UTM
UNIVERSITI TEKNOLOGI MALAYSIA

ACADEMIC SESSION
2025/2026

UNDERGRADUATE ACADEMIC GUIDELINES

FACULTY OF CIVIL ENGINEERING

civil.utm.my

INNOVATING SUSTAINABLE SOLUTIONS

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This book contains brief information about Full-time Undergraduate Degree Programme in Civil Engineering at the UTM- Faculty of Civil Engineering Universiti Teknologi Malaysia. Detailed information on the academic matter scan be obtained from the following documents:
UTM Prospectus
UTM Academic Regulations

The contents of this book are accurate at the time of printing. Any amendments or clarification is subject to the discretion of the UTM-Faculty of Civil Engineering, Universiti Teknologi Malaysia.

Academic guidelines undergraduate degree programme for session 2024/2025 UTM-Faculty of Civil Engineering

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FOREWORD
FROM THE DEAN

Assalamualaikum wrt. wbt. and Greetings,

It is my great pleasure to welcome you to the Faculty of Civil Engineering (FKA), Universiti Teknologi Malaysia, for the academic session 2025/2026. Joining FKA marks the beginning of an exciting and meaningful journey, as our faculty continues to uphold its strong reputation as one of the leading civil engineering faculties in Malaysia and consistently recognized among the top institutions worldwide.

At FKA, we are dedicated to nurturing a conducive and inspiring learning environment that supports your academic growth and professional aspirations. We take pride in guiding and preparing you to become competent, innovative, and responsible civil engineers who will contribute significantly to society.

This Academic Guidelines handbook has been designed to assist you in navigating your studies with confidence. It provides important information to ensure transparency, consistency, and clarity in academic matters, while also encouraging you to take charge of your learning journey. By familiarizing yourself with the guidelines, you will be better equipped to fulfill academic requirements, make informed decisions, and actively engage with the faculty and university community.

We are honored that you have chosen the Faculty of Civil Engineering, UTM, as your platform for academic and professional development. I encourage you to embrace every opportunity, face challenges with resilience, and make the most of your time here

On behalf of the faculty, I wish you every success in your endeavors.

Thank you, Wassalam.

Professor Ts. Dr. Mohd Rosli bin Hainin
Dean
Faculty of Civil Engineering
Universiti Teknologi Malaysia

UTM

FACULTY OF CIVIL ENGINEERING

UTM's establishment is in line with the development of the civil engineering faculty since the objective and its inception was to train Technical Assistants for the Department of Railways, Survey and Public Works, Federated Malay States. UTM started in 1904 when the Treacher Technical School began its operation at Weld Road (now Jalan Raja Chulan) to train Technical Assistants.

The school was then upgraded to the status of Technical College and officially opened on March 1, 1905, officiated by the British High Commissioner, Sir Donald Mac Gillivray. The college offered courses at a Diploma level, and one of the courses was a Diploma in Civil Engineering. On March 1972, His Majesty DYMM Yang Dipertuan Agong officially proclaimed the formation of Institut Teknologi Kebangsaan (ITK) under section 5 (1) of the university and University College Act, 1971. On 1 April 1975 the institute reached another milestone of its history when it was officially declared as Universiti Teknologi Malaysia. The faculty of civil engineering started with a Department of Engineering in 1972, and later became a faculty in 1975. The journey of the faculty started as a college becoming an institute and finally a faculty.

In 1989, the faculty moved from the UTM Kuala Lumpur Campus at Jalan Semarak to UTM Johor Bahru Campus. During its initial formation, the faculty had 3 departments, namely the Structures and Materials Department, the Hydraulics and Hydrology Department and the Geotechnics and Transport Department. The new Environmental Engineering Department was set up in 1976. To support the service and future development of the faculty, two (2) management units were formed. The units are Surveying Unit and Civil Engineering Testing Unit (CETU). The faculty has a long history of producing distinguished graduates who have contributed substantially to the development of the infrastructure in Malaysia.

In undertaking the restructuring of its academic entity and witnessing the merger of faculty from 2018, Universiti Teknologi Malaysia has embarked on a unique history when 18 to seven. The restructuring is effective from 1 July 2018. The restructuring, known as UTM Synergy 4.0 leads the university to have only seven faculties, one of them is Faculty of Engineering. This major transformation is meant to open more opportunities for synergy and collaborations between academicians from different academic disciplines and innovation in offering academic programs that can fulfill the new needs of society.

The Faculty of Engineering is a result of the merger of Faculty of Civil Engineering, Faculty of Electrical Engineering, Faculty of Mechanical Engineering, Faculty of Chemical and Energy Engineering, Faculty of Computing and Faculty of Bioscience and Medical Engineering. Then, the name of the School of Civil Engineering was established after the merger of the Faculty of Engineering. In 2022, the School of Civil Engineering reverted to being the Faculty of Civil Engineering.

MISSION, VISION & MOTTO

Mission
To spearhead excellence in the development of education, talent and innovative wellbeing and prosperity.

Vision
To be a globally prominent Civil Engineering Centre for education, research and innovation.

Motto
"ALWAYS AHEAD"

UTM UNIVERSITI TEKNOLOGI MALAYSIA | Faculty of Civil Engineering

FACTS AND FIGURE

POSTGRADUATE STUDENTS: 485	UNDERGRADUATE STUDENTS: FT 1006
ACADEMIC STAFF: 118	STAFF WITH PHDS: 115
GRADUATES EMPLOYABILITY RATE AS OF MAY 2025: 91.54 %	GRADUATES MARKETABILITY RATE AS OF MAY 2025: 96.15 %

IR.: 29	ADMIN STAFF: 39
SR.: 1	TECHNICAL STAFF: 41
TS.: 28	SUPPORTING STAFF: 80

FACULTY OF CIVIL ENGINEERING I ALWAYS AHEAD

Organization Chart
Faculty of Civil Engineering

UTM Faculty of Civil Engineering
UNIVERSITI TEKNOLOGI MALAYSIA

PROF. TS. DR. MOHD ROSLI BIN HAININ
Dean

ASSOC. PROF. IR. TS. DR. MOHAMAD HIDAYAT BIN JAMAL
Deputy Dean (Academic & Student Affairs)

PROF. IR. TS. DR. AHMAD SAFUAN BIN A. RASHID
Deputy Dean (Research, Innovation and Development)

KAMSAINI BIN KAMARUDDIN
Senior Deputy Registrar (Faculty Executive Manager)

ASSOC. PROF. DR. NOR ZURAIRAHETTY BINTI MOHD YUNUS
Head of *Department (Geotechnics and Transportation)*

IR. DR. NOOR NABILAH BINTI SARBINI
Head of Department (Structure and Materials)

DR. NORALIANI BINTI ALIAS
Head of Department (Water And Environmental Engineering)

Academic Staff

ASSOC. PROF. DR. ROSLLI NOOR BIN MOHAMED
Quality & Strategy Manager

ASSOC. PROF. TS. DR. MARIYANA AIDA BINTI AB. KADIR
External & Global Engagement Manager

SR. DR. RADZUAN BIN SA'ARI
Undergraduate Academic Manager

DR. MOHD HAFIZ BIN PUTEH
Post Graduate Academic Manager

DR. MOHD ZAMRI BIN RAMLI
External Program Academic Manager

CIK NURIN ASYIKA BINTI ABD JALEL
Senior Assistant Registrar (Academic Manager)

Supporting Staff

TS. DR. MOHD KHAIRUL IDHAM BIN MOHD SATAR
Research Manager

DR. AIDEE KAMAL BIN KHAMIS
Information & Research Manager

MOHD NAZMI BIN ISMAIL
Lab Manager

Technical Staff / Research Assistant / Supporting Staff

HAZLINA BTE STAM
Senior Assistant Registrar (Human Resource Manager)

NORANIZAM BIN DEMIN
IT Executive

MUHAMMAD HAQIM BIN AHMAD
Facility Executive

Supporting Staff

Updated 2 Sept 2025

DEPARTMENT IN FACULTY OF CIVIL ENGINEERING

DEPARTMENT OF STRUCTURE AND MATERIALS

54 STAFF

DEPARTMENT OF GEOTECHNICS AND TRANSPORTATION

29 STAFF

DEPARTMENT OF WATER AND ENVIRONMENTAL ENGINEERING

35 STAFF

UTM

RESEARCH CENTRES

FORENSIC ENGINEERING CENTRE

CENTRE OF TROPICAL GEOENGINEERING

UTM CONSTRUCTION RESEARCH CENTRE

CENTRE FOR ENVIRONMENTAL SUSTAINABILITY AND WATER SECURITY

CENTRE FOR RIVER AND COASTAL ENGINEERING

3 FACILITIES

The UTM-Faculty of Civil Engineering has one of the largest civil engineering teaching and research facilities in the country. The main facilities include smart classrooms, lecture theatres and halls, well-equipped laboratories, IT facilities and a resource center.

3.1 Lecture Theatres, Halls and Classrooms

The Faculty has two lecture halls, each with a capacity of 120 students. It also has fifteen classrooms that can accommodate 60 students each, including one Active Learning Classroom. In addition, the Faculty has one Smart Classroom with a capacity of 120 students.

There are room for practical and studio work that can accommodate between 50-60 students each, and two 60-capacity classrooms for Problem-Based Learning (PBL) activities. To cater for examination needs there are two examination halls with a capacity of 120-200 students.All lecture halls and classrooms are fully air-conditioned and are equipped with the latest teaching and learning aids.

3.2 Laboratories

The Faculty has a teaching laboratory located at Block M50, which includes the Structure Laboratory, Concrete Laboratory, Hydraulics Laboratory, Geotechnics Laboratory, Transportation Laboratory and Environmental Laboratory. In addition, the Surveying Laboratory is located at Block M47. These facilities are primarily used for teaching purposes, providing students with hands-on experience supported by essential equipment and testing setups.

The Faculty also has several specialized research laboratories including the Structure and Materials Laboratory at Block D04, the Geotechnics Laboratory at Block D03, the Transportation Laboratory at Block D02, the Hydraulics and Hydrology Laboratory (4450 m^2) at Block D01 and the Environmental Engineering Laboratory at Block C07. These research laboratories are equipped with state-of-the-art equipment and advanced testing facilities to support a wide range of research activities.

3.3 Computing Facilities

The IT facilities at the Faculty consist of four computer laboratories containing more than two hundred computers for teaching and students' use. Networking and internet facilities with wi-fi access points are available throughout the premises. The Faculty also provides various engineering and general-purpose software to assist students in their study. Building Information Modelling (BIM) Lab has also been established in the Faculty that can accommodate 50 capacity.

3.4 Resource Center and student lounge room

The Faculty houses a resource center that is manned by trained personnel to provide students and staff with specific civil engineering references such as a collection of theses, staff publications, reports and relevant textbooks. The center is also responsible for the management of teaching and learning equipment such as computers, LCD projectors, audio, and video equipment. The Faculty also has 'Student Lounge' area which provides multifunctional space for students to engage in various activities beyond the traditional classroom setting.

4 PROGRAMME OF STUDY

4.1 Programme Specification

The Bachelor of Civil Engineering with Honours is offered either on a full-time or part-time basis. The full-time programme is the main programme, offered by the Faculty while the part-time programme is offered by the School of Professional and Continuing Education (SPACE UTM). 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. Further information on the part-time programme is available at https://space.utm.my

4.1.1 General

1. Awarding Institution			Universiti Teknologi Malaysia	
2. Teaching Institution			Universiti Teknologi Malaysia	
3. Programme Name			Bachelor of Civil Engineering with Honours	
4. Final Award			Bachelor of Civil Engineering with Honours	
5. Programme Code			SKAWH	
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 and Part 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	10	14	14
Short	4	4	8	8

4.1.2 Entry Requirements

The minimum qualifications for candidates who intend to do a Bachelor of Engineering (Civil) with Honours are as follows:

1. Minimum results based on **the Malaysian High School Certificate (STPM)**, with results determined by both the general requirements and other conditions as pre-requisites for the programme set by the university).

   General University Requirements:

   i. Passed the **Malaysian Certificate Examination (SPM)** or its equivalent with a minimum of:
      a. **Grade C** in the Bahasa Melayu subject
      b. **Grade E** in the History subject, effective from the year 2013
   ii. Passed the **Malaysian High School Certificate (STPM)** or its equivalent and obtained a minimum of the following:
      a. **CGPA 2.00**
      b. **Grade C** in the General paper, and
      c. **Grade C** in two (2) other subjects
   iii. Obtained at least **Band 1.0** in the Malaysian University English Test (MUET) for examinations commencing from Session 1, 2021 onwards, or Band 1 for examinations conducted up to the year 2020, subject to the validity period at the date of application.

   Special Requirements for the Programme

   i. Obtained a **CGPA of 2.80**; and Passed with a minimum **Grade B- (NGMP 2.67)** in two of the following subjects:
      a. Mathematics (T)
      b. Physics/ Chemistry/ Biology
   ii. Passed **Mathematics** and **Physics** in SPM with minimum of **GRED C**.
   iii. Obtained at least Band 2.0 in the Malaysian University English Test (MUET) for examinations commencing from Session 1, 2021 onwards, or Band 2 for examinations conducted up to the year 2020, subject to the validity period at the date of application.
   iv. No disabilities such as blindness, deafness, muteness, learning disabilities, paralysis, or other physical impairments that would hinder learning or practical activities.

2. Minimum requirements for **Matriculation Certificates (KPM) / Asasi Sains UM / Asasi UKM/ Asasi UiTM** (fulfil the general requirements set by the university, as well as other conditions of the programme).

   General University Requirements

   i. Passed the **Malaysian Certificate Examination (SPM)** or its equivalent with a minimum of:
      a. **Grade C** in the Bahasa Melayu subject
      b. **Grade E** in the History subject, effective from the year 2013
   ii. Passed the **Matriculation Certificate Examination KPM/Asasi Sains UM / Asasi UKM/ Asasi UiTM** with a minimum **CGPA of 2.00** and passed all core subjects.

iii. Obtained at least **Band 1.0** in the Malaysian University English Test (MUET) for examinations commencing from Session 1, 2021 onwards, or Band 1 for examinations conducted up to the year 2020, subject to the validity period at the date of application.

Special Requirements of the Programme:

i. Obtained a **CGPA of 2.80**; and Passed with a **Grade B- (2.67)** in two of the following subjects:
   a. Mathematics
   b. Physics/Chemistry / Biology
ii. Passed **Mathematics** and **Physics** in SPM with minimum of **GRED C.**
iii. Obtained at least **Band 2.0** in the Malaysian University English Test (**MUET**) for examinations commencing from **Session 1, 2021** onwards, or Band 2 for examinations conducted up to the year 2020, subject to the validity period at the date of application.
iv. No disabilities such as blindness, deafness, muteness, learning disabilities, paralysis, or other physical impairments that would hinder learning or practical activities.

3. Minimum qualifications for students with **Certificates/Diplomas** (fulfil the general requirements set by the university, as well as other conditions of the programme).

General University Requirements

i. Passed the **Malaysian Certificate Examination (SPM)** or its equivalent with a minimum of:
   a. **Grade C** in the Bahasa Melayu subject
   b. **Grade E** in the History subject, effective from the year 2013
ii. Obtained a Diploma from a Public Higher Education Institution (IPTA), Private Higher Education Institution (IPTS), or other qualifications recognized as equivalent by the Government of Malaysia and approved by the University Senate (specific program requirements depend on the type of program offered at the Public University).
iii. Obtained at least **Band 1.0** in the Malaysian University English Test (MUET) for examinations commencing from Session 1, 2021 onwards, or Band 1 for examinations conducted up to the year 2020, subject to the validity period at the date of application.

Special Requirements of the Programme

i. Obtained a **Diploma in Civil Engineering from UTM** or its equivalent with a minimum **CGPA of 2.70**; or for candidates with a CGPA below 2.70 but with at **least two years of working experience** in a related field of study are also eligible to apply for admission to the university.
ii. Obtained a credit pass in **Mathematics** and **Physics** in the SPM or an equivalent examination, or a minimum **grade C** in any **Mathematics** and **Physics** course (or equivalent) taken at the diploma level.
iii. Obtained at least Band 2.0 in the Malaysian University English Test (MUET) for examinations commencing from Session 1, 2021 onwards, or Band 2 for examinations conducted up to the year 2020, subject to the validity period at the date of application.

iv. No disabilities such as blindness, deafness, muteness, learning disabilities, paralysis, or other physical impairments that would hinder learning or practical activities.

v. Candidates are required to submit the transcript of results for all examinations taken during their Diploma studies (from semester one until the final semester) to UTM. A copy of the diploma or a letter of completion of studies must also be submitted along with their application

Note: - Year of entry and duration of study will be based on the credit exemptions and credit transfer awarded by the university.

4. Minimum Entry Qualifications for Students with Equivalent Credentials (A Level / International Baccalaureate Diploma (IB) / Australian Matriculation Program (AUSMAT).

General University Requirements

i. Passed the **Malaysian Certificate Examination (SPM)** or its equivalent with a minimum of:
   a. **Grade C** in the Bahasa Melayu subject
   b. **Grade E** in the History subject, effective from the year 2013

ii. Obtained **Malaysian Sports School Pre-University qualification / GCE A Level / International Baccalaureate (IB) Diploma / Australian Matriculation (AUSMAT)** or other qualifications recognized as equivalent by the Government of Malaysia and approved by the University Senate.

iii. Obtained at least **Band 1.0** in the Malaysian University English Test (MUET) for examinations commencing from Session 1, 2021 onwards, or Band 1 for examinations conducted up to the year 2020, subject to the validity period at the date of application.

Special Requirements of the Programme

i. Obtained **GCE A Level** with at least **Grade C** or **International Baccalaureate Diploma (IB)** with **Grade 4 in HL subjects** or **Australian Matriculation Program (AUSMAT)** with **Grade C / 60% ATAR Rank** in **TWO (2)** of the following subjects:
   a) Mathematics
   b) Physics / Chemistry / Biology

ii. Passed Mathematics and Physics in SPM with minimum of GRED C.

iii. Obtained at least **Band 2.0** in the Malaysian University English Test (**MUET**) for examinations commencing from Session 1, 2021 onwards, or Band 2 for examinations conducted up to the year 2020, subject to the validity period at the date of application / **Band 5.5** in **IELTS (Academic)** / score of **500** in **TOEFL PBT** / score of **46** in **TOEFL iBT** / score of **51** in Pearson Test of English (**PTE**) / score of **160** in **Cambridge English Qualifications** and Tests / Level **108** in **ELS Certified Intensive English Programme**.

iv. No disabilities such as blindness, deafness, muteness, learning disabilities, paralysis, or other physical impairments that would hinder learning or practical activities.

4.1.3 Programme Educational Objectives (PEO)

CODE	INTENDED EDUCATIONAL OBJECTIVES
PEO 1	Competent, innovative and productive in applying knowledge towards solving Civil Engineering problems.
PEO 2	Possess leadership qualities and ability to communicate, work and manage diverse teams effectively, and contribute to society in a multi-disciplinary environment.
PEO 3	Demonstrate professionalism and uphold ethical values and integrity in fulfilling responsibilities and acknowledge the need for lifelong learning.

4.1.4 Programme Learning Outcomes (PLO)

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

CODE	INTENDED EDUCATIONAL OBJECTIVES
PLO 1	Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialization as specified in WK1 to WK4 respectively to develop solutions to complex engineering problems.
PLO 2	Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences with holistic considerations for sustainable development (WK1 to WK4).
PLO 3	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 (WK5).
PLO 4	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 (WK8).
PLO 5	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, (WK2 and WK6).
PLO 6	Analyze and evaluate sustainable development impacts to society, the economy, sustainability, health and safety, legal frameworks, and the environment, in solving complex engineering problems (WK1, WK5, and WK7).
PLO 7	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 (WK9).
PLO 8	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 (WK9).
PLO 9	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.
PLO 10	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.
PLO 11	Recognise the need for and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change (WK8).

4.1.5 Mapping Program Outcomes (PLO), Complex Problems (WP), Complex Engineering Activities (EA) and Knowledge Profiles (WK)

Mapping Core Courses of Program Outcomes (PLO), Complex Problems (WP), Complex Engineering Activities (EA) and Knowledge Profiles (WK)

NO. OF COURSES	CIVIL ENGINEERING CORE		PROGRAMME LEARNING OUTCOME											COMPLEX PROBLEM SOLVING ATTRIBUTES							KNOWLEDGE PROFILE									ENGINEERING ACITIVITIES				
			Engineering Knowledge	Problem Analysis	Design/ Development of Solutions	Investigation	Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team Work	Communication	Project Management and Finance	Life Long Learning	Depth of knowledge	Range of conflicting	Depth of analysis	Familiarity of issues	Extent of applicable codes	Extent of stakeholder involvement	Interdependence	Theory-based natural	Conceptually-based	Engineering fundamentals	Engineering specialist knowledge	Engineering design	Engineering practice	Role of engineering in	Research literature	Ethics, inclusive Behaviour & Conduct	Range of resources	Level of interaction	Innovation	Consequences to society	Familiarity
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	EA1	EA2	EA3	EA4	EA5
1	SKAC 1023	Engineering Surveying	▪	▪			▪						▪	▪	▪	▪					▪	▪	▪			▪		▪						
2	SKAC 1031	Survey Camp	▪	▪			▪			▪	▪			▪	▪	▪					▪	▪	▪			▪			▪	▪	▪			
3	SKAC 1213	Engineering Mechanics	▪							▪				▪	▪	▪					▪	▪	▪		▪									
4	SKAC 1422	Engineering Drawing	▪				▪				▪			▪	▪		▪						▪	▪		▪								
5	SKAC 1513	Fluid Mechanics	▪	▪						▪				▪	▪	▪							▪		▪			▪						
6	SKAC 1713	Soil Mechanics	▪								▪			▪	▪	▪					▪		▪			▪				▪				
7	SKAC 1722	Engineering Geology and Rock Mechanics	▪	▪		▪					▪			▪	▪	▪					▪		▪			▪		▪		▪				
8	SKAC 1112	Civil Engineering Materials	▪										▪	▪	▪	▪					▪	▪	▪			▪		▪						
9	SKAC 2022	The Engineer and The World	▪					▪	▪		▪			▪	▪	▪					▪	▪	▪	▪	▪		▪		▪	▪	▪		▪	
10	SKAC 2012	Civil Engineering Laboratory 1		▪			▪			▪				▪	▪					▪		▪	▪	▪		▪			▪					
11	SKAC 2132	Construction Technology and Building Services	▪					▪						▪	▪	▪					▪	▪	▪	▪	▪	▪	▪	▪						

12	SKAC 2223	Mechanics of Materials and Structures		■	■					■				■	■	■					■	■	■		■				■						
13	SKAC 2513	Hydraulics	■	■	■					■				■	■	■					■	■	■		■	■									
14	SKAC 2722	Geotechnics 1		■		■					■			■	■	■					■	■	■		■	■		■							
15	SKAC 2832	Highway Engineering		■									■	■	■	■					■	■	■	■	■			■							
16	SKAC 2913	Water Treatment and Supply Engineering	■		■								■	■	■	■		■	■		■		■		■			■							
17	SKAC 3012	Civil Engineering Laboratory 2		■			■			■	■			■	■					■		■	■	■		■			■			■			
18	SKAC 3045	Industrial Training	■	■					■	■	■			■	■	■			■		■	■	■			■	■		■	■					■
19	SKAC 3122	Construction Economics and Estimating		■								■		■	■	■	■	■			■	■	■	■		■									
20	SKAC 3243	Theory of Structures		■		■				■				■		■	■						■					■	■						
21	SKAC 3313	Reinforced Concrete Design 1	■		■					■				■	■			■							■	■			■						
22	SKAC 3323	Structural Steel Design			■					■				■	■	■									■	■			■						
23	SKAC 3613	Hydrology and Water Resources	■	■				■						■	■	■					■	■	■	■	■	■	■	■							
24	SKAC 3712	Geotechnics 2	■	■	■						■			■	■	■							■		■	■	■	■		■					
25	SKAC 3842	Traffic Engineering		■	■		■							■	■	■					■	■	■	■	■	■									
26	SKAC 3922	Wastewater Engineering	■		■								■	■	■	■					■	■	■		■			■							
27	SKAC 3913	Environmental Management	■		■			■						■	■	■					■		■		■		■								
28	SKAC 4012	Integrated Design Project 1		■	■					■	■	■		■	■	■					■	■	■	■	■	■			■	■		■	■		
29	SKAC 4021	Civil Engineering Seminar							■				■															■	■						
30	SKAC 4022	Research Methodology and Pre-Project	■	■									■	■	■	■					■	■	■	■				■							
31	SKAC 4034	Final Year Project	■	■		■					■		■	■	■	■				■	■	■	■	■				■		■		■			
32	SKAC 4032	Integrated Design Project 2		■	■					■	■			■	■	■					■	■	■	■	■	■			■	■		■	■		
33	SKAC 4113	Construction & Project Management	■									■		■	■	■					■	■	■	■		■									
34	SKAC 4223	Structural Analysis		■			■						■	■	■	■						■	■			■									
35	SKAC 4333	Reinforced Concrete Design 2			■					■				■	■			■							■	■			■						
36	SKAC 4##3 or SKAC 5##3 (PRISMS)	CE Elective 1																																	
37	SKAC 4##3 or SKAC 5##3 (PRISMS)	CE Elective 2																																	
38	S### ###3	Free Elective Course																																	

COMPUTING

1	SKAC 2413	Computer Programming for Civil Enginee			■		■						■	■	■	■						■	■		■	■		■						
2	SKAC 3412	Building Information Modelling and Data Management	■		■		■							■	■	■						■			■	■								
3	SKAC 4412	Data Science and Arfificial Intelligence for Civil Engineers	■				■	■						■	■	■					■	■	■	■	■	■	■							
		NUMBER OF COURSES												37	36	32	3	4	2	3	25	26	33	15	22	26	7	16	11	9	4	2	3	3
		PERCENTAGE OF FOCU ELEMENTS (%)												97	95	84	8	11	5	8	66	68	87	39	58	68	18	42	29	24	11	5	8	8

Mapping Elective Courses of Program Outcomes (PLO), Complex Problems (WP), Complex Engineering Activities (EA) and Knowledge Profiles (WK)

NO. OF COURSES	**CIVIL ENGINEERING ELECTIVES SKAC 4##3**		**PROGRAMME LEARNING OUTCOME**											**COMPLEX PROBLEM SOLVING ATTRIBUTES**							**KNOWLEDGE PROFILE**									**ENGINEERING ACITIVITIES**				
			Engineering Knowledge	Problem Analysis	Design/ Development of Solutions	Investigation	Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team Work	Communication	Project Management and Finance	Life Long Learning	Depth of knowledge	Range of conflicting	Depth of analysis	Familiarity of issues	Extent of applicable codes	Extent of stakeholder involvement	Interdependence	Theory-based natural	Conceptually-based	Engineering fundamentals	Engineering specialist knowledge	Engineering design	Engineering practice	Role of engineering in	Research literature	Ethics, inclusive Behaviour & Conduct	Range of resources	Level of interaction	Innovation	Consequences to society	Familiarity
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	EA1	EA2	EA3	EA4	EA5
1	SKAC 4013	Advanced Engineering Survey	■	■			■						■	■	■	■					■	■	■			■		■						
2	SKAC 4153	Offshore Structures	■										■	■	■	■	■						■	■				■						
3	SKAC 4163	Concrete Technology	■										■	■	■	■					■	■	■	■		■		■						
4	SKAC 4173	Prefabricated Construction	■					■				■		■		■							■	■	■	■	■							
5	SKAC 4243	Finite Element Method			■	■	■							■	■	■						■	■		■	■		■						

6	SKAC 4263	Earthquake And Wind Engineering		▪	▪	▪				▪				▪	▪			▪		▪			▪		▪			▪	▪						
7	SKAC 4293	Advanced Solid Mechanics			▪	▪				▪				▪		▪	▪							▪	▪			▪	▪						
8	SKAC 4323	Prestressed Concrete Design	▪		▪					▪				▪	▪	▪								▪	▪			▪							
9	SKAC 4383	Analysis And Design Of Tall Building Systems			▪					▪				▪	▪	▪							▪		▪				▪						
10	SKAC 4423	Building Information Modelling And Const Digitalisation	▪		▪		▪							▪	▪	▪						▪	▪		▪	▪									
11	SKAC 4473	Geographic Information Systems for Engineers	▪	▪			▪						▪	▪	▪	▪					▪	▪	▪			▪		▪							
12	SKAC 4513	Hydraulic Engineering Structures	▪	▪	▪					▪				▪	▪	▪					▪	▪							▪						
13	SKAC 4523	Coastal Processes			▪	▪					▪			▪	▪	▪				▪					▪			▪							
14	SKAC 4613	Integrated Water Resources Management			▪	▪					▪		▪	▪	▪	▪			▪	▪		▪		▪				▪			▪				
15	SKAC 4623	Climate Resilience in Civil Engineering	▪	▪		▪	▪							▪	▪	▪					▪	▪	▪	▪		▪		▪							
16	SKAC 4633	Groundwater	▪	▪				▪						▪	▪	▪					▪	▪	▪	▪	▪		▪								
17	SKAC 4723	Engineering Rock Mechanics			▪	▪					▪			▪	▪	▪							▪	▪	▪			▪		▪					
18	SKAC 4733	Foundation Engineering			▪	▪					▪			▪	▪	▪							▪		▪	▪		▪			▪				
19	SKAC 4753	Geological Engineering And Environmental			▪	▪			▪					▪	▪	▪				▪	▪		▪		▪	▪		▪	▪						
20	SKAC 4763	Tunnel and Underground Space			▪	▪					▪			▪	▪	▪					▪				▪	▪		▪		▪					
21	SKAC 4813	Advanced Highway Engineering			▪	▪				▪				▪	▪	▪							▪		▪	▪		▪							
22	SKAC 4823	Transportation Engineering And Planning			▪	▪	▪							▪	▪	▪									▪			▪					▪		
23	SKAC 4853	Railway Engineering			▪	▪							▪	▪	▪	▪	▪						▪		▪	▪		▪							
24	SKAC 4923	Advanced Water And Waste Water Treatment		▪	▪	▪					▪			▪	▪								▪		▪			▪				▪			
25	SKAC 4943	Municipal Solid Waste Management			▪	▪					▪			▪	▪	▪					▪		▪		▪		▪								
26	SKAC 4973	Industrial And Hazardous Waste Treatment		▪	▪	▪					▪			▪	▪								▪		▪			▪				▪			
27	SKAC 4983	Water Quality Management	▪			▪					▪			▪	▪	▪	▪				▪											▪			

Mapping Prisms Elective Courses of Program Outcomes (PLO), Complex Problems (WP), Complex Engineering Activities (EA) and Knowledge Profiles (WK)

NO. OF COURSES	PRISMS ELECTIVES SKAC 5##3		PROGRAMME LEARNING OUTCOME											COMPLEX PROBLEM SOLVING ATTRIBUTES							KNOWLEDGE PROFILE									ENGINEERING ACITIVITIES				
			Engineering Knowledge	Problem Analysis	Design/ Development of Solutions	Investigation	Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team Work	Communication	Project Management and Finance	Life Long Learning	Depth of knowledge	Range of conflicting	Depth of analysis	Familiarity of issues	Extent of applicable codes	Extent of stakeholder involvement	Interdependence	Theory-based natural	Conceptually-based	Engineering fundamentals	Engineering specialist knowledge	Engineering design	Engineering practice	Role of engineering in	Research literature	Ethics, inclusive Behaviour & Conduct	Range of resources	Level of interaction	Innovation	Consequences to society	Familiarity
			PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	EA1	EA2	EA3	EA4	EA5
	Master of Engineering (Geotechnics) Track																																
1	SKAC 5713	Advanced Soil Mechanics			▪	▪				▪				▪	▪	▪							▪	▪	▪			▪	▪					
2	SKAC 5723	Advanced Geotechnical Analysis And Design			▪	▪			▪					▪	▪	▪				▪	▪				▪	▪		▪	▪					
3	SKAC 5733	Slope Engineering	▪	▪			▪							▪	▪	▪	▪			▪	▪		▪	▪	▪	▪	▪							
	Master of Engineering (Transportation) Track																																
4	SKAC 5813	Highway And Infrastructure Design			▪	▪					▪			▪	▪	▪							▪		▪	▪		▪			▪			
5	SKAC 5823	Advanced Road Material			▪	▪							▪	▪	▪	▪	▪								▪			▪						
6	SKAC 5833	Traffic Management And Analysis		▪	▪	▪					▪			▪	▪	▪					▪	▪	▪	▪	▪			▪			▪			
	Master of Engineering (Structure) Track																																
7	SKAC 5233	Structural Dynamics		▪		▪				▪				▪	▪	▪							▪	▪				▪	▪					
8	SKAC 5323	Advanced Design Of Steel		▪						▪				▪	▪					▪				▪	▪	▪	▪			▪	▪	▪	▪	▪
9	SKAC 5313	Advanced Design Of Reinforced Concrete			▪		▪			▪				▪	▪	▪							▪	▪					▪					
10	SKAC 5213	Analysis and Modelling	▪	▪	▪		▪					▪				▪	▪					▪	▪	▪	▪	▪	▪			▪				▪

	Master of Construction Management Track																																			
11	SKAC 5113	Construction Law And Contract	▪	▪					▪					▪	▪	▪					▪	▪	▪	▪				▪	▪								
12	SKAC 5123	Construction Site Management And Safety Control	▪								▪			▪	▪	▪					▪	▪	▪	▪		▪										
13	SKAC 5133	Sustainability And Environment Management In Construction	▪	▪							▪			▪	▪	▪					▪	▪	▪	▪	▪			▪		▪						
	Master of Engineering (Hydraulics and Hydrology) Track																																		
14	SKAC 5513	Advanced Hydraulics	▪	▪	▪		▪							▪	▪	▪							▪		▪	▪									
15	SKAC 5613	Advanced Hydrology	▪	▪			▪				▪			▪	▪	▪					▪	▪	▪	▪	▪						▪				
16	SKAC5623	Urban Stormwater	▪	▪	▪		▪							▪	▪	▪					▪	▪	▪	▪	▪	▪									
	Master of Engineering (Environmental Management) Track																																		
17	SKAC 5913	Environmental	▪	▪							▪			▪	▪				▪	▪	▪			▪			▪		▪	▪					▪
18	SKAC 5933	Air And Noise Pollution	▪		▪						▪		▪	▪	▪	▪					▪					▪		▪		▪					
19	SKAC5923	Land Use And	▪		▪							▪		▪	▪	▪					▪				▪		▪			▪				▪	

Mapping Core Courses to C P A

NO. OF COURSES	CIVIL ENGINEERING CORE		COGNITIVE						AFFECTIVE					PSYCHOMOTOR						
			C1	C2	C3	C4	C5	C6	A1	A2	A3	A4	A5	P1	P2	P3	P4	P5	P6	P7
1	SKAC 1023	Engineering Surveying	▪	▪	▪	▪								▪	▪	▪	▪	▪	▪	
2	SKAC 1031	Survey Camp	▪	▪	▪	▪			▪	▪	▪			▪	▪	▪	▪	▪	▪	▪
3	SKAC 1213	Engineering Mechanics	▪	▪	▪	▪			▪	▪	▪	▪								
4	SKAC 1422	Engineering Drawing	▪	▪	▪				▪	▪	▪			▪	▪	▪	▪	▪		
5	SKAC 1513	Fluid Mechanics	▪	▪	▪	▪			▪	▪	▪									
6	SKAC 1713	Soil Mechanics	▪	▪	▪	▪			▪	▪	▪	▪								
7	SKAC 1722	Engineering Geology and Rock Mechanics	▪	▪	▪	▪	▪		▪	▪	▪	▪								
8	SKAC 1112	Civil Engineering Materials	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪							
9	SKAC 2022	The Engineer and The World	▪	▪	▪	▪			▪	▪	▪									
10	SKAC 2012	Civil Engineering Laboratory 1	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪
11	SKAC 2132	Construction Technology and Building Services	▪	▪	▪	▪			▪	▪	▪	▪								
12	SKAC 2223	Mechanics of Materials and Structures	▪	▪	▪	▪			▪	▪	▪									
13	SKAC 2513	Hydraulics	▪	▪	▪	▪	▪	▪	▪	▪	▪									
14	SKAC 2722	Geotechnics 1	▪	▪	▪	▪			▪	▪	▪	▪								
15	SKAC 2832	Highway Engineering	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪								
16	SKAC 2913	Water Treatment and Supply Engineering	▪	▪	▪	▪			▪	▪	▪	▪								
17	SKAC 3012	Civil Engineering Laboratory 2	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪
18	SKAC 3045	Industrial Training	▪	▪	▪	▪			▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪
19	SKAC 3122	Construction Economics and Estimating	▪	▪	▪	▪	▪		▪	▪	▪									
20	SKAC 3243	Theory of Structures	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪							
21	SKAC 3313	Reinforced Concrete Design 1	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪							
22	SKAC 3323	Structural Steel Design	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪							
23	SKAC 3613	Hydrology and Water Resources	▪	▪	▪	▪	▪	▪	▪	▪	▪									
24	SKAC 3712	Geotechnics 2	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪								
25	SKAC 3842	Traffic Engineering	▪	▪	▪	▪	▪	▪						▪	▪	▪	▪			
26	SKAC 3922	Wastewater Engineering	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪							
27	SKAC 3913	Environmental Management	▪	▪	▪	▪	▪		▪	▪	▪									
28	SKAC 4012	Integrated Design Project 1	▪	▪	▪	▪	▪		▪	▪	▪									

29	SKAC 4021	Civil Engineering Seminar	▪	▪	▪				▪	▪	▪	▪								
30	SKAC 4022	Research Methodology and Pre-Project	▪	▪	▪	▪	▪	▪						▪	▪	▪	▪	▪	▪	
31	SKAC 4034	Final Year Project	▪	▪	▪	▪	▪	▪	▪	▪	▪									
32	SKAC 4032	Integrated Design Project 2	▪	▪	▪	▪	▪		▪	▪	▪									
33	SKAC 4113	Construction & Project Management	▪	▪	▪	▪			▪	▪	▪									
34	SKAC 4223	Structural Analysis	▪	▪	▪	▪	▪		▪	▪	▪			▪	▪	▪				
35	SKAC 4333	Reinforced Concrete Design 2	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪								
36	SKAC 4##3 or SKAC 5##3 (PRISMS)	CE Elective 1																		
37	SKAC 4##3 or SKAC 5##3 (PRISMS)	CE Elective 2																		
38	S### ###3	Free Elective Course																		
COMPUTING																				
1	SKAC 2413	Computer Programming for Civil Engineers	▪	▪	▪	▪	▪	▪	▪	▪	▪			▪	▪	▪	▪			
2	SKAC 3412	Building Information Modelling and Data Management	▪	▪	▪	▪	▪	▪						▪	▪	▪	▪			
3	SKAC 4412	Data Science and Artificial Intelligence for Civil Engineers	▪	▪	▪	▪	▪	▪						▪	▪	▪	▪	▪		
		NUMBER OF COURSES	38	38	38	36	24	18	33	33	33	18	8	12	12	12	11	8	6	4
		PERCENTAGE OF TAXONOMY ELEMENTS (%)	100	100	100	95	63	47	87	87	87	47	21	32	32	32	29	21	16	11

Mapping Elective Courses to C P A

NO. OF COURSES	CIVIL ENGINEERING ELECTIVES SKAC 4##3		COGNITIVE						AFFECTIVE					PSYCHOMOTOR						
			C1	C2	C3	C4	C5	C6	A1	A2	A3	A4	A5	P1	P2	P3	P4	P5	P6	P7
1	SKAC 4013	Advanced Engineering Survey	▪	▪	▪	▪	▪	▪						▪	▪	▪	▪			
2	SKAC 4153	Offshore Structures	▪	▪	▪	▪	▪		▪	▪	▪	▪								
3	SKAC 4163	Concrete Technology	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪							
4	SKAC 4173	Prefabricated Construction	▪	▪	▪	▪	▪		▪	▪	▪									
5	SKAC 4243	Finite Element Method	▪	▪	▪	▪	▪							▪	▪	▪				
6	SKAC 4263	Earthquake And Wind Engineering	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪							
7	SKAC 4293	Advanced Solid Mechanics	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪							
8	SKAC 4323	Prestressed Concrete Design	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪							
9	SKAC 4383	Analysis And Design Of Tall Building Systems	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪							
10	SKAC 4423	Building Information Modelling And Construction Digitalisation	▪	▪	▪	▪	▪	▪						▪	▪	▪	▪			
11	SKAC 4473	Geographic Information Systems for Engineers	▪	▪	▪	▪	▪	▪						▪	▪	▪	▪			
12	SKAC 4513	Hydraulic Engineering Structures	▪	▪	▪	▪	▪	▪	▪	▪	▪									
13	SKAC 4523	Coastal Processes	▪	▪	▪	▪	▪	▪	▪	▪	▪									
14	SKAC 4613	Integrated Water Resources Management	▪	▪	▪	▪	▪	▪	▪	▪	▪									
15	SKAC 4623	Climate Resilience in Civil Engineering	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪								
16	SKAC 4633	Groundwater	▪	▪	▪	▪	▪		▪	▪	▪	▪								
17	SKAC 4723	Engineering Rock Mechanics	▪	▪	▪	▪	▪		▪	▪	▪	▪								
18	SKAC 4733	Foundation Engineering	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪								
19	SKAC 4753	Geological Engineering And Environmental	▪	▪	▪	▪	▪		▪	▪	▪	▪								
20	SKAC 4763	Tunnel and Underground Space	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪								
21	SKAC 4813	Advanced Highway Engineering	▪	▪	▪	▪	▪		▪	▪	▪	▪								
22	SKAC 4823	Transportation Engineering And Planning	▪	▪	▪	▪	▪							▪	▪	▪	▪			
23	SKAC 4853	Railway Engineering	▪	▪	▪	▪	▪	▪						▪	▪	▪	▪	▪		
24	SKAC 4923	Advanced Water And Waste Water Treatment	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪								
25	SKAC 4943	Municipal Solid Waste Management	▪	▪	▪	▪	▪		▪	▪	▪	▪								
26	SKAC 4973	Industrial And Hazardous Waste Treatment	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪								
27	SKAC 4983	Water Quality Management	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪								

Mapping Prisms Elective Courses to C P A

NO. OF COURSES	PRISMS ELECTIVES SKAC 5##3		COGNITIVE						AFFECTIVE					PSYCHOMOTOR						
			C1	C2	C3	C4	C5	C6	A1	A2	A3	A4	A5	P1	P2	P3	P4	P5	P6	P7
	Master of Engineering (Geotechnics) Track																			
1	SKAC 5713	Advanced Soil Mechanics	▪	▪	▪	▪	▪		▪	▪	▪	▪								
2	SKAC 5723	Advanced Geotechnical Analysis And Design	▪	▪	▪	▪	▪	▪	▪	▪	▪									
3	SKAC 5733	Slope Engineering	▪	▪	▪	▪	▪	▪						▪	▪	▪				
	Master of Engineering (Transportation) Track																			
4	SKAC 5813	Highway And Infrastructure Design	▪	▪	▪	▪	▪		▪	▪	▪									
5	SKAC 5823	Advanced Road Material	▪	▪	▪	▪	▪		▪	▪	▪	▪	▪							
6	SKAC 5833	Traffic Management And Analysis	▪	▪	▪	▪	▪		▪	▪	▪									
	Master of Engineering (Structure) Track																			
7	SKAC 5233	Structural Dynamics	▪	▪	▪	▪	▪		▪	▪	▪	▪	▪	▪	▪	▪	▪			
8	SKAC 5323	Advanced Design Of Steel and Composite Structures	▪	▪	▪	▪	▪		▪	▪	▪	▪								
9	SKAC 5313	Advanced Design Of Reinforced Concrete	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪							
10	SKAC 5213	Advanced Structural Analysis and Modelling	▪	▪	▪	▪	▪		▪	▪	▪	▪	▪	▪	▪	▪	▪			
	Master of Construction Management Track																			
11	SKAC 5113	Construction Law And Contract	▪	▪	▪	▪	▪		▪	▪	▪									
12	SKAC 5123	Construction Site Management And Safety Control	▪	▪	▪	▪			▪	▪	▪	▪								
13	SKAC 5133	Sustainability And Environment Management In Construction	▪	▪	▪	▪	▪		▪	▪	▪									
	Master of Engineering (Hydraulics and Hydrology) Track																			
14	SKAC 5513	Advanced Hydraulics	▪	▪	▪	▪	▪							▪	▪	▪	▪			
15	SKAC 5613	Advanced Hydrology	▪	▪	▪	▪	▪							▪	▪	▪				
16	SKAC5623	Urban Stormwater Management	▪	▪	▪	▪	▪		▪	▪	▪			▪	▪	▪				
	Master of Engineering (Environmental Management) Track																			
17	SKAC 5913	Environmental Management And Sustainability	▪	▪	▪	▪	▪	▪	▪	▪	▪									
18	SKAC 5933	Air And Noise Pollution	▪	▪	▪	▪			▪	▪	▪	▪								
19	SKAC5923	Land Use And Environmental Planning	▪	▪	▪	▪			▪	▪	▪	▪								

4.1.6 Classification of Courses

NO.	CLASSIFICATION	CREDIT HOURS	PERCENTAGE
i.	University Courses a. General b. Service (Mathematic) c. Language d. Entrepreneurship e. Co-Curriculum	 6 15 6 2 2	22.96%
ii.	Faculty/Programme Core	95	70.37%
iii.	Programme Electives	9	6.67%
	Total	**135**	**100%**
For engineering programmes please complete the following classification. (Others please refer to the Statutory Body guidelines)			
A	Engineering Courses a. Lecture/Project/Laboratory b. Workshop/Field/Design Studio c. Industrial Training d. Final Year Project	 88 5 5 6	77.04%
Total Credit Hours for Part A		**104**	
B	Related Courses a. Applied Science/Mathematic/Computer b. Management/Law/Humanities/Ethics/Economy c. Language d. Co-Curriculum	 15 8 6 2	22.96%
Total Credit Hours for Part B		**31**	
Total Credit Hours for Part A and B		**135**	100%
Total Credit Hours to Graduate		**135 credit hours**	

4.1.7 Programme Structures, Curriculums and Award Requirements

The programme is offered on full-time basis and is based on a two (2) semester per academic session. Generally, students are expected to undertake courses equivalent to between twelve (12) to eighteen (18) credit hours per semester. Assessment is based on coursework and final examinations given throughout the semester.

Award requirements:

To graduate, students must:

i. Attain a total of not less than 135 credit hours with a minimum CGPA of 2.0.
ii. Pass Industrial Training
iii. Students from other approved programmes who wish to undertake a Minor in the programme must complete not less than 15 credit hours of specialized Civil Engineering courses which form part of the core and/or electives of the programme, as listed in the minor programme list.

YEAR 1

SEMESTER 1		
COURSE CODE	**COURSE NAME**	**CREDIT**
SKAC 1422	Engineering Drawing	2
SKAC 1713	Soil Mechanics	3
SKAC 1112	Civil Engineering Materials	2
SKAC 1722	Engineering Geology and Rock Mechanics	2
SSCE 1693	Engineering Mathematics I	3
UNIVERSITY GENERAL COURSE:		
ULRS 1182	Appreciation of Ethics and Civilizations	2
UHLM 1012	Malay Language Communication 2 (for International Students)	
UHLB 1112	English Communication Skills (Enhancement for students with MUET scores under 4.0)	
TOTAL CREDIT		**14**

SEMESTER 2		
COURSE CODE	**COURSE NAME**	**CREDIT**
SKAC 1023	Engineering Surveying	3
SKAC 1513	Fluid Mechanics	3
SKAC 1213	Engineering Mechanics	3
SSCE 1793	Differential Equations	3
SSCE 1993	Engineering Mathematics 2	3
UNIVERSITY GENERAL COURSE		
ULRS 1032	Integrity and Anti-Corruption	2
TOTAL CREDIT		**17**

SEMESTER 3 (SHORT SEMESTER)		
COURSE CODE	**COURSE NAME**	**CREDIT**
SKAC 1031	Survey Camp	1
CUMULATIVE CREDIT OF YEAR 1		**32**

YEAR 2

SEMESTER 1		
COURSE CODE	**COURSE NAME**	**CREDIT**
SKAC 2012	Civil Engineering Laboratory 1	2
SKAC 2513	Hydraulics	3
SKAC 2223	Mechanics of Materials and Structures	3
SKAC 2913	Water Treatment and Supply Engineering	3
SSCE 2393	Numerical Methods	3
UNIVERSITY GENERAL COURSE:		
ULRS 1022	Philosophy and Current Issues	2
UHLB 2122	Professional Communication Skills 1	2
TOTAL CREDIT		**18**

SEMESTER 2		
COURSE CODE	**COURSE NAME**	**CREDIT**
SKAC 2722	Geotechnics 1	2
SKAC 2413	Computer Programming for Civil Engineers	3
SKAC 2832	Highway Engineering	2
SKAC 2132	Construction Technology and Building Services	2
SKAC 2022	The Engineer and The World	2
SSCE 2193	Engineering Statistics	3
UNIVERSITY GENERAL COURSE:		
ULRF2##2	Service Learning & Community Engagement Course	2
TOTAL CREDIT		**16**
CUMULATIVE CREDIT OF YEAR 2		**66**

YEAR 3

SEMESTER 1		
COURSE CODE	**COURSE NAME**	**CREDIT**
SKAC 3012	Civil Engineering Laboratory 2	2
SKAC 3243	Theory of Structures	3
SKAC 3613	Hydrology and Water Resources	3
SKAC 3842	Traffic Engineering	2
SKAC 3922	Wastewater Engineering	2
SKAC 3712	Geotechnics 2	2
UNIVERSITY GENERAL COURSE:		
ULRS 3032	Entrepreneurship & Innovation	2
TOTAL CREDIT		**16**

SEMESTER 2		
COURSE CODE	**COURSE NAME**	**CREDIT**
SKAC 3313	Reinforced Concrete Design 1	3
SKAC 3323	Structural Steel Design	3
SKAC 3412	Building Information Modelling and Data Management	2
SKAC 3913	Environmental Management	3
SKAC 3122	Construction Economics and Estimating	2
UNIVERSITY GENERAL COURSE:		
UHLB 3132	Professional Communication Skills 2	2
UHL# 1##2	Communication in Foreign Language Elective	2
TOTAL CREDIT		**17**

SEMESTER 3 (SHORT SEMESTER)		
COURSE CODE	**COURSE NAME**	**CREDIT**
SKAC 3045	Industrial Training	5
CUMULATIVE CREDIT OF YEAR 3		**104**

YEAR 4

SEMESTER 1		
COURSE CODE	**COURSE NAME**	**CREDIT**
SKAC 4012	Integrated Design Project 1	2
SKAC 4021	Civil Engineering Seminar	1
SKAC 4022	Research Methodology and Pre-Project	2
SKAC 4223	Structural Analysis	3
SKAC 4412	Data Science and Artificial Intelligence for Civil Engineers	2
SKAC 4##3/ SKAC 5##3 (PRISMS)	CE Elective 1	3
S### ###3	University Free Elective*	3
TOTAL CREDIT		**16**

SEMESTER 2		
COURSE CODE	**COURSE NAME**	**CREDIT**
SKAC 4032	Integrated Design Project 2	2
SKAC 4034	Final Year Project	4
SKAC 4113	Construction & Project Management	3
SKAC 4333	Reinforced Concrete Design 2	3
SKAC 4##3/ SKAC 5##3 (PRISMS)	CE Elective 2	3
TOTAL CREDIT		**15**
CUMULATIVE CREDIT OF YEAR 4		**135**

* Elective course offered by other faculties

4.2 Our Uniqueness

Faculty of Civil Engineering has its own characteristics and extraordinary achievements that distinguish us from others, both locally and globally. In the field of Civil Engineering education, our faculty stands as a towering presence, boasting numerous awards and achievements that underscore our commitment to excellence.

i. One of the biggest Civil Engineering lab/facilities in the country.
ii. A major contributor of Civil Engineering graduates in the local workforce.
iii. High employability rate of graduates.
iv. A major contributor of leaders in government and industrial sectors.
v. The Faculty has a certified accredited laboratory, the Civil Engineering Testing Unit (CETU), which is accredited with ISO 17025:2017 certification.
vi. Diversity of lecturers (qualification background from institutions all over the world).
vii. Students are given the opportunity to experience studying abroad through various programmes organized by the Faculty/ University. Programmes such as service learning and student exchange are highly sought after by students who want to broaden their knowledge and prepare themselves for the global market.

4.3 Career Prospects and Career Path

Graduates of the programme can be employed as Project Engineers, Construction Engineers, Hydraulic Engineers, Environmental Engineers, Highway and Transport Engineers, Geotechnical Engineers, Site Engineers, Design Engineers, Structural Engineers and Quality Assurance/Quality Control Engineers.

4.4 Professional Skills Certificate (PSC)

Students are compulsory to enroll in certificate programs offered by the Centre of Excellence in the University and the School of Professional and Continuing Education (SPACE) during semester breaks:

For Compulsory Courses:

i. Design Thinking for Entrepreneur
ii. Talent and Competency Management
iii. English Communication Skills for Graduating Students (ECS)

For Electives Courses:

i. Data Analytics for Organization
ii. Professional Ethics and Integrity
iii. Construction Measurement (Mechanical & Electrical)
iv. OSHE for Engineering Industry and Laboratory
v. Quality Management for Built Environment and Engineering Professional
vi. Safety and Health Officer Introductory Course
vii. Industrial Machinery and Lubrication

4.5 Civil Engineering Exit Test (CEET)

The Civil Engineering Exit Test (CEET) is a mandatory examination that all students must undertake in their final year. Passing this test is a prerequisite for graduation. It comprehensively evaluates the knowledge and skills acquired since the first year of study.

4.6 Facilities Available

At the heart of our academic profile lies a commitment to providing students with an unparalleled educational experience, anchored by a robust infrastructure and facilities that caters to the diverse needs of the community.

i. Structural Engineering Laboratory
ii. Material Engineering Laboratory
iii. Hydraulic and Hydrology Laboratory
iv. Environmental Laboratory
v. Geotechnical Laboratory
vi. Highway & Transportation Laboratory
vii. Computer Laboratory
viii. Civil Engineering Testing Unit (CETU)
ix. Resource Centre and Student Lounge Room
x. Surveying Unit
xi. Teaching Laboratory
xii. Building Information & Modelling Laboratory
xiii. Lecture Halls
xiv. Smart Classroom
xv. Active Learning Classroom
xvi. Examination Hall
xvii. Meeting Room
xviii. Management Office
xix. Surau
xx. Food Kiosk

4.7 Supports for Students and Their Learning

In the dynamic landscape of academia, fostering an environment conducive to student success is paramount. It entails offering a comprehensive suite of resources and services to ensure their holistic development and well-being. In addition to personalised academic support, our institution offers a wealth of infrastructure support designed to facilitate student learning and engagement.

i. Personal Support
   - Academic Advisor
   - Student Academic Guidelines
   - Counselling

ii. Infrastructure Support
   - Internet Access
   - E-Learning
   - Digital Library
   - Health Career and Recreational

iii. Financial Support

- Research Grant
- Teaching Assistant
- Research Assistant
- Perbadanan Tabung Pengajian Tinggi Negara (PTPTN)
- Biasiswa Endowmen
- Zakat

4.8 Methods for Evaluating and Improving the Quality and Standards of Teaching and Learning Mechanisms

1 Students' performance based on:

- Good Status (KB) and Conditional Status (KS)
- Cumulative Point Average (CPA)
- Graduation On Time (GOT)
- Analysis of course performance (Course Assessment Report – CAR)
- Analysis of programme performance (Programme Assessment Report – PAR)
- Overall performance at Graduation Point

2 Employability

- Graduate Tracking Study Scheme/Skim Kajian Pengesanan Graduan (SKPG)
- Alumni Survey
- Market Survey
- Employer Survey

3 Lecturer's Performance:

- Teaching evaluation by students (e-PPP)
- Alumni Survey
- Competency checklist for staff (CV)
- Annual staff appraisal (e-LPPT)

4 Other Supports

- Faculty Academic Committee
- PSM (undergraduate final year project) survey
- External Examiner Reports
- Industrial Advisory Panel Reports
- Exit Survey
- Students e-Portfolio
- Generic Skills Evaluation
- Visiting Professors Reports

5 Delivery Systems

- Quality Management System Committee
- Civil Engineering Testing Unit (CETU)- ISO 17025:2005
- CSI (Customer Satisfaction Index)
- AKA Audit Report
- SAR / EAC Standard

6 Role of External Examiners (Visiting Examiners) and Industry Advisory Panel (IAP)
They are appointed by the Faculty Academic Committee to:

- Review and evaluate program curriculum.
- Review and evaluate assessment procedure and methods.
- Make necessary recommendations to the Academic Committee

7 In general, the programme is realized based on the following approaches:

i. Lectures and Tutorials

The theories are taught through lectures and tutorials according to a fixed schedule.

ii. Laboratory Activities

The laboratory activities include testing and experiments related to the theories taught in the lectures. This is important to enhance the students' understanding of the basic theories and their applications.

iii. Practical Design Session

All design and project-based courses are required to include hands-on design sessions.

iv. Problem Based Learning (PBL)

Problem Based Learning is a very important component of teaching and learning process. PBL is implemented in a number of courses at the Faculty. It helps students to reinforce their understanding of the course contents.

v. Surveying Camp

Apart from the theories learnt during lectures, students are required to attend a two-week survey camp which is conducted outside of the campus during semester break.

vi. Industrial training

All third-year students are required to undergo twelve (12) weeks Industrial Training at civil engineering establishments of their choice. At the end of the training, students are required to submit an Industrial Training Report to the Faculty for assessment purposes.

vii. Civil Engineering Seminar (SEMKA)

This is a compulsory seminar that is organized to expose students to the latest technologies, practical knowledge and techniques that are applied in civil engineering practices. This is one of the methods to disseminate contemporary knowledge that could not be implemented in the traditional lecture settings. The speakers at the seminar are mostly local or foreign professionals.

viii. Integrated Design Project (IDP)

The course is implemented in Year 4 through Integrated Design Project I and Integrated Design Project II, encompassing Structures and Infrastructure Design. Numerous related project works such as earthwork, geotechnics, roads, drainage and detention ponds, erosion and sedimentation control measures, sewerage, and water reticulation provide students with a robust platform to develop their design skills.

ix. Final Year Project

As part of the fulfilment for the award of the Bachelor's Degree, students have to complete a Final Year Project under the supervision of academic staff. The project must be completed within two semesters. Upon the completion of the project the

students are required to give an oral presentation and submit a Final Year Project report. Failing to deliver either the oral presentation or the Final Year Project Report will result in failed status.

To enhance the generic skills of the students, the curriculum is designed to address generic skills through infusion or diffusion. By doing so, graduates from this Faculty would be competitive, competent and have high ethical values. The generic skill attributes are as stipulated in the Programme Selection.

4.9 Students' Academic Assessment

As the programme is implemented using the semester system, the performance of students is assessed continuously throughout the semester. The grades are given based on the coursework and the final examination.

5 SEMESTER SYSTEM RULES AND GUIDELINES

5.1 Academic Advisory System and Role of Students

Every student is assigned an academic staff as an academic advisor. The objectives of the academic advisory system are:

i. To guide and assist students in adapting themselves to the academic system of the University, especially at the initial stage.
ii. To advise students in solving academic related problems such as workload, selection of courses and to explain the aim and purpose of the courses.
iii. To identify and provide counselling to problematic students as well as to develop a balanced character and positive attitude among students.
iv. To act as a link between students and the faculty.

With various services and facilities provided, the faculty expects students to be responsible in their study plan. The academic advisor should not be held responsible for the students' failure in completing their study on time. The students are advised to consult their academic advisor for the following matters:

i. To obtain information on the semester system and other matters related to their study, during the first week of each semester.
ii. To obtain endorsement for registration or withdrawal of courses.
iii. To seek advice in planning for their study, particularly in terms of course selection, total number of credits and duration of study.
iv. To obtain endorsement for application of graduation award.

5.2 Programme Registration Guidelines

1. Students must register for the programme offered on the date stipulated by the University.
2. If new students do not abide by item 1 without valid reasons acceptable to the University, the offer will be annulled.
3. Students who have been determined to participate in the bridging program must complete the course prescribed before registering for the programme.
4. Registration of the programme or senior students will be automatically done by the University administration based on the previous semester's examination results.
5. Senior students with Deferment of Study Status must re-register for the programme and the courses. Students who failed to do so within the specified time will be terminated from their studies.

5.3 Course Registration Guidelines

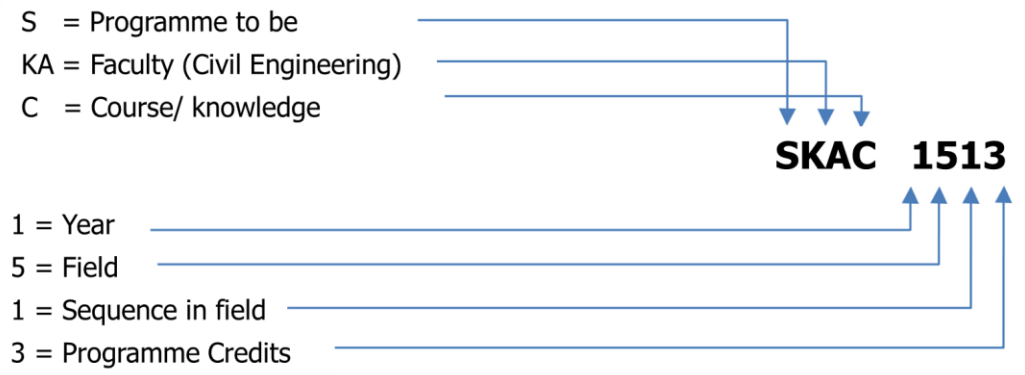
1. Course registration must be completed online during the current semester for the following semester.
2. The university may impose fines on students who register late for courses at rates determined by the Student Financial Regulations from time to time.
3. Students must settle all outstanding debts before registering for courses.
4. Course registration will be automatically cancelled if students receive a "Fail and Terminated (KG)" or "Conditional Status (KS)" result or if they are suspended from studies.
5. Students must register for courses based on the correct timetable, course codes, sections, and status (if applicable), and obtain confirmation from their academic advisor.
6. Course registration statuses (if applicable):
    a. HS – Registering for courses not listed in the program curriculum for additional knowledge.
    b. HW – Registering for mandatory courses as specified in the program curriculum.
    c. KM – Registering for equivalent courses offered at other institutions under a mobility program.
    d. MN – Registering for courses specified under a minor program offered by the University.
    e. UG – Registering for courses with grades of B- and below in the previous semester to improve academic performance, subject to faculty approval.
    f. UK – Registering for courses that were failed in the previous semester for the purpose of repeating them.
7. Registration for students who have received Conditional Status (KS) will be cancelled, and they are required to register again within a specified special registration period.
8. Students who fail to register for courses after the specified registration period will be suspended from studies, except for reasons deemed acceptable by the University.
9. Students are fully responsible for ensuring there are no errors in their course registration records. Corrections must be made within the timeframe specified by the University.
10. Attendance Only Course (HS) Registration:
    a. With permission or upon faculty instruction, students may register for no more than two (2) courses with HS status in any semester.
    b. Credits for courses registered with HS status are not counted in GPA and CGPA calculations.
    c. Students registering for HS status courses must attend all scheduled class meetings and participate in all forms of course assessment.

11. Withdrawal from Courses (TD):
    a. Students may apply to withdraw from any registered courses after informing the course lecturer and academic advisor.
    b. Students must submit the withdrawal form to the faculty no later than the last working day of the eighth (8th) week of the respective semester.
    c. Students are allowed to withdraw from taking a course subject to the minimum credit requirements, except with the Dean's permission.
    d. TD status will be recorded in the course registration records, examination result slips, and student transcripts.

12. The details regarding course registration can be found in the University Academic Regulations.

5.4 Course Code

Course Code consists of 4 alphabets and 4 digits as description below:



Programme to be awarded

D	=	Diploma
S	=	Bachelors Degree
M	=	Masters
P	=	Doctor of Philosophy
U	=	University's General Courses

5.5 Credit Scheme

5.5.1 Course Credit

Each course has a credit value to signify the importance, learning time and the nature of the course. The course credit for this program is 135.

5.5.2 Credit Load For Each Semester

i. Students with Good Status (KB) must register for not less than the total minimum credit, i.e., TWELVE (12) credits and not more than EIGHTEEN (18) credits.

ii. Students who are in the final TWO (2) semesters of their study are not subjected to item (i)

iii. Students who wish to take more than EIGHTEEN (18) credits must obtain approval from the Dean. However, students are **NOT** allowed to take more than TWENTY-ONE (21) credits in a semester.

iv. Students with Conditional Status (KS) are allowed to take between NINE (9) and TWELVE (12) credits only in the following semester.

v. Students who wish to enroll in a Short Semester are allowed to take a maximum of EIGHT (8) credits only.

5.5.3 Credit Earned

i. Credit Earned is defined as credit of the Passed course including the Compulsory Attendance (HW) course but not the Hadir Sahaja (HS) course.
ii. For students who are given Credit Transfer, the Credit Earned is the sum of the total transferred credit and the Passed credit.

5.5.4 Credit Counted

Credit Counted is the credit taken in the current and in all semesters which are used to calculate the GPA and CGPA respectively. The credit of the HS and HW courses are not included int the Credit Counted.

5.5.5 Credit Transfer

i. Credit transfer can be carried out vertically and horizontally.
ii. Vertical credit transfer may be granted to students with a diploma recognised by the Senate, with a maximum allowable credit transfer of 30% or 40 credits of the total graduate credits. In general, the minimum acceptable course grade for transfer is a grade of C, subjected to certain course conditions. Applications must be submitted no later than the end of the second week of the first semester of the program. The course credits transferred are counted towards the total graduate credits. However, the course grades are not calculated into the calculation of the student's GPA and CGPA.
iii. Horizontal credit transfer may apply between accredited/recognized programme of same level, i.e. from Bachelor to Bachelor degree, with a maximum allowable credit transfer of 50% of the total graduate credit. Applications must be submitted no later than the end of the second week of the current semester of the programme. The course credits transferred are counted towards the total graduate credit, and the course grades are calculated into the calculation of the student's GPA and CGPA.
iv. Rules and regulations regarding Credit Exemption are outlined in the University Academic Regulations.

5.6 Grading System

i. The performance of a student in a course is represented by the grade obtained. The relationship between the marks, grade and grade point is as listed in Table 1.

Table 1: Relationship between Marks, Grade and Grade Points

Marks	Grade	Grade Points
90 – 100	**A+**	4.00
80 – 89	**A**	4.00
75 – 79	**A-**	3.67
70 – 74	**B+**	3.33
65 – 69	**B**	3.00
60 – 64	**B-**	2.67
55 – 59	**C+**	2.33
50 – 54	**C**	2.00
45 – 49	**C-**	1.67
40 – 44	**D+**	1.33
35 – 39	**D**	1.00
30 – 34	**D-**	0.67
00 – 29	**E**	0.00

ii. Table 2 describes the meaning of each grade obtained by students for a course.

Table 2: Course Grade Description

Marks	Grade Points	Grade	Explanation
90 – 100	4.00	**A+**	Shows an outstanding performance beyond the highest standards. Course content has been fully mastered. Able to apply the knowledge acquired through various approaches and showcase exceptional understanding in a wider and comprehensive context.
80 – 89	4.00	**A**	Shows an excellent performance that meets the highest standards. Course content has been mastered very well. Able to apply the knowledge gained through various approaches and show clear understanding in a holistic context.
75 – 79	3.67	**A-**	Demonstrate excellent performance that meets the high standards. Course content has been well-mastered. Able to apply the

			knowledge gained through various approaches and show clear understanding.
70 – 74	3.33	**B+**	Demonstrate a very good performance that meets the high standards. Course content has been mastered with a holistic understanding of concepts and techniques.
65 – 69	3.00	**B**	Demonstrate good performance that meets the standards. Course content has been mastered with a good understanding of concepts and techniques.
60 – 64	2.67	**B-**	Fulfill the standards as well as show a good understanding of the course content and the mastery of course content. Most of the specified course content can be mastered.
55 – 59	2.33	**C+**	Demonstrate satisfactory understanding of course content. Fulfill or in certain circumstances exceed basic standards.
50 – 54	2.00	**C**	Demonstrate sufficient understanding of course content and meet basic standards.
45 – 49	1.67	**C-**	Demonstrate a minimum level of understanding of course content and in certain circumstances do not meet basic standards.
40 – 44	1.33	**D+**	Demonstrate minimum understanding of the course content.
35 - 39	1.00	**D**	Demonstrates an understanding of the course content below the minimum level. The student fails the course.
30 – 34	0.67	**D-**	Demonstrate weak understanding of course content. Student fails in the course.
0 – 29	0.00	**E**	Demonstrate that students cannot understand course content. Student fails in the course.

iii. Table 3 describes the meaning of each grade obtained by students for a practical course.

Table 3: Practical Course Grade Description

Marks	Grade Points	Grade	Explanation
			Excellent
90 – 100	4.00	**A+**	• Demonstrate excellent knowledge and performance based on the ability to apply theory to practical work
80 – 89	4.00	**A**	• Demonstrate automatic and spontaneous work skills
75 – 79	3.67	**A-**	• Master the skills identified excellently
			Good
70 – 74	3.33	**B+**	• Demonstrate good knowledge and performance based on the ability to apply theory to practical work
65 – 69	3.00	**B**	• Demonstrate skillful, optimal and efficient work skills
60 – 64	2.67	**B-**	• Master the identified skills well
			Average
55 – 59	2.33	**C+**	• Demonstrate average knowledge and performance based on the ability to apply theory to practical work
50 – 54	2.00	**C**	• Demonstrate work skills with minimum guidance
45 – 49	1.67	**C-**	• Master the identified skills moderately
			Weak
40 - 44	1.33	**D+**	• Demonstrates weak knowledge and performance in applying theory to practical work. Carries out tasks with full guidance. Lacks proficiency in mastering identified skills.
			Fail
35 – 39	1.00	**D**	• Failure to demonstrate knowledge in applying the theory to practical work
30 – 34	0.67	**D-**	• Not able to perform the work even with guidance
0 – 29	0.00	**E**	• Failure to master identified skills

iv. Generally, Grade D+ is the minimum passing grade. However, the passing grade of a course is subjected to the requirements of the Faculty with the Senate's approval.

v. Besides the grades listed above, the following grading in Table 4 is also used:

Table 4: Description of Grade Points without Value

Grade	Explanation
HS (Audit)	Grade given for courses registered with HS status
HL (Pass)	Passing grade given to course registered with HW status
HG (Fail)	Failing grade given to course registered with HW status

vi. Grade for Industrial Training is Pass (HL) or Fail (HG).

5.7 Assessment System

5.7.1 Attendance Requirement

i. Students must attend all forms of scheduled face-to-face learning activities (lectures/practical/studio/fieldwork etc.). If students do not attend these activities, they will have to inform their lecturers immediately and provide reasons for their absence.
ii. Lecturers need to report to the Faculty if there are students who have been absent for more than 20% of the total scheduled contact hours of learning activities.
iii. The Faculty needs to issue a warning letter to the students after receiving a report from lecturers.
iv. Students who attend less than 80% of the total scheduled contact hours of a course in a semester without any reason acceptable to the University, are not allowed to attend all subsequent forms of scheduled face-to-face learning activities and sit for any form of assessment. ZERO (0) mark will be awarded for the said courses; or Fail (HG) for compulsory audit courses (HW) and courses registered as audit (HS) will not be recorded in the transcript.
v. The Faculty will inform the students in writing of the results of the action as stated in item (iv).

5.7.2 Assessment Scheme

i. Ongoing assessment of a course will be done through coursework, final examinations and other forms of assessment during the semester of study according to the methods and weightings determined by the Faculty.
ii. Assessment for Industrial Training and Final Year Project is based on the format determined by the Faculty.
iii. For courses that are assessed based on coursework and final examination, the coursework mark must not be less than 50% of the total marks whereas the final examination mark should not exceed 50% unless approval has been obtained from the Faculty.
iv. Assessment of courses based on 100% coursework can be implemented with the approval of the Faculty.
v. Application for approval by the course coordinator/lecturer for Item (iv) should be made before the semester begins.

5.7.3 Final Examination

The final examination must be conducted within a specific time frame, according to guidelines set by the University.

5.7.4 Special Examination

1. Special Examination can be held for the following cases:
    i. Students who are unable to sit for the final examination because of illness and validated by a medical officer from the university or government hospital or have given reasons accepted by the university; or
    ii. Students in their final semester who have passed with Good Status (KB) but failed in ONE (1) course taken in the last TWO (2) semesters of study not including the semester used for Practical/Industrial Training.
2. Special Examination will not be held for the following cases:
    i. Courses that have no final examination; or
    ii. Students who did not sit for the final examination and gave reasons that are not accepted by the university; or
    iii. Students who have been barred from sitting for the final examination.
3. Special Examination will only be conducted once in a semester unless with the approval of the Senate.
4. Students who fail to sit for the Special Examination for item (5.7.4 (1)) will be given ZERO (0) mark for the final examination.

5.7.5 Appeal On the Results

If students are not satisfied with the results of the review of their scripts, they may apply for a course grade appeal. The script will be reassessed and re-marked. Students may only apply for a course grade appeal after they have reviewed and discussed the answer scripts with the respective lecturers.

5.8 Conferment Result

i. A student's performance is assessed based on the TWO (2) measurements GPA and CGPA which are as follow:

$$\text{GPA} = \frac{\text{Total Grade Point per Semester}}{\text{Total No. of Attempted Credit per Semester}}$$

$$\text{CGPA} = \frac{\text{Total Credit Point for all Semesters}}{\text{Total No. of Credit Counted of all Semesters}}$$

ii. The academic standing of a student at the end of every semester is based on the CGPA as shown in Table 5 below:

Table 5: Conferment Result Based on CGPA

Status	CGPA
Good Status (KB)	CGPA ≥ 2.00
Conditional Status (KS)	1.70 ≤ CGPA < 2.00
Fail Status (KG) (Study Terminated)	CGPA < 1.70

iii. Students who obtain GPA < 1.00 even though the CGPA ≥ 1.70 may continue their studies. However, the senate can:
   a. Defer their studies to the following semester: or
   b. Give a Fail Status (KG) and terminate their studies.

iv. Students who obtained THREE (3) consecutive Conditional Status (KS) will be given a Fail Status (KG) and they will be terminated from their studies.

v. Students who have completed their studies but do not meet the requirements of the award will be given a Fail Status (KG) and terminated from their studies.

vi. The academic standing of a student for the Short Semester will not be ascertained. The grade obtained in that semester will be considered for the calculation of the CGPA in the first semester of the following session.

vii. The status of the student's academic standing who enroll in the student mobility programme outside UTM with the Unfinished Status (Student Mobility) TS(KM) for that semester is not specified. Grades obtained in the semester will be considered for the calculation of CGPA in the next semester.

viii. Students may be given a temporary result if they do not meet the requirements of the University as shown in Table 6.

Table 6: Conferment Result

Status	Description
KB (BM)	Students are in Good Status and pass all courses required in the curriculum of the programme but have not fulfilled the Bahasa Melayu requirement
KB (MU)	Students are in Good Status and pass all courses required in the curriculum of the programme but have not sat for MUET
KB (TK)	Students are n Good Status and pass all courses required in the curriculum of the programme but have not applied for an award of a degree
KB (PSC)	Students are in Good Status and pass all courses required in the curriculum of the programme but have not fulfilled the requirements of PSC
TS	No final examination/evaluation mark in at least one course for the student and must be completed within the current semester
TS (KM)	No mark because students enroll in the mobility programme and need to be completed within the current semester of next regular semester

5.8.1 Improving Academic Performance

i. Students are given the chance to improve their grades with the faculty's approval during their study according to the following conditions:
   a. obtain faculty's approval;

b. improve the grade of the course which is B- and below;
c. allowed to improve only once the grade of the course;
d. the better grade between the original and the latest grade will be used in the GPA and CGPA calculation; and
e. request for improving grade will have to be accompanied with grade improvement registration payment determined by the Senate.

ii. Students who have completed their study but have not fulfilled the requirements for an award such as Good Status (KB) (Completed Program) will not be allowed to improve the grade of their course.

5.9 Status of Students' Academic Year

Students' academic year will be determined by the faculty according to the total Credit Earned as shown in Table 7.

Table 7: Classification of students CREDIT FOR

Classification of students	Total of Normal Credits Earned Year Before	Total Credits Must Be Earned for the Semester
Second Year	32	29
Third Year	67	61
Fourth Year	100	91

5.10 Award and Recognition

The Dean's List

A student who obtains a GPA of 3.67 and above will be awarded a Dean's List Certificate, upon registered for at least 12 credit hours for that semester excluding courses with HS and HW status. The remark "Dean's List" will be printed on the student's transcript.

5.11 Deferment of Study

i. A student who has been diagnosed as having illness by a Medical Officer is entitled to request for deferment of study. This deferment will not be counted as part of the total number.

ii. The maximum length for deferment for each application is TWO (2) continuous semesters.

iii. A student can also request for deferment of study for non-medical reasons. The application must be made before the last working day of week NINE (9) of the semester. The non-medical deferment period will be counted as part of the total number of semesters in the calculation of his/her maximum Duration of Study.

iv. However, the deferment period may be waived from being counted in the student's maximum Duration of Study, apart from the mentioned cases as follows:

a. For a student who is deferred by the University due to obtaining a GPA < 1.00 in the previous semester.

b. For a student who is deferred by the University due to disciplinary action.

c. For a student who is deferred from their studies for reasons of national interest. However, the maximum allowable period is only two (2) years, which is four (4) semesters. For each deferment application, the University will approve the application for a period of two (2) semesters, and students may apply for an extension of the deferment, if necessary, subject to a maximum of four (4) semesters.
d. For a student who is deferred from their studies for participating in a Gap Year program.
e. For a student who is deferred from their studies due to no courses are offered in that semester.
f. For a student who is deferred from their studies due to emergency reasons.

5.12 General Provisions

i. All Academic Rules and Regulations must be observed. The Senate is entitled to the Rules and Regulations as deemed appropriate.
ii. Should any dispute arise, the regulations stated in the University Academic Regulations will apply.
iii. The information in this book is correct at the time it is published.

6 CURRICULUM AND SYLLABUS

6.1 Area of Study

The Civil Engineering programme is designed in accordance with the Body of Knowledge outlined by the Engineering Accreditation Council (EAC). The areas of study include Strength of Materials, Structural Analysis and Design, Fluid Mechanics and Hydraulics, Soil Mechanics and Geotechnical Engineering, Civil Engineering Materials, Statics and Dynamics, Construction Engineering, Surveying, Water Resources and Hydrology, Highway and Transportation, and Environmental Studies. These areas collectively provide students with a comprehensive foundation in both theoretical knowledge and practical skills essential for civil engineering practice.

6.2 Curriculum of Bachelor of Civil Engineering with Honours

The curriculum for the Bachelor of Civil Engineering with Honours is given in the following tables. The courses are arranged according to the semester in which they are offered. Students are strongly encouraged to enrol in the courses according to the proposed arrangement. Students may not graduate on time should they fail or withdraw from the courses offered.

6.2.1 Course Menu for Group 1

COURSE MENU FOR GROUP 1

Year 1 Semester 1

Code	Course	Credits	L	T	P / S	Lab
SKAC 1422	Engineering Drawing	2	1		2	
SKAC 1713	Soil Mechanics	3	3	1		
SKAC 1112	Civil Engineering Materials	2	2			
SKAC 1722	Engineering Geology and Rock Mechanics	2	2			
SSCE 1693	Engineering Mathematics I	3	3	1		
ULRS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	2			
UHLM 1012	Malay Language Communication 2 (for International Students)	2	2			
UHLB 1112	English Communication Skills (English Communication Skills (Enhancement for students with MUET scores under 4.0)		2			
Total Credits		**14**				
Cumulative Credits		**14**				

Year 1 Semester 2

Code	Course	Credits	L	T	P/S	Lab
SKAC 1023	Engineering Surveying	3	3			
SKAC 1513	Fluid Mechanics	3	3	1		
SKAC 1213	Engineering Mechanics	3	3	1		
SSCE 1793	Differential Equations	3	3	1		
SSCE 1993	Engineering Mathematics 2	3	3	1		
ULRS 1032	Integrity and Anti-Corruption	2	2			
Total Credits		**17**				
Cumulative Credits		**31**				

Year 1 Short Semester

Code	Course	Credits	P/S
SKAC 1031	Surveying Camp	1	2 weeks
	Cumulative Credits	**32**	

Year 2 Semester 1

Code	Course	Credits	L	T	P/S	Lab
SKAC 2012	Civil Engineering Laboratory 1	2				4
SKAC 2513	Hydraulics	3	3			
SKAC 2223	Mechanics of Materials and Structures	3	3			
SKAC 2913	Water Treatment and Supply Engineering	3	3			
SSCE 2393	Numerical Methods	3	3			
ULRS 1022	Philosophy and Current Issues	2	2			
UHLB 2122	Professional Communication Skill I	2	2			
Total Credits		**18**				
Cumulative Credits		**50**				

Year 2 Semester 2

Code	Course	Credits	L	T	P/S	Lab
SKAC 2722	Geotechnics 1	2	2			
SKAC 2413	Computer Programming for Civil Engineers	3	2	2		
SKAC 2832	Highway Engineering	2	2			
SKAC 2132	Construction Technology and Building Services	2	2			
SKAC 2022	The Engineer and the world	2	2			
SSCE 2193	Engineering Statistics	3	3			
ULRF 2**2	Service Learning & Engagement Courses	2	2			
Total Credits		**16**				
Cumulative Credits		**66**				

Year 3 Semester 1

Code	Course	Credits	L	T	P/S	Lab
SKAC 3012	Civil Engineering Laboratory 2	2				4
SKAC 3243	Theory of Structures	3	3			
SKAC 3613	Hydrology and Water Resources	3	3			
SKAC 3842	Traffic Engineering	2	2			
SKAC 3922	Wastewater Engineering	2	2			
SKAC 3712	Geotechnics 2	2	2			
ULRS 3032	Entrepreneurship & Innovation	2	2			
Total Credits		**16**				
Cumulative Credits		**82**				

Year 3 Semester 2

Code	Course	Credits	L	T	P/S	Lab
SKAC 3313	Reinforced Concrete Design 1	3	2		2	
SKAC 3323	Structural Steel Design	3	2		2	
SKAC 3412	Building Information Modelling and Data Management	2	1		2	
SKAC 3913	Environmental Management	3	3			
SKAC 3122	Construction Economics and Estimating	2	2			
UHLB 3132	Professional Communication Skills 2	2	2			
UHL# 1##2	Communication in Foreign Language Elective	2	2			
Total Credits		**17**				
Cumulative Credits		**99**				

Year 3 Short Semester

Code	**Course**	**Credits**	**P/S**
SKAC 3045	Industrial Training	5	12 weeks
Cumulative Credits		**104**	

Year 4 Semester 1

Code	Course	Credits	L	T	P/S	Lab
SKAC 4012	Integrated Design Project 1	2			4	
SKAC 4021	Civil Engineering Seminar	1	1			
SKAC 4022	Research Methodology and Pre-Project	2	2		2	
SKAC 4223	Structural Analysis	3	3			
SKAC 4412	Data Science and Artificial Intelligence for Civil Engineers	2	1		2	
SKAC 4##3	CE Elective 1	3	3			
S### ###3	University Free Elective	3	3			
Total Credits		**16**				
Cumulative Credits		**120**				

Year 4 Semester 2

Code	Course	Credits	L	T	P/S	Lab
SKAC 4032	Integrated Design Project 2	2	2		2	
SKAC 4034	Final Year Project	4			12	
SKAC 4113	Constructions & Project Management	3	3			
SKAC 4333	Reinforced Concrete Design 2	3	2		2	
SKAC 4##3	CE Elective 2	3	3			
Total Credits		**15**				
Cumulative Credits		**135**				

Professional Skills Certificate

Code	Course	Credits	L	T	P/S	Lab
GLRB0010	Design Thinking for Entrepreneur (DTE)					
GLRM0010	Talent and Competency Management (TCM)					
GLRL0010	English Communication Skill for Graduating Students (ECS)					
GLRT####	Elective Course 1					
GLRT####	Elective Course 2					

Subject to change

Notes :- L - Lecture; **T -** Tutorial; **P/S -** Practical/Studio**; Lab –** Laboratory

6.2.2 Course Menu for Group 2

COURSE MENU FOR GROUP 2

Year 1 Semester 1

Code	Course	Credits	L	T	P/S	Lab
SKAC 1023	Engineering Surveying	3	3			
SKAC 1513	Fluid Mechanics	3	3	1		
SKAC 1213	Engineering Mechanics	3	3	1		
SSCE 1693	Engineering Mathematics I	3	3	1		
ULRS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	2			
UHLM 1012	Malay Language Communication 2 (for International Students)	2	2			
UHLB 1112	English Communication Skills (English Communication Skills (Enhancement for students with MUET scores under 4.0)		2			
Total Credits		**14**				
Cumulative Credits		**14**				

Year 1 Semester 2

Code	Course	Credits	L	T	P/S	Lab
SKAC 1422	Engineering Drawing	2	1		2	
SKAC 1713	Soil Mechanics	3	3	1		
SKAC 1112	Civil Engineering Materials	2	2			
SKAC 1722	Engineering Geology and Rock Mechanics	2	2			
SSCE 1793	Differential Equations	3	3	1		
SSCE 1993	Engineering Mathematics 2	3	3	1		
ULRS 1032	Integrity and Anti-Corruption	2	2			
Total Credits		**17**				
Cumulative Credits		**31**				

Year 1 Short Semester

Code	Course	Credits	P/S
SKAC 1031	Surveying Camp	1	2 weeks
Cumulative Credits		**32**	

Year 2 Semester 1

Code	Course	Credits	L	T	P/S	Lab
SKAC 2722	Geotechnics 1	2	2			
SKAC 2413	Computer Programming for Civil Engineers	3	2	2		
SKAC 2832	Highway Engineering	2	2			
SKAC 2132	Construction Technology and Building Services	2	2			
SKAC 2022	The Engineer and the world	2	2			
SSCE 2193	Engineering Statistics	3	3			
ULRS 1022	Philosophy and Current Issues	2	2			
UHLB 2122	Professional Communication Skill I	2	2			
Total Credits		**18**				
Cumulative Credits		**50**				

Year 2 Semester 2

Code	Course	Credits	L	T	P/S	Lab
SKAC 2012	Civil Engineering Laboratory 1	2				4
SKAC 2513	Hydraulics	3	3			
SKAC 2223	Mechanics of Materials and Structures	3	3			
SKAC 2913	Water Treatment and Supply Engineering	3	3			
SSCE 2393	Numerical Methods	3	3			
ULRF 2##2	Service Learning & Engagement Courses	2	2			
Total Credits		**16**				
Cumulative Credits		**66**				

Year 3 Semester 1

Code	Course	Credits	L	T	P/S	Lab
SKAC 3313	Reinforced Concrete Design 1	3	2		2	
SKAC 3323	Structural Steel Design	3	2		2	
SKAC 3412	Building Information Modelling and Data Management	2	1		2	
SKAC 3913	Environmental Management	3	3			
SKAC 3122	Construction Economics and Estimating	2	2			
UHL# 1##2	Communication in Foreign Language Elective	2	2			
Total Credits		**15**				
Cumulative Credits		**81**				

Year 3 Semester 2

Code	Course	Credits	L	T	P/S	Lab
SKAC 3012	Civil Engineering Laboratory 2	2				4
SKAC 3243	Theory of Structures	3	3			
SKAC 3613	Hydrology and Water Resources	3	3			
SKAC 3842	Traffic Engineering	2	2			
SKAC 3922	Wastewater Engineering	2	2			
SKAC 3712	Geotechnics 2	2	2			
ULRS 3032	Entrepreneurship & Innovation	2	2			
UHLB 3132	Professional Communication Skills 2	2	2			
Total Credits		**18**				
Cumulative Credits		**99**				

Year 3 Short Semester

Code	**Course**	**Credits**	**P/S**
SKAC 3045	Industrial Training	5	12 weeks
Cumulative Credits		**104**	

Year 4 Semester 1

Code	Course	Credits	L	T	P/S	Lab
SKAC 4012	Integrated Design Project 1	2			4	
SKAC 4022	Research Methodology and Pre-Project	2	2		2	
SKAC 4113	Constructions & Project Management	3	3			
SKAC 4333	Reinforced Concrete Design 2	3	2		2	
SKAC 4##3	CE Elective 1	3	3			
S### ###3	University Free Elective	3	3			
Total Credits		**16**				
Cumulative Credits		**120**				

Year 4 Semester 2

Code	Course	Credits	L	T	P/S	Lab
SKAC 4032	Integrated Design Project 2	2	2		2	
SKAC 4034	Final Year Project	4			12	
SKAC 4021	Civil Engineering Seminar	1	1			
SKAC 4223	Structural Analysis	3	3			
SKAC 4412	Data Science and Artificial Intelligence for Civil Engineers	2	1		2	
SKAC 4##3	CE Elective 2	3	3			
Total Credits		**15**				
Cumulative Credits		**135**				

Professional Skills Certificate

Code	Course	Credits	L	T	P/S	Lab
GLRB0010	Design Thinking for Entrepreneur (DTE)					
GLRM0010	Talent and Competency Management (TCM)					
GLRL0010	English Communication Skill for Graduating Students (ECS)					
GLRT####	Elective Course 1					
GLRT####	Elective Course 2					

Subject to change

Notes :- L - Lecture; **T -** Tutorial; **P/S -** Practical/Studio**; Lab –** Laboratory

6.3 List of Faculty's Elective Courses

6.3.1 Elective Courses

Apart from the core course, students must also take 9 credits of elective course.

1. Materials, Management and Construction

SKAC 4013	Advanced Engineering Survey
SKAC 4153	Offshore Structures
SKAC 4163	Concrete Technology
SKAC 4173	Prefabricated Construction
SKAC 4423	Building Information Modelling and Construction Digitalisation
SKAC 4473	Geographic Information Systems for Engineers

2. Structural Analysis and Design

SKAC 4243	Finite Element Method
SKAC 4263	Earthquake and Wind Engineering
SKAC 4293	Advanced Solid Mechanics
SKAC 4323	Prestressed Concrete Design
SKAC 4383	Analysis and Design of Tall Building Systems

3. Hydraulics and Hydrology

SKAC 4513	Hydraulic Engineering Structures
SKAC 4523	Coastal Processes
SKAC 4613	Integrated Water Resources Management
SKAC 4623	Climate Change and Civil Engineering
SKAC 4633	Groundwater

4. Geotechnics and Transportation

SKAC 4723	Engineering Rock Mechanics
SKAC 4733	Foundation Engineering
SKAC 4753	Geological Engineering and Environment
SKAC 4763	Tunnel and Underground Space
SKAC 4813	Advanced Highway Engineering
SKAC 4823	Transportation Engineering and Planning
SKAC 4853	Railway Engineering

5. Environmental Engineering

SKAC 4923	Advanced Water and Wastewater Treatment
SKAC 4943	Municipal Solid Waste Management
SKAC 4973	Industrial and Hazardous Waste Treatment
SKAC 4983	Water Quality Management

6.3.2 PRISMS Elective Courses

Only students with a minimum CGPA of 3.3 are eligible to enrol in the PRISMS program. This program offers the following elective courses, which are associated with the postgraduate program.

1. Construction Management

SKAC 5113	Construction Law and Contract
SKAC 5123	Construction Site Management and Safety Control
SKAC 5133	Sustainability & Environmental Management in Construction

2. Project Management

SKAC 5143	Fundamental of Project Management
SKAC 5153	Planning and Scheduling
SKAC 5163	Project Financial Management

3. Structure

SKAC 5213	Advanced Structural Analysis and Modelling
SKAC 5233	Structural Dynamics
SKAC 5313	Advanced Design of Reinforced Concrete
SKAC 5323	Advanced Design of Steel Composite Structures

4. Hydraulics and Hydrology

SKAC 5513	Advanced Hydraulics
SKAC 5613	Advanced Hydrology
SKAC 5623	Urban Stormwater Management

5. Geotechnics

SKAC 5713	Advanced Soil Mechanics
SKAC 5723	Advanced Geotechnical Analysis and Design
SKAC 5733	Slope Engineering

6. Transportation

SKAC 5813	Highway and Infrastructure Design
SKAC 5823	Advanced Road Material
SKAC 5833	Traffic Management and Analysis

7. Environmental

SKAC 5913	Environmental Management and Sustainability
SKAC 5923	Land Use and Environmental Planning
SKAC 5933	Air and Noise Pollution

6.4 Synopsis of Core Courses

6.4.1 First Year

SKAC 1023 - Engineering Surveying

This course provides the basic theory and practice of surveying to civil engineering students. Methods of establishing horizontal & vertical control for construction and design are explained, compared, and practiced via fieldwork. Since accuracy of survey work is vital in ensuring designs are exactly positioned, students must be able to analyze errors so that standard accuracies are met. Detailing for producing site plans, area and volume estimations, road curves geometric design is also discussed. The concept of field survey automation and the usage of software are explained. At the end of the course, students are expected to be able to plan, execute, compute, and analyze surveying works involved in establishing horizontal & vertical controls and producing plans for civil engineering applications. Students should also be able to geometrically design horizontal and vertical curves according to standards, perform area calculations and volume estimation for earthwork activities in civil engineering.

SKAC 1031 - Surveying Camp

Pre-requisite: SKAC 1023 Engineering Surveying

After successfully completing course SKAA 1023, students are well exposed to the theory and practice of surveying. Nevertheless, surveying projects that were undertaken so far are 'stand- alone' projects with emphasis on the understanding of the concepts involved. Therefore, this subject provides training for the surveying work involved in a typical civil engineering project. In other words, this subject gives a holistic view of the surveying activities needed prior to and during the construction stage of a civil engineering project. The course will furthermore train students in planning and executing survey work on a larger scale. Th e surveying works involved depend on the type of project undertaken, but normally include establishing horizontal and vertical controls, detailing, earthwork calculations and setting out. Students are assessed based on their oral presentation and written reports submitted at the end of the course. This subject introduces the basics and concepts of surveying in general with emphasis on engineering surveying. Basic surveying needs commonly required in civil engineering are explained. Methods of establishing horizontal & vertical controls, detailing for producing site plans, area and volume estimations, road curves geometric design and setting out are discussed.

Students are introduced to the typical field tasks as required in civil engineering. Common methods of field procedures, bookings and reduction of observations are adopted. Students are expected to be able to establish horizontal and vertical controls, setting out and detailing. The importance of surveying field activities prior to the design and during the construction stages in civil engineering work is highlighted. Since accuracy of survey work is vital in ensuring designs are exactly positioned, students must be able to conduct survey works that meet standard accuracies.

SKAC 1213 - Engineering Mechanics

The course is designed to expose the students to the basic principles of statics and dynamics. The subject is divided into two parts: Mechanics of Statics and Mechanics of Dynamics. The content of the lecture will be emphasized on the application of the basic mechanics principle in civil engineering. Mechanics of Statics deals with equilibrium of bodies, i.e., bodies at rest and bodies moving with a constant velocity. It includes resultant and resolution of forces, equilibrium of a particle, force system resultant, equilibrium of rigid bodies, the center of gravity and centroid, and moment of inertia of an area. Mechanics of Dynamics deals with the accelerated motion of bodies. It includes kinematics and kinetics of a particle and of a rigid body. Kinematics discusses the relationship between

displacement, velocity, and acceleration against time. Kinetics covers the concepts of force and acceleration (Newton's second law of motion), energy and work, impulse and momentum, and vibration. At the end of the course, students should be able to incorporate and utilize principles of applied mechanics in civil and structural engineering problems.

SKAC 1423 - Engineering Drawing

This course is designed to expose the students to the basic understanding of technical and engineering drawings. It will cover the aspect of understanding and interpretation of the element of drawings.The concept of orthographic and isometric projection will be discussed and applied in the hands-on session with Computer Aided Drawing (CAD). Students will also be exposed to the civil works drawings, i.e. reinforced concrete detailing. Several exercises are performed with the use of CAD to get the students acquaintance of the software. During this session, students will be asked to draw and submit group projects that are given to them. After completing this course students should be able to produce civil engineering drawings using Cad in 2D and 3D.

SKAC 1513 - Fluid Mechanics

This course is designed to introduce and apply the concepts of Fluid Mechanics (fluid statics and kinematics, forces and flow in closed conduits, pipe networks and centrifugal pumps) and to solve problems related to Civil Engineering. It encompasses topics such as fluid statics and fluid dynamics. The pressures and forces in these static and dynamic fluids are introduced, discussed, and analyzed through equations. It also covers upon the analyses of flows in closed conduits to include minor and major head losses. The performance characteristics, functions, and applications of centrifugal pumps in pipeline systems are also demonstrated and analyzed in this course.

SKAC 1713 - Soil Mechanics

This subject is a compulsory subject for civil engineering students. The content of this subject will give a student basic understanding and exposure towards practical in Geotechnical Engineering. It will cover basic soil properties which consists of soil composition, soil classification and soil compaction. Besides that, it will also discuss vertical stresses in soil due to overburden and external loading, water in soil and soil shear strength. The topic that will be covered is important to civil engineers where most of the problems occur at site will involve geotechnical and soil mechanics. At the end of this subject, students will be able to apply the knowledge on basic soil properties, soil classification and compaction properties, water in soil and shear strength parameters in the planning, analysis, design, and supervision of related geotechnical works.

SKAC 1722 – Engineering Geology and Rock Mechanics

This course is designed to enable students to evaluate, to apply and to analyse the relevant geological and rock mechanics principles in designing safe and economical rock engineering structures. In geology, the related topics on rock types/classifications, geological structures and geological processes are taught. Having acquired this knowledge, the principles of rock mechanics are then introduced mainly to highlight the relevance of engineering properties of geological materials in designing rock engineering projects. These principles include engineering properties of rock material, rock discontinuities and rock stabilisation systems. At the end of the course, students should acquire the related knowledge and principles in geology and rock mechanics and should be able to apply these knowledge and principles in designing safe and economic engineering structures in rock masses.

SKAC 1112 – Civil Engineering Materials

This course is designed for students to understand the different types of construction materials used in civil engineering. It will emphasize the types, properties, and functions of cement, aggregates, water, and admixtures in concrete; properties of fresh and hardened concrete, concrete mix design method, manufacturing concrete on site; test of hardened concrete; properties, characteristics, manufacturing, and applications of timber; types and characteristics of brick and block, mortar in masonry work; ferrous and nonferrous metal; and other latest materials in the construction industry. At the end of the course, students should be able to describe, identify, and discuss the properties and behavior of different types of civil engineering materials, together with selecting the right materials for applications in practice.

6.4.2 Second Year

SKAC 2012 - Civil Engineering Laboratory 1

Civil engineering is a practical field and laboratory work is essential to be performed by students in this field. The laboratory work, which consists of workshops and experiments, is designed to expose students' essential problem solving and experimental techniques. Most of the generic attributes that the students must develop at the University are acquired through laboratory experiments and researches. Laboratory sessions can strengthen the students to relate the fundamental theories with laboratory experiments in the field of concrete, transportation, hydraulics, and structural engineering. Each student will experience data collection and perform data analysis and result interpretations. Application of the experimental results to the real civil engineering problem will be highlighted. Upon completion of the course, students are expected to be able to perform laboratory experimental work and investigation in concrete, transportation, hydraulics, and structural engineering, to develop the techniques of conducting measurements, data analysis and interpret results in written report, and to develop generic attributes and enhance their ability to participate effectively in a laboratory environment and be able to work as part of a team.

SKAC 2022 – The Engineer and the World

The objective of the course is to furnish students with foundational understanding in sustainability, complex problem-solving skills, and knowledge in law and finance. This knowledge is subsequently applied in various practical settings such as Integrated Design Projects, Final Year Projects, and assignments or projects within Design, Construction, Project Management, and related courses. The topics covered encompass an introduction to Civil Engineering, a comprehensive approach to complex problem-solving, exploration of Engineering Ethics, understanding Local and International Laws, and a focus on sustainable practices including clean energy sources such as solar energy and solar farm applications. Additionally, the course explores financial sustainability, covering topics like cost analysis, engineering finance, and engineering economics to equip students with a holistic perspective on the intersection of engineering and sustainable practices.

SKAC 2132 – Construction Technology and Building Services

This compulsory course emphasizes on the principles of construction in building and civil engineering works, which consists of construction industry, construction work process, site layout and facilities, building foundations, building elements and external works. It also covers other important aspects of construction plant and machineries, formwork and scaffolding. General concepts on Industrialised Building System (IBS) including precast, pre-stressed and modular coordination in construction are also covered. Besides, this course also covers several topics on building services including an introduction, domestic water supply and plumbing installation, domestic electrical installation and domestic mechanical installation. At the end of the course, the students should be able to analyse the wide-range

technical and non-technical and emerging issues on sustainable development in construction industry, construction technology application in building and civil engineering practices and building services. The students should be able to analyse and evaluate sustainable development impacts to society, economy, sustainability, health and safety, legal frameworks and environment. Besides, the students should be able to apply knowledge of engineering fundamentals and engineering specialization to develop solutions to complex engineering problems.

SKAC 2223 - Mechanics of Materials and Structures
Pre-requisite: SKAC 1213 Engineering Mechanics
This is a core subject. Students will be able to understand the basic theory of the fundamental principles of mechanics of materials. Students will be able to incorporate these basic fundamentals into the application of the basic analysis of simple structures. It will assure them of the concepts of stress and strain, plane-stress transformation, shear force and bending moment, stresses in beams, and deflections of beams and trusses, and columns. At the end of the course, the students should be able to solve numerous problems, including being able to draw the shear force and bending moment diagrams and understand the structural and materials behaviours. The students will also be able to develop the skills of easing any such problem from its physical description to a structural model as a representation to which the principles may be applied.

SKAC 2413 - Computer Programming for Civil Engineers
This course is designed to expose the students to the development of programming skills using a computer language to solve related engineering problems. It emphasises the general concept of computer programming that includes steps of problem-solving using computer, algorithm and program logic tools, interface design, modularisation, arrays, files, and graphics. Programming examples, lab exercises, assignments and group projects related to various civil engineering fields are given to the students. At the end of the course, the student should be able to plan, analyse, design and write computer programs for basic as well as complex civil engineering applications.

SKAC 2513 – Hydraulics
Pre-requisite: SKAC 1513 Fluid Mechanics
Hydraulics is one of the major disciplines of civil engineering. This course introduces the concepts of open channel fluid flow and their applications in hydraulics engineering problems. It covers various aspects of open channel hydraulics including types of open channel flow, design of channel section dimensions, uniform, and non-uniform steady flows. Dimensional analysis and the principle of hydraulic similitude in physical modelling are also included. At the end of the course, students should be able to apply the knowledge in solving civil engineering hydraulics problems.

SKAC 2722 - Geotechnics I
Pre-requisite: SKAC 1713 Soil Mechanics
This course is one of the core courses, which provides solid background knowledge on the properties and behavior of soils for geotechnical engineering practice. Understanding of the course will help the students in designing civil and geotechnical engineering structures. Topics for the course are stresses in soils, compressibility and consolidation of soils, and slope stability. At the end of the course, students should be able to analyze and apply the related theories of soil behavior, and to solve problems of stresses on retaining structures, consolidation settlement and slope stability.

SKAC 2832 - Highway Engineering
This is one of the compulsory courses which will expose students to the fundamental theory of highway engineering. Topics covered are highway materials and evaluations, premix plants, construction techniques and plants, mix designs, quality controls and testing, pavement structural thickness design, highway drainage, pavement visual assessment, maintenance, and rehabilitation.

SKAC 2913 - Water Treatment and Supply Engineering
This course is designed to expose the students to water treatment technology. Topics discussed include basic water quality requirement, water characteristics, water treatment process and supply, and design of unit water treatment systems. For design of water treatment system, it will cover the design of unit treatment operation. Other than treatment methods, the course also discuss on the water distribution.

6.4.3 Third Year

SKAC 3012 - Civil Engineering Laboratory 2
Civil engineering is a practical field, and laboratory work is essential to be performed by students in this field. The laboratory work, which consists of workshops and experiments, is designed to expose students' essential problem solving and experimental techniques. Most of the generic attributes that the students must develop at the University are acquired through laboratory experiments and research. Laboratory sessions can strengthen the students to relate the fundamental theories with laboratory experiments in the field of concrete, transportation, hydraulics, and structural engineering. Each student will experience data collection and perform data analysis and result interpretations. Application of the experimental results to the real civil engineering problem will be highlighted. Upon completion of the course, students are expected to be able to perform laboratory experimental work related to civil engineering such as; concrete, transportation, hydraulics, environmental, geotechnical and structural engineering, to develop the techniques of conducting measurements, data analysis and interpret results in written report, and to develop generic attributes and enhance their ability to participate effectively in a laboratory environment and be able to work as part of a team.

SKAC 3045 – Industrial Training
Pre-requisite: Min 90 credits
Industrial Training is a core course which will assign students to work with industries for a period of 12 weeks. The training aims to exposed students to real civil engineering practices such as project planning and design, construction management and site supervision and other fields of specialization. Students will gain knowledge and working experience as well as improving their interpersonal skills through working with professionals from the industries. Depending on the nature of work, the students will have opportunity to apply theories learnt in the lecture room into real civil engineering practices.

SKAC 3122 - Construction Economics and Estimating
This compulsory course emphasizes on the principles of construction economics, which consists of introduction to construction economics, economics for project development and building. It also covers other important aspects of cost data, cost planning and cost analysis required for economics in construction. Then, this course covers estimating topics starting from basic principle of estimating until estimation calculations. It emphasize more on estimating including introduction, process and method of estimating and introduction of Standard Method of Measurement (SMM). It covers estimating of earthwork, concrete works and reinforcement works. Built-up rates were also covered for the

preparation of Bill of Quantities which include introduction, construction plants and machineries and related works. This course ends with overview of current technologies for estimating works. At the end of the course, the students should be able to identify, formulate and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics with holistic considerations for sustainable development. Besides, the student should be able to apply knowledge and understanding of engineering management principles and economic decisionmaking and apply these to one's own work, as a member and leader in a team, and to manage projects in multidisciplinary environments.

SKAC 3243 - Theory of Structures
Pre-requisite: SKAC 2223 Mechanics of Materials
This course introduces students to the analysis of determinate and indeterminate structures in civil engineering. The course emphasizes the analysis of beams and frame structures subjected to various load conditions by using classical techniques. The course is limited to the linear elastic analysis of beam and frame structures except in plastic analysis where the critical loads at failure are being examined. Students will also be taught on the use of influence diagrams to solve problems involving determinate beams subjected to moving loads. At the end of the course, students should be able to apply the knowledge and use the classical techniques for solving problems in structural engineering.

SKAC 3313 - Reinforced Concrete Design I
Pre-requisite: SKAC 2223 Mechanics of Materials and Structures
This is a core course which will provide an understanding and ability to analyse, and design reinforced concrete structural elements. Among the topics discussed are reinforced concrete as a sustainable construction materials, objective and methods of design, code of practice, analysis, and design of sections for flexural and shear, checking for deflection and cracking, durability and detailing requirements, design of simply supported and continuous beams, design of one way and two ways restrained and simply supported slab. In addition, the students will be exposed to the concept of prestressed concrete which covers topics on principle and methods of prestressing, stress limit, losses, and selection of section.

SKAC 3323 - Structural Steel & Timber Structures
Pre-requisite: SKAC 2223 Mechanics of Materials and Structures
This course is one of the core courses. Upon completion of the course, students will be able to incorporate and utilize relevant standards and technology pertaining to the analysis and design of steel and timber structures. In this course, students will be exposed to the analysis and design of major structural elements constructed using steel and timber. For the design of steel structures, the main topics that will be covered in addition to the general concepts and advantages of steel construction are the analysis and design of restrained and unrestrained beams, columns (axially loaded columns, columns in simple construction and columns with moments), trusses, and connections (bolted and welded). As for the design of timber structures, the major topics that will be covered include the design of flexural and compression members.

SKAC 3412 - Building Information Modelling and Data Management
Pre-requisite: SKAC 1423 Engineering Drawing
This course is designed to introduce the concept and principles of Building Information Modelling (BIM), the utilization of BIM technology in the architecture, engineering, and construction (AEC) industry, and future trends of BIM developments. BIM is not only a technology that is dramatically changing the way AEC projects are delivered today, but also involves more integrated processes and parties (considering

clients, designers and planners, owners, and other stakeholders) throughout the project life cycle. This course is also designed to expose the students to analysing, designing, and managing the huge of data. It concerns the management of information and how to model it in a structured manner so that the information can be manipulated and used effectively. The used of the database system as an application tool give the student a further step to apply an IT application in solving their problems. The aim of the course is to give students a practical knowledge to BIM and data management techniques for the documentation and modelling of designed structures. At the end of the course, students should be able to plan, analyse, and modelling the data to create a data model for database development and also able to create BIM model for civil engineering projects.

SKAC 3613 - Hydrology and Water Recourses

The course emphasizes hydrology and its application in the field of engineering, especially those related to water resources. Interdisciplinary aspects of hydrology that will be introduced and discussed are the understanding of the hydrological processes. These processes are precipitation, evaporation, transpiration, surface runoff, groundwater flow and infiltration. Some processes which play more dominant role will be discussed in more detail as compared to the others. An introduction to flood estimation will be highlighted together with the basic analysis and concept design in accordance to local guideline of Urban Storm Water Management Manual for Malaysia (MSMA). Frequency analysis will be discussed in this subject. Hydrologic modelling processes will be introduced as a basic requirement to the understanding to the empirical and numerical modelling concepts. Groundwater analysis and reservoir analysis that focuses on reservoir capacity estimation will be introduced. Upon completion of the course, students are expected to be able to describe and assess all the physical processes found in the hydrologic cycle together with the basic quantitative hydrologic analysis methods.

SKAC 3712 - Geotechnics 2

Pre-requisite: SKAC 1713 Soil Mechanics

This course will provide students with sound knowledge of onsite investigation and foundation designs for civil and geotechnical engineering structures. The main topics of the course are site investigations, shallow foundations, and pile foundations. The importance of site investigation for safe and economic foundation designs will be emphasized. Methods, procedures, and planning of effective site investigation will be addressed. The topic of shallow foundation will be based on Terzaghi's theory and Meyerhof's general bearing capacity equation, which will include the effects of ground water and eccentric load. Static formulae (Meyerhof' method, α and β methods) and dynamics formula will be introduced to determine single pile capacity in different soil conditions. Capacity and efficiency of pile groups in different soils will be addressed.

SKAC 3842 - Traffic Engineering

This is one of the compulsory courses which will expose students to the fundamental theory of traffic engineering. The main content of the course provides students with the fundamental theory of traffic flow and management. Major topics include drivers' behaviour and interactions, fundamental theory of speed–flow–density relationships and applications in road performance analysis, traffic studies, design of traffic signal control system, and highway geometric design.

SKAC 3922 – Wastewater Engineering

The course is designed to expose students to wastewater treatment technology. It will emphasize basic environmental microbiology, the characteristics of wastewater, wastewater analysis, the design of conventional wastewater treatment systems, and sludge treatment. Regarding the design of wastewater treatment systems, it will cover the design of clarifiers, waste stabilization ponds,

conventional activated sludge processes, extended aeration systems, sequential batch reactors, aerated lagoons, and trickling filters. The course also covers sewage quality standards under the Environmental Quality Act of 1974. Furthermore, the course exposes students to selecting suitable wastewater treatment systems for specific applications. By the end of the course, students should be able to apply this knowledge to design a simple unit operation for wastewater treatment systems and modify existing unit operations.

SKAC 3913 - Environmental Management

The course is designed to expose the students to various aspects in environmental pollution and concepts of environmental management. The course will emphasize discussion in different aspects of environmental components including water, air, soil, and waste management. The importance of the use of different energy resources and their impacts towards the environments as well as issues related to carbon storage will also be covered in this course. Various pollution control and prevention methods, environmental regulations as well as the implementation and concept in the environmental impact assessment (EIA) in achieving sustainable development will also be among the important aspects of this course. Upon completion, students should be able to demonstrate and apply the knowledge by the ability to identify specific pollution control technology and methods and the processes in preparing an environmental impact assessment (EIA) report. The students should be able to synthesize the knowledge in a group project and demonstrate a cooperative effort while working in a team as well as develop good relationship and interaction with colleagues and work effectively with other people to achieve mutual objective.

6.4.4 Fourth Year

SKAC 4012 – Integrated Design Project 1

Integrated Design Project 1 is the final phase of the IDP series tailored to process the Detailed Design Stage of a development project that has previously undergone the Planning - Design - Costing Stage (IDP 1). The subject focuses on the implementation and integration of infrastructure design, building design and geotechnical design to produce a comprehensive final technical report documenting all engineering proposals and drawings, charts, diagrams etc. Apart from the basic infrastructure of earthwork and water reticulation and Erosion Sedimentation Control Plan-ESCP design students are also required to integrate their knowledge of other civil engineering disciplines such as (but not limited to) costing and estimation analysis into their overall project work. The content on this subject is designed to expose students to real life complex engineering problems that require knowledge integration at all levels of execution. At the end of this course, the students will be able to comprehend the needs and requirements of local/government authorities regarding submission procedures and are able to appreciate the importance of integration and synthesis of various discipline of civil engineering knowledge.

SKAC 4021 - Civil Engineering Seminar

This course is designed as a compulsory attending course, which is carried out based on a seminar format. Speakers from universities and from within the practicing civil engineering- based organizations are invited to deliver a topic on specialized topics and issues in various civil engineering field, including ethics and professional in civil engineering practice. At the end of the course, students should be able to understand the actual civil engineer practices in civil engineering-based activities and adhere to professional ethics.

SKAC 4022 - Research Methodology and Pre-Project

This course is a compulsory course for all students before they undergo the Final Year Project. In this course, the student will be exposed to various aspects of research including types of research, method of literature review, research design, results, and analysis, writing of thesis and journal and also presentation skills. The students will also be exposed to the problem-solving methodology, decision-making and data collection process. This helps to prepare the students for the Final Year Project. The student must prepare a Pre-Project proposal report in the topic that will be given by their supervisors. At the end of this course, students should be able to understand all aspects of research, conduct research in a systematic way, solve and analyze data and results and write and present pre-project proposal reports.

SKAC 4032 - Integrated Design Project 2

Pre-requisite: SKAC 3022 Integrated Design Project 1

Integrated Design Project 2 (IDP 2) is tailored to process the Detailed Design Stage of a development project that has previously undergone the Planning – Design – Costing Stage (IDP 1). The subject focuses on the implementation and integration of infrastructure design, building design and geotechnical design to produce a comprehensive final technical report documenting all engineering proposals and drawings, charts, diagrams etc. Apart from the basic infrastructure of road and drainage and sewerage design students are also required to integrate their knowledge of other civil engineering disciplines such as (but not limited too) structural analysis and reinforced concrete design and geotechnical (foundation) analysis and design into their overall project work. The content on this subject is designed to exposed students to real life complex engineering problems that require knowledge integration at all levels of execution. At the end of this course, the students will be able to comprehend the needs and requirements of local/government authorities regarding submission procedures and are able to appreciate the importance of integration and synthesis of various discipline of civil engineering knowledge.

SKAC 4034 - Final Year Project

Pre-requisite: SKAC 4022 Research Methodology and Pre-Project

This course is compulsory for all students before they can get their Bachelor Degree. In this course, the student is expected to be able to conduct research activity independently with supervision from their supervisor. The students are also required to write a good thesis report and be able to present their project findings effectively. At the end of the course, students should be able to conduct research in a systematic way, collect data relating to the project, solve and analyse data to obtain results, write a good project report and present project findings.

SKAC 4113 - Construction and Project Management

This course aims to develop an understanding of the importance of construction management principles and its related tools. The course starts with an overview of the construction industry's importance. Major issues, problems, challenges, and processes in manging a construction project will be explored. The construction project life cycle phases and costing together with phases of project management will be discussed. The roles and responsibilities of stakeholders involved at each stage will be explained. Organisational functions in management and types of organizational structures will be exposed. The usage of tools available in construction management particularly in the application of planning and scheduling techniques using the Gantt chart and networking technique. Students will be able to develop and solve a construction project schedule manually and digitally using the critical path method concept. The course will also expose the students to the application of popular scheduling software. The

application of scheduling techniques related to resource allocation, project crashing and project cash flow requirements will be exposed. The best practices on how to monitor and control project effectively will be explained. The last important topic involves learning experiences in managing projects using available scheduling software such as Microsoft Project.

SKAC 4223 - Structural Analysis
Pre-requisite: SKAC 3243 Theory of Structures
This course is designed to expose the students to analysing two-dimensional structures using a matrix operational method and computer applications. The matrix operational method is also suitable to be programmed in computers as the solutions adopt the matrix concept. The course consists of the flexibility method, the stiffness method, concept for solving matrices, an introduction to finite element method and structural modelling using existing software. The structures include beams, trusses, and frames. At the end of the course, students should be able to analyse the structures by using the numerical methods and/or the existing computer software. The students should also have problem-solving skill on problems of interest in Civil Engineering structures.

SKAC 4333 - Reinforced Concrete Design 2
Pre-requisite: SKAC 3313 Reinforced Concrete Design 1
This course is a core course in which students will be exposed to a wider scope of reinforced concrete design. As a continuation to the Reinforced Concrete Design 1, the topics to be covered are design of staircase, design of column, design of footing and pile cap and design of retaining walls. In addition, the students will be exposed to the method of analysis of reinforced concrete frames.

SKAC 4412 – Data Science and Artificial Intelligence for Civil Engineers
This course offers students extra credential on numeracy skills in Data Science and Artificial Intelligence (AI). The essential topics and theory of AI are presented with practical information on data input and output at various scenarios. In particular, this course emphasizes on theoretical and practical aspects of Data Science, AI search algorithms, knowledge representations, and machine learning methods. The course features practical implementations through Group Projects to solve real-life and complex engineering problems in Civil Engineering.

6.5 Synopsis of Faculty's Elective Courses

SKAC 4013 – Advanced Engineering Surveying
Pre-requisite: SKAC 1023 Engineering Surveying
This course provides the theory and practice of advanced surveying to civil engineering students. Methods of surveying measurement using modern and advanced technology civil engineering designs and projects are discussed. The applications of precise levelling, 3D terrestrial laser scanning (TLS), global satellite navigation system (GNSS), photogrammetry, and hydrographic surveying in typical civil engineering projects are highlighted. Deformation surveys, which are often required in dilapidation surveys are also discussed. The theory of error propagations and their adjustments are also discussed. Relevant fieldwork is conducted to enhance students' grasp of the theory. At the end of the course, students are expected to apply advanced measurement techniques in solving positioning and dimensioning problems in civil engineering.

SKAC 4163 – Offshore Structures

This course emphasizes on the overview of offshore structural engineering related to oil and gas industry by covering vast amount of fundamental topics such as Front-end engineering design (FEED), Environmental loads, Response of Structures to environmental loading, Analysis and Design of Offshore Steel platforms, Analysis and Design of Offshore Topside Modules, Construction of Steel Platforms, Load-out, installation, hook-up and commissioning of offshore structures, Inspection, repair and Maintenance, Structural assessment of existing structures as well as removal of disused structures.

SKAC 4163 - Concrete Technology

This course is designed to introduce students and enhance their knowledge on concrete technology. It will emphasize on the rheology of fresh concrete, the various design methods of concrete mixes, the different types and properties of cement replacement materials, special concretes which include fibre reinforced concrete, high strength concrete, lightweight concrete, flowable concrete, self-consolidating concrete, and polymer concrete. Other topics that will be covered include concrete deformations, durability of concrete, and repair of concrete structures due to various causes of deterioration. At the end of the course students should be able to identify, discuss and apply the materials and technology available in producing good concrete that is suitable for different applications.

SKAC 4173 – Prefabricated Construction

This course is an elective course, provides in-depth exploration of construction management principles and practices of Industrialised Building System (IBS) in construction project. Upon completion of the course, students will gain comprehensive insights into the construction management in prefabrication construction, covering contractual aspects, design concepts, site management, quality management, risk management, safety & health and issues & challenges in prefabricated project. Through theoretical studies, students will develop the knowledge and skills necessary to effectively plan, execute and monitor prefabricated project in alignment with industry standard, best practices and technology.

SKAC 4243 - Finite Element Method

This course is developed to expose students to the fundamental theory and application of the finite element method. The course covers linear analyses for displacements and stresses in continuum structures. Formulation of stiffness matrices for one-dimensional elements, beams, plane stress and plane strain are presented in detail. Application towards more complex engineering problems including truss and frame systems is discussed. Isoparametric formulation is emphasized. Use of mathematical / finite element software for modelling and analysis is also emphasized. At the end of the course, students should be able to formulate finite element problems and to solve them by hand calculation for simple engineering problems and should also be able to develop finite element model, investigate and interpret results accordingly for more complicated problems. Students should also be able to analyse and discuss practical problems through project to demonstrate their understanding about the course materials.

SKAC 4263 - Earthquake and Wind Engineering

This is an elective subject. In the beginning of this course, an introduction to earthquake engineering and structural dynamic is provided. Then, structural dynamic with the focus on the single-degree and multi-degree of freedom structures is presented. Next, seismic design regulations and requirements based on current design codes are addressed. After that, wind load effects on buildings are explained and the calculation of wind force based on current design codes is presented. At the end of the course student should be able to calculate the effect of dynamic loads on the structures and design buildings against wind and seismic actions.

SKAC 4293 – Advanced Solid Mechanics

This course concerns the tensorial approach for solid mechanics, which is more general as compared to the strength of material approach previously discussed at the undergraduate level. This course is designed to discuss the theories of elasticity and to provide the mathematical background for finite element applications. The course begins with the discussion of the basic concepts in elasticity covering tensors notations, analysis of stress and strain, as well as the constitutive equations. At the end of the course, students should be able to understand multidimensional states and analyses through the ability to utilize the compact notations of tensors.

SKAC 4323 - Prestressed Concrete Design

This course introduces students to the principles and practises of prestressed concrete design. The content encompasses a thorough understanding of the principles and concepts of prestressing, methodologies for prestressing, stress limits, prestress losses, section selection, serviceability criteria, and strength requirements. Furthermore, students will gain familiarity with the intricate analysis and design procedures for prestressed concrete beams, along with the design principles governing continuous beams. At the end of the course, students should be equipped to critically evaluate construction processes for prestressed concrete and understand the importance of quality control measures. This includes the ability to analyse and compare different methods of prestressing, assess the impact of construction techniques on prestress losses, and identify potential challenges in the construction of prestressed structures. Case studies and real-world examples will be used to reinforce this practical understanding.

SKAC 4383 - Analysis and Design of Tall Building Systems

This course deals with modelling, analysis and design of tall building structural system. The course content covers an introduction to tall building structures and related issue in analysis and design. The student will be guided through the Eurocode 1, 2, 3, 4, 7 and 8 basic requirements of analysis and design of tall buildings. The modelling, analysis and design of tall building structural elements such as frame, shear wall and core wall structures will first be explained before the students are guided through the analysis and design of various tall building shapes using software. Finally, the detailing of shear and core walls will be explained in detail.

SKAC 4423 - Building Information Modelling and Construction Digitalisation

The course aims at providing the students with the concepts of basic understanding of model-based workflows in the construction industry using Building Information Modelling (BIM) that applied in current practice. The topics will cover the whole life cycle of construction includes, modelling, design/construction, estimating, scheduling which can be coordinate by using BIM tools and basic understanding on the modelling. At the end of the course the student is able to identify technical limitation, drawbacks of current practice and able to propose new solution to overcome the problems. The students are also able to develop their own understanding of Building Execution Plan based on BIM process required for project.

SKAC 4473 – Geographic Information System for Engineers

This course is an elective course specially designed for undergraduate civil engineering students. This course also introduces the concept and application of the Geographic Information System (GIS) theories especially in civil engineering fields such as transportation engineering, geotechnical engineering, structure and construction engineering, environmental engineering, hydraulic and hydrology engineering). This course will emphasize on the overview and the application of GIS in civil engineering applications, GIS data structure, data manipulation and GIS implementation, information presentation

of GIS, GIS case study in civil engineering, GIS prototype project, and future technology of spatial data storage. At the end of the course, students will be able to plan, analyse, and modelling the information to develop advanced GIS applications related to civil engineering problems.

SKAC 4513 – Hydraulics Engineering Structure

This course is designed to provide an in-depth understanding of hydraulics structures and their applications in various systems. The course will cover topics such as elements of dam engineering, embankment dam engineering, dam outlet works, sedimentation in reservoirs, gates and valves, diversion works, and energy dissipation. This course covers the common terminology of hydraulics structures and their components.

SKAC 4523 – Coastal Processes

The course covers theoretical and fundamental principles of coastal hydrodynamics and processes. It gives background knowledge of the various hydrodynamic parameters acting in the coastal region due to waves, tides and currents. Underlying principles of coastal engineering works, coastal erosion management and implications from implementing coastal structures in the coastal environment are delivered. Emphasis in solving and tackling coastal engineering problems adopts the use of established analytical techniques. At the end of the course, students should be able to describe and analyse the various coastal processes and the effect of these forces on the coastal zone. The students should be able to quantify coastal environmental parameters. They should also be capable of proposing methods to manage and control the coastal processes when applied to solve coastal engineering problems.

SKAC 4613 – Integrated Water Resources Management

This course covers an Integrated Water Resources (IWR) perspective including social, economic, environmental and reservoir management and design related knowledge and expertise will be developed in relevant topics which include: water resources issues, water resource development, water law, policy and institutions, water resource planning, reservoir yield and operation, river basin management, water resources system analysis, risk and reliability analysis.

SKAC 4623 – Climate Resilience in Civil Engineering

This course is designed for civil engineers who wish to gain a foundational understanding of climate change, its assessment methods, impacts across various sectors, and strategies for adaptation and mitigation. The course will explain key concepts related to climate change science, examine tools and techniques for assessing climate change, and explore the implications of climate change on water resources, natural disasters, sea levels, infrastructure, and the environment. Additionally, the course will cover strategies and technologies for adapting to climate change challenges and mitigating its effects. This includes adaptation strategies tailored to civil engineering projects, familiarization with mitigation measures and technologies for reducing greenhouse gas emissions, development of problem-solving skills to address climate change challenges encountered in civil engineering practice, and integrating climate resilience into the planning, design, and maintenance of civil engineering infrastructure to ensure long-term sustainability.

SKAC 4633 – Groundwater

The course has been prepared for hydrologists and engineers interested in learning groundwater exploration, exploitation, quality control and management. The course gives emphasis on basic hydrogeology and nature of groundwater, groundwater occurrence, groundwater movement, groundwater investigation and development, well hydraulics, evaluation of groundwater resources, contamination of groundwater resources, mass transport and subsurface contaminants

SKAC 4723 -–Engineering Rock Mechanics

Construction in Civil Engineering is associated with two types of geological materials, namely soils and rocks. This course deals with rocks, particularly on how these geological materials react to both geological and construction induced stresses. Construction of structures in or on rock mass (e.g. foundation, slope, tunnel & cavern) depends greatly on the rock mass properties and the interaction between the rock mass and the engineered structures. The term 'rock mechanics' refers to the basic science of mechanics applied to rocks, while the term 'rock engineering' refers to any engineering activities involving rocks. Basic knowledge in geology (particularly rock types, discontinuities in rock and structural geology) is essential for this course.

The content is tailored to enable students to acquire knowledge on the principles of rock mechanics, and subsequently able to understand the importance of these principles in designing and construction of rock engineering structures. Week 1 - Week 6 the students are introduced to the relevant principles that include rock properties and rock mass classification. In these weeks the students learn the importance of the rock strengths and properties, and the effect of geological discontinuities on in situ rocks. Week 7 to Week 13 the application of rock mechanics principles in designing common rock engineering structures (foundation, slope and tunnel) are introduced. This enables the students to appreciate the importance of rock mechanics in designing rock engineering structures and reaction of mass to both geological and construction induced stresses. Week 14 to Week 15 cover topic on methods of stabilisation for unstable rock masses. Focus is on 2 fundamental aspects; mechanisms of stabilisation of each method and various modes of instability in rock mass. The correlation of both aspects allows student to appreciate the approach used in selecting suitable and effective method for rock stabilization. At the end of the course, students should acquire the knowledge on principles rock mechanics, and should be able to appreciate and to apply them in designing common rock engineering structures.

SKAC 4733 – Foundation Engineering

This subject is one of the core subjects offered by the Department of Geotechnics and Transportation, which will highlight the application of soil mechanics to foundation design in practice. Lectures will be emphasised on foundation design in Civil Engineering projects. Foundation design must be based on parameters evaluated from the Site Investigation programme and make use of the soil parameters, which requires the knowledge of geology and soil mechanics principles. Various types of foundation and their criteria for selection will be presented, which is interpreted from site investigation related to the shallow foundation, pile, raft foundation, drilled shaft, cofferdam and underpinning. Group piles, laterally loaded, and uplift piles will be covered in the course. Settlement and bearing capacity considerations will be employed to select and design the appropriate foundation scheme for structures. At the end of the course, the student will be able to understand and apply the principles of foundation design in terms of technical feasibility, economic viability, articulate and justify technical analyses through oral, written and graphical means. The student will also be able to appreciate the constantly evolving nature of civil engineering design and practice.

SKAC 4753 -–Geological Engineering and Environment

Geological Engineering and Environment course provides students with a comprehensive understanding of the principles, concepts, and practical applications of geology in civil engineering and environmental contexts. This course equips students with the knowledge and skills necessary to assess geological factors, mitigate environmental risks, and make informed decisions in the fields of civil engineering,

environmental science, and resource management. By the end of this course, students will have a strong foundation in geological engineering and environmental principles, enabling them to contribute effectively to the sustainable development of infrastructure and the responsible management of natural resources. Geological Engineering and Environment is an attractive discipline for students who wish to pursue the challenge of combining the complexity of nature and engineering design, who are interested in the physical mechanics of the earth's surface and subsurface.

SKAC 4763 – Tunnel and Underground Space

This elective course is offered by the Department of Geotechnics and Transportation for Civil Engineering students. The course deals with tunnel and undergound space construction in ground conditions consisting of common geological materials such as soils, rocks and a mixture of both. The content is tailored to enable the students to acquire essential knowledge on related activities in tunnel construction. The first part of the module aims to introduce the importance of tunnelling and undergound construction work as alternative to overcome scarce land issues in future. This then followed with introduction of two types of tunnelling conditions in soft and hard ground and the available tunnelling and underground space construction method such as TBM, micro tunnelling etc. The risk associated with the disturbance under the ground also highlighted, and the stability analysis is introduced. Some aspects of health, safety, environmental issues is included. Introduction to the available finite element software in determining the stress redistribution and structural integrity is also presented. This course implement experiential learning and generalised blended learning.

SKAC 4813 –Advanced Highway Engineering

This is one of the elective subjects that will develop the knowledge and experience of the students in pavement design construction. This course comprises the following topics: Factors influencing thickness design, methods of pavement design: AASHTO, Asphalt Institute, ATJ5/85 (2013), Rigid pavement design, Interlocking block design, surface dressing design, construction of various pavement types, earthworks, cut slopes, embankments, surface drainage, subsurface drainage, erosion control, slope protection, culverts.

SKAC 4823 –Transportation Engineering Planning

This elective course discusses the transportation planning process. It covers a range of topics namely transportation models which include four-step travel demand forecasting models. The various techniques of forecasting travel patterns and mode choice will be elaborated. The applications of regression and categorical analysis for trip generation and attraction will also be explained.

SKAC 4853 – Railway Engineering

This is one of elective courses which focuses on the fundamental concepts of railway engineering. It is very important for engineering students and new entrants into the field of railways to be aware of not only the fundamentals of railway engineering but also latest developments with regard to railway tracks. Major topics include railway track gauge, engineering surveys and construction of new lines, geometric design of track, track drainage, level crossing, railway stations and high speed trains.

SKAC 4923 –Advanced Water and Wastewater Treatment

This course is an extension of the water and wastewater treatment course (SKAC 2912 & SKAC 2922). It covers two different aspects of treatment namely, advanced treatment processes and effluent reuse. In advanced treatment processes, students are exposed to different physico-chemical unit processes i.e. air stripping and aeration, chemical precipitation, ion exchange, chemical oxidation, adsorption and membrane filtration. It also covers the advance topic in aerobic biological treatment process, anaerobic

treatment process, and nutrients removal. Effluent reuse and the applications of the advanced processes are also discussed. The emphasis is on theoretical background, conceptual design, and applications of the treatment processes.

SKAC 4943 –Municipal Solid Waste Management
This is an elective course, offered to final year undergraduate students. It provides the students with an overview of particularly municipal solid waste. The program includes discussion on the practices of municipal waste management, sources of wastes, generation rate and characteristics (physical and chemical properties), analysis of collection systems, handling of waste and disposal practices of municipal waste. Processing and recycling of wastes are also discussed. At the end of the course, students should be able to apply the theory and knowledge of managing municipal solid waste. The students should also be able to work in a team and be able to present works through a written report as well as an oral presentation.

SKAC 4973 –Industrial and Hazardous Waste Management
This course introduces students to issues of industrial and hazardous wastes management. The course includes the introduction of the scheduled wasted type as well as discussion on the concept of hazardous waste, sources, quantities and characteristics (physical and chemical properties). The key elements in waste management such as storage, collection, transport, treatment and disposal of hazardous wastes are also addressed. Waste minimisation, one of the main strategies is also introduced. At the end of the course, students should be able to apply the knowledge by associating environmental problems that arise with poor management, treatment and disposal of industrial waste.

SKAC 4983 –Water Quality Management
This course is designed to expose students to current trends and various aspects in water quality assessment and management for river catchments, lakes, reservoirs and wetlands. It tackles problems involving water pollution and its impacts on the environment and legislation. Water quality monitoring projects carried out by students will enable application of proper sampling and monitoring methods. At the end of the course students will then be able to assess water quality problems and plan mitigation and control measures for water pollution.

6.6 Synopsis of Faculty's PRISMS Elective Courses

SKAC 5113 - Construction Laws and Contract
This course introduces students to Malaysia laws, which will focus on the sources, and branches of law in Malaysia. The course will emphasize on private laws related to construction practice, law of contract and construction contract administration. Construction contracts and the laws underpinning them will be subjected to detailed consideration and analysis, in tandem with a comparative analysis of the approach adopted by a wide range of standard form contracts. Other topics covered include avoidance, management and resolution of construction claims and disputes. Students will be exposed to various court cases related to construction contract administration. Students will also apply the knowledge of the Malaysian legal framework and legal requirements in contract administration to resolve legal issues in construction projects. More importantly, the students will be able to use their knowledge to promote an ethical and better image of the construction industry.

SKAC 5123 - Construction Site Management and Safety Control
The course is designed to educate the student on the construction site management and occupational health and safety (OHS) concept. The course is divided into two parts namely site management and

safety control. The first part will emphasize on site management particularly principles of site management, site performance, site reporting, monitoring and control, site layout, workers' welfare and site resources management. The second part will focus on the OHS legislation, accident causation theories, prevention and investigation, risk management, OHS Management, performance and culture, the occupational health such as stress and ergonomics in construction projects. Upon completion, students should be able to apply effective site management and practice the knowledge of Occupational Health & Safety Management and Accident Prevention in managing construction projects.

SKAC 5133 - Sustainability & Environment Management in Construction

The developments of building and infrastructure have inherent links with the environment. Land, materials, water, energy are all consumed during the construction operation of buildings and infrastructure. The constructed facilities than become part of the new environment we must live with. The process along the product development and the facilities lifespan generates greenhouse emissions which cause damage (e.g., global warming) to our environment. This subject offers an inter-disciplinary topic designed to promote collaboration and enhance understanding of the global challenge of sustainable development that related to construction industry. The course will emphasize on sustainability and environmental management within construction related issues to meet the principles Sustainable Development Goals (SDG 2030) and other niche guidelines related to construction industry. The subject will cover aspects of embodied energy (renewable & non-renewable), energy efficiency in building, construction waste, construction noise and management prevention method for construction. Thus, environmental regulations & legislation; Green Assessment Tools, environmental Impact Assessment (EIA) and Environmental Management System (EMS) will be incorporated into the subject. At the end of the course, students are expected to able to understand the principles of sustainable development and apply knowledge to plan, design and construct using sustainable concepts and methods.

SKAC 5213 - Advanced Structural Analysis and Modelling

The aim of this course is to provide future structural engineers with the tools to deal with the structural analysis of realistic civil engineering structures. The content of the course covers linear elastic analysis of structures using matrix method and its application using analysis software. It begins with a review of the basic concepts of structural analysis using matrix method focussing on the formulation and solution of equilibrium equation for skeletal structures which covering plane and space frame and grids. Then the formulation for continuum structural elements using Finite Element approach is presented. Understanding the behaviour of elements used in the structural analysis is emphasized, which includes plane stress, plane strain, axisymmetric, plate bending and shell elements. Students are expected to be able to apply these elements in combination with skeletal element in the modelling and analysis of a complete 3D structural system using structural analysis software. Modelling of various types of details as found in the real structures which affect the analysis results is also discussed. Individual projects on modelling and analysis using software is given at the end of the semester followed by the presentation about the project. Analysis software such as ROBOT or STAAD is used throughout the course.

SKAC 5233 – Structural Dynamics

The topic in structural dynamics course covers introduction, natural frequency, single degree of freedom, multi-degree of freedom system, eigenvalues and eigenvectors, free vibration response, response to excitation as well as time and frequency domain. Students will also be introduced to various structural dynamic tests and further exposed to hands-on experiments for the free vibration and ground motion conditions and computer analysis to solve dynamics problems. At the end of the course, the students should be able to solve numerous problems which involve dynamic loads.

SKAC 5323 - Advanced Design of Steel Composite Structures

This course intends to give an extensive understanding to the students in the advanced design of steel structures which are the multi-story steel frames, composite beams, plate girder, and portal frame. Eurocodes (EN 1993 and EN 1994) will be employed as the standards for design. The design of multi-story steel frames covers mainly the design aspects of braced and unbraced frames. In the design of unbraced frames, a special method called a Wind-Moment method is introduced. For braced frames, three aspects of design namely simple, semi-continuous, and continuous construction are discussed and compared to give a better picture on the economic aspects of the design. Details of the design of the frames include the analysis and design of the frames for columns, beams, connections, bracing system, column and beam splices. The course also covers the design of composite beams by using linear and stress block interaction methods which include the interaction of shear stud as full strength and partial strength. The design of plate girder is also included to cater for heavy load transferred to a long span or "column-free" construction of multi-story steel frames and bridges. Lastly, the design of portal frame is covered with the focus on a single-span symmetrical frame. Analysis and design software maybe employed in the course.

SKAC 5313 - Advanced Design of Reinforced Concrete

This course is intended to provide advanced knowledge on the aspect of design of reinforced concrete structural members. As a continuation to the Reinforced Concrete Design 1 and 2, the topics discussed are analysis and design of ribbed, waffle and flat slabs, water retaining structures, shear walls, corbel and nibs. Furthermore, students will be exposed to the methods of deflection calculation, design of elements for torsion and design of raft foundations. The design methodology will follow Eurocode 2 and any appropriate relevant design code.

SKAC 5513 - Advanced Hydraulics

This course introduced advanced concepts of fluid mechanics in relation to unsteady flow in pipes and open channels, fluid kinematics, and fluid dynamics including conservation of mass and momentum, the Bernoulli equation, the Navier-Stokes equation and the boundary layer theory. It covers laminar flows, transition to turbulent and fully turbulent flows and will be taught with civil engineering applications in mind. The students should already have a fundamental understand of fluid properties and mechanics, open channel and pipe flow. Basic knowledge in dealing with differentials and integrals is an advantage. In this course, computational methods of solving unsteady flow in open channels and pipes, which are topics of specific interest to civil engineers, will also be covered. The second half of the course deals with flow kinematic and flow dynamics. The student is introduced to the concepts of Lagrangian and Eulerian approaches, the Reynolds Transport Theorem, visualisation of flow properties in a dynamic system, the concepts of system and control volume in flow analysis and the Navier-Stokes equation with emphasis on the boundary layer flow.

SKAC 5613 - Advanced Hydrology

The subject mainly covers the theoretical aspects and design of urban storm water drainage system. This includes drainage planning process, non-structural planning, and control option for flow reduction and pollution minimization. Importance and impacts of best management practices of urban storm water management are also covered throughout the topics. At the end of the course, the students are being exposed to design elements in urban drainage and flood control systems that comply with Malaysian design criteria. The students will also realize the importance of urban storm water management and be exposed to real projects examples and climate change impact elements.

SKAC 5623 - Urban Stormwater Management

The subject mainly covers the theoretical aspects and design of urban storm water drainage system. This includes drainage planning process, non-structural planning, and control option for flow reduction and pollution minimization. Importance and impacts of best management practices of urban storm water management are also covered throughout the topics. At the end of the course, the students are being exposed to design elements in urban drainage and flood control systems that comply with Malaysian design criteria. The students will also realize the importance of urban storm water management and be exposed to real projects examples and climate change impact elements.

SKAC 5713 - Advanced Soil Mechanics

This subject is one of the electives (PRISMS) subjects offered by Department of Geotechnics and Transportation, which will provide: the advanced knowledge on the application and principles of soil mechanics and introduction of unsaturated soil mechanics. It considers the following topics: soil and clay mineralogy, strength behaviour of cohesionless and cohesive soils, Mohr-Coulomb failure criterion, peak stresses, effective stress ratio, residual stress and critical state soil mechanics. It also will covers principles of advanced laboratory measurement and extensive consolidation theory and pore pressure parameters. In addition, introduction of unsaturated Critical state soil mechanics for both strength and compressibility characteristics.

SKAC 5723 - Advanced Geotechnical Analysis & Design

This course, offered by the Department of Geotechnics and Transportation, will provide advanced knowledge on the analysis and design of geotechnical engineering structures such as the earth dam, earth retaining structures, embankment on soft soils and tunnelling through soils. It includes evaluating poor ground conditions and propose alternative technique(s) for ground improvement such as the sand drain, vertical drains, geosynthetics, soil reinforcement, electro-osmosis and others. Practical solution to problems which often confronted during construction in difficult ground area will also be highlighted. The course explores examples of the construction and post-construction data for the purposes of performance, safety and design compatibility. Slope and embankment stability; natural and manmade slopes, earth dams and embankments on soft clay, will be lay out in this course. Earth retaining structures for deep excavation, brace cut, gravity cantilever, buttress and reinforced earth wall and cantilever and anchored sheet pile will also be included. Besides that, the analysis and design of tunnelling work through soil and the earth dam on various foundation soil types will be demonstrated. The geotechnical instrumentation for monitoring of the geotechnical engineering structures will be explored in each chapter separately.

SKAC 5733 - Slope Engineering

This course provides a comprehensive introduction to the subject of slope stability, from initial classification through assessment and analysis to remediation. It provides the student with the knowledge, strategy and capability to inspect, understand and assess slope instability. The course covers both the theory and practice of slope engineering.

This course is ideal for those involved in the design, analysis or construction of civil engineering projects where the existence, creation or alteration of slope features may occur.

This course considers the background to slope movements, simple classification systems and the fundamental soil mechanics that control stability. The key parameters are highlighted and discussed. The principles and assumptions of the more popular methods of analysis are introduced together with a pragmatic guide for assessing the competence of analysis software. Specific problems covered include natural and cut slopes, earthworks and fills.

It also focuses on the practical approach to slope stability assessment and remediation. The investigation of failed slopes is considered. Remedial options to arrest or prevent movement are detailed together with a section on modelling. Techniques for the back analysis of slopes are covered and the application of stability calculations for suction assessment is explored.

SKAC 5813 - Highway and Infrastructure Design

This course provides state of art knowledge on highway and infrastructure design. Understanding of the subject will help the students to design highways and related infrastructure facilities. Topics for the subject are intersection design including roundabout design, intersection control system, highway surveys and location, geometric design of roads and highway facilities and also road cross section design. At the end of the course, students are able to analyse and apply the related theories in order to design highway and infrastructure facilities.

SKAC 5823 - Advanced Road Material

This is one of the elective subjects that will enhance the knowledge of the students on advanced road materials. The course consists of the following topics i.e., asphalt mixture (HMA, WMA, CMA), premix plant (types and operation), modified asphalt, rubberised asphalt, nanotechnology and its impact on road construction, durability of asphalt premix, asphalt mixture specification and testing, emulsified, cutback and foamed asphalt, road maintenance, and quality control and acceptance of asphalt mixtures.

SKAC 5833 - Traffic Management & Analysis

This course discusses urban traffic and transportation management strategies. It addresses the basic traffic and transportation data collections, analysis and the fundamental theory of traffic flow, capacity assessment of transportation facilities and the transportation systems management (TSM) planning processes and strategies. TSM includes Advanced Traffic Management (ATM), Urban Traffic Control System (UTCS), Intelligent Transport and Traffic System (ITS) and Highway
Information System.

SKAC 5913 - Environmental Management & Sustainability

This course is designed to expose students to various aspects in environmental management and the concept of sustainability. Topics discussed include the principles of sustainable development, understanding the environmental sensitive areas particularly the natural water bodies, catchment management, development of coastal and inland areas. Current issues related to environmental problems especially on climate change and water supply are the main aspects to be addressed. Some methods and concepts of sustainable approaches are introduced in order to promote and achieve sustainable development goals. At the end of the course, the students should be able to understand the concept of environmental sustainability and present it through an effective communication. The course enables the students to understand, plan and incorporate the concept of sustainability in environmental management.

SKAC 5923 - Land use and Environmental Planning

This course covers the fundamental concepts and mechanisms underlying land use and environmental planning from conceptual to its implementation. It focuses on the understanding of ecosystems, the impacts of land development activities along with the appropriate tools/techniques of environmental planning and management used to mitigate them. It provides an overview of the field, along with the fundamentals of land use planning, and presents a collaborative approach to environmental planning while explaining the principles of ecosystem management, restoration, and protection; land conservation; and the mitigation of natural hazards.

SKAC 5933 - Air and Noise Pollution

This course is designed to expose students with a comprehensive understanding in elements involved in air and noise pollution, and the practical approaches to control the pollution. In the air pollution part, topics discussed include elements and phenomena of air pollution, meteorology, control of air pollution and design considerations. In a noise pollution part, topics discussed include elements of noise pollution, effects, types of noise pollution, road traffic & aircraft/industrial noise. At the end of the course, students should acquire the fundamental knowledge related to the principles and control strategies of air and noise pollutions.

7 UNIVERSITY'S GENERAL COURSES

7.1 Introduction

Undergraduate students in the Bachelors Degree Program are required to register for the University's General Courses during their duration of study. The University's General Courses are categorized as follows:
Cluster 1: Malaysia Core Value
Cluster 2: Value and Identity
Cluster 3: Global Citizen
Cluster 4: Communication Skill
Cluster 5: Enterprising Skills

These courses, introduced in Semester 1 Session 2022/2023 Academic Session, are compulsory to all Bachelor's Degree students of UTM. Students will have to complete these courses as one of the requirements for graduation.

7.2 Cluster 1: Malaysia Core Value

Students are required to take a total of four (4) credits of courses as listed in the following table.

List of Courses and The Codes

Code	Name of Course	Credit
FOR INTERNATIONAL STUDENTS		
ULRS 1022	Philosophy and Current Issues	2
OR ULRS 1182	Appreciation of Ethics and Civilization	2
AND UHLM 1012	Malay Language Communication 2	2
FOR LOCAL STUDENTS		
ULRS 1022	Philosophy and Current Issues	2
ULRS 1182	Appreciation of Ethics and Civilization	2
Total no. of compulsory university credit course for international or local students		**4**

7.3 Cluster 2: Value & Identity

Students are required to take a total of two (2) credits of courses as listed in the following table.

List of Courses and The Codes

Code	Name of Course	Credit
ULRS 1032	Integrity and Anti-corruption	2
Total no. of compulsory university credit course		**2**

7.4 Cluster 3: Global Citizen

Students are required to take a total of two (2) credits of courses as listed in the following table.

List of Courses and The Codes

Code	Name of Course	Credit
ULRF****	Credit Co-curricular Courses	2
Total no. of compulsory university credit course		**2**

7.5 Cluster 4: Communication Skill

Students are required to take six (4) credits of English Language courses and another two (2) credits of Foreign Language as listed in the following table. The total compulsory credit for language skill is six (6) credits.

List of Courses and The Codes

Code	Name of Course	Credit
UHLB2122	Professional Communication Skills 2	2
UHLB3132	Professional Communication Skills 3	2
UHLX1112	Elective of Foreign Language	2
Total no. of compulsory university credit course		**6**

7.6 Cluster 5: Enterprising Skill

Students are required to take a total of two (2) credits of courses as listed in the following table.

List of Courses and The Codes

Code	Name of Course	Credit
ULRS3032	Innovation and Entrepreneurship	2
Total no. of compulsory university credit course		**2**

7.7 Summary of Total Credit Hours for University's General Courses

Cluster	Name of Cluster	Credit
Cluster 1	Malaysia Core Value	4
Cluster 2	Value and Identity	2
Cluster 3	Global Citizen	2
Cluster 4	Communication Skill	6
Cluster 5	Enterprising Skill	2
Total no. of compulsory university credit course		**16**

7.8 Mathematics Core Courses (SSCE)

Student are required to complete 15 credits of Science and Mathematics courses as listed below:

Code	Name of Course	Credit
SSCE 1693	Engineering Mathematics I	3
SSCE 1793	Differential Equations	3
SSCE 1993	Engineering Mathematics II	3
SSCE 2193	Engineering Statistics	3
SSCE 2393	Numerical Methods	3
Total no. of compulsory university credit course		**15**

7.9 Co-Curricular Courses

The co-curricular courses were first introduced as part of the University General Courses in July semester 1992/1993 Academic Session. It is compulsory for every student to take these courses as a pre-requisite for graduation.

The courses offered are managed by the General Courses and Co-curricular center. To attract the interest of students, a variety of courses are offered, and they are categorized into main modules such as Sports and Character Building, Personal and Social Development, Arts and Culture, and Special Programmes

8 GRADUATION CHECKLIST

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

NO.	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	GRADE
a) CIVIL ENGINEERING COURSES					
1	SKAC 1023	Engineering Surveying	3	3	
2	**SKAC 1031**	**Survey Camp** (YEAR 1/ SHORT SEMESTER)	**1**	**HL**	
3	SKAC 1112	Civil Engineering Materials	2	2	
4	SKAC 1213	Engineering Mechanics	3	3	
5	SKAC 1422	Engineering Drawing	2	2	
6	SKAC 1513	Fluid Mechanics	3	3	
7	SKAC 1713	Soil Mechanics	3	3	
8	SKAC 1722	Engineering Geology and Rock Mechanics	2	2	
9	SKAC 2012	Civil Engineering Laboratory 1	2	2	
10	SKAC 2022	The Engineer and The World	2	2	
11	SKAC 2132	Construction Technology and Building Services	2	2	
12	SKAC 2223	Mechanics of Materials and Structures	3	3	
13	SKAC 2413	Computer Programming	3	3	
14	SKAC 2513	Hydraulics	3	3	
15	SKAC 2722	Geotechnics 1	2	2	
16	SKAC 2832	Highway Engineering	2	2	
17	SKAC 2913	Water Treatment and Supply Engineering	3	3	
18	SKAC 3012	Civil Engineering Laboratory 2	2	2	
19	**SKAC 3045**	**Industrial Training** (YEAR 3/SHORT SEM.) for 12 weeks/3 months	**5**	**HL**	
20	SKAC 3122	Construction Economics and Estimating	2	2	
21	SKAC 3243	Theory of Structures	3	3	
22	SKAC 3313	Reinforced Concrete Design I	3	3	
23	SKAC 3323	Structural Steel Design	3	3	
24	SKAC 3412	Building Information Modelling & Data	2	2	
25	SKAC 3613	Hydrology and Water Resources	3	3	
26	SKAC 3712	Geotechnics 2	2	2	
27	SKAC 3842	Traffic Engineering	2	2	
28	SKAC 3913	Environmental Management	3	3	
29	SKAC 3922	Wastewater Engineering	2	2	
30	SKAC 4012	Integrated Design Project 1	2	2	
31	**SKAC 4021**	**Civil Engineering Seminar (SEMKA)**	**1**	**HL**	
32	SKAC 4022	Research Methodology and Pre-Project	2	2	
33	SKAC 4032	Integrated Design Project 2	2	2	
34	SKAC 4034	Final Year Project	4	4	
35	SKAC 4113	Construction & Project Management	3	3	
36	SKAC 4223	Structural Analysis	3	3	
37	SKAC 4333	Reinforced Concrete Design 2	3	3	
38	SKAC 4412	Data Science and Artificial Intelligence	2	2	
39	SKAC 4##3	CE Elective 1	3	3	
40	SKAC 4##3	CE Elective 2	3	3	
TOTAL CREDIT OF CIVIL ENGINEERING COURSES (a)			**101**	**94**	
b) 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**	
c) UNIVERSITY GENERAL COURSES					
Cluster 1: Malaysia Core Value (2 courses only)					
1	ULRS1182	Appreciation of Ethics & Civilisations	2	2	
2	ULRS1022	Philosophy and Current Issues (for local students only)	2	2	
3	UHLM1012	Malay Language Communication 2 (for International Students only)	2	2	
Cluster 2 : Value & Identity					
1	ULRS1032	Integrity and Anti Corruption	2	2	
Cluster 3 : Global Citizen					
1	ULRF 2##2	Co-Curriculum & Service Learning	2	2	
Cluster 4 : Communication Skills					
1	UHLB2122	Professional Communication Skills 2	2	2	
2	UHLB3132	Professional Communication Skills 3	2	2	
3	UHL# 1112	Elective Of Foreign Language	2	2	
Cluster 5 : Enterprising Skills					
1	ULRS3032	Innovation & Enterpreneurship	2	2	
Cluster 6 : Free Elective					
1	S### ###3	* to be taken at other faculty	3	3	
		TOTAL CREDIT of UNIVERSITY GENERAL COURSES (c)	**19**	**19**	
		TOTAL CREDIT TO GRADUATE (a + b + c)	**135**	**128**	
Professional Skills Certificate (PSC) (SPACE/FKA)					
1	*GLRM0010*	Talent and Competency Management (TCM)			
2	*GLRB0010*	Design Thinking for Entrepreneur (DTE)			
3	*GLRL0010*	English Communication Skills For Graduating Students (ECS)			
4	*GLRT00##*	Electives Courses			
5	*GLRT00##*	Electives Courses			
		CPA :			
		CGPA :			
		Cumulative Credit Counted of All Semester/ Jumlah Kredit Kira (JKK) :			
		Cumulative Credit Earned of All Semester/ Jumlah Kredit Dapat (JKD) :			
		Results (KB, KS or KG) :			
		Deferment of Study :			
		Academic Advisor's Signature :			

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