



FACULTY OF ENGINEERING



ACADEMIC SESSION 2021/2022

# UNDERGRADUATE HANDBOOK

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## ABOUT US

Faculty of Engineering (FE) was formed on 1<sup>st</sup> July 2018, by merging 6 big faculties into one. With the transformation, Faculty of Engineering now comprises six schools namely School of Biomedical Engineering and Health Sciences, School of Chemical and Energy Engineering, School of Civil Engineering, School of Computing and School of Electrical Engineering. This transformation strengthens the collaboration of expertise with different engineering backgrounds within the faculty.

### VISION

To be a premier global faculty in engineering and technology

### MISSION

Synergizing academic capacity to nurture holistic talents and lead in innovative technologies.

### MOTTO

Nurturing Talents. Delivering Excellence.

### UNIVERSITI RANKING

UTM is now ranked at #191 Globally : QS World University **Rankings 2021**. **Universiti Teknologi Malaysia** continues soaring high internationally when its performance improved to Top 15% in the Quacquarely Symonds (QS) World University **Rankings 2021**, recently.



## EDUCATIONAL GOALS

Bil.	Matlamat Pendidikan UTM
1	<p><b><i>Demonstrate knowledge and competency in various field of study, appropriate research and professional practices, and the processes of critical thinking, creative thinking, and problem solving for universal well-being and prosperity</i></b> <i>Mempamerkan pengetahuan dan kemahiran dalam pelbagai bidang pengajian, amalan penyelidikan dan profesional yang bersesuaian serta proses-proses pemikiran kritis, pemikiran kreatif dan penyelesaian masalah untuk kemakmuran dan kesejahteraan sejagat.</i></p>
2	<p><b><i>Demonstrate high standard of ethical conduct, positive character, and societal responsibilities</i></b> <i>Mempamerkan taraf etika yang tinggi, watak positif, dan tanggungjawab sosial</i></p>
3	<p><b><i>Appreciate and always be guided by the Universiti Teknologi Malaysia core values of Integrity, Synergy, Excellence and Sustainability</i></b> <i>Menghayati dan sentiasa berpandukan nilai-nilai teras Universiti Teknologi Malaysia iaitu integriti, sinergi, kecemerlangan dan kelestarian</i></p>
4	<p><b><i>Communicate and collaborate effectively with other professionals, and the society</i></b> <i>Berkomunikasi dan bekerjasama secara berkesan dengan ahli profesional yang lain serta masyarakat</i></p>
5	<p><b><i>Demonstrate the ability to learn and grow profesionally and further contribute to the development of science, technology and engineering</i></b> <i>Menunjukkan keupayaan untuk belajar dan meningkat secara profesional dan seterusnya menyumbang kepada pembangunan sains, teknologi dan kejuruteraan</i></p>

## MESSAGE FROM THE DEAN



Faculty of Engineering (FE), also known as UTM Engineering is currently accommodating more than 10,000 undergraduate and postgraduate students, and therefore has become one of renowned institutions in Malaysia to provide professional and engineering workforce to the market, making UTM proud to be the premier engineering university.

Faculty of Engineering has more than 700 engineering specialists in various engineering fields of Civil, Electrical, Chemical, Mechanical, Biomedical and Computing. With this broad expertise, FE aims to build a borderless future particularly in providing knowledge across multi-disciplines to address contemporary global challenges.

With this strength, FE is determined to continue to be a leading academic excellence institution based on the mission and vision of the faculty along with the slogan of “Nurturing Talent, Delivering Excellence”.

As well all know, the presence of unexpected Covid-19 pandemic has contributed to disruptive life-changing situation, particularly in the delivery of our teaching and learning since 2020. During this uncertainty period, FE is managing with our best mechanisms to continually provide teaching and learning activities through multiple learning platforms and pedagogies to accommodate with the new normal.

Finally, let us engineer the future through meaningful collaboration together for the benefit of our nation.

Professor Ts. Dr. Ruzairi bin Abdul Rahim  
Dean, Faculty of Engineering,  
Universiti Teknologi Malaysia

# ORGANISATION STRUCTURE



# UNDERGRADUATE STUDY

## ENTRY REQUIREMENTS

### BACHELOR'S DEGREE

#### For Malaysian Students

##### General Entry Requirements:

1. A pass in Malaysian Certificate of Education (SPM) or equivalent with a credit in Bahasa Melayu/Bahasa Malaysia or a credit in Bahasa Melayu/Bahasa Malaysia (July paper), **and**
2. Having Diploma or equivalent qualification recognized by the Malaysian Government, **or**
3. A pass in Malaysian Higher School Certificate (STPM) with at least C grade (CGPA 2.00) in General Paper and C grade (CGPA 2.00) in any two of the taken subjects in the STPM, **or**
4. A pass in Malaysian Matriculation Certificate / Foundation with minimum CGPA of 2.00, **or**
5. Hold A – Level / International Baccalaureate / Australian Matriculation (Ausmat) Certificate.
6. Attained a minimum Band 2 in Malaysian University English Test (MUET)/ Band 5.5 in IELTS/ Score of 500 in TOEFL PBT/ Score of 59 in TOEFL IBT.

##### Special Requirements for the Programme

1. Comply to university general requirements, **and**
2. Comply to special requirements for the programme.  
Please refer to [admission.utm.my/undergraduate-malaysian/](http://admission.utm.my/undergraduate-malaysian/) for further details.
3. Do not have any physical disabilities

## For International Students

### **General Entry Requirements:**

1. Passed General Certificate of Education (GCE), 'A' Level, Diploma in related field or other equivalent pre-university examinations; **or**
2. Any other certificate that is recognized by Senat of the University equivalent to the above; **or**
3. Participate in the bridging program organized by the university, **and**
4. Pass the English Proficiency requirements.
5. Pass the Health requirements.

Please refer to [admission.utm.my/entry-requirements-ug-international/](http://admission.utm.my/entry-requirements-ug-international/) for further details.

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

### **English Language Requirement for International Students**

If English is not your native language and you are attending a school where English is not the language of instruction, you must take the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System Academic (IELTS Academic)

Applicants who do not meet the English proficiency requirements of their chosen programme at Universiti Teknologi Malaysia (UTM) can improve their English at Intensive English Programme (IEP) at Language Academy, UTM or CIEP at ELS Language Centers in Malaysia. UTM accepts IELTS Level 5.5 and above upon completion of IEP conducted by Language Academy, UTM or ELS English Certificate (level 107) as an ENGLISH LANGUAGE ENTRY REQUIREMENTS FOR INTERNATIONAL STUDENTS. Students who choose to attend IEP (Language Academy, UTM) must attain IELTS 5.5 or attend ELS and must pass the required English course(s) before starting their programmes in UTM



## COURSE REGISTRATION

It is mandatory for all students who have registered for a programme – a full time or external candidate – to register every course that will be taken for the semester. Students who did not enroll in the programme will not be allowed to register for any course.

Students can only register for courses that are offered for a particular semester based on the regulations set by the student's faculty. Students cannot register for any course that is not offered in the semester.

Student can withdraw (TD) any course registered for the semester. Application to withdraw must be made by using the Course Withdrawal Form (UTM.E/3-2).

If student fails to do the registration or does not do the registration of courses within the specified duration as mentioned above, unless valid reasons are given, he or she will be dismissed from the University.

### ACADEMIC TRANSCRIPT

Applications will be charged a fee of RM25.00 for each Master and PhD. Transcripts released in English and student were enrolled on year 2000 onwards.

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Applications will be charged a fee of RM25.00 for each Master and PhD. Transcripts released in English and student were enrolled on year 2000 onwards.

## AWARD REQUIREMENTS

### Bachelor's Degree

- Attain a total of not less than 138 credit hours with a minimum CGPA of 2.0.
- Professional Skill Certificate (PSC)

#### *Compulsory:*

1. Talent and Competency Management
2. English Communication Skills Graduating Students (ECS)
3. Design Thinking for Entrepreneur

#### *Elective (Choose two only):*

1. Data Analytics for Organization
2. Professional Ethics and Intergrity
3. Construction Measurement (Mechanical & Electrical)
4. OSHE for Engineering Industry and Laboratory
5. OSHE for Construction Industry and Laboratory Works
6. Quality Management for Built Environment and Engineering Professionals
7. Safety and Health Officer Introductory Course

### **Cross-Campus Programme**

Students are given the opportunity to enrol in a few courses in participating universities. The grades and credits obtained during this period are transferable.

The programme is open to undergraduates who have undergone a minimum of two semesters of their studies with the following conditions:

- (i) The total number of credits allowed to be taken is between twelve (12) and eighteen (18) credits only.
- (ii) The student should hold a minimum CGPA of 3.00 at the time of application.
- (iii) The student is not a residence of or originated from the state where the university that he/she intends to attend is located.

The student will not be charged tuition fees by the participating university but shall pay the regular tuition fees at UTM. However, should the participating university provide accommodation, the student will need to pay accommodation fees.

### **Professional Skills Certificate (PSC)**

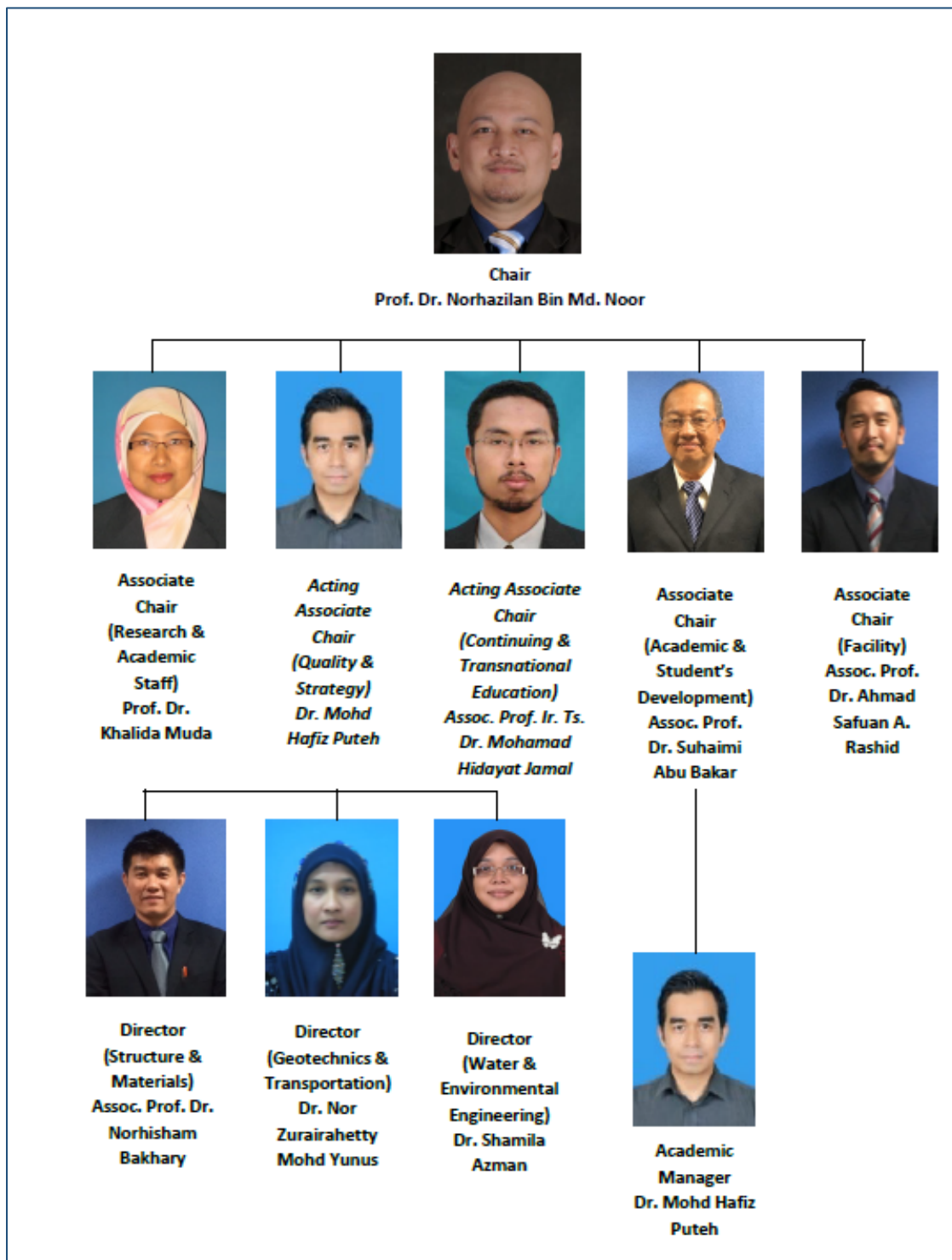
Students must enrol in certificate programmes offered by the Centres of Excellence in the University and the School of Professional and Continuing Education (SPACE) as part of the award requirement:

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



**SCHOOL OF CIVIL ENGINEERING**

## MANAGEMENT TEAM



Position	Name
Chair	Professor. Dr. Norhazilan Bin Md Noor <a href="mailto:norhazilan@utm.my">norhazilan@utm.my</a> 07-553 1500
Associate Chair (Academic and Student Development)	Associate Professor Dr. Suhaimi Abu Bakar/Md Ramli <a href="mailto:suhaimibakar@utm.my">suhaimibakar@utm.my</a> 07-553 1507
Associate Chair (Research and Academic Staff)	Professor Dr. Khalida Muda <a href="mailto:khalida@utm.my">khalida@utm.my</a> 07-553 1503
<i>Acting Associate Chair (Quality and Strategy)</i>	Dr. Mohd Hafiz Puteh <a href="mailto:mhafizputeh@utm.my">mhafizputeh@utm.my</a> 07-553 1744
<i>Acting Associate Chair (Continuous Education and TNE)</i>	Associate Professor Ir. Ts. Dr. Mohamad Hidayat Jamal <a href="mailto:mhidayat@utm.my">mhidayat@utm.my</a> 07-553 2536
Associate Chair (Facility)	Associate Professor Dr. Ahmad Safuan A. Rashid <a href="mailto:ahmadsafuan@utm.my">ahmadsafuan@utm.my</a> 07-553 1591
Director (Structures and Materials)	Associate Prof. Dr. Norhisham Bakhary <a href="mailto:norhisham@utm.my">norhisham@utm.my</a> 07-553 1504
Director (Water and Environmental Engineering)	Dr. Shamila Azman <a href="mailto:shamila@utm.my">shamila@utm.my</a> 07-553 1506
Director (Geotechnics and Transportation)	Ts. Dr. Norzurairahetty Mohd Yunos <a href="mailto:nzurairahetty@utm.my">nzurairahetty@utm.my</a> 07-553 1587
Academic Manager	Dr. Mohd Hafiz Puteh <a href="mailto:mhafizputeh@utm.my">mhafizputeh@utm.my</a> 07-553 1744

# BACHELOR OF CIVIL ENGINEERING WITH HONOURS

## PROGRAMME SPECIFICATIONS

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

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

### General Information

1. Awarding Institution		Universiti Teknologi Malaysia		
2. Teaching Institution		Universiti Teknologi Malaysia		
3. Programme Name		Bachelor in Civil Engineering		
4. Final Award		Bachelor of Civil Engineering with Honours		
5. Programme Code		SEAWH		
6. Professional or Statutory Body of Accreditation		Kementerian Pendidikan Malaysia		
7. Language(s) of Instruction		English and Bahasa Melayu		
8. Mode of Study (Conventional, distance learning, etc)		Conventional		
9. Mode of operation (Franchise, self-govern, etc)		Self-governing		
10. Study Scheme (Full Time/Part Time)		Full Time		
11. Study Duration		Minimum : 4 yrs Maximum : 6 yrs		
Type of Semester	No. of Semesters		No of Weeks/Semester	
	Full Time	Part Time	Full Time	Part Time
Normal	8	-	14	-
Short	4	-	8	-

### Course Classification

No	Classification	Credit Hours	Percentage
i.	University Courses a. General b. Language c. Entrepreneurship d. Co-Curriculum e. Mathematics	8 8 2 3 15	26.3%
ii.	Faculty/Programme Core	92	67.2%
iii.	Programme Electives	9	6.6%
	<b>Total</b>	<b>137</b>	<b>100%</b>
A	Engineering Courses (a) Lecture/Project/Laboratory (b) Workshop/Field/Design Studio (c) Industrial Training (d) Final Year Project	79 6 5 6	70.1%
	<b>Total Credit Hours for Part A</b>	<b>96</b>	
B	Related Courses (a) Applied Science/Mathematic/Computer (b) Management/Law/Humanities/Ethics/Economy (c) Language (d) Co-Curriculum	20 10 8 3	29.9%
	<b>Total Credit Hours for Part B</b>	<b>41</b>	
	<b>Total Credit Hours for Part A and B</b>	<b>137</b>	100%
	<b>Total Credit Hours to Graduate</b>	<b>137 credit hours</b>	

## Award Requirements

To graduate, students must:

- Attain a total of not less than 139 credit hours with a minimum CGPA of 2.0.
- Pass Industrial Training
- Complete all Professional Skills Certificate (PSC)
- 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.

## Entry Requirements

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

- 1) Minimum results based on **the Malaysian High School Certificate (STPM)** (results would be based on the general requirements as well as other conditions as the pre-requisites for the programme set by the university).

### General University Requirements:

- i. Passed and obtained good results in the **Malaysian Certificate Examination (SPM)** or its equivalent.
- ii. Passed Bahasa Melayu /Bahasa Malaysia with **credit** in the SPM/equivalent.
- iii. Passed the **Malaysian High School Certificate (STPM)** or its equivalent and obtained the following:
  - a) **Grade C (NGMP 2.00)** General paper, and
  - b) **Grade C (NGMP 2.00)** in two (2) other subjects
- iv. Passed the Malaysian University English Test (MUET) with minimum result of **Band 1**.

### 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 / Further Mathematics
    - b) Physics/ Chemistry/ Biology  
(Eligible candidates in **Physics** subjects at Matriculation / Foundation must obtained minimum of **Grade C** in SPM for **Chemistry** subjects.) Or  
(Eligible candidates in **Chemistry or Biology** subjects at Matriculation / Foundation must obtained minimum of **Grade C** in SPM for **Physics** subjects.)
  - ii. Passed **Mathematics** and **Physics** in SPM with minimum of **Grade C**.
  - iii. Passed the **Malaysian University English Test (MUET)** with minimum result of **Band 2**.
  - iv. No disabilities which inhibit physical activities.
- 2) Minimum requirements for **Matriculation Certificates (KPM) / Asasi Sains UM / 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)** / equivalent examination with **Grade C** in Bahasa Melayu/Bahasa Malaysia.
  - ii. Passed the **Matriculation Certificate Examination KPM/Asasi Sains UM / Asasi UiTM** with a minimum **CGPA of 2.00** and passed all the core subjects.
-



- iii. Passed the **Malaysian University English Test (MUET)** with minimum result of **Band 1**.

**Special Requirements of the Programme:**

- i. Obtained a **CGPA of 2.80**; and Passed with a **Grade B- (CGPA 2.67)** in two of the following subjects:
    - a) Mathematics
    - b) Physics/ Engineering Physics / Chemistry / Engineering Chemistry / Biology (Eligible candidates in **Physics / Engineering Physics** subjects at Matriculation / Foundation must obtained minimum of **Grade C** in SPM for **Chemistry** subjects.)Or  
(Eligible candidates in **Chemistry / Engineering Chemistry or Biology** subjects at Matriculation / Foundation must obtained minimum of **Grade C** in SPM for **Physics** subjects.)
  - ii. Passed **Mathematics** and **Physics** in SPM with minimum of **GRES C**.
  - iii. Passed the Malaysian University English Test (MUET) with minimum result of **Band 2**.
  - iv. No disabilities which inhibit physical activities.
- 3) Minimum qualifications for students with **Certificates/Diplomas**  
(Fulfill the general requirements set by the university as well as specific requirements of the programme).

**General University Requirements**

- i. Passed the **Malaysian Certificate Examination (SPM)** / equivalent examination with **credit** in Bahasa Melayu/Bahasa Malaysia.
- ii. Obtained a **Diploma** or **other equivalent** qualification recognized by the **Government of Malaysia** and approved by the **Senate of IPTA**. or Passed the **Malaysian High School Certificate (STPM)** in year 2016 or earlier with minimum result of:-
  - **Grade C (NGMP 2.00)** General paper
  - **Grade C (NGMP 2.00)** in two (2) other subjects
- iii. Passed Matriculation examination in year 2015 or earlier with minimum of **CGPA 2.00**.
- iv. Passed the Malaysian University English Test (MUET) with minimum result of **Band 1**.

**Special Requirements of the Programme:**

- i. Obtained a **Diploma in Civil Engineering from UTM**/equivalent with a minimum **CGPA of 2.70**; or for candidates with a CGPA below 2.70 but have a minimum of **two or more years of working experience** in the related area of study will be eligible to apply for a place to study at the university.
- ii. Obtained a **credit pass in Mathematics** in their SPM/equivalent examination or a minimum **grade C** in any of the Mathematics Courses taken at the diploma level.
- iii. Passed the Malaysian University English Test (MUET) with minimum result of **Band 2**.
- iv. No disabilities which inhibit physical activities.
- v. Candidates are required to submit the results transcript of all their examinations taken during their Diploma study (semester one until the final semester) to UTM. A copy of the diploma or a letter of completion of study will also have to be submitted

together with their applications.

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

### Programme Educational Objectives (PEO)

Code	Intended Educational Objectives
PEO1	Competent, innovative and entrepreneurial in acquiring and applying knowledge towards solving Civil Engineering problems.
PEO2	Possess leadership qualities, able to work, manage in diverse teams and serve the society in multi-disciplinary environment.
PEO3	Professionalism and uphold ethical values with emphasis on sustainable environment.
PEO4	Communicate effectively, possess strong self-confidence and recognize the need for life-long learning.

### Programme Learning Outcomes (PLO)

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

Code	Intended Learning Outcomes
PLO1	Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to the solution of complex engineering problems
PLO2	Identify, formulate, conduct research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences (WK1 toWK4)
PLO3	Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (WK5)
PLO4	Conduct investigation of complex engineering problems using research-based knowledge (WK8) and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions
PLO5	Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations (WK6)
PLO6	Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems (WK7)
PLO7	Understand and evaluate the sustainability and impact of professional engineering work in the solutions of complex engineering problems in societal and environmental contexts. (WK7)
PLO8	Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice (WK7)

<b>PLO9</b>	Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings
<b>PLO10</b>	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
<b>PLO11</b>	Demonstrate 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, to manage projects in multidisciplinary environments
<b>PLO12</b>	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

### CROSS-CAMPUS PROGRAMME

Students are given the opportunity to enroll in a few courses in participating universities. The grades and credits obtained during this period are transferable (up to 1/3 of the total credits of the curriculum). Currently, there are four participating universities i.e. Universiti Teknologi Malaysia, Universiti Sains Malaysia, Universiti Malaya and Universiti Malaysia Sarawak.

The programme is open to undergraduates who have undergone a minimum of two semesters of their studies with the following conditions:

- (i) The total number of credits allowed to be taken is between twelve (12) and sixteen (16) credits only.
- (ii) The student should hold a minimum CGPA of 3.00 at the time of application.
- (iii) The student is not a residence of or originated from the state where the university that he/she intends to attend is located.

The student will not be charged tuition fees by the participating university but shall pay the regular tuition fees at UTM. However should the participating university provide accommodation, the student will need to pay accommodation fees

### COURSE MENU

<b>YEAR 1 : SEMESTER 1</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
SEAA 1011	Introduction to Civil Engineering	1	
SEAA 1213	Engineering Mechanics	3	
SEAA 1513	Fluid Mechanics	3	
SSCE 1693	Engineering Mathematics I	3	
UHMT 1012	Graduate Success Attributes	2	
UHLB 1112	English Communication Skills	2	<b>MUET – BAND 1, 2 &amp; 3</b>
UHMS 1182	Appreciation of Ethics and Civilizations (For Local Students Only)	2	

UHS 1022/ UHMS 1182	Philosophy and Current Issues Appreciation of Ethics and Civilizations (For International Students Only)		
UKQ# 2##2	Co-Curriculum & Service Learning	2	
<b>TOTAL CREDIT</b>		<b>18</b>	
<b>CUMULATIVE CREDITS</b>		<b>18</b>	

<b>YEAR 1 : SEMESTER 2</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
SEAA 1023	Engineering Surveying	3	
SEAA 1422	Engineering Drawing	2	
SEAA 1713	Soil Mechanics	3	
SSCE 1793	Differential Equations	3	
SSCE 1993	Engineering Mathematics II	3	
UBSS 1032	Introduction to Entrepreneurship	2	
UHS 1022	Philosophy and Current Issues (For Local Students Only)	2	
UHLM 1012	Malay Language 2 (For International Students Only)		
<b>TOTAL CREDIT</b>		<b>18</b>	
<b>CUMULATIVE CREDITS</b>		<b>36</b>	

<b>YEAR 1 : (SHORT SEMESTER)</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
SEAA 1031	Surveying Camp	1	SEAA 1023
<b>TOTAL CREDIT</b>		<b>1</b>	
<b>CUMULATIVE CREDITS</b>		<b>37</b>	

<b>YEAR 2 : SEMESTER 1</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
SEAA 2012	Civil Engineering Laboratory 1	2	
SEAA 2032	Mechanical and Electrical Systems	2	
SEAA 2513	Hydraulics	3	
SEAA 2722	Geotechnics 1	2	SEAA 1713
SEAA 2832	Highway Engineering	2	SEAA 1713
SEAA 2912	Water Treatment	2	
SSCE 2393	Numerical Methods	3	
UHLB 2122	Advanced Academic English Skills	2	UHLB1112
<b>TOTAL CREDIT</b>		<b>18</b>	
<b>CUMULATIVE CREDITS</b>		<b>55</b>	

<b>YEAR 2 : SEMESTER 2</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
SEAA 2112	Civil Engineering Materials	2	
SEAA 2223	Mechanics of Materials and Structures	3	SEAA 1213
SEAA 2413	Computer Programming	3	SEAA 1422
SEAA 2712	Engineering Geology and Rock Mechanics	2	SEAA 1713
SEAA 2922	Wastewater Engineering	2	
SSCE 2193	Engineering Statics	3	
UHIT 2302	The Thought of Science and Technology	2	
<b>TOTAL CREDIT</b>		<b>17</b>	
<b>CUMULATIVE CREDITS</b>		<b>72</b>	

<b>YEAR 3 : SEMESTER 1</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
SEAA 3123	Construction Technology, Contract & Estimating	3	
SEAA 3243	Theory of Structures	3	SEAA 2223
SEAA 3313	Reinforced Concrete Design 1	3	SEAA 2223
SEAA 3412	Building Information Modelling and Data Management	2	SEAA 2413
SEAA 3712	Geotechnics	2	SEAA 2722
UHLX 1122	Elective of Foreign Language	2	
UKQT 3001	Extracurricular Experiential Learning (EXCEL)	1	
<b>TOTAL CREDIT</b>		<b>16</b>	
<b>CUMULATIVE CREDITS</b>		<b>88</b>	

<b>YEAR 3 : SEMESTER 2</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
SEAA 3012	Civil Engineering Laboratory 2	2	
SEAA 3022	Integrated Design Project 1	2	All SEAA Year 1 and Year 2 courses
SEAA 3323	Structural Steel & Timber Design	3	
SEAA 3613	Hydrology and Water Resources	3	SEAA 1513
SEAA 3842	Traffic Engineering	2	
SEAA 3913	Environmental Management	3	
UHLB 3132	English for Professional Purpose	2	
<b>TOTAL CREDIT</b>		<b>17</b>	
<b>CUMULATIVE CREDITS</b>		<b>105</b>	

<b>YEAR 3 : (SHORT SEMESTER)</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
SEAA 3045	Industrial Training	5	All Basic Civil Engineering Core Courses
<b>TOTAL CREDIT</b>		<b>5</b>	
<b>CUMULATIVE CREDITS</b>		<b>110</b>	

<b>YEAR 4 : SEMESTER 1</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
SEAA 4021	Civil Engineering Seminar	1	
SEAA 4022	Research Methodology and Pre-Project	2	
SEAA 4032	Integrated Design Project 2	2	SEAA 3022
SEAA 4333	Reinforced Concrete Design 2	3	SEAA 3313
SEAA 4**3	Elective 1	3	
SEAA 5**3	PRISMS Elective 1		
<b>TOTAL CREDIT</b>		<b>14</b>	
<b>CUMULATIVE CREDITS</b>		<b>124</b>	

<b>YEAR 4 : SEMESTER 2</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
SEAA 4034	Final Year Project	4	SEAA 4022
SEAA 4113	Constructions & Project Management	3	
SEAA 4223	Structural Analysis	3	SEAA 3243
SEAA 4**3	Elective 2	3	
SEAA 5**3	PRISMS Elective 2		
SEAA 4**3	Elective 3	3	
SEAA 5**3	PRISMS Elective 3		
<b>TOTAL CREDIT</b>		<b>13</b>	
<b>CUMULATIVE CREDITS</b>		<b>137</b>	

*Subject to change*

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

English prerequisite is shown below:

<b>ENGLISH LANGUAGE TESTS</b>	<b>UHLB 1112</b>	<b>UHLB 2122</b>	<b>UHLB 3132</b>
a) MUET : $\geq$ Band 4 b) IELTS : $\geq$ Band 5.5 c) TOEFL : $\geq$ 525 d) TOEFL iBT : $\geq$ 60 e) CEFR : $\geq$ B2	Exemption*	Compulsory	Compulsory

## **Elective Courses**

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

### **1. Materials, Management and Construction**

- SEAA 4143 Construction Plants and Equipment
- SEAA 4153 Offshore Structures
- SEAA 4163 Concrete Technology

### **2. Structural Analysis and Design**

- SEAA 4203 Stability and Dynamics of Structures
- SEAA 4243 Finite Element Method
- SEAA 4263 Earthquake and Wind Engineering
- SEAA 4273 Maintenance of Seismic Structures and Materials
- SEAA 4293 Advanced Solid Mechanics
- SEAA 4323 Prestressed Concrete Design
- SEAA 4383 Analysis and Design of Tall Building Systems

### **3. Information Technology**

- SEAA 4433 Advanced Computer Programming
- SEAA 4463 Construction Integration Environment
- SEAA 4473 Geographic Information System

### **4. Hydraulics and Hydrology**

- SEAA 4523 Coastal Engineering
- SEAA 4613 Water Resources Management
- SEAA 4633 Groundwater Hydrology

### **5. Geotechnics and Transportation**

- SEAA 4723 Engineering Rock Mechanics
- SEAA 4733 Advanced Foundation Engineering
- SEAA 4813 Pavement Design and Construction
- SEAA 4823 Transportation Planning

### **6. Environmental Engineering**

- SEAA 4923 Advanced Water and Wastewater Treatment
- SEAA 4943 Solid Waste Management
- SEAA 4973 Industrial and Hazardous Waste Treatment
- SEAA 4983 Water Quality Management

## **PRISMS ELECTIVE COURSES**

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

### **1. Construction Management**

- SKAB 5113 Construction Law and Contract
- SKAB 5123 Construction Site Management and Safety Control
- SKAB 5133 Sustainability & Environment Management in Construction

### **2. Project Management**

- SKAB 5143 Stakeholders Communication and Management
- SKAB 5153 Project Planning & Scheduling
- SKAB 5163 Project Financial Management

### **3. Structure**

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

### **4. Hydraulics and Hydrology**

- SKAB 5513 Advanced Hydraulics
- SKAB 5613 Advanced Hydrology
- SKAB 5623 Urban Stormwater Management

### **5. Geotechnics**

- SKAB 5713 Advanced Soil Mechanics
- SKAB 5723 Geotechnical Analysis & Design
- SKAB 5733 Slope Engineering

### **6. Transportation**

- SKAB 5813 Highway and Infrastructure Design
- SKAB 5823 Advanced Road Material
- SKAB 5833 Traffic Management & Analysis

### **7. Environmental**

- SKAB 5913 Environmental Management & Sustainability
- SKAB 5923 Land use and Environmental Planning
- SKAB 5933 Air and Noise Pollution

### **8. Forensic**

- SKAB 5173 Laws in Forensic Engineering
- SKAB 5223 Risk Analysis



## **COURSE SYNOPSIS**

### **CORE COURSES**

#### **First Year**

##### **SEAA 1011 - Introduction to Civil Engineering**

This course is only offered in the 1st Semester to all new students of Faculty of Civil Engineering. The course includes a general introduction to the field of civil engineering and the engineer's responsibilities to society. Main subfields in the discipline such as Structural Engineering, Transportation and Geotechnical Engineering, Hydraulics and Hydrology and Environmental Engineering will be highlighted by experts of the respective subfields. The course also exposes the students to generic skills related to engineering practices such as team working, making ethical decisions and communication skills through the lectures and group projects. Prior to the weekly lectures and presentations, a special welcoming lecture will be given by the Dean of Faculty.

##### **SEAA 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 fieldworks. Since accuracy of survey work is vital in ensuring designs are exactly positioned, students must be able to analyse errors so that standard accuracies are met. Detailing for producing site plans, area and volume estimations, road curves geometric design are 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 analyse 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.

##### **SEAA 1031 - Surveying Camp**

###### **Pre-requisite: SEAA 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 of 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 works on a larger scale. The 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 towards 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.

### **SEAA 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, 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 the course, students should be able to incorporate and utilize principles of applied mechanics in civil and structural engineering problems.

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### **SEAA 1422 - 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. the earthworks, reinforced concrete detailing and structural steel detailing drawings. 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

### **SEAA 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 analysed 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 analysed in this course.

### **SEAA 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 on basic soil properties which, consists of soil composition, soil classification and soil compaction. Besides that, it will also discuss on vertical stresses in soil due to overburden and external loading, water in soil and soil shear strength. The topic that will cover is important to civil engineers where most of problems occur at site will involve with geotechnical and soil mechanics. At the end of this subject, students will 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.

## **Second Year**

### **SEAA 2012 - Civil Engineering Laboratory 1**

Civil engineering is a practical field and the laboratory work is essential to be performed by students in this field. The laboratory work, which consists of workshops and experiments are 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 the laboratory experiments and researches. Laboratory sessions are able to strengthen the students to relate the fundamental theories with laboratory experiments in the field of concrete, transportation, hydraulics, and structural engineering. Each student will experiences data collections and performs 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.

### **SEAA 2032 - Mechanical and Electrical Systems**

This course is a service course from the Faculty of Mechanical Engineering & the Faculty of Electrical Engineering. The course will expose civil engineering students to the fundamentals of Mechanical & Electrical building services. The topics to be covered in the Mechanical Portions are design of Domestic Water Supply System, Fire Prevention System, Ventilation and Air-Conditioning System and Lift and Escalators System. Students will be exposed more on design using professional charts and codes and catalogues from manufacturers. The electrical portion of the course covers single phase and three phase system followed by an insight to transformer and induction motor operation. The electrical section will also cover the commercial practice of electrical wiring and substation design. At the end of the course, students should be able to demonstrate the understanding of electrical system and machines operation and ability to design domestic wiring system.

### **SEAA 2112 - Civil Engineering Materials**

This course is designed for students to understand the different types of construction materials used in civil engineering. It will emphasize on types, properties, and function of cement, aggregates, water, admixtures in concrete; properties of fresh and hardened concrete, concrete mix design method, manufacturing concrete on site; test of hardened concrete; timber - properties, characteristics, manufacturing, and applications, masonry - types and characteristics of brick and block, mortar in masonry work, ferrous and non-ferrous metal, and other latest materials in 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 the selection of the right materials for applications in practice.

### **SEAA 2223 - Mechanics of Materials and Structures**

#### **Pre-requisite: SEAA 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 application of the basic design 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, vibration of beams, columns, and torsion. At the end of the course, the students should be able to solve numerous problems that depict realistic situations encountered in engineering practice. The students will also be able to develop and master the skills of reducing any such problem from its physical description to a model or symbolic representation to which the principles may be applied.

### **SEAA 2413 - Computer Programming**

This course is designed to expose the students on the development of programming skill using a computer language, which is suitable for the current computer operating system. It will emphasize on the general concept of computer programming that includes steps of problem solving using computer, algorithm and program logic tools, interface design, modularization, arrays, files and graphics. Examples, 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, analyze, and write computer programs for basic civil engineering applications.

### **SEAA 2513 - Hydraulics**

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.

### **SEAA 2712 - Engineering Geology and Rock Mechanics**

#### **Pre-requisite: SEAA 1713 Soils Mechanics**

This course is designed to enable students to evaluate, to apply and to analyze 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 relevancy of engineering properties of geological materials in designing rock engineering projects. These principles include engineering properties of rock material, rock discontinuities and rock stabilization 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.

### **SEAA 2722 - Geotechnics I**

#### **Pre-requisite: SEAA 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.

### **SEAA 2832 - Highway Engineering**

#### **Pre-requisite: SEAA 1713 Soil Mechanics**

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.

### **SEAA 2912 - Water Treatment**

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.

### **SEAA 2922 - Wastewater Engineering**

The course is designed to expose the students to wastewater treatment technology. The course will emphasize on basic environmental microbiology, characteristics of wastewater, wastewater analysis, design of conventional wastewater treatment systems and sludge treatment. For design of wastewater treatment systems, it will cover the design of clarifier, waste stabilization pond, conventional activated sludge, extended aeration, sequential batch reactor, aerated lagoon and trickling filters. The course also covers the sewage quality standards under Environmental Quality Act 1974. The course exposes students to select the suitable wastewater treatment systems for certain application. At the end of the course, the students should be able to apply the knowledge to design a simple unit operation of wastewater treatment systems and also to modify existing unit operation.

### **Third Year**

#### **SEAA 3012 - Civil Engineering Laboratory 2**

Civil engineering is a practical field and the laboratory work is essential to be performed by students in this field. The laboratory work, which consists of workshops and experiments are 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 the laboratory experiments and researches. Laboratory sessions are able to strengthen the students to relate the fundamental theories with laboratory experiments in the field of concrete, transportation, hydraulics, and structural engineering. Each student will experiences data collections and performs 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.

#### **SEAA 3022 - Integrated Design Project 1**

##### **Pre-requisite: All SEAA 1### and SEAA 2### courses**

Integrated Design Project 1 is tailored to encourage students to explore the inception and conceptual planning stage of a civil engineering development project. The subject focuses on site and utility planning of a development project given to students, working in groups. Such exercise may include developing a survey plan. For the specific proposed site, developing a general drainage and sewerage plan including evaluation of and connection to existing infrastructure and possible need for sewage lift station, proposing location and type of soil investigation to be carried out, producing preliminary road and utility cross sections and recommending any improvements to ease traffic congestion, developing an environmental mitigation plan including sittings of detention ponds and wetlands, to consider alternatives for sustainable design, evaluate the impact of relocating existing utility services and producing a preliminary project design schedule showing milestones and critical path.

The scope and brief of the proposed development will be as reflective of a real life development project. Students are required to integrate their knowledge of civil engineering disciplines such as (but not limited to) geotechnical engineering, highway and transportation, waste water engineering, and sustainable development considerations into their overall project work. At the end of this course, the students will be able to comprehend the importance of proposing a viable and workable development project and appreciate the importance of integration and synthesis of various discipline of civil engineering knowledge.

### **SEAA 3045 - Industrial Training**

#### **Pre-requisite: All Basic Civil Engineering Core Courses**

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.

### **SEAA 3123 - Construction Technology, Estimating & Contract**

This is a compulsory course. This course emphasizes on the principles of construction in building and civil engineering works, which consists of site preparation and layout, earthwork activities, construction of various building elements such as foundations, floors, walls and roofs. It also covers other important aspects in construction i.e formworks and scaffoldings. General concepts on industrialized building systems including precast, prestressed and modular coordination in construction are also introduced. The syllabus also covers the introduction to the methods of estimating and the preparation of the Bills of Quantities and project estimating. At the end of the course, the students should be able to describe and distinguish the various building elements, techniques and systems used in a construction and also to be able to estimate the cost of the building elements. The students should also be able to demonstrate capability of working in a team and some acquirement of contemporary knowledge

### **SEAA 3243 - Theory of Structures**

#### **Pre-requisite: SEAA 2223 Mechanics of Materials**

This course introduces students to the analysis of determinate and indeterminate structures in civil engineering. The course emphasizes on 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

### **SEAA 3313 - Reinforced Concrete Design I**

#### **Pre-requisite: SEAA 2223 Mechanics of Materials**

This is a core course which will provide an understanding and ability to analyze 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 moments and shear, checking for deflection and cracking, durability and detailing requirements, design of simply supported and continuous beams, design of one way and two way restrained and simply supported slab. Furthermore 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.

### **SEAA 3323 - Structural Steel & Timber Design**

This is a core subject. Students will able to incorporate and utilize technology in the analysis and design of steel and timber structures It will expose the students to the analysis and design of steel and timber structural elements. For the steel design, the topics covered include the advantages and the general concepts of steel constructions, analysis and design of restrained and unrestrained beams, columns with axial load, columns with axial load and bending moment, trusses, bolt and weld connections. For timber structures, the topics covered include the design of beams and columns.

### **SEAA 3412 - Building Information Modelling and Data Management**

#### **Pre-requisite: SEAA 1422 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 in analysing, designing and developing the huge of data. It concerns on the management of information and how to model it in a structured manner. The used of database system as an application tool give the student a further step in order to apply an IT application in solving their problems. This course also exposes the knowledge on the usage, management and sharing of data and information to ensure that information is manipulated and used effectively. The aim of the course is to give students a practical, hands-on introduction 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, analyze, and modelling the data to develop the BIM model and data management related to civil engineering problems.

### **SEAA 3613 - Hydrology and Water Recourses**

#### **Pre-requisite: SEAA 1513 Fluid Mechanics**

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, infiltration and interception. Some processes 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 (MASMA). Frequency analysis will be discussed in this subject. A brief introduction to the hydrologic modeling processes will be introduced as a basic requirement to the understanding to the empirical and numerical modeling concepts. 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.

### **SEAA 3712 - Geotechnics 2**

#### **Pre-requisite: SEAA 2722 Geotechnics 1**

This course will provide students with sound knowledge on site 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,  $\alpha$  and  $\beta$  methods) and dynamics formula will be introduced to determine single pile capacity in different soil conditions. Capacity and efficiency of pile group in different soils will be addressed.

### **SEAA 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' behavior 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.

### **SEAA 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 on discussion in different aspects of environmental component including water, air, soil and waste management. The important and impacts on type of energy usage towards the environment 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 aspect 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.

## Fourth Year

### **SEAA 4013 - Advanced Engineering Surveying**

**Pre-requisite: SEAA1023 Engineering Surveying  
SKAB1031 Survey Camp**

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 positioning system (GPS), photogrammetry and hydrographic surveying in typical civil engineering projects are highlighted. Deformation surveys, which are often required in dilapidation surveys is also discussed. The theory of error propagations and their adjustments are also discussed. Relevant fieldworks are 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.

### **SEAA 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 will be invited to talk on specialized topics and issues in various civil engineering field including safety and health. At the end of the course, student should be able to understand the actual civil engineer practices in civil-engineering based activities, and adhere to professional ethics.

### **SEAA 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 in various aspect 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 Final Year Project. The student has to 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 report.

### **SEAA 4032 - Integrated Design Project 2**

**Pre-requisite: SEAA 3022 Integrated Design Project 1**

Integrated Design Project 2 (IDP 2) is tailored to expose and familiarize students to a feasibility study and preliminary design of a civil engineering development project that has been developed previously in Integrated Design Project 1 (IDP 1) (conceptual planning stage). The aim of the Feasibility Study phase is to determine the optimum scheme from a technical, economic, environmental, and construction view. A Feasibility Study Report is the minimum expected output of this phase. The Feasibility Report shall encompass all the engineering attributes developed in the Planning Stage (IDP 1) and shall propose several options. Each option shall then be investigated to measure its capability to sufficiently address the project constraint aspects and the optimum scheme determined. The chosen scheme will then be developed to the stage of producing a Detailed Design Brief to be adopted at the final

Integrated Design Project phase (SKAA 4042). Such exercise shall in part maintain the continuity of the IDP project series. At the end of this course, the students will be able to comprehend the importance of reviewing and selecting a feasible technical proposal and appreciate the importance of integration and synthesis of various discipline of civil engineering knowledge.

### **SEAA 4034 - Final Year Project**

#### **Pre-requisite: SEAA 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 analyze data to obtain results, write a good project report and present project findings.

### **SEAA 4113 - Construction and Project Management**

This course aims to develop understanding on the importance of construction management principles and its related tools. The course starts with understanding the general perspective of management issues and processes and their relationship to construction. The construction project life cycle together with the roles and responsibilities of professionals involved at each stage will be discussed. The Knowledge, Skills, Roles and Ethical responsibilities of a project manager will be explained. The second part of the course will include the usage of tools available in construction management particularly in the application of planning and scheduling technique using Gantt chart and networking technique. The course will also expose the students to the application of popular scheduling software. The third part of the course is dedicated to the application of scheduling technique related to resource management, resource allocation and project time cost trade-off. The last important topic involves analyzing the project cash flow requirements, project monitoring and control. New Academia Learning Innovation (NALI) such as case study teaching will also be implemented.

### **SEAA 4223 - Structural Analysis**

#### **Pre-requisite: SEAA 3243 Theory of Structures**

This course is designed to expose the students in analysing the 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 also 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 a problem solving skill on problems of interest in Civil Engineering structures.

## **SEAA 4333 - Reinforced Concrete Design 2**

### **Pre-requisite: SEAA 3313 Reinforced Concrete Design 1**

This course is a core course which will expose students 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. Furthermore the students will be exposed to the method of analysis of reinforced concrete frame.

## **Synopsis of Faculty's Elective Courses**

### **SEAA 4143 - Construction Plants and Equipment**

This course introduces the techniques of applying engineering fundamentals and analyses to the planning, selection and utilization of construction equipment. In general, the right selection, efficient utilization and cost-effectiveness of major construction operations have significant impacts on the overall cost and duration of construction activities. This course uses concepts from various engineering disciplines such as Engineering Economics, Geotechnical, Mechanical, Structural and Environmental Engineering, among others. At the end of this course, the students should be able to apply engineering fundamentals and analyses to the planning, selection and utilization of construction equipment. This includes a thorough understanding on the total construction process and how construction equipment should be selected and used to produce the intended quality in the most cost-effective manner.

### **SEAA 4153 - Offshore Structures**

#### **Pre-requisite: SEAA 3243 Theory of Structures**

#### **SEAA 3352 Reinforced Concrete Design 1**

#### **SEAA 3323 Structural Steel & Timber Design**

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.

### **SEAA 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 of concrete mixes, the different types and properties of cement replacement materials, special concretes which include fiber reinforced concrete, high strength concrete, lightweight aggregate 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.

### **SEAA 4203 - Stability and Dynamics of Structures**

**Pre-requisite: SEAA 3243 Theory of Structures**

#### **SEAA 4223 Structural Analysis**

This is an elective course that is offered to final year undergraduate students. The structural dynamics covers introduction, natural frequency, single degree of freedom, multi-degree of freedom system, Eigenvalues and Eigenvectors, free vibration response. Structural instability covers concept, simple model, Euler column instability, stability functions, Bolton Method and Horne Method. At the end of the course the students should be able to solve numerous problems which involves dynamics and instability. The students will also be able to develop and master the skills of reducing any problems from its physical description to a model or symbolic representative to which the principles may be applied.

### **SEAA 4243 - Finite Element Method**

**Pre-requisite: SEAA 4223 Structural Analysis**

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. Grillage, plate bending, shell, Axisymmetric and solid elements are also discussed. Isoperimetric formulation is emphasized. Use of finite element software for modeling and analysis is also emphasized. At the end of the course, students should be able to apply the finite element method by hand calculation for simple problems. For more complicated problems, the students should be able to create finite element model, choose correct elements, analyze and interpret results using Finite Element software. Students also should be able to analyze practical problems by implementation through final project and make class presentation to demonstrate their understanding about the course materials.

### **SEAA 4263 - Earthquake and Wind Engineering**

This is an optional course. In the early stage, introduction to structural design and dynamic effect from wind and earthquake is revealed. Steps and method of structural design for wind load will be discussed. Then, engineering aspect in seismology will be discussed. Other than that, seismic reaction on structure, general consideration on earthquake resistant design and seismic behavior of structural system will be taught. Students will also be introduced with the permanent earthquake resistant design and structural earthquake resistant design. Lastly, some issues on special topics in Earthquake Engineering will be discussed.

### **SEAA 4273 - Maintenance of Seismic Structures and Materials**

This is an optional subject. This subject gives an introduction on seismic maintenance and concepts related to it. Dynamic analysis with computer will also be introduced. Topics related including non-linear seismic analysis, structure and earth interaction, base separation and energy dissipation device.

### **SEAA 4323 - Prestressed Concrete Design**

#### **Pre-requisite: SEAA 3352 Reinforced Concrete Design I**

This is an elective course, which will provide students an understanding and ability to analyze and design prestressed concrete structural elements. Topics discussed include the concept and principles of prestressing, methods of prestressing concrete, stress limits, losses of prestress, and selection of section, serviceability and strength requirements. Students will also be exposed to the complete analysis and design procedure of simply supported prestressed concrete non-composite and composite beams, and design principles of continuous beams.

### **SEAA 4383 - Analysis and Design of Tall Building Systems**

The subject emphasized on the analysis and design of tall buildings structural system. It covers a fundamental to tall building structures and related issue in analysis and design from around the world. The students will be guided through the Code of Practice basic requirement of analysis and design of tall buildings. The ultimate behavior, analysis and design of tall building structural elements such as from basic element of reinforced concrete plates, formation of frames structures, composition of shear walls and core wall of structures will be checked and explain before the students are guided through the real analysis and design of various shapes of buildings. Finally, detailing of shear walls and core walls will be explained together with the behavior of infills of frame structures.

### **SEAA 4433 - Advanced Computer Programming**

#### **Pre-requisite: SKAA 3413 Computer Programming**

This course is designed to expose the students in designing and developing computer program using suitable programming languages such as visual basic and active server pages. It will emphasize on the general concepts of computer programming, steps of problem solving using computer program, advanced interface design, graphic, multimedia, animation, database design and web programming. The course will also provide hands- on session for the students to solve tutorials and problems given that related to civil engineering fields. At the end of the course, students should be able to understand the steps in problems solving and apply the knowledge to identify and analyze civil engineering problems that require computer programming solutions. The students should also be able to design and write the computer program to solve the problems.

### **SEAA 4463 - Construction Integration Environment**

#### **Pre-requisite: SKAA 3412 Building Information Modelling and Data Management**

This subject is concerns on the Integrated Construction Environment (ICE) which involve coordinating the integration process between various construction applications. Such environment will provide a platform whereby the Architectural, Engineering and Construction (AEC) can share and exchange the information. The progress of information technology (IT) in the construction industry relies on the ability of the project participants to exchange and share information among themselves and managing Information System (MIS). The student is expected to gain some knowledge on the Computer Integrated Construction (CIC) which is an emerging technology to automate the flow and exchanging of construction project information. They will be exposed to Information Modeling, E-Construction, Internet, Networking, Artificial Intelligent and Groupware. The used of database management system (DBMS) and Standardization to manipulate the information will give the student a further step in order to apply an IT application in solving their construction problems. In the new development on the

current research and development (R&D), the applications of IT in the construction are becoming more important, especially in the new era of globalization. Therefore, the new generation of civil engineers should be equipped with this knowledge to stay competitive in the industry equipped with this knowledge to stay competitive in the industry.

### **SEAA 4473 - Geographic Information System**

This course is an elective course specially designs for civil engineering students who always have to manipulate huge amount of spatial data. It concerns on the management of information (spatially and attribute) and how to model it in a structured manner. This course will emphasize on the overview and the application of GIS in civil engineering, GIS data structure, data manipulation and GIS implementation, information presentation of GIS, and a review of GIS software and sample of application. The development of a prototype system is also been highlighted in this course in order to give the student a proper technique for developing an application. At the end of the course, students will be able to plan, analyze, and modeling the information for develop GIS application related to civil engineering problems.

### **SEAA 4523 - Coastal Engineering**

#### **Pre-requisite: SEAA 2513 Hydraulics**

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. Sediment transport mechanism in the littoral zone leading to the understanding of coastal morphology, erosion and accretion processes are described. 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. The application of state-of-the-art computational techniques as a tool in several aspects of coastal engineering and management works are introduced. At the end of the course, students should be able to describe and analyze 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 control the processes using analytical techniques and evaluate results yielded by computational techniques when applied to solve coastal engineering problems.

### **SEAA 4613 - Water Resources Management**

#### **Pre-requisite: SEAA 1513 Fluid Mechanics**

#### **SEAA 3613 Hydrology and Water Recourses**

This is an elective course aim to equip students with in-depth knowledge in water resources design and management. This course highlights major water resources management issues with the emphasis on the integration of various management components. While the course contents maintain the technical elements of water resources system and engineering, students are also exposed to the realities of the political, economic, and social settings that influent the decision making process. Upon completion of this course, the students should be able to demonstrate the diverse and complicated issues in water resource management, discuss the need and steps for integrated management approach, analyze and determine viable project

options, propose appropriate management strategies, and apply the appropriate techniques and strategies in reservoir planning and design.

### **Synopsis of Faculty's PRISMS Elective Courses**

#### **SKAB5113 - 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, torts, law of contract and construction contract administration. Students will be exposed to construction contract administration which covers the Standard Forms of Contract, disputes in construction and dispute resolutions. At the end of the course, students should possess a sound knowledge of the Malaysian legal framework and familiar with legislative and legal constraints applicable to the practice of construction. More importantly, the students should be able to use their knowledge to promote ethical and better image of the construction industry

#### **SKAB 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. 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. The second part will focus on the accident theories, prevention and investigation, risk management, OHS Management, performance and culture, occupational health such as stress and ergonomics within construction projects. Upon completion, students should be able to apply the effective site management and practice the knowledge Occupational Health & Safety Management and Accident Prevention within construction projects.

#### **SKAB 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 then become part of the new environment we have to live with. The process also generates greenhouse emissions which cause damage (e.g. global warming) to our environment. This subject offers an inter-disciplinary elective designed to promote collaboration and enhance understanding of the global challenge of sustainable development that related to construction industry. The course will emphasise on sustainability and environmental management within construction related issues as promoted by Agenda 21. The subject will cover aspects of embodied energy (renewable & non renewable), energy efficiency in building, construction waste, construction noise, water pollution, biodiversity and various sustainability control and prevention method for construction. Thus environmental regulations & legislation; 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.



### **SKAB 5143 - Stakeholders Communication and Management**

This course focuses on project personnel building and maintaining robust project relationships by using appropriate tools to identify key stakeholders and then to manage the relationships between their unique stakeholder community and the project. The course is designed to expose students to both the methodology and the supporting theory to provide students with a thorough understanding of both stakeholder and communication theory and practice in a project environment and how effective management of these factors will contribute to a successful project outcome.

### **SKAB 5153 - Project Planning & Scheduling**

This course provides knowledge on contemporary practice in project planning and scheduling process in managing construction project. Major software for project planning and scheduling will be used. Student will be taught to develop project schedule and WBS then use advance technique to monitor and track project performance against baseline schedule. The concept and application of Earn Value Management system will be taught and the student will be able to appraise project performance from time to time and recognised major delay and budget control.

### **SKAB 5163 - Business Planning and Financial Management**

This course discusses the basic concepts of accounting and financial management, methods of financial statement analysis, evaluation of financial assets in terms of risk and return, and short- term and long-term capital management of an organization.

### **SKAB 5213 - Advanced Structural Analysis and Modelling**

This is a core course in the Structural Engineering Program that exposes the students to matrix methods for advanced structural analysis and solving many structural problems. The types of structures involved are beams, trusses and frames. Three dimensional structures are also included. This course also includes the application of matrix method for nonlinear geometric or second order elastic analysis and critical load prediction of structures. The applications of matrix methods for nonlinear material analysis of frame structures are also included in this course

### **SKAB 5323 - Advanced Design of Steel Composite Structures**

**Pre-requisite: SKAB 3243 Theory of Structures**

**SKAB 3323 Design of Steel and Timber Structures**

This course intends to give an extensive understanding to the students in the advanced design of steel structures which are the multi-storey 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-storey 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 method 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-storey steel frames and bridges. Lastly, the design of portal frame is covered with the focus on single span symmetrical frame.

### **SKAB 5313 - Advanced Design of Reinforced Concrete**

#### **Pre-requisite: SKAB 4333 Reinforced Concrete Design 1**

This course is intended to provide extra knowledge on the aspect of design of reinforced concrete structural elements. 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.

### **SKAB 5513 - Advanced Hydraulics**

#### **Pre-requisite: SEAA 1513 Fluid Mechanics**

This course is designed to introduce advanced concepts of fluid mechanics in relation to viscous flows. It covers laminar flows, transition to turbulence and turbulent flows and will be taught with civil engineering applications in mind. The students should understand the topics of open channel flow, friction and sediment transport from the fundamental point of view. In this course, unsteady flow in open channels and pipes - topics of specific interest to civil engineers – will also be covered.

### **SKAB 5613 - Advanced Hydrology**

#### **SEAA 3613 - Hydrology & Water Resources**

The study in hydrological processes and systems, include the rainfall, evapotranspiration, infiltration, soil water processes and overland flow. Aspect of rainfall-runoff processes and hydrologic routing are discussed and how these are modelled for use in flood estimation. Various rainfall-runoff models are reviewed. The surface water quality aspect also covered.

### **SKAB 5623 - Urban Stormwater Management**

#### **Pre-requisite: SEAA 1513 Fluid Mechanics**

#### **SEAA 3613 Hydrology & Water Resources**

The course covers the theoretical aspects and design of urban storm water drainage system. It is intended to introduce students to the fundamentals of storm water drainage system design. Methods of hydrologic design, rainfall design, flood estimation, rainfall-runoff relationship and flood routing will be taught. This will involve the planning, analysis, design and management for the quantity aspect.

### **SKAB 5713 - Advanced Soil Mechanics**

This subject is one of the elective subjects for civil engineering students, which will provide: the advanced knowledge on the application and principles of 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. Principles of the laboratory measurement. Consolidation theory and pore pressure parameters. Difference between 1-D and 3-D Consolidation theory and introduction of unsaturated Critical state soil mechanics.

### **SKAB 5723 - Geotechnical Analysis & Design**

**Pre-requisite: SKAB 1713 Soil Mechanics**

**SKAB 2722 Rock Mechanics**

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 tunneling 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 tunneling work through soil and the earth dam on various foundation soil types will be demonstrated. Lastly, the geotechnical instrumentation for monitoring of the geotechnical engineering structures will be explored

### **SKAB 5733 - Slope Engineering**

**Pre-requisite: SKAB 1713 Soil Mechanics**

**SKAB 2722 Rock Mechanics**

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's also focusses 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 modeling. Techniques for the back analysis of slopes are covered and the application of stability calculations for suction assessment explored

### **SKAB 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.

### **SKAB 5823 - Advanced Road Material**

This is one of the core 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.

### **SKAB 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.

### **SKAB 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.

### **SKAB 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.

### **SKAB 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.

### **SKAB 5173 - Laws in Forensic Engineering**

This course introduces students to laws related to the professional engineering practices. The course will emphasize on two main liabilities; tort, and statutory liabilities. The role of professional as expert witness will be introduced in law of evidence so as the students will be familiar to the role of expert witness and the procedures involved during experts at trial. The focus will be on building a credible and believable testimony. At the end of the course, the students are expected to understand the legal setting in the practice and be able to analyse and apply critical reasoning and make informed judgement in addressing legal issues in engineering practice and to stand as credible expert witness.

### **SKAB 5223 - Risk Analysis**

This courses aims to give students a comprehensive exposure to structural safety, risk assessment and reliability engineering concept related to civil engineering system. The course contents consist of four different module named Systems Reliability, Safety & Risk, Data Analysis & Simulation and Risk Assessment & Safety Management. Safety & Risk leads to an understanding of the principles of structural reliability theory and its application to risk and reliability engineering. Data Analysis & Simulation is designed to develop knowledge of statistical data analysis and its application in engineering and science and introduces the concepts of using simulation techniques for analysis of complex systems. It also teaches linear optimization techniques and the ability to apply them to solve simple problems. In Systems Reliability, this section gives an understanding of the qualitative and quantitative techniques that are used in the reliability, availability and maintainability analysis of all types of engineering systems. The final part of this course, Risk Assessment & Safety Management gives student an appreciation of risk from individual and societal perspectives as well as understanding the basic principles of risk assessment and modelling and how safety management works in practice.

## GRADUATION CHECKLIST

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

NO.	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (✓) IF PASSED
<b>SCHOOL OF CIVIL ENGINEERING COURSES</b>					
1	SEAA 1011	Introduction to Civil Engineering	1	1	
2	SEAA 1023	Engineering Surveying	3	3	
3	SEAA 1031	Survey Camp (YEAR 1 / SHORT SEMESTER)	1	HL	
4	SEAA 1213	Engineering Mechanics	3	3	
5	SEAA 1422	Engineering Drawing	2	2	
6	SEAA 1513	Fluid Mechanics	3	3	
7	SEAA 1713	Soil Mechanics	3	3	
8	SEAA 2012	Civil Engineering Laboratory 1	2	2	
9	SEAA 2032	Mechanical & Electrical Systems	2	2	
10	SEAA 2112	Civil Engineering Materials	2	2	
11	SEAA 2223	Mechanics of Materials and Structures	3	3	
12	SEAA 2413	Computer Programming	3	3	
13	SEAA 2513	Hydraulics	3	3	
14	SEAA 2712	Engineering Geology and Rock Mechanics	2	2	
15	SEAA 2722	Geotechnics 1	2	2	
16	SEAA 2832	Highway Engineering	2	2	
17	SEAA 2912	Water Treatment	2	2	
18	SEAA 2922	Wastewater Engineering	2	2	
19	SEAA 3012	Civil Engineering Laboratory 2	2	2	
20	SEAA 3022	Integrated Design Project 1	2	2	
21	SEAA 3045	Industrial Training (YEAR 3 / SHORT SEMESTER) for 12 weeks / 3 months	5	HL	
22	SEAA 3123	Construction Technology, Estimating & Contract	3	3	
23	SEAA 3243	Theory of Structures	3	3	
24	SEAA 3313	Reinforced Concrete Design 1	3	3	
25	SEAA 3323	Structural Steel & Timber Design	3	3	
26	SEAA 3412	Building Information Modelling and Data Management	2	2	
27	SEAA 3613	Hydrology and Water Resources	3	3	
28	SEAA 3712	Geotechnics 2	2	2	
29	SEAA 3842	Traffic Engineering	2	2	

30	SEAA 3913	Environmental Management	3	3	
31	SEAA 4021	Civil Engineering Seminar	1	HL	
32	SEAA 4022	Research Methodology and Pre-Project	2	2	
33	SEAA 4034	Final Year Project	4	4	
34	SEAA 4032	Integrated Design Project 2	2	2	
35	SEAA 4113	Construction & Project Management	3	3	
36	SEAA 4223	Structural Analysis	3	3	
37	SEAA 4333	Reinforced Concrete Design 2	3	3	
38	SEAA 4**3	Elective 1	3	3	
39	SEAA 5**3	PRISMS Elective 1			
40	SEAA 4##3	Elective 2	3	3	
41	SEAA 5**3	PRISMS Elective 2			
42	SEAA 4##3	Elective 3	3	3	
43	SEAA 5**3	PRISMS Elective 3			
<b>TOTAL CREDIT OF CIVIL ENGINEERING COURSES (a)</b>			<b>101</b>	<b>94</b>	
<b>MATHEMATICS COURSES (Faculty of Science)</b>					
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	
<b>TOTAL CREDIT OF MATHEMATICS COURSES (b)</b>			<b>15</b>	<b>15</b>	
<b>UNIVERSITY GENERAL COURSES</b>					
<b>Kluster 1: Appreciation of Philosophy, Value and History (Faculty of Social Sciences and Humanities)</b>					
1	UHMS1182	Appreciation of Ethics and Civilizations (for Local Students Only)	2	2	
	UHS1022	Philosophy and Current Issues (for International Students only)			
	OR UHMS 1182	OR Appreciation of Ethics and Civilizations (for International Students)			
2	UHS 1022	Philosophy and Current Issues (for Local Students)	2	2	
	UHLM 1012	Malay Language 2 (for International Students)			
<b>Cluster 2: Generic Skills</b>					
1	UHMT 1012	Graduate Success Attributes	2	2	
2	UBSS 1032	Introduction to Entrepreneurship	2	2	

3	U**2**2	Soft Skills Elective	2	2	
<b>Cluster 3: Knowledge Enhancement</b>					
1	UHIT 2302	The Thought of Science and Technology	2	2	
<b>Cluster 4: Co-Curriculum and Service Learning</b>					
1	UKQ* 2**2	Co-Curriculum & Service Learning	2	2	
2	UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	1	
<b>Cluster 5: Language Skills (Language Academy, Faculty of Social Sciences and Humanities)</b>					
1	UHLB 1112	English Communication Skills	2	2	1
2	UHLB 2122	Academic Communication Skills	2	2	2
3	UHLB 3132	Professional Communication Skills	2	2	3
4	UHL* 1112	Elective of Foreign Language	2	2	4
<b>TOTAL CREDIT of UNIVERSITY GENERAL COURSES (c)</b>			<b>21</b>	<b>21</b>	
<b>TOTAL CREDIT TO GRADUATE (a + b + c)</b>			<b>137</b>	<b>130</b>	

### OTHER COMPULSORY COURSES – PROFESSIONAL SKILLS CERTIFICATE (PSC)

Students are required to enrol and pass FIVE (5) PSC courses, to be eligible to graduate. Enrol the PSC courses as follows:

#### COMPULSORY PSC COURSES (Enrol All 3 Courses)

1	GLRB0010	Design Thinking for Entrepreneur	
2	GLRM0010	Talent and Competency Management	
3	GLRL0010	English Communication Skills for Graduating Students (ECS)	

#### ELECTIVE PSC COURSES (Choose Any 2 Courses only)

1	GLRT0010	Data Analytics for Organization	
2	GLRM0020	Professional Ethics and Integrity	
3	GLRT0020	Construction Measurement (Mechanical & Electrical)	
4	GLRT0030	OSHE for Engineering Industry and Laboratory	
5	GLRT0040	OSHE for Construction Industry and Laboratory Works	
6	GLRT0050	Quality Management for Build Environment and Engineering Professionals	
7	GLRT0060	Safety and Health Officer Introductory Course	



8	GLRT0070	Industrial Machinery and Lubrication	
Or any other elective PSC courses offered by UTM iLeague. Information on PSC Courses: <a href="https://ileague.utm.my/utm-professional-skills-certificate-utm-psc/">https://ileague.utm.my/utm-professional-skills-certificate-utm-psc/</a> Online PSC Registration: <a href="https://elearnpsc.utmspace.edu.my/">https://elearnpsc.utmspace.edu.my/</a>			