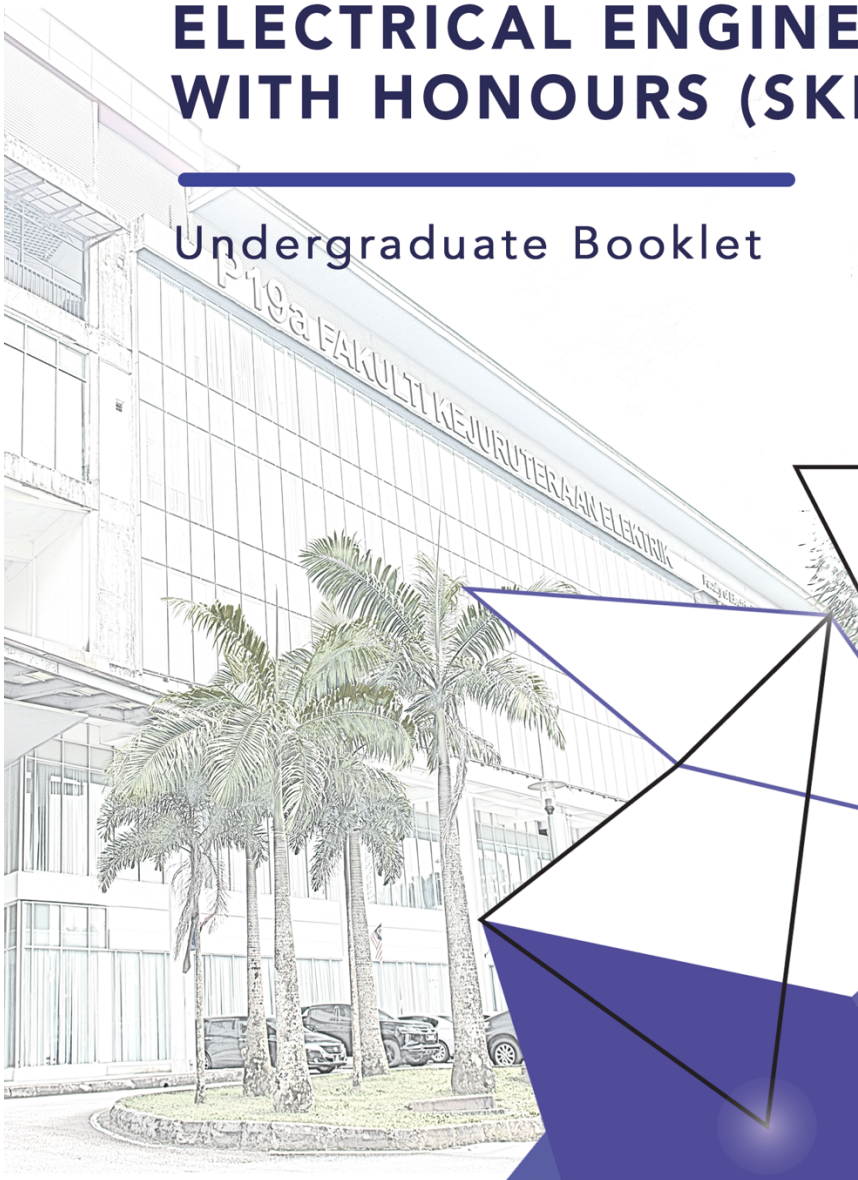
UTM
UNIVERSITI TEKNOLOGI MALAYSIA

Faculty of
Electrical Engineering

Academic Session
2024/2025

BACHELOR OF ELECTRICAL ENGINEERING WITH HONOURS (SKEEH)

Undergraduate Booklet



www.fke.utm.my

Profile Page

BACHELOR OF ELECTRICAL ENGINEERING WITH HONOURS (SKEEH)

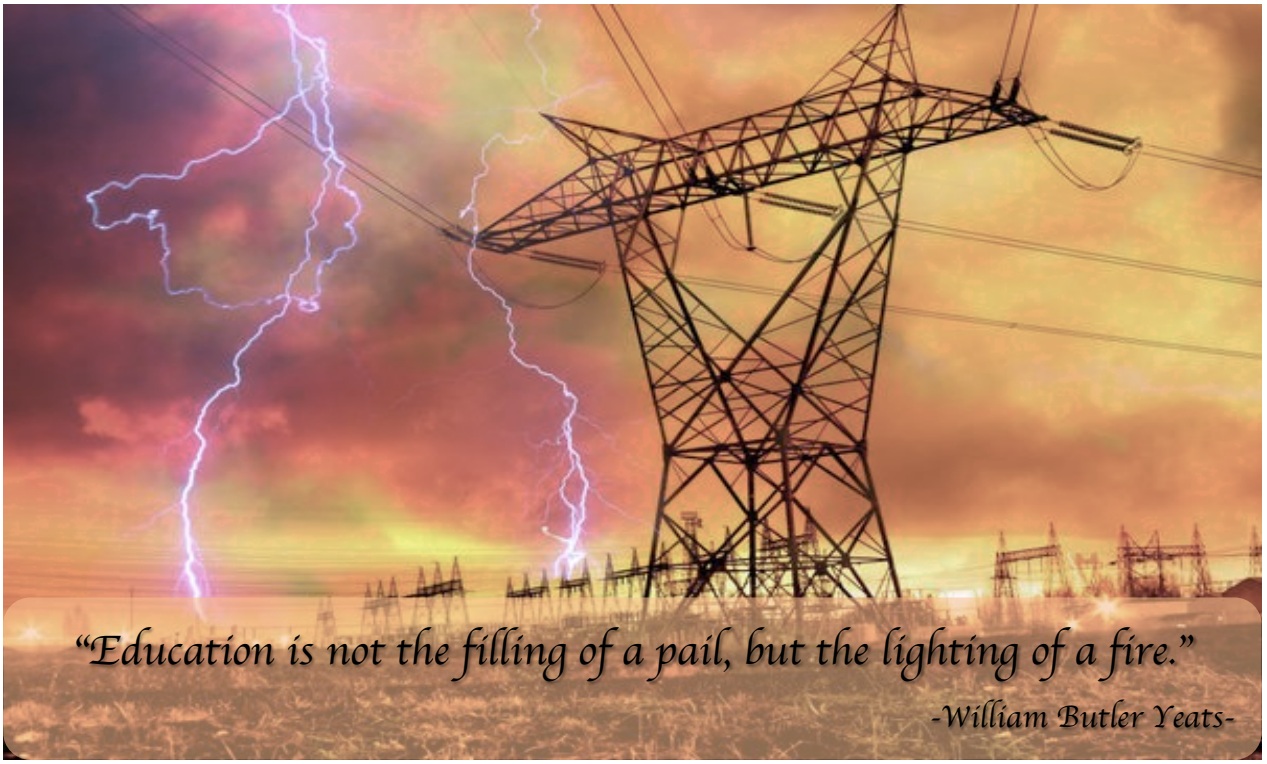
Name of Student : _____

Matric. No. : _____

Phone No. : _____

Email : _____

Name of Academic Advisor : _____



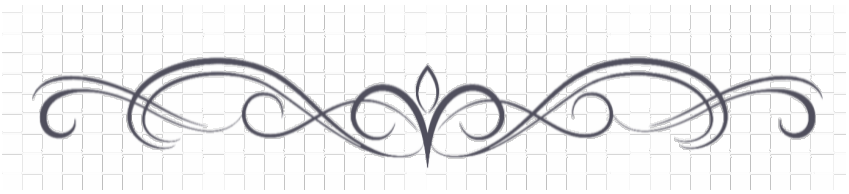
PROGRAMME GUIDELINES

The University adopts the semester system. An academic year is divided into two (2) normal semesters, namely Semester I and Semester II, and a short semester at the end of Semester II. A new intake of undergraduate students is normally made during Semester I and Semester II of an academic year. The minimum duration of the programme is four years (8 semesters).

All courses offered by the faculty have credits, except for courses approved by the University Senate. One (1) credit is equivalent to 14 hours of lectures or 30 hours of practical sessions (studio/project) in a semester. The total number of credits for the Bachelor of Electrical Engineering with Honours (SKEEH) programme is 137.

All students' performance and achievements are assessed formally. Normally, every course is assessed based on the coursework, which constitutes not less than 50% of the overall marks, and a final exam paper, which constitutes another 50%. Coursework can be in the form of homework, quiz, test, and presentation. The final examination is held at the end of each academic semester. Students' performance in a course is indicated by the letter grade. Generally, the passing grade for any course is a 'D+'. Students who failed a course (obtained a grade of 'D' and below) are required to repeat the course the following semesters when it is offered. Students may improve the grade of any course with a 'B-' or lower grade with a maximum of 15 credits allowed. Subject to the Faculty and University's Academic Regulations, students may withdraw from a course within the stipulated period. Other information on academic regulation can be retrieved from the UTM website (UTM Academic Regulations).

A student must pass all courses specified in his/her programme of study and fulfil all the requirements specified for his/her programme of study set by the Faculty and University to be awarded with the Bachelor degree.



Programme Learning Outcomes (PLO)

All undergraduate programme offered in FKE share a common Programme Learning Outcomes (PLO). After having completed the Bachelor degree programme, graduates should be able to demonstrate the following competencies:

PLO	PLO STATEMENTS
PLO1 (Engineering Knowledge)	Apply knowledge of mathematics, science, computing and engineering fundamentals, and electrical engineering specialization to develop solutions to **complex engineering problems.** *Mengaplikasi pengetahuan matematik, sains, komputeran dan asas kejuruteraan, dan pengkhususan kejuruteraan elektrik untuk membangun penyelesaian masalah kejuruteraan yang kompleks.*
PLO2 (Problem Analysis)	Identify, formulate, conduct research literature and analyze **complex engineering problem** reaching substantiated conclusions using principles of mathematics, sciences and electrical engineering with holistic considerations for sustainable development. *Mengenalpasti, merumus, menjalankan kajian literatur dan menganalisa masalah kejuruteraan kompleks bagi mencapai Kesimpulan yang dibuktikan menggunakan prinsip matematik, sains dan kejuruteraan elektrik dengan pertimbangan holistik untuk pembangunan mampan.*
PLO3 (Design / Development Solutions)	Design creative solutions for **complex engineering problems** and design systems, components or processes to meet identified needs with appropriate consideration for public health and safety, whole-life cost, net-zero carbon as well as resource, cultural, societal, and environmental considerations as required. *Merekabentuk penyelesaian kreatif untuk masalah kejuruteraan yang kompleks dan merekabentuk sistem, komponen atau proses bagi memenuhi keperluan yang dikenalpasti melalui pertimbangan bersesuaian untuk kesihatan dan keselamatan awam, kos sepanjang hayat, karbon sifar bersih, serta pertimbangan sumber, budaya, masyarakat dan alam sekitar mengikut keperluan.*
PLO4 (Investigation)	Conduct investigation of **complex engineering problems** using research methods including research-based knowledge, including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions. *Melaksanakan kajian masalah kejuruteraan kompleks menggunakan kaedah penyelidikan termasuk pengetahuan berasaskan penyelidikan, rekabentuk eksperimen, analisis dan tafsiran data, dan sintesis maklumat*

	untuk memberikan kesimpulan yang sah.
PLO5 (Tool Usage)	Create, select and apply, and recognize limitation of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to **complex engineering problems**. *Mencipta, memilih dan mengaplikasi, dan mengenalpasti had untuk teknik, sumber, serta peralatan moden kejuruteraan dan IT yang bersesuaian, termasuk jangkaan dan permodelan, bagi masalah kejuruteraan kompleks.*
PLO6 (The Engineer & The World)	Analyze and evaluate sustainable development impacts to: society, the economy, sustainability, health and safety, legal frameworks, and the environment, in solving **complex engineering problems.** *Menganalisa dan menilai impak pembangunan mampan kepada: masyarakat, ekonomi, kelestarian, kesihatan dan keselamatan, rangka kerja perundangan, dan alam sekitar, dalam menyelesaikan masalah kejuruteraan kompleks.*
PLO7 (Ethics)	Apply ethical principles and commit to professional ethics and norms of engineering practice and adhere to relevant national and international laws. Demonstrate an understanding of the need for diversity and inclusion. *Mengaplikasi prinsip beretika dan komited kepada etika profesional dan norma amalan kejuruteraan dan mematuhi undang-undang negara dan antarabangsa yang berkaitan. Menunjukkan pemahaman terhadap keperluan kepada kepelbagaian dan keterangkuman.*
PLO8 (Individual & Collaborative Teamwork)	Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multidisciplinary, face-to- face, remote and distributed settings. *Berfungsi secara berkesan sebagai individu, dan ahli atau ketua dalam pasukan yang pelbagai dan terangkum, dan dalam persekitaran multidisiplin, bersemuka, jarak jauh dan teragih.*
PLO9 (Communicatio n)	Communicate effectively and inclusively on **complex engineering activities** with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, taking into account cultural, language, and learning differences. *Berkomunikasi secara efektif dan terangkum mengenai aktiviti kejuruteraan kompleks bersama komuniti kejuruteraan dan masyarakat umum, seperti kebolehan memahami dan menulis laporan dan dokumen*

	rekabentuk secara efektif, membuat pembentangan secara efektif, dengan mengambilkira perbezaan budaya, bahasa dan pembelajaran.
PLO10 (Project Management & Finance)	Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects in multidisciplinary environments. *Mengaplikasi pengetahuan dan pemahaman berkaitan prinsip pengurusan kejuruteraan dan membuat keputusan secara ekonomikal dalam pekerjaan, sebagai ahli dan ketua pasukan, dalam mengurus projek dalam persekitaran multidisiplin.*
PLO11 (Life-Long Learning)	Recognise the need for, and have the preparation and ability for i) independent and lifelong learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. *Mengenalpasti keperluan, dan mempunyai persediaan serta kebolehan untuk* *i) pembelajaran mandiri dan sepanjang hayat* *ii) kebolehsuaian kepada teknologi terkini dan baharu muncul, dan* *iii) pemikiran kritis merangkumi konteks perubahan teknologi yang luas.*

PROFESSIONAL SKILLS CERTIFICATE (PSC)

UTM has designed its own UTM Professional Skills Certificate (UTM PSC) programme managed by UTM School of Undergraduate Studies (UGS) to enhance the knowledge and skills of UTM students. It provides students with value-added courses so that they will have competitive-edge skills when they enter the employment market. Students will receive a Certificate of UTM Professional Skills Programme and the courses will appear in the student transcript. Students are required to undertake and must pass five (5) PSC courses as listed as follows in order to graduate:

No.	PSC COURSES	CODE
Compulsory Courses (all THREE (3) courses)		
1	Design Thinking for Entrepreneur	GLRB0010
2	Talent and Competency Management	GLRM0010
3	English Communication Skills for Graduating Students	GLRL0010
Elective Courses (any TWO (2) courses)		
1	Data Analytics for Organization	GLRT0010
2	Professional Ethics and Integrity	GLRM0020
3	Construction Measurement (Mechanical & Electrical)	GLRT0020
4	OSHE For Engineering Industry and Laboratory	GLRT0030
5	Quality Management for Built Environment and Engineering Professionals	GLRT0050
6	Safety and Health Officer Introductory Course	GLT0060

PRISMS (PROGRAM INTEGRASI SARJANA MUDA - SARJANA)

PRISMS is a newly introduced programme that integrates undergraduate high-level elective SKE*5**3 courses with the core courses of the Master's degree programme. Under PRISMS, students can complete and receive two degrees, a Bachelor's degree and a Master's degree, within five years (4+1).

Requirements

Students who have completed third-year second-semester courses with a cumulative grade point average (CGPA) of 3.3 and above can apply for PRISMS. Students can apply using the PRISMS application form and must be recommended by the Academic Advisor, approved by the Program Director, and certified by the Dean of Faculty. Once the application to join PRISMS is approved, students can register for the SKE*5**3 courses during the course pre-registration or compulsory registration period.

PRISMS Credit Transfer

For vertical credit transfer into the master's degree program that students plan to enroll in, students must obtain grade B and above of the high-level elective SKE*5**3 courses. The maximum unit allowed for the credit transfer is twelve (12) credits.

BACHELOR OF ELECTRICAL ENGINEERING WITH HONOURS (SKEEH)

Introduction

The Bachelor of Electrical Engineering with Honours (SKEEH) program is offered by the Faculty of Electrical Engineering to prepare graduates for careers in electrical engineering. Throughout the program, emphasis is placed on acquiring a thorough understanding of the basic principles and skills in Electrical Engineering. The curriculum includes core and specialised electrical engineering courses, related general education courses, and non-technical support courses.

The students' exposure to engineering practice is integrated into the curriculum through industrial training and invited lectures from the industries. The programme also provides the students with opportunities for analytical, critical, and constructive thinking besides communication, teamwork, and lifelong learning skills to prepare them for careers as an electrical engineer in private/public sectors or continuing education at the postgraduate level.

Programme Specifications

The Bachelor of Electrical Engineering with Honours is offered either full-time or part-time. 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 study duration for the full-time programme is subject to the student's entry qualifications and lasts between four (4) years and a maximum of six (6) years.

The programme is offered full-time based on a 2-Semester per academic session. Generally, students are expected to undertake courses equivalent to fifteen (16) to eighteen (18) credit hours per semester. Assessment is based on coursework and final examinations given throughout the semester

Programme Educational Objectives (PEO)

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

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

PROGRAMME GENERAL INFORMATION		
1.	Awarding Institution	**Universiti Teknologi Malaysia**
2.	Teaching Institution	**Universiti Teknologi Malaysia**
3.	Programme Name	**Bachelor of Electrical Engineering with Honours**
4.	Final Award	**Bachelor of Electrical Engineering with Honours**
5.	Programme Code	**SKEEH**
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 Electrical Engineering with Honours - SKEEH

No.	Classification	Credit Hours	Percentage
i.	University General Courses	16	11.68 %
ii.	Mathematics	15	10.95 %
iii.	Programme Core	89	64.96 %
iv.	Programme Electives	12	8.76 %
v.	Free Electives	5	3.65 %
	Total	137	100 %
A	**Engineering Courses**		73.72 %
	a) Lecture/Project/Laboratory	90	
	b) Workshop/Field/Design Studio	-	
	c) Industrial Training	5	
	d) Final Year Project	6	
Total Credit Hours for Part A		101	
B	Related Courses		26.28 %
	a) Applied Science/ Mathematic/ Computer	15	
	b) Management/ Law/ Humanities/ Ethic/ Economy	8	
	c) Language	6	
	d) Co-Curriculum	2	
	e) Free Electives	5	
Total Credit Hours for Part B		36	100
Total Credit Hours for Part A and B		137	100
Total Credit Hours to Graduate		**137**	

Award Requirements

To graduate, students must:

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

STUDY PLAN
SKEEH Cohort 2024/2025 (Intake Semester 1)

Code	Course	Credit	Pre-requisite	Total Credit
YEAR 1: SEMESTER 1				
ULRS 1032	Integrity and Anti-Corruption	2		**16**
SSCE 1693	Engineering Mathematics I	3		
SKEE 1012	Introduction to Electrical Engineering	2		
SKEE 1013	Electrical Circuit Analysis	3		
SKEE 1033	Scientific Programming	3		
SKEE 1233	Digital Electronic Systems	3		
YEAR 1: SEMESTER 2				
SSCE 1793	Differential Equations	3	SSCE 1693	**17**
SEMU 2113	Engineering Science	3		
SKEE 1103	C Programming for Engineers	3		
SKEE 1073	Electronic Devices and Circuits	3	SKEE 1013	
SKEE 2133	Electronic Instrumentation and Measurement	3		
ULRS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2		
UHLM 1012	Malay Language for Communication 2 (for International Students)			
YEAR 2: SEMESTER 1				
SSCE 1993	Engineering Mathematics II	3	SSCE 1693	**17**
SSCE 2193	Engineering Statistics	3		
SKEE 2073	Signal and Systems	3		
SKEE 3223	Microprocessor	3	SKEE 1223	
SKEE 2433	Principles of Electrical Power Systems	3	SKEE 1013	
SKEE 2752	Electronic Design Laboratory	2		
YEAR 2: SEMESTER 2				
SSCE 2393	Numerical Methods	3		**18**
SKEE 2523	Electromagnetic Field Theory	3	SSCE 1993	
SKEE 3133	System Modelling and Analysis	3	SKEE 2073	
SKEE 3633	Electrical Machines	3	SKEE 2433	
UHLB 2122	Professional Communication Skills 1	2		
ULRF 2**2	Elective of Service Learning and Community Engagement	2		
ULRS 1022	Philosophy and Current Issues (for Local Students)	2		
ULRS 1022 OR ULRS 1182	Philosophy and Current Issues OR Appreciation of Ethics and Civilizations (for International Students)			

YEAR 3: SEMESTER 1				
UHL* 1112	Elective of Foreign Language for Communication	2		**18**
UHLB 3132	Professional Communication Skills 2	2		
SKEE 3143	Control System Design	3	SKEE 3133	
SKEE 3533	Communication Principles	3	SKEE 2073	
SKEE 3443	Power System Analysis	3	SKEE 2433	
SKEE 3732	Common Third Year Laboratory	2		
S*** ***3	Free Elective 1	3		
YEAR 3: SEMESTER 2				
SKEE 3742	Specialized Third Year Laboratory	2		**18**
SKEE 3733	Integrated Design Project	3		
SKEE 3433	Power Electronic and Drives	3	SKEE 2433	
SKEE 4523	Power System Protection	3	SKEE 3443	
SKEE 3463	High Voltage Technology	3	SKEE 3443	
S*** ***2	Free Elective 2	2		
ULRS 3032	Entrepreneurship & Innovation	2		
YEAR 3: SEMESTER 3				
SKEE 3925	Industrial Training	5		**5**
YEAR 4: SEMESTER 1				
SKEE 4542	Engineering Management Principles	2		**17**
SKEE 4533	Electrical Energy Utilization	3		
SKEE 4813	Methodology of Research and Development	3		
SKE* ***3	Field Elective 1 / PRISMS Elective 1	3		
SKE* ***3	Field Elective 2 / PRISMS Elective 2	3		
SKE* ***3	Field Elective 3 / PRISMS Elective 3 / Faculty Free Elective	3		
YEAR 4: SEMESTER 2				
SKEE 4012	Professional Engineering Practice	2		**11**
SKEE 4826	Final Year Project	6	SKEE 4813	
SKE* ***3	Field Elective 4 / PRISMS Elective 4	3		
CUMULATIVE CREDITS				**137**

STUDY PLAN
SKEEH Cohort 2024/2025 (Intake Semester 2)

Code	Course	Credit	Pre-requisite	Total Credit
YEAR 1: SEMESTER 2				
SSCE 1693	Engineering Mathematics I	3		**17**
SEMU 2113	Engineering Science	3		
SKEE 2133	Electronic Instrumentation and Measurement	3		
SKEE 1013	Electrical Circuit Analysis	3		
SKEE 1103	C Programming for Engineers	3		
ULRS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2		
UHLM 1012	Malay Language for Communication 2 (for International Students)			
YEAR 1: SEMESTER 1				
SSCE 1793	Differential Equations	3	SSCE 1693	**18**
SKEE 1012	Introduction to Electrical Engineering	2		
SKEE 1033	Scientific Programming	3		
SKEE 1073	Electronic Devices and Circuits	3	SKEE 1013	
SKEE 1233	Digital Electronic Systems	3		
UHL* 1112	Elective of Foreign Language for Communication	2		
ULRS 1032	Integrity and Anti-Corruption	2		
YEAR 2: SEMESTER 2				
SSCE 1993	Engineering Mathematics II	3	SSCE 1693	**17**
SSCE 2193	Engineering Statistics	3		
SKEE 2073	Signal and Systems	3		
SKEE 3223	Microprocessor	3	SKEE 1223	
SKEE 2433	Principles of Electrical Power Systems	3	SKEE 1013	
ULRF 2**2	Elective of Service Learning and Community Engagement	2		
YEAR 2: SEMESTER 1				
SSCE 2393	Numerical Methods	3		**16**
SKEE 2523	Electromagnetic Field Theory	3	SSCE 1993	
SKEE 3133	System Modelling and Analysis	3	SKEE 2073	
SKEE 3633	Electrical Machines	3	SKEE 2433	
SKEE 2752	Electronic Design Laboratory	2		
ULRS 1022	Philosophy and Current Issues (for Local Students)	2		
ULRS 1022 OR ULRS 1182	Philosophy and Current Issues OR Appreciation of Ethics and Civilizations (for International Students)			

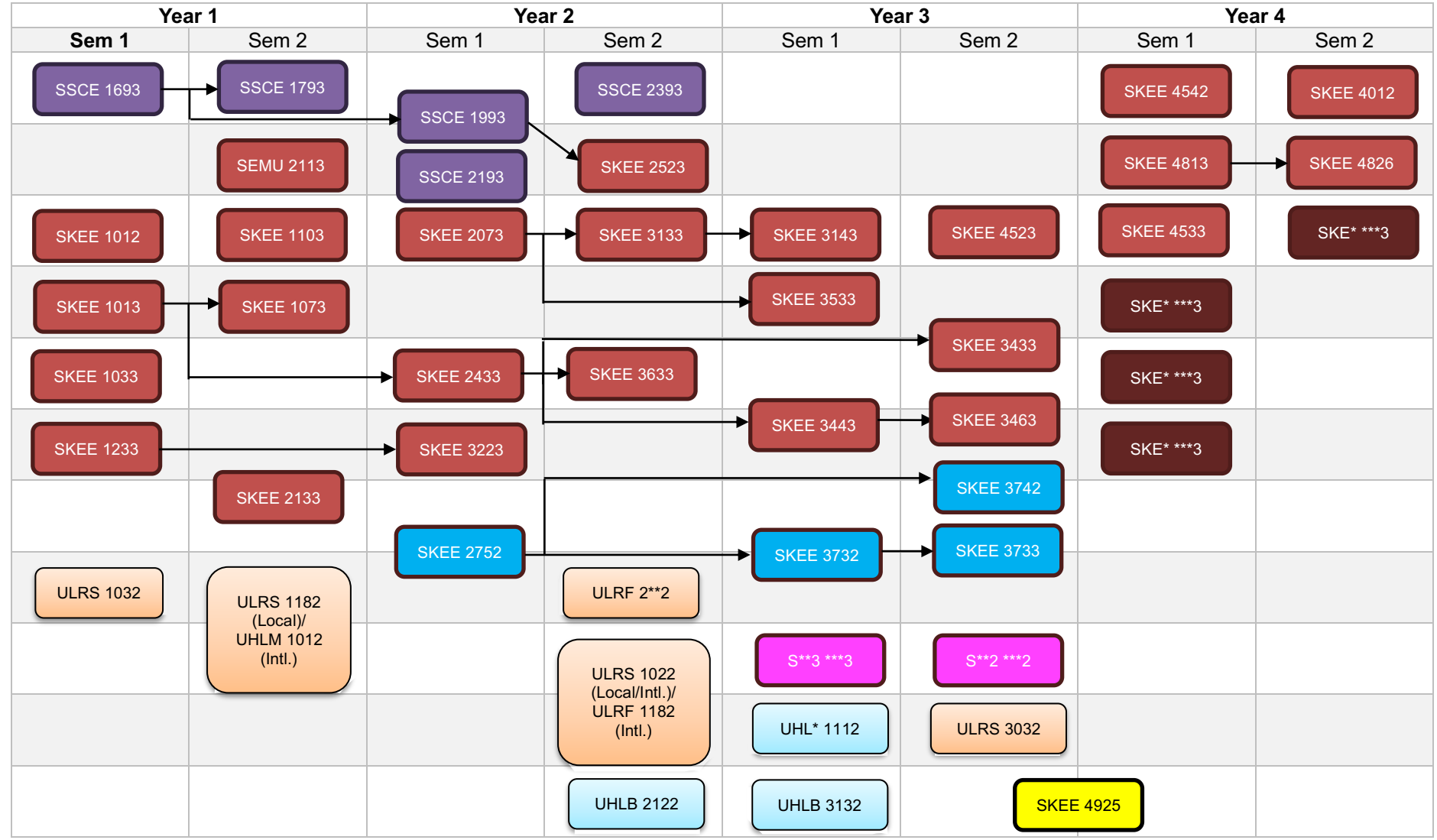
YEAR 3: SEMESTER 2				
SKEE 3433	Power Electronic and Drives	3	SKEE 2433	**18**
UHLB 2122	Professional Communication Skills 1	2	UHLB 2122	
SKEE 3143	Control System Design	3	SKEE 3133	
SKEE 3533	Communication Principles	3	SKEE 2073	
SKEE 3443	Power System Analysis	3	SKEE 2433	
ULRS 3032	Entrepreneurship & Innovation	2		
S*** ***2	Free Elective 2	2		
YEAR 3: SEMESTER 3				
SKEE 3925	Industrial Training	5		**5**
YEAR 3: SEMESTER 1				
SKEE 4542	Engineering Management Principles	2		**18**
SKEE 4533	Electrical Energy Utilisation	3		
SKEE 4523	Power System Protection	3	SKEE 3443	
SKEE 3463	High Voltage Technology	3	SKEE 3443	
SKEE 3732	Common Third Year Laboratory	2		
UHLB 3132	Professional Communication Skills 2	2		
S*** ***3	Free Elective 1	3		
YEAR 4: SEMESTER 2				
SKEE 4813	Methodology of Research and Development	3		**17**
SKE* ***3	Field Elective 1 / PRISMS Elective 1	3		
SKE* ***3	Field Elective 2 / PRISMS Elective 2	3		
SKE* ***3	Field Elective 3 / PRISMS Elective 3 / Faculty Free Elective	3		
SKEE 3742	Specialized Third Year Laboratory	2		
SKEE 3733	Integrated Design Project	3		
YEAR 4: SEMESTER 2				
SKEE 4012	Professional Engineering Practice	2		**11**
SKEE 4826	Final Year Project	6	SKEE 4813	
SKE* ***3	Field Elective 4 / PRISMS Elective 4	3		
CUMULATIVE CREDITS				**137**

Elective Fields (*Choose 4)

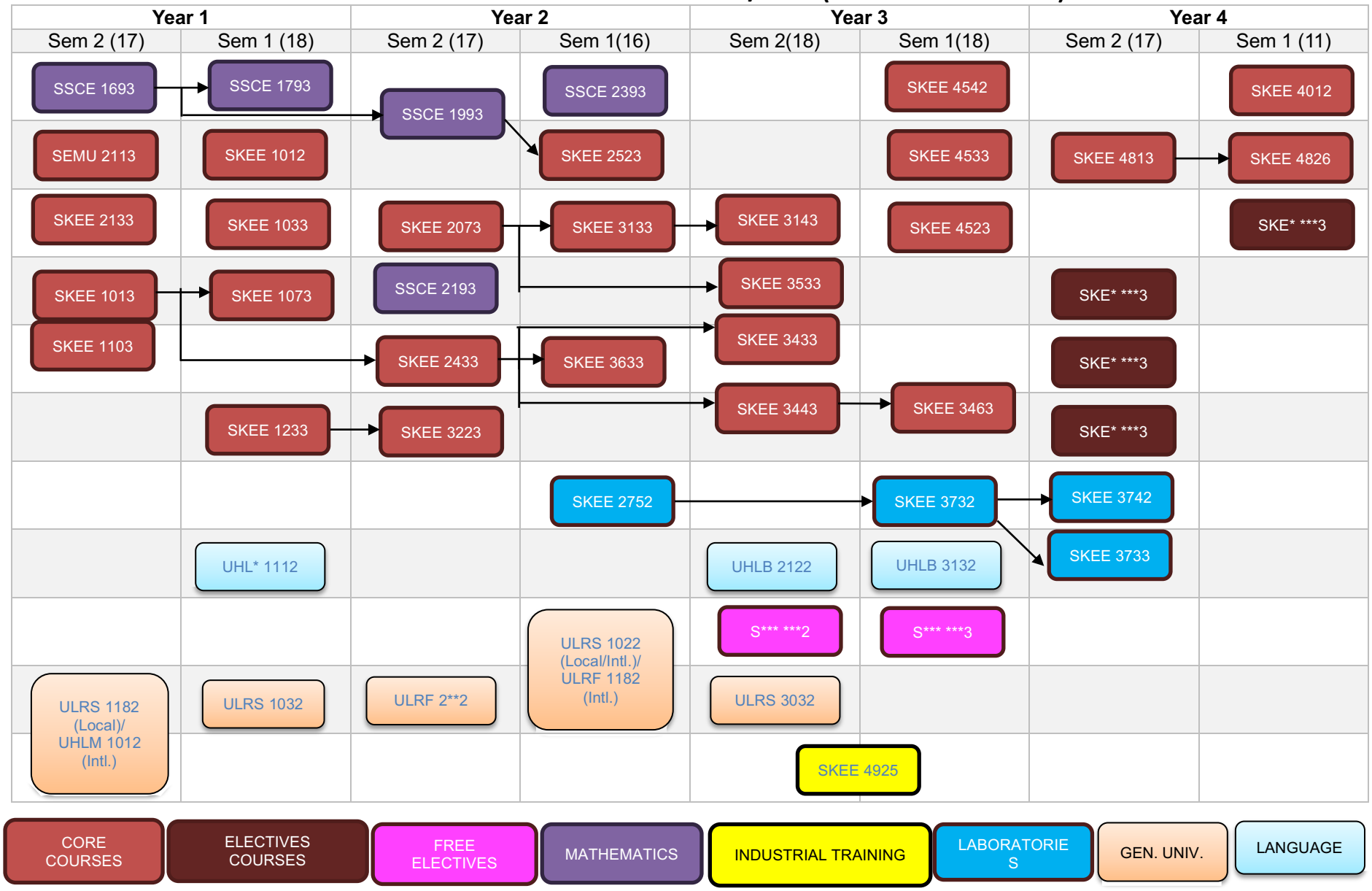
FIELD ELECTIVES			
Code	**Course**	**Credit**	**Pre-requisite**
Power Engineering			
SKEE 4453	Power System Control	3	SKEE 4523
SKEE 4613	High Voltage Testing and Calibration	3	SKEE 3463
SKEE 4643	Control and Design of Power Electronic System	3	SKEE 3433
SKEE 4563	Renewable Energy System and Technology	3	SKEE 3433
SKEE 4663	Electricity for Sustainable Energy	3	SKEE 4523
SKEE 4673	Electrical Energy Market	3	SKEE 3443
SKEE 4683	Power System Design and Operation	3	SKEE 3443
SKEE 4693	Smart Grid	3	
SKEE 4513	Special Topic in Electrical Engineering	3	
Control Engineering			
SKEE 4153	Digital Control System	3	SKEE 3143
SKEE 4173	Industrial Process Control	3	SKEE 3143
SKEM 4113	Modern Control Theory	3	SKEE 3143
SKEM 4183	Industrial Instrumentations and Applications	3	SKEE 2133
SKEM 4193	Advanced Transducers and Sensors	3	SKEM 4183
SKEM 4313	PLC and SCADA System Design	3	SKEE 3143
SKEM 4173	Artificial Intelligence	3	
SKEE 4513	Special Topic in Electrical Engineering	3	
Electronic Engineering			
SKEL 3613	Semiconductor Material Engineering	3	SKEE 1073
SKEL 3263	Electronic System	3	SKEE 1073
SKEL 3233	Digital Signal Processing	3	SKEE 2073
SKEL 3383	RTL Design	3	SKEE 1223
SKEL 4663	Embedded Processor System	3	SKEE 1073
SKEL 4743	Basic Digital VLSI Design	3	SKEE 3263
SKEL 4283	Analog CMOS IC Design	3	SKEE 1073
SKEL 4373	IC Testing Techniques	3	
SKEE 4513	Special Topic in Electrical Engineering	3	
Communication Engineering			
SKET 3573	Microwave Engineering	3	SKEE 3533
SKET 3623	Data Communication and Networks	3	SKEE 3533
SKET 3583	Digital Communication Systems	3	SKEE 3533
SKET 4523	Optical Communication Systems	3	SKEE 3533
SKET 4533	Wireless Communication Systems	3	SKET 3573
SKET 4543	RF Microwave Circuit Design	3	SKET 3573
SKET 4593	Acoustic Engineering	3	SKEE 3533
SKET 4623	Network Programming	3	SKET 3623
SKEE 4513	Special Topic in Electrical Engineering	3	
PROGRAM INTEGRASI SARJANA MUDA-SARJANA (PRISMS)			
SKEE 5533	Power Electronics Systems	3	
SKEE 5583	High Voltage and Electrical Insulation	3	
SKEE 5603	Power System Analysis and Computational Method	3	
SKEE 5563	Power Quality	3	
SKEL 5113	Advanced Nanoelectronics Devices	3	
SKEL 5123	Advanced Microprocessor System	3	

SKEL 5173	Advanced Digital System Design	3	
SKEL 5193	Advanced Analog CMOS IC Design	3	
SKET 5313	Communication and Computer Network	3	
SKET 5423	Advanced Wireless Communication System	3	
SKET 5513	Sustainable Design, Engineering and Management	3	
SKET 5523	Internet of Things Technologies	3	
SKEM 5753	Advanced Instrumentation and Measurement	3	
SKEM 5713	Artificial Intelligence and Applications	3	
SKEM 5703	Control System Engineering	3	

COURSE FLOW SKEEH COHORT 2024/2025 (INTAKE SEMESTER 1)



COURSE FLOW SKEEH COHORT 2024/2025 (INTAKE SEMESTER 2)



GRADUATION CHECKLIST

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

NO	CODE	COURSE	CREDIT EARNED	CREDIT COUNTED	TICK (/) IF PASSED
ENGINEERING COURSES					
1	SKEE 1012	Introduction to Electrical Engineering	2	2	
2	SKEE 1013	Electrical Circuit Analysis	3	3	
3	SKEE 1033	Scientific Programming	3	3	
4	SKEE 1233	Digital Electronic Systems	3	3	
5	SEMU 2113	Engineering Science	3	3	
6	SKEE 1103	C Programming for Engineers	3	3	
7	SKEE 1073	Electronic Devices and Circuits	3	3	
8	SKEE 2133	Electronic Instrumentation and Measurement	3	3	
9	SKEE 2073	Signals and Systems	3	3	
10	SKEE 3223	Microprocessor	3	3	
11	SKEE 2433	Principles of Electrical Power Systems	3	3	
12	SKEE 2752	Electronic Design Laboratory	2	2	
13	SKEE 3133	System Modelling and Analysis	3	3	
14	SKEE 2523	Electromagnetic Field Theory	3	3	
15	SKEE 3633	Electrical Machines	3	3	
16	SKEE 3143	Control System Design	3	3	
17	SKEE 3533	Communication Principles	3	3	
18	SKEE 3443	Power System Analysis	3	3	
19	SKEE 3732	Common Third Year Laboratory	2	2	
20	SKEE 3742	Specialized Third Year Laboratory	2	2	
21	SKEE 3733	Integrated Design Project	3	3	
22	SKEE 3433	Power Electronic and Drives	3	3	
23	SKEE 4523	Power System Protection	3	3	
24	SKEE 3463	High Voltage Technology	3	3	
25	SKEE 3925	Industrial Training	5	HL	
26	SKEE 4542	Engineering Management Principles	2	2	
27	SKEE 4533	Electrical Energy Utilisation	3	3	
28	SKEE 4813	Methodology of Research and Development	3	3	
29	SKEE 4826	Final Year Project	6	6	
30	SKEE 4012	Professional Engineering Practice	2	2	
31	SKE* ***3	Field Elective 1 / PRISMS Elective 1	3	3	
32	SKE* ***3	Field Elective 2 / PRISMS Elective 2	3	3	
33	SKE* ***3	Field Elective 3 / PRISMS Elective 3 / Faculty Free Elective	3	3	
34	SKE* ***3	Field Elective 4 / PRISMS Elective 4	3	3	
		Total Credit of Engineering Courses (A)	**101**	**96**	

MATHEMATICS COURSES					
1	SSCE 1693	Engineering Mathematics 1	3	3	
2	SSCE 1793	Differential Equations	3	3	
3	SSCE 1993	Engineering Mathematics 2	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: Malaysia Core Value					
1	UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	2	
	UHIS 1022 OR UHMS 1182	Philosophy and Current Issues 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: Value and Identity					
1	ULRS 1032	Integrity and Anti-Corruption	2	2	
Cluster 3: Global Citizen					
1	UKQF 2**2	Service Learning & Community Engagement	2	2	
Cluster 4: Communication Skill					
1	UHLB 2122	Professional Communication Skills 1	2	2	
2	UHLB 3132	Professional Communication Skills 2	2	2	
3	UHL* 1112	Foreign Language for Communication	2	2	
Cluster 5: Enterprising Skill					
1	ULRS 3032	Entrepreneurship & Innovation	2	2	
		Total Credit of University General Courses (C)	**16**	**16**	
FREE ELECTIVE COURSES					
1	S*** ***3	Free Elective 1	3	3	
2	S*** ***2	Free Elective 2	2	2	
		Total Credit of Free Elective Courses (D)	**5**	**5**	
Total Credit to Graduate (A + B + C + D)			**137**	**132**	

OTHER COMPULSORY COURSES - PROFESSIONAL SKILLS CERTIFICATE (PSC)

Students are required to enroll and pass FIVE (5) PSC courses, in order to be eligible to graduate.

COMPULSORY PSC COURSES (Enroll all 3 courses)			
1	GLRB0010	Design Thinking for Entrepreneur	
2	GLRM0010	Talent and Competency Management	
3	GLRL0010	English Communication Skills for Graduating Students	
ELECTIVE PSC COURSE (Choose 2 only)			
1	GLRT0010	Data Analytics for Organization	
2	GLRM0020	Professional Ethics and Integrity	
3	GLRT0020	Construction Measurement (Mechanical & Electrical)	
4	GLRT0030	OSHE For Engineering Industry and Laboratory	
5	GLRT0050	Quality Management for Built Environment and Engineering Professionals	
6	GLRT0060	Safety and Health Officer Introductory Course	
7	GLRT0070	Industrial Machinery and Lubrication	

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Power Electronics Converter, converter Modelling and Control

COURSE SYNOPSIS

SKEE 1012: Introduction to Electrical Engineering
This course serves as a general introduction to electrical engineering programmes offered by the Faculty of Electrical Engineering, 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 of the responsibilities of electrical engineers to society. By exploring contemporary issues, the students would be able to suggest sustainable solutions to mankind and its environment.

SKEE 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 Ohm's 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 were also exposed to the steady-state electrical circuit. Afterwards, the relevant concepts in transient circuit analysis for first and second order circuits are taught to the students. With the knowledge learned, the student would be able to apply the basic laws, theorems and methods of analysis for solving completely with confidence various problems in circuit analysis.

SKEE 1033: 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. 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. Students also will be introduced to create scientific documents using LaTeX programming language.

SKEE 1233: Digital Electronic Systems
This course teaches the principles of digital systems. From signal concepts and number systems and codes, it proceeds to logic gates, their relationship to Boolean algebra, logic simplification, and the integration of gates to form digital circuits for medium-scale integration, arithmetic logic, registers, and counters. It covers combinational and sequential logic circuits, including finite state machines, emphasizing circuit design and analysis. This course uses an industry-standard engineering software tool to design and simulate digital circuits.

SKEE 1103: C Programming for Engineers
This course introduces students to basic programming concepts and problem-solving techniques, with an emphasis on embedded systems. The course begins with an introduction to
computer structures, before moving on to C programming concepts (editing, compiling, and debugging). Programs will be modeled with high level programming constructs (sequence, selection, looping) along with design tools (pseudocode and flowchart). Students will apply these ideas to arithmetic expressions, bit manipulations, arrays, strings, pointers, user-defined functions, and basic C library functions. By the end of the course, students should be able to run
simple input/output demonstration programs on a single board computer to show their understanding.

SKEE 1073: Electronic Devices and Circuits | Pre-requisite: SKEE 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 behavior of the electronic devices and predict the behavior of the electronic circuits, this course makes use of simulation software. The goal of this course is to develop excellent understanding of the devices operation for students to be applied in analogue circuit design.

SKEE 2133: Electronic Instrumentation and Measurement
This course introduces students to some of the metrological terminologies used in experimental methods, concept of metrology and its applications. The course will also provide the students with an understanding on the concept of electrical measurement quantity using analogue and digital instruments. The interfaces of the instruments with embedded sensors and also the acquired signal quality analysis is 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, characteristics and functions will be discussed. P&ID diagram will also be introduced. This course includes hands-on activities using the latest embedded system related to electrical and electronic measurement.

SKEE 2073: Signal and Systems
This course introduces the students to 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.

SKEE 3223: Microprocessor | Pre-requisite: SKEE 1223 (Digital Electronic Systems)
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 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.

SKEE 2433: Principles of Electrical Power Systems
This course introduces fundamental concepts of power systems, magnetic circuits and transformer. 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 magnetic circuits in transformers, power in ac circuits, three-phase system, power system generation and component modeling and analysis in power system transmission.
At the end of the course, the students are expected to critically analyze the power system comprising of generation and transmission.

SKEE 2752: Electronic Design Laboratory
In this course, the students will attend four 2nd year laboratories namely Electrotechnic, Basic Electronic, Digital Electronic and Instrumentation Laboratories. The students will attend a three-hour lab per week. The

students are expected to complete 3 experiment topics for each lab in three weeks. In total, the student will perform 12 experiments. All experiments in the laboratories are emphasized on the design case for a given complex engineering problem or project. The students will use appropriate software simulation tools to assist them during the design process.

SKEE 2523: Electromagnetic Field Theory | Pre-requisite: SSCE1993 (Engineering Mathematics II)
This course presents several major collective understandings and theories within the area of electrostatic, magnetostatic and electromagnetic fields to the students. The abovementioned electromagnetic field theory is succinctly summarized via Maxwell's equations. Here, the course is conducted with the assumption that the enrolled students are already equipped with the necessary mathematical foundations including multivariable calculus. Furthermore, they should also possess some familiarity with basic concepts covered in the typical introductory circuit theory course such as resistance, capacitance and inductance to list a few.

SKEE 3133: System Modelling and Analysis | Pre-requisite: SKEE 2073 (Signal and Systems)
This course introduces the students to the fundamental ideas and definitions of control systems, open loop and closed loop control systems, process of control system design and representation. Students will be taught how to obtain mathematical models of actual physical systems such as electrical, mechanical and electromechanical systems in transfer function (frequency domain) and state space equations (time domain). Methods of system representation such as block diagram representation and signal flow graphs will be examined. The students will be exposed to techniques of analyzing control systems performance and stability in the time domain. Finally, to simulate the stability and performance of the systems using software tools.

SKEE 3633: Electrical Machines| Pre-requisite: SKEE 2433 (Principles of Electrical Power Systems)
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 switch reluctance machines and permanent magnet DC 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.

SKEE 3143: Control System Design| Pre-requisite: SKEE 3133 (System Modelling and Analysis)
The course begins with the root locus designs using root locus procedures and MATLAB. Then, PID controller will be designed using the root locus approach. The PID controller and lead-lag compensator will be used to improve the transient and steady state performances in the 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.

SKEE 3533: Communication Principles | Pre-requisite: SKEE 2073 (Signal and Systems)
This course introduces students to the basic principles of communication systems. The fundamental concepts of analogue modulation in particular amplitude and frequency modulations will be covered. 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 band-pass digital modulations are introduced. The system performance in terms of signal to noise ratio (SNR) and bit error rate (BER) will also be covered, as well as studied methods to utilize the communication resource efficiently (e.g., multiplexing, multiple access). The course will utilize parts of the Ericsson Educate initiative learning materials, and/or feature invited industry speaker(s). At the end of the course students should be able to explain, evaluate and solve problems related to communication systems.

SKEE 3732: Common Third Year Laboratory | Pre-requisite: SKEE 2752 (Electronic Design 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 four different laboratories (Basic Power, Basic Communication, Instrumentation, Microprocessor). 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.

SKEE 3443: Power System Analysis| Pre-requisite: SKEE 2433 (Principles of Electrical Power Systems)
This course is designed to introduce the per-unit representation of power system and the applications of power system analysis in a practical power system. Topics include: per unit, 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.

SKEE 3742: Specialized Third Year Laboratory | Pre-requisite: SKEE 2752 (Electronic Design Laboratory)
The 3rd Year Specialised Laboratory is a required course for third year students in the Bachelor of Engineering degree program. This course requires students to conduct four experiments in four different laboratories depending on their degree major and electives. 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 hours/week) within three weeks. The students are required to solve the given project as a team, design suitable experimental procedures and conduct the experiments, design suitable experimental procedures and conduct the experiments, present the problem solutions and submit a report following a standard journal format.

SKEE 3733: Integrated Design Project | Pre-requisite: SKEE 3732 (Common Third Year Laboratory)
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 an optional 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. The project produced from this course needs to address one or more relevant Sustainable Development Goals such as good health and well-being, quality education, industry, innovation and infrastructure depending on the nature of the project.

SKEE 3433: Power Electronics and Drives| Pre-requisite: SKEE 2433 (Principles 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.

SKEE 4523: Power System Protection| Pre-requisite: SKEE 3443 (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.

SKEE 3463: High Voltage Technology| Pre-requisite: SKEE 3443 (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, including high voltage generation, are also covered. Lightning, switching and temporary overvoltages will also be discussed. Various types of electrical discharges, some of which are used for condition monitoring applications, will also be discussed. The students are expected to be able to apply the concept of high voltage engineering in designing solutions for complex high voltage engineering problems.

SKEE 3925: Industrial Training
Students will undergo an industrial training lasting for 12 weeks at an approved private, government or semi-government agency. Placement at the respective agencies will be initiated by the applications from the students. Approval of the application is at the discretion of the Faculty. 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. Industrial Guidance, Independent and Dependent Learning discrete implementation can make this course a work based learning course.

SKEE 4542: Engineering Management Principles
Today's technological society is constantly changing and with the change comes a need for the engineer to be able to address the technological societal challenges and opportunities for the future. Engineers are a key element today in the role to maintain technological leadership and a sound economy while the world becomes flatter in today's global economy. To do this the engineer needs to remain alert to changing products, processes, technologies, and opportunities and be prepared for a creative and productive life and position of leadership. This course introduces the engineer to the ways in which principles of management, project management and financial management have been and are applied in the kinds of work they are almost likely to encounter. Today these principles are needed by the engineering manager and those they manage. The basic outline of the course looking at the four main management functions followed by the functions of project management. Finally, the course further discusses on financial management in achieving organization goals and objectives efficiently and effectively.

SKEE 4533: Electrical Energy Utilisation
This course introduces students to the electrical energy consumption calculation, electrical tariff, and energy audit. The course also exposes the student to the various utilization of electrical energy such as electrical heating and cooling systems for residential and industrial. The student also will be introduced on the application of electrical traction.

SKEE 4813: Methodology of Research and Development
This course introduces the scientific method for conducting research and development projects, particularly in electrical engineering (EE). It covers topics such as problem formulation and objective, literature review, research methodology and design, data collection and analysis, research management and ethics. It also emphasizes technical writing skills for scientific publications, research proposals and thesis. The main objective is to equip the students with a solid background of methods to plan and conduct research and development projects, which will benefit their undergraduate final year project. The general principles of this course are applicable to other disciplines besides EE.

SKEE 4012: Professional Engineering Practice
This course introduces and exposes the students to the concepts, theories, and practice of Professional Engineer. It highlights the works of professionals in engineering, relevant acts and regulations, engineering code of ethics, engineers' roles and responsibilities, engineering ethics, the impact of the work of engineers on society, and knowledge to cater the needs for sustainable development. In terms of knowledge of accreditation of engineering programmes, the internationalization of engineers and sustainability, elements of EAC,

Washington Accord and the UN's sustainable development goals (SDGs) 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.

SKEE 4826: Final Year Project | Pre-requisite: SKEE 4813 (Methodology of Research and Development)
This course introduces the scientific method for conducting research and development projects, particularly in electrical engineering (EE). It covers topics such as problem formulation and objective, literature review, research methodology and design, data collection and analysis, research management and ethics. It also emphasizes technical writing skills for scientific publications, research proposals and thesis. The main objective is to equip the students with a solid background of methods to plan and conduct research and development projects, which will benefit their undergraduate final year project. The general principles of this course are applicable to other disciplines besides EE.

SKEE 4453: Power System Control | Pre-requisite: SKEE 4523 (Power System Protection)
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.

SKEE 4613: High Voltage Testing and Calibration | Pre-requisite: SKEE 3463 (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.

SKEE 4643: Control and Design of Power Electronic System | Pre-requisite: SKEE 3433 (Power Electronic 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.

SKEE 4563: Renewable Energy System and Technology | Pre-requisite: SKEE 3433 (Power Electronic 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.

SKEE 4663: Electricity for Sustainable Energy | Pre-requisite: SKEE 4523 (Power System Protection)
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, energy efficiency (EE) measures and energy audit implementation under this course. Students will also be exposed to design and model renewable energy integration 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.

SKEE 4673: Electrical Energy Market | Pre-requisite: SKEE 3443 (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.

SKEE 4683: Power System Design and Operation | Pre-requisite: SKEE 3443 (Power System Analysis)
This course embodies the basic principles and objectives of fundamentals of power system analysis. The aim is to instill confidence and apply the basic concepts of power systems for further study and practice of electric power engineering. The course also provides an in-depth understanding of how the entire electricity network is built, i.e., from generation to 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 completing the course, the students would easily fit into the industry, having acquired knowledge.

SKEE 4693: Smart Grid
This course introduces students to the smart grid system including its components and operation. The course also exposes the students to the smart grid elements including communication, monitoring and cyber security. The students also will be introduced to the protection and main pillars of the smart grid, also challenges for future implementation. At the end of the course, the students should be able to relate and analyse the concept of a smart grid based on an existing smart grid system.

SKEE 4153: Digital Control System | Pre-requisite: SKEE 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.

SKEE 4173: Industrial Process Control | Pre-requisite: SKEE 3143 (Control System Design)
This course provides an introduction to 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 its endless application.

SKEM 4113: Modern Control Theory | Pre-requisite: SKEE 3143 (Control System Design)
This is a module of modern control theory for linear dynamical systems. It focuses on analysis and synthesis of controllers in the time domain. The module introduces students to the techniques and analysis of dynamical systems using state-space models. The major topics covered are: Introduction to State-Space Model; Solution of State-Space Model; Canonical Forms of StateSpace Model; Controllability and Observability; State Feedback and State Estimation; Linear Quadratic Optimal Control and Stability. MATLAB software is utilised throughout the course. Design on case study will be explored

SKEM 4183: Industrial Instrumentation and Application | Pre-requisite: SKEE 2133 (Electronic Instrumentation and Measurement)
This course presents the principles of industrial instrumentations. Students will be taught about various instruments used for different types of measurement. The course will enable students to understand the process of selecting measuring instruments and final control elements for performing different kinds of applications. At the end of the course student should be able to design industrial instruments according to the given specifications.

SKEM 4193: Advance Transducers and Sensors
This course is an introduction the advanced transducers and sensors. This course introduces students to the major views and theories in transducers and sensors. It will examine some key principles of measurement and the importance of transducers on process industries. Students are required to demonstrate competencies in the use of various transducers depending on project requirement and able to show proficiency in choosing transducers for different measurement and applications. 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 transducers, displacement sensors, flow sensors, level sensors, position sensors, motion sensors and biometrics. Special topic in Flow Measurement Techniques use Process Tomography Applications.

SKEM 4313: PLC and SCADA 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.

SKEM 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, Machine Learning (ML), Deep Learning (DL) and optimization methods (such as 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.

SKEL 3613: Semiconductor Material Engineering
This course introduces students to 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 the fundamentals of P-N structures. At the end of the course student should understand the operation of present day and future electronic devices.

SKEE 3263: Electronic Systems| Pre-requisite: SKEE 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 instrumentations. 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.

SKEL 3233: Digital Signal Processing | Pre-requisite: SKEE 2073 (Signal and Systems)
This course introduces concepts in digital signal processing. Continuous-time signals and systems will be reviewed. Consecutively, introduction to digital signal processing, the 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, Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT). Another domain presented is z- transform, which consists of topics on derivations, the region of convergence, transformation properties, poles and zeros, and inverse z-transform. At the end of the course, analysis and design of digital filter cover filter basics, analog filter prototypes, and design of IIR and FIR filters.

SKEL 3383: RTL Design | Pre-requisite: SKEE 1233 (Digital Electronic 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.

SKEL 4663: Embedded Processor 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. 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**.**

SKEL 4743: Basic Digital VLSI Design | Pre-requisite: SKEE 1233 (Digital Electronic Systems)
This course aims to introduce students to basic techniques to design and implement VLSI circuits. 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 behavior, 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 are investigated. Fabrication processes are elaborated. Layout, design rules, and stick diagram are explained. Several logic families will be introduced. The advantages and disadvantages of each logic design style are explained. Delay and power performance of each logic family are also compared. Latch and flip-flop circuits are also covered. Interconnect issues, when various components are connected, are elaborated. To gain a better understanding of a complete design, a subsystem design in the form of adder circuits are included.

SKEL 4283: Analog CMOS IC Design | Prerequisite: SKEE1073 (Electronic Devices and Circuits)
In this course students will be taught the characteristics of a 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 analyze CMOS single ended as well as differential amplifiers. The trademark of analog design, which is the design challenge to fulfill 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.

SKEL 4373: IC Testing Techniques
This course introduces students to the techniques of testing a digital circuit and designing a testable digital circuit. Several fault models including a single stuck-at fault model will be analyzed in detail. 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 the learning process, computer-aided design (CAD) software is used throughout the course. Some practical or almost actual environmental problems and solutions are provided.

SKET 3573: Microwave Engineering
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, traveling wave tubes, filters, and microwave solid-state devices. Fundamentals in microwave instruments and measurement techniques are introduced.

SKET 3623: Data Communication and Networks
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 interworking between computer networks and switching components in telecommunication systems. 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 networks.

SKET 3583: Digital Communication Systems
This course introduces the fundamental concepts in digital communication systems. Main topics to be covered

are information theory, baseband transmission, detection methods, signal space analysis, digital modulation and channel coding. The system tradeoffs in designing a digital communication system will also be discussed.

SKET 4523: Optical Communication Systems
This course will provide students with an understanding of optical communication systems. The first part of this course will review basic properties of light, fibers and waveguides. In this part, the emphasis is on the fiber transmission characteristics such as attenuation, absorption, scattering, dispersion and fiber bending loss which influences optical communication system performances. The second part of this course will cover light sources and detectors used in optical transmitter and receiver systems. Basic principles of Light Emitting Diode (LED) and laser as optical sources, and its suitable power launching and coupling technique will be discussed. As for the detectors, p-n junction photodiode (PN), positive-intrinsic-negative photodiode (PIN) and avalanche photodiode (APD) will be covered to gain understanding on receiver performance issues including noise, sensitivity and bandwidth. The last part of this course will introduce students to optical link power budget and rise time budget analysis as a guideline in designing optical communication systems.

SKET 4533: Wireless Communication Systems
This course introduces students to the concepts and principles of mobile radio as well as satellite communication systems. Topics covered include mobile radio propagation, multiple access, cellular concept, modern wireless communication systems plus operation and subsystems of satellite communication. The course will utilize parts of the learning materials and/or feature invited speaker(s) from the Ericsson Educate initiative.

SKET 4543: RF Microwave Circuit Design
This course introduces students to the concept of designing RF/Microwave circuits in wireless communication systems 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 the communication system. The filter design is based on the lump component and the response 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 mixers is also discussed in this subject. Microwave simulation software will also be introduced to facilitate the learning process.

SKET 4593: Acoustic Engineering
This course embodies the basic principles of fundamentals of acoustics engineering. The aim is
mainly to instill 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 covers 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 rooms for optimum acoustics and sound system.

SKET 4623: Network Programming
The aim of this course is to familiarize students with the fundamentals of network programming within networking contexts. Through this course, students will gain insight into socket programming for establishing connections between computers or devices in a network. The module will cover topics such as treads, input-output streams, handling errors and exceptions, multi-threading and security in socket programming. Upon completion of the course, students will be able to interface between clients and servers and perform network analysis.

SKEE 4513: Special Topic in Electrical Engineering

The Special Topic in Electrical Engineering course offers an in-depth exploration of emerging and advanced concepts within the electrical engineering field which will be taught by the visiting professor. This course is intended for students with a solid foundation in electrical engineering principles and looking to expand their knowledge in specific areas of interest. It is designed to allow students to explore specialized areas of electrical engineering beyond the scope of the regular curriculum. This course aims to foster critical thinking, problem-solving skills for complex engineering problems, and an understanding of cutting-edge technologies shaping the future of electrical engineering. All these components are vital to understanding the operation of present-day devices and any future development in the field. At the end of the course, students will be prepared for further research, industry positions, or advanced studies in electrical engineering.

SKEE 5533: Power Electronic 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: 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, CCM, DCM operation, non-idealities, isolated topologies-Flyback, Forward, switched-mode power supply. 4. DC to AC conversion: single-phase, three-phase, harmonics, PWM and SVM techniques and multilevel inverter topologies. The focus is on the design of power converters for specific applications such as utility, domestic appliance, electric vehicle and industrial applications.

SKEE 5583: High Voltage and Electrical Insulation

This course provides an understanding of high voltage phenomena and presents 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 an introduction to the dielectric properties of materials, diagnostic testing of insulation, overvoltages and insulation coordination. By adapting the knowledge, the students will be able to develop essential technical skills in solving real-world problems involving insulation characteristics. The students will conduct simulation work to solve engineering problems related to high voltage engineering applications.

SKEE 5603: Power System Analysis and Computational Method

This course provides students with an overview of the engineering matter involved in formulating rigorously power system network model at steady state. The application of Bus impedance 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 Newton-Raphson Method and the Decoupled Load Flow. The student is expected to be familiar in using standard load flow analysis program. The programs will be tested with IEEE test systems with the aim to achieve results comparable with commercial software. 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.

SKEE 5563: Power Quality

This course introduces students to the fundamentals of electrical power quality and its effect on power system performance. Emphasis will be on the different power quality issues, their sources, effects and different related standards. For each type of disturbances, case-study examples and concepts are provided. Following that, the solution of the problem is discussed in order to understand and maximize the available benefits. At the end of the course, the measurement technique is introduced to expose an idea commonly present in the actual system. By combining the knowledge obtained, students will be able to conduct power quality measurement, analysis the data and suggest suitable mitigation for different types of the power quality problem.

SKEL 5113: Advanced Nanoelectronics Devices
This course introduces students to the semiconductors form the basis of most modern electronic 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. At the end of the course, students should understand how to bring together quantum mechanics, the quantum theory of solids, semiconductor material physics, and semiconductor device physics. All these components are vital to the understanding of both the operation of present-day devices and any future development in the field.

SKEL 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.

SKEL 5173: Advanced Digital System Design
This course is designed for students to learn and be able to design and verify complex digital synchronous systems - towards becoming an RTL digital hardware designer in industry. This is a course that goes beyond the introductory course on digital basic principles and techniques. This course introduces digital circuit modeling with hardware description languages (HDLs), which is the key technique to modern design of integrated circuits (ICs). The technique involves a CAD approach in which a high-level, text-based, abstract description of the circuit is created, then synthesized to a hardware implementation in a selected technology, and finally verified for its functionality and timing.

SKEL 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 amplifiers, where 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 that include differential amplifiers and op amps will be studied in detail towards the end of the course.

SKET 5313: Communication and Computer Networks
This course will enhance students' knowledge in communication and computer networks. It explains the advanced concept of transport and network layers, protocols, interfacing and interworking 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.

SKET 5423: Advanced Wireless Communication Systems
This course introduces students to advanced wireless communication system and technologies. Students will be presented with the concept of wireless communication systems and mobile radio propagation. Next, the course will describe cellular concepts that will include small cell networks. Students will then be exposed to multiple access techniques and MIMO technology. This is followed by reviewing the overall evolution and future trends of cellular communication systems. The course utilizes parts of the learning materials and/or feature invited speaker(s) from the Ericsson Educate initiative.

SKET 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 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 and green technology. The students also will experience conducting case studies and project-based learning based on 4 themes in sustainability: connecting, conceptualizing, valuing and implementing.

SKET 5523: Internet of Things Technologies
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. To provide insights from an industrial perspective, the students will also be introduced to guest speakers from Ericsson, a leading multinational networking and telecommunication company, and its Ericsson Educate program modules. It is recommended for the students taking this course to have programming skills and knowledge on networking.

SKEM 5753: Advanced Instrumentation and Measurements
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.

SKEM 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.

SKEM 5703: Control System 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.

COURSE APPROVAL

MORE THAN 18 CREDITS

Students are **not allowed** to take more than 21 credit hours

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Notes

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