

# BACHELOR OF ENGINEERING (PETROLEUM)

## PROGRAMME SPECIFICATIONS

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

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

### General Information

1. Awarding Institution	Universiti Teknologi Malaysia			
2. Teaching Institution	Universiti Teknologi Malaysia			
3. Programme Name	Bachelor of Engineering (Petroleum)			
4. Final Award	Bachelor of Engineering (Petroleum) with Honours			
5. Programme Code	TK31			
6. Professional or Statutory Body of Accreditation	Board of Engineers Malaysia (BEM)			
7. Language(s) of Instruction	English and Bahasa Melayu			
8. Mode of Study	Conventional			
9. Mode of operation	Self-govern			
10. Study Scheme	Full Time			
11. Study Duration	Minimum : 4 years Maximum : 6 years			
Type of Semester	No. of Semesters		No of Weeks/Semester	
	Full Time	Part Time	Full Time	Part Time
Normal	8	-	14	-

Short	4	-	8	-
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### Course Classification

No.	Classification	Credit Hours	Percentage
i.	University Courses (a) General (b) Language (c) Entrepreneurship (d) Co-Curriculum	10 8 2 3	16.6%
ii.	Faculty/Programme Core	110	79.1%
iii.	Programme Electives	6	4.3%
	<b>Total</b>	<b>139</b>	<b>100%</b>
A	Engineering Courses (a) Lecture/Project/Laboratory (b) Workshop/Field/Design Studio (c) Industrial Training (d) Final Year Project	74 7 5 6	67.6%
	<b>Total Credit Hours for Part A</b>	<b>92</b>	
B	Related Courses (a) Applied Science/ Mathematic/ Computer (b) Management/Law/Humanities/Ethics/Economy (c) Language (d) Co-Curriculum	21 12 8 3	32.4%
	<b>Total Credit Hours for Part B</b>	<b>47</b>	
	<b>Total Credit Hours for Part A and B</b>	<b>139</b>	<b>100%</b>
	<b>Total Credit Hours to Graduate</b>	<b>139 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)
- Sit for Test of English Communication Skills (TECS) for graduating Students.
- Students from other approved programmes who wish to undertake a Minor in the programme must complete not less than 15 credit hours of specialized Chemical 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 (Petroleum) 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).

#### University General 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 other subjects
- iv. Passed the Malaysian University English Test (MUET) with minimum result of Band 2.

#### 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

- ii. Passed with a minimum Grade B at SPM/equivalent examination in the following subjects:
    - a) Mathematics
    - b) Physics
  - iii. Candidate who fulfill the requirements in Physics or Biology at STPM must obtained a minimum Grade B at SPM level in Chemistry.
  - iv. Passed the Malaysian University English Test (MUET) with minimum result of Band 2.
  - v. Does not possess severe colour blindness or not physically handicapped that can constrain practical work.
- 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) with good results.
- ii. Passed in Bahasa Melayu/Bahasa Malaysia with credits in the SPM/equivalent examination.
- iii. Passed the Matriculation Certificate Examination (KPM) / Asasi Sains UM/ Asasi UiTM with a minimum CGPA of 2.00 and passed all the core subjects.
- iv. Passed the Malaysian University English Test (MUET) with minimum result of Band 2.

Special Requirements of the Programme:

- i. Obtained a CGPA of 2.80; and Passed with a Grade B- (2.67) in two of the following subjects:
  - a) Mathematics
  - b) Chemistry/Engineering Chemistry/Physics/Engineering Physics/Biology
- ii. Passed with a minimum Grade B at SPM/equivalent examination in the following subjects:
  - a) Mathematics
  - b) Physics
- iii. Candidate who fulfill the requirements in Physics or Biology at STPM must obtained a minimum Grade B at SPM level in Chemistry.
- iv. Passed the Malaysian University English Test (MUET) with minimum result of Band 2

- v. Does not possess severe colour blindness or not physically handicapped that can constrain practical work.

### 3. Minimum qualifications for students with **Certificates/Diplomas**

There is no acceptance to the programme based on this qualification.

### **PROFESSIONAL SKILLS CERTIFICATE (PSC)**

Students are given a chance to enrol in certificate programmes offered by the Centres of Excellence in the University and the School of Professional and Continuing Education (SPACE) during semester breaks

1. How to Get Yourself Employed (HTGYE)
2. ISO 9001: 2008 Quality Management System Requirement (ISO)
3. Occupational Safety and Health Awareness (OSHA)
4. How to Manage Your Personal Finance (HTMYPF)
5. Test of English Communication Skills for Graduating Students (TECS):
  - (i) TECS 1001 (Paper I – Oral Interaction)
  - (ii) TECS 1002 (Paper II - Writing)

### **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 (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>
SSCE 1693	Engineering Mathematics 1	3	
UHLB 1112	English Communication Skills	2	
UHS 1022	Philosophy and Current Issues (Local Students)	2	
UHLM 1012	Malay Language Communication 2 (for International Students)		
SSCK 1203	Analytical Chemistry for Engineers	3	
SETP 1313	Introduction to Petroleum Engineering*	3	
SETP 1113	Engineering Mechanics	3	
	<b>TOTAL CREDIT</b>	<b>16</b>	
	<b>CUMULATIVE CREDITS</b>	<b>16</b>	

<b>YEAR 1: SEMESTER 2</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
UHMT 1012	Graduate Success Attributes	3	
SSCE 1793	Differential Equations	2	SSCE 1693#
UHMS 1182	Appreciation Ethics and Civilizations (for Local Students)	2	
UHS 1022 OR UHMS 1182	Philosophy and Current Issues (for International Students) OR Appreciation Ethics and Civilizations (for International Students)		
SETP 1123	Fluid Mechanics*		
SETP 1133	Engineering Drawing	3	
SETP 2113	Thermodynamics	3	
	<b>TOTAL CREDIT</b>	<b>16</b>	
	<b>CUMULATIVE CREDITS</b>	<b>32</b>	

<b>YEAR 2: SEMESTER 1</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
UHLB 2122	Academic Communication Skills	2	ULEA 1112
UHL* 1112	Foreign Language Elective	2	
SCSP 1103	Programming Technique I	3	
SSCE 1993	Engineering Mathematics II	3	SSCE 1693#
SEEU 2003	Electrical Technology	3	
SETP 2213	Basic Geosciences*	3	
SETP 2721	Geosciences Lab	1	SETP 2213
SETP 1711	Fluid Mechanics Lab.	1	SETP 1123
	<b>TOTAL CREDIT</b>	<b>18</b>	

	<b>CUMULATIVE CREDITS</b>	<b>50</b>	
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<b>YEAR 2: SEMESTER 2</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
SSCE 2193	Engineering Statistics	3	SSCE 1693#
SETP 2123	Mechanics of Materials	3	SETP 1113#
SETP 2313	Reservoir Rock and Fluids Properties*	3	
SETP 2731	Thermodynamics & Mechanics of Material Lab.	1	SETP 2123, SETP 2113#
UHIT 2302	The Thought of Science and Technology	2	
U*** 2**2	University General Elective (Soft Skills Cluster)	2	
UBSS 1032	Introduction to Entrepreneurship	2	
UKQF 2**2	Co-curriculum & Service Learning	2	
	<b>TOTAL CREDIT</b>	<b>18</b>	
	<b>CUMULATIVE CREDITS</b>	<b>68</b>	

<b>YEAR 3: SEMESTER 1</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
SSCE 2393	Numerical Methods	3	SSCE 1693#
SETP 3413	Drilling Engineering*	3	
SETP 3741	Drilling Fluid Lab.	1	SETP 3413
SETP 3213	Formation Evaluation	3	
SETP 3313	Reservoir Engineering*	3	SETP 2313#
SETP 3741	Reservoir Engineering Lab.	1	SETP 3313
SETP 3921	Geology Field Work®	1	SETP 2213#
UHLB 3132	Professional Communication Skills	2	ULEA 2122
UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	
	<b>TOTAL CREDIT</b>	<b>18</b>	
	<b>CUMULATIVE CREDITS</b>	<b>86</b>	

<b>YEAR 3: SEMESTER 2</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
SETP 3423	Well Completion	3	
SETP 3113	Petroleum Economics	3	
SETP 3513	Petroleum Production Engineering*	3	
SETP 3123	Health, Safety and Environment*	3	
SETP 3323	Reservoir Simulation	3	SETP 3313#, SSCE 2393#
SETP 3812	Undergraduate Project I**	2	
	<b>TOTAL CREDIT</b>	<b>17</b>	
	<b>CUMULATIVE CREDITS</b>	<b>103</b>	

<b>YEAR 3: SEMESTER 3 (SHORT SEMESTER)</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
SETP 3915	Industrial Training	5	
	<b>TOTAL CREDIT</b>	5	
	<b>CUMULATIVE CREDITS</b>	108	
<b>YEAR 4: SEMESTER 1</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
SETP 4814	Undergraduate Project II**	4	SETP 3812#
SETP 4822	Field Development Plan I**	2	SETP 4213, SETP 3213#, SETP 3313#, SETP 3413#, SETP 3513#
SETP 4213	Petroleum Geology	3	SETP 2213#
SETP 4113	Petroleum Management and Entrepreneurship	3	SETP 3113#,
SETP 4313	Well Testing	3	SETP 3313
	<b>TOTAL CREDIT</b>	<b>15</b>	
	<b>CUMULATIVE CREDITS</b>	<b>123</b>	

<b>YEAR 4: SEMESTER 2</b>			
<b>Code</b>	<b>Course</b>	<b>Credit</b>	<b>Pre-requisite</b>
SETP 4834	Field Development Plan II**	4	SETP 4822#
SETP 4323	Secondary and Tertiary Oil Recovery	3	SETP 3313#
SETP 4513	Gas Engineering	3	
SETP 4**3	Petroleum Eng. Elective	3	
SET* 4**3	Technical Elective	3	
	<b>TOTAL CREDIT</b>	<b>16</b>	
	<b>CUMULATIVE CREDITS</b>	<b>139</b>	

Note: \* - cornerstone course; \*\* - capstone course;  
# - must pass (at least with grade D+) for prerequisite course

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

\*Eligible students are required to apply for UHLB 1112 course credit exemption. The credit exemption form (UTM.E/3.8) is provided in the academic office.



## Petroleum Engineering Elective Courses

Code	Course	Credit	Pre-requisite
SETP 4123	Petroleum Refining Technology	3	
SETP 4223	Geophysics	3	
SETP 4413	Advanced Drilling Engineering	3	SETP 3413#
SETP 4423	Advanced Well Completion	3	SETP 3423#
SETP 4523	Well Diagnosis and Treatment	3	
SETP 4533	Production Data Analysis	3	

## Technical Elective Courses

Code	Course	Credit	Pre-requisite
SETG 4143	Energy Management and Economics	3	
SETG 4163	Green Energy Technology	3	
SETG 4263	Fire and Explosion Safety	3	
SETG 4283	Corrosion Engineering	3	
SETN 4483	Radiographic Testing	3	
SETK 4333	Gas Transportation and Storage	3	
SETK 4223	Smart Materials	3	
SETK 4613	Fundamental of Polymer	3	
SETK 4623	Polymer Physics and Properties	3	
SETK 4633	Polymer Rheology and Processing	3	

## 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 courses are not allowed to graduate.

NO	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (✓) IF PASSED
<b>PETROLEUM ENGINEERING COURSES</b>					
1	SETP 1313	Introduction to Petroleum Engineering	3	3	
2	SETP 1113	Engineering Mechanics	3	3	
3	SETP 1123	Fluid Mechanics	3	3	
4	SETP 1133	Engineering Drawing	3	3	
5	SETP 1711	Fluid Mechanics Lab.	1	1	

6	SETP 2213	Basic Geosciences	3	3	
7	SETP 2721	Geosciences Lab	1	1	
8	SETP 2113	Thermodynamics	3	3	
9	SETP 2123	Mechanics of Materials	3	3	
10	SETP 2313	Reservoir Rock and Fluids Properties	3	3	
11	SETP 2731	Thermodynamics & Mechanics of Material Lab.	1	1	
12	SETP 3413	Drilling Engineering	3	3	
13	SETP 3741	Drilling Fluid Lab.	1	1	
14	SETP 3213	Formation Evaluation	3	3	
15	SETP 3313	Reservoir Engineering	3	3	
16	SETP 3741	Reservoir Engineering Lab.	1	1	
17	SETP 3921	Geology Field Work	1	1	
18	SETP 3423	Well Completion	3	3	
19	SETP 3113	Petroleum Economics	3	3	
20	SETP 3513	Petroleum Production Engineering	3	3	
21	SETP 3123	Health, Safety and Environment	3	3	
22	SETP 3323	Reservoir Simulation	3	3	
23	SETP 3812	Undergraduate Project I	2	2	
25	SETP 3915	Industrial Training (Year 3/Short Sem.) for 12 weeks/3 months	5	HL	
27	SETP 4814	Undergraduate Project II	4	4	
28	SETP 4822	Field Development Plan I	2	2	
29	SETP 4213	Petroleum Geology	3	3	
30	SETP 4113	Petroleum Management and Entrepreneurship	3	3	
31	SETP 4313	Well Testing	3	3	
32	SETP 4834	Field Development Plan II	4	4	
33	SETP 4323	Secondary and Tertiary Oil Recovery	3	3	
34	SETP 4513	Gas Engineering	3	3	
35	SETP 4**3	Petroleum Eng. Elective	3	3	
36	SET* 4**3	Technical Elective	3	3	
		TOTAL CREDIT OF PETROLEUM ENGINEERING COURSES (a)	92	87	

### APPLIED SCIENCE / MATHEMATICS / COMPUTER COURSES

1	SCSP 1103	Programming Technique I	3	3	
2	SSCE 1693	Engineering Mathematics I	3	3	
3	SSCE 1793	Differential Equations	3	3	
4	SSCE 1993	Engineering Mathematics II	3	3	
5	SSCE 2193	Engineering Statistics	3	3	
6	SSCE 2393	Numerical Methods	3	3	
7	SEEU 2003	Electrical Technology	3	3	

8	SSCK 1203	Analytical Chemistry for Engineering	3	3	
		TOTAL CREDIT OF APPLIED SCIENCE / MATHEMATICS / COMPUTER COURSES (b)	24	24	
<b>UNIVERSITY GENERAL COURSES</b>					
<b>Kluster 1: Penghayatan Falsafah, Nilai &amp; Sejarah (Faculty of Social Sciences and Humanities)</b>					
1	UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	2	
	UHMS 1022 OR UHMS 1182	Philosophy and Current Issues (for International Students) OR Appreciation of Ethics and Civilizations (for International Students)			
2	UHis 1022	Philosophy and Current Issues (for Local Students)	2	2	
	UHLM 1012	Malay Language Communication 2 (for International Students)			
<b>Kluster 2: Kemahiran Insaniah (Soft Skills)</b>					
1	UHMT 1012	Graduate Success Attributes	2	2	
2	U*** 2**2	University General Elective (Soft Skills Cluster)	2	2	
<b>Kluster 3: Perluasan Ilmu</b>					
1	UHIT 2302	The Thought of Science and Technology	2	2	
<b>Kluster 4: Kurikulum Pembelajaran Servis</b>					
1	UKQF 2**2	Co-Curriculum & Service Learning	2	2	
2	UKQT 3001	Extracurricular Experiential Learning (ExCEL)	1	1	
<b>Kluster 5: Kemahiran Bahasa (Language Skill) (Language Academy, Faculty of Social Sciences and Humanities)</b>					
1	UHLB 1112	English Communication Skills	2	2	
2	UHLB 2122	Academic Communication Skills	2	2	
3	UHLB 3132	Professional Communication Skills	2	2	

4	UHL* 1112	Foreign Language Elective	2	2	
<b>Kluster 6: Keusahawanan</b>					
1	UBSS 1032	Introduction to Entrepreneurship	2	2	
		<b>TOTAL CREDIT of UNIVERSITY GENERAL COURSES (c )</b>	<b>23</b>	<b>23</b>	
		<b>TOTAL CREDIT TO GRADUATE (a + b + c)</b>	<b>139</b>	<b>134</b>	
<b>OTHER COMPULSORY COURSES</b>					
<b>Professional Skills Certificate (PSC) (UTMSPACE/ School)</b>					
1	GLL 1001	How to Get Your Self Employed			
2	GLL 1029	ISO 9001:2008 Quality Management System Requirement			
3	GLL 1040	Occupational Safety, Health and Environment			
4	GLL 1041	How to Manage Your Personal Finance			
<b>Test of English Communication Skill (TECS) (Language Academy, Faculty of Social Sciences and Humanities)</b>					
1	TECS 1001	Oral Interaction			
2	TECS 1002	Writing			

## COURSE SYNOPSIS

### CORE COURSES

#### **SETP 1313 Introduction to Petroleum Engineering**

This course introduces students to various disciplines in petroleum engineering. The contents of the course include the origin, migration, accumulation and the exploration of petroleum, the types and properties of reservoir rocks and reservoir fluid, and type of formation evaluation. This course also briefly discusses the operation and equipment used in drilling, well completion and production of petroleum. This course is conducted by normal lectures, classroom discussion, group project and presentation.

#### **SETP 1113 Engineering Mechanics**

This course has been designed to introduce students to the basic principles and concepts in statics and dynamics. The course is divided into two parts: the first part deals with the analysis of particle and rigid body in static, which covers the resultant and resolution of force(s) acting on a particle and rigid body, the equilibrium of a particle and rigid body, how to replace a force system with an equivalent system, and analysis of friction. The second part deals with the analysis of particle(s) in motion. It includes the kinematics and kinetics of particles and kinematics of rigid bodies. It will cover the rectilinear and curvilinear motion of particles, Newton's Second Law of particles and work and energy for particles.

### **SETP 1123 Fluid Mechanics**

This course introduces students to basic concept and principles of fluid mechanics. The contents of the course include the physics of fluid, analysis of fluid in statics and in motion, friction in fluid flow, flow measurement, and dimensional analysis. This course is conducted by normal lectures, class exercise activities and group assignment.

### **SETP 1133 Engineering Drawing**

This course provides a fundamental background in engineering drawing to the students, which will enable them to work more effectively in the various fields of engineering. This course aims at developing the skills needed for documenting designs using drawings and for performing graphical analysis of two-dimensional and three-dimensional problems. The students will be exposed to different available CAD for engineering drawing with more emphasis on the utilization of QCAD and AutoCAD software. This course focuses on the introduction to engineering drawing, fundamentals of engineering drawing, geometry, orthographic and isometric drawing. This course also introduces the sectional and flowchart drawing and computer aided engineering drawing to the students. Besides that, this course also provides the basic skills and concept on the technical drawing of the gas engineering related Piping & Instrumentation Diagram (P&ID) that is essential for process industries.

### **SETP 1711 Fluid Mechanics Laboratory**

#### ***Co-Requisites: SETP 1123 Fluid Mechanics (Taken)***

This course covers eight fluid mechanics-related experiments which are friction losses in pipe, stability of floating body, jet impact, flow measurement, water hammer, forced vortex flow, calibration of bourdon tube pressure gauge, and an open-ended laboratory work.

### **SETP 2213 Basic Geoscience**

This course introduces students with the introduction of geosciences/geology and subtitles of physical geology. The course emphasizes on the Earth physical & chemical characteristic, especially its surface and internal features. Then, turn to a discussion of Earth materials and the related processes. Next, Earth's internal structure and the processes that deform rocks and give rise to mountains will also be included. Finally, the course concludes with geologic time and Earth history.

### **SETP 2721 Geoscience Laboratory**

#### ***Co-Requisites: SETP 2213 Basic Geoscience (Taken)***

This course exposes the students the practical aspect of basic geosciences laboratory. It provides the students with the identification of minerals and rocks, geologic maps construction, particle size analysis of sediments and the use of Brunton compass in measuring strike and dip of geological structure planes.

### **SETP 2113 Thermodynamics**

Thermodynamics is a basic engineering course where concepts such as system, boundaries, mass, heat, work and energy are introduced. These concepts are then related in the 1<sup>st</sup> and 2<sup>nd</sup> Law of Thermodynamics. Properties of common fluid, such as water, air, and refrigerants are determined using tables of properties or equations of state. The concepts are applied in power and refrigeration cycles.

**SETP 2123 Mechanics of Materials**

***Pre-Requisites: SETP 1113 Engineering Mechanics (pass with at least D+)***

The course covers both the theory and application of the fundamental principles of mechanics of materials. Emphasis is placed on the importance of satisfying equilibrium, compatibility of deformation, and material behavior requirement. Topics being covered include stress and strain under axial loading, torsion, bending, combined loadings, stress transformation, design of beams and shafts, and deflection of beams and shafts.

**SETP 2313 Reservoir Rock and Fluids Properties**

This course introduces students to the important concepts, theories, and methods of properties determinations (calculation, correlation, and laboratory method) of some reservoir rock and fluid properties. The topics in reservoir rock properties include porosity, permeability, fluid saturation, rock compressibility, rock wettability, relative permeability, capillary pressure, and electrical properties of reservoir rocks. In reservoir fluid properties, the topics cover one- and two-phase behaviors of both ideal and real systems, gas properties, liquid properties, and reservoir fluid properties.

**SETP 2731 Thermodynamics and Mechanics of Material Lab.**

***Co-Requisites: SETP 2113 Thermodynamics, SETP 2123 Mechanics of Materials (Taken)***

This laboratory course contains 6 experiments that cover basic concepts in Thermodynamics and Strength of Materials. Laboratory experiments are designed for hands-on experiences to understand the engineering principles. The experiments application includes First and Second Law of Thermodynamics, Properties of Pure Substances and Properties & Strength of Materials. This course also emphasizes the technical writing aspect where all students' observation and arguments of each experiment must be reported in proper format.

**SETP 3413 Drilling Engineering**

This course introduces the activities involved in drilling operations. The contents of the course include the rig components and drilling systems, types of drilling fluid and properties, drilling fluid formulations and calculations, drilling problems, drilling hydraulics calculation, formation pressures and its effect to the drilling operations, well control and well configurations. This course is conducted through lectures, group assignments, and presentations.

**SETP 3741 Drilling Fluid Laboratory**

***Co-Requisites: SETP 3413 Drilling Engineering (Taken)***

This course requires the students to perform hands-on preparing and measuring drilling fluids properties according to the API standard. Laboratory experiments are designed to help students better understand the factors controlling drilling fluid properties as well as familiarize students with field testing procedures of drilling fluids. This laboratory is equipped with complete drilling fluid testing and analysis. Equipment available include blenders, mud balances, marsh balances, rheometers, pH meters, resistivity meters, and the filter press unit, etc.

**SETP 3213 Formation Evaluation**

This course exposes students to electric logging which covers the basic concept of reservoir resistivity, spontaneous potential, resistivity log, Gamma-ray log, neutron

log, formation density log, and acoustic log. Lectures also cover open hole log analysis and interpretation, the use of Archie's equation and other methods to determine water saturation, lithology and porosity determination, and assessing the true formation resistivity prior to computing the hydrocarbon reserves.

### **SETP 3313 Reservoir Engineering**

***Pre-requisites: SETP 2313 Reservoir Rock and Fluids Properties (pass with at least D+)***

This course covers the fundamentals of reservoir engineering which include the description and characterization of the oil and gas reservoirs, calculation of fluid in-place and the recoverable reserves, theory and calculation of fluid flow in porous media, and the influence of aquifer on reservoir performance. This course is conducted by normal lectures and student group project based on published reservoir data.

### **SETP 3741 Reservoir Engineering Laboratory**

***Co-Requisites: SETP 3313 Reservoir Engineering (Taken)***

The content of this laboratory works can assist students to understand better the theories they learned from the Reservoir Rock and Fluid Properties course. Measurement of absolute permeability: gas permeameter and liquid permeameter. Measurement of viscosity: glass capillary, Brookfield apparatus and Kern balance. Measurement of porosity: helium porosimeter and Ruska pump apparatus. Measurement of relative permeability: core lab retorted. Measurement of density: gas density, hydrometer. Measurement of capillary pressure.

### **SETP 3921 Geology Field Work**

***Pre-requisites: SETP 2213 Basic Geoscience (pass with at least D+)***

This course exposes the students to the practical aspect of field geology and geology of Malaysia. Students will be trained on how to make geological observations including simple geological mapping using the compass-step method.

### **SETP 3423 Well Completion**

The course covers casing design, cementing job, well completion practices, and completion and workover fluids in order to maintain well integrity. Lectures also cover types of perforations, tubing string and its accessories, production packer and tubing sealing assemblies that should be installed in production wells to produce oil and gas safely to the surface.

### **SETP 3113 Petroleum Economics**

This course introduces students to petroleum economics in evaluation of oil and gas development and production. The contents of the course include the principles, methods, and techniques of engineering economic analysis, such as topics on interest and time value of money, depreciation and income tax calculations, cash flow, economic indicators, decision making, and risk and sensitivity analysis. This course will allow student to finally be able to generate cash flow of the project and perform an economic evaluation of the project.

### **SETP 3513 Petroleum Production Engineering**

This course introduces students to complete petroleum production system of a petroleum well/field. The course will provide an overview of the well/field petroleum production system components including production philosophy and objectives, present and future well productivity and performance, single and multiphase flow

system for surface delivery, artificial lift system and surface facilities. By the end of the course, students should be able to identify and describe the major components of the petroleum production system, understand the mechanism of delivering the reservoir fluid to the surface and the process involved for optimum production of petroleum sellable products. This course is conducted by normal lectures, classroom work and group project report and presentation with software utilization in the classroom and group project work.

### **SETP 3123 Health, Safety and Environment**

The course presents fundamental principle of safety and risk assessment in petroleum engineering. In particular, it emphasizes on safety legislations, inherent safety design concept, methods of hazard identification, chemical health risk assessment and various methods of risk assessments. The course also covers health and environmental issues related to petroleum engineering. At the end of this course, it is expected that the students will be able to appreciate the theoretical and practical aspects of occupational safety, health and environment in petroleum engineering. Students should also be able to use the techniques of hazard identification and risk assessment in the design and operation of petroleum engineering projects.

### **SETP 3323 Reservoir Simulation**

***Pre-Requisites: SETP 3313 Reservoir Engineering, SSCE 2393 Numerical Methods (pass with at least D+)***

This course includes derivations of basic equations and underlying principles used in developing reservoir simulators. It covers the development of a simple governing equation, partial differential equations for single-phase and multiphase flow in porous media. Finite difference approximations are used to solve the equations. Input data requirements and applications of simulation models for history matching and prediction of field performance will be discussed. A spreadsheet, i.e. Microsoft Excel, would be used for many of the examples and exercises.

### **SETP 3812 Undergraduate Project 1**

This course is designed to train students on some important aspects of research management. In the first part of the undergraduate research project course, the students are not only required to carry out preliminary studies on the assigned petroleum engineering related topics but are also required to plan the research methodology that will be implemented in the following semester and maintain a log book. At the end of this course, students are required to prepare a complete research proposal, and subsequently present it. In addition, students will have the opportunity to gain important generic skills such as communication, team working, problem-solving and creative and critical thinking.

### **SETP 3915 Industrial Training**

A 12-week training in industry. The main rationale of introducing the programme is to provide UTM students with exposure to practical aspects of industry and their work practices. During the programme, the students will have the opportunity to relate their theoretical understanding to the real application in industry and to develop skills in work ethics, management, communication and human relations.

### **SETP 4814 Undergraduate Project II**

***Pre-Requisites: SETP 3812 Undergraduate Project I (pass with at least D+)***



This course is a continuation of the Undergraduate Project I. The second part of Undergraduate Project requires students to implement the research proposal that has been prepared in the previous semester. This might involve practical activities such as laboratory works, data collection from industry and computer programming/simulation. At the end of the course, students should be able to prepare a full report compiling the first and second part of the Undergraduate Research Project and subsequently present their research findings. Finally, students must submit a bound thesis according to the UTM thesis-writing format. In addition, at the end of the course, students will have the opportunity to gain important generic skills such as communication, team working, problem-solving and creative and critical thinking.

### **SETP 4822 Field Development Plan I**

***Pre-Requisites: SETP 3213 Formation Evaluation, SETP 3313 Reservoir Engineering, SETP 3413 Drilling Engineering, SETP 3513 Petroleum Production Engineering (pass with at least D+)***  
***Co-Requisites: SETP 4213 Petroleum Geology (Taken)***

Field Development Plan courses expose students to the process and methods in developing an optimum plan for a particular petroleum field. It covers all aspects of field development planning, commencing with screening studies, after discovering hydrocarbons, to project sanction. The first part of the course covers collection and analysis of data, including proving of resources and reduction of uncertainty and risk. Students must build a model of geological layering of the subsurface to estimate the initial volume of oil and gas in the reservoir.

### **SETP 4213 Petroleum Geology**

***Pre-Requisites: SETP 2213 Basic Geoscience (pass with at least D+)***

This course exposes the students with the introduction of petroleum geology, sedimentology and applied geophysics to the search for and production of oil and gas. Explanation will be given on the source rocks, kerogen, the concept of maturity of organic matter, and the process of generation of petroleum. The topics on sedimentology and stratigraphy will also be included, to give the knowledge of reservoir rock characteristics and identifying areas of petroleum accumulation. The processes of migration, entrapment of petroleum, types of sedimentary basins and petroleum system will also be discussed to give an idea of the locations and distribution of oil and gas fields around the world as well as its relationship to the zone of seismicity.

### **SETP 4113 Petroleum Management and Entrepreneurship**

***Pre-Requisites: SETP 3113 Petroleum Economics (pass with at least D+)***

This course is pertinent to petroleum engineering and business topics. A group project evaluation utilized a widely used industry software package for economic evaluations. The project consisted of information regarding possible investments in oil and/or gas fields to determine the best options of development for the fields that would yield the maximum total return on investment. The knowledge of financing, costing, and budgeting will be considered in the analysis.

### **SETP 4313 Well Testing**

***Pre-Requisites: SETP 3313 Reservoir Engineering (pass with at least D+)***

This course introduces students to well testing practices in oil and gas industries. The contents of the course include the concept and principles of well testing, equipment, well test interpretation methods and well test design. This course is conducted by normal lectures, class workshop, and application software activities.

### **SETP 4834 Field Development Plan II**

***Pre-Requisites: SETP 4822 Field Development Plan I (pass with at least D+)***

The objective of this course is to provide training, assignment and understanding of a particular development plan and profitability analysis on a particular gas or oil fields or both which are found either onshore or offshore. The second part of the course covers the simulation of the reservoir fluid flow behavior and optimises the field development scenario. This simulation leads to the design of an appropriate production system. An economic assessment is performed taking into account revenue according to production forecasts and the estimated development costs. Students are required to work in small groups, submit written plans, and present their proposals to a panel.

### **SETP 4323 Secondary and Tertiary Oil Recovery**

***Pre-Requisites: SETP 3313 Reservoir Engineering (pass with at least D+)***

Provides students with an important concepts, theories, and methods of enhanced oil recovery (EOR). This course covers the general classification of EOR processes, microscopic displacement of multiphase fluids in porous media, the concept of mobilization and trapping of oil, mobility ratio, capillary number, gravity segregation, and recovery efficiencies. Also included are the important concepts and operational procedures of various types of EOR methods such as polymer flooding, surfactant/micellar flooding, alkaline flooding, ASP flooding, miscible gas flooding, thermal recovery processes and microbial EOR.

### **SETP 4513 Gas Engineering**

The course introduces students to connect the relationship between upstream and downstream gas processing which covers both theories and calculations. The contents of the course include the gas well deliverability, gas well performance, gas pipeline flow, gas compressors, gas dehydration, gas treatment, and gas measurement. This course is conducted through lectures, group assignments, and presentations.

## **PETROLEUM ENGINEERING ELECTIVE COURSES**

### **SETP 4123 Petroleum Refining Technology**

This course introduces the characteristics of crude oil and that each of the hydrocarbon compounds has its own boiling temperature. The principles of distillation are introduced leading to the separation into fractions according to cut points. Maximisations of cuts or fractions are achieved through processes like catalytic cracking, alkylation, catalytic reforming and hydro cracking. Gasoline blending is introduced to increase octane number for better performance and to provide designed vapour pressure in gasoline to cope with seasonal altitudinal needs.

### **SETP 4223 Geophysics**

This course introduces students with the introduction and application of exploration geophysics in resource exploration and development, and pollution control. The course

emphasis on the methods of geophysical techniques, especially seismic methods, including some of the modern interpretation techniques. It will discuss the general approach, equipment and field operations of the methods used. The course will also provide practice in carrying out a small-scale fieldwork project to investigate shallow geological features which are presumed to exist in the subsurface.

### **SETP 4413 Advanced Drilling Engineering**

***Pre-Requisites: SETP3413 Drilling Engineering (pass with at least D+)***

This course introduces students to special operations such as coring and fishing, advanced drilling operations and techniques used in the industry, drilling optimization and, procedures and legislation of well abandonment.

### **SETP 4423 Advanced Well Completion**

***Pre-Requisites: SETP3423 Well Completion (pass with at least D+)***

Upon completion of this course, students should be able to prepare well space-out for single and dual completions. This course also exposes students to a safe slickline and completion operations, and preparation of a completion report after the respective well has been released to production and slickline report upon completion of its operation. The content delivered also covers deepwater completion and slickline operations, and completion in unconventional hydrocarbon energy sources.

### **SETP 4523 Well Diagnosis & Treatment**

***Pre-Requisites: SKTP3413 Drilling Engineering (pass with at least D+)***

The course covers problem wells, diagnosis of problem wells, through tubing production tubing, formation damage, work over planning, sand control, and stimulation.

## **TECHNICAL ELECTIVE COURSES**

### **SKTG 4143 Energy Management and Economics**

This course introduces basic background, terminology, and fundamentals of energy conversion. Discusses current and emerging technologies for production of thermal, mechanical, and electrical energy. Topics include fossil and nuclear fuels, solar energy, wind energy, fuel cells, and energy storage.

### **SKTG 4163 Green Energy Technology**

The aim of the programme is to prepare students for a professional career in the development of advanced technologies and systems that can satisfy energy demand while striving for environmental, social and economic sustainability. In addition to in-depth knowledge of energy technologies and systems, students will be trained to understand the basic challenges of sustainable development, with a specific focus on the challenges that face the energy system. The course is unique in that it deals with the energy system on all relevant systems levels and that the courses are integrated in such a way that students are trained to approach problem solving in an interdisciplinary way. At the end of the course, students will have acquired a thorough insight into the possibilities and

limitations of energy systems, specifically in relation to sustainable development.

### **SKTG 4263 Fire and Explosion Safety**

This course enables students to understand the basic concept of fire science and combustion and related calculations as well as to expose them to the concept of explosion and detonation. In addition, the principles of fire and explosion protection and mitigation will be discussed within the context of understanding the fire and explosion development mechanism. At the end of the course, students should be able to explain and relate the fundamental knowledge of combustion, flame and explosion and its important safety aspects involving gaseous fuel utilization. Students should be able to apply general combustion and engineering principles to fires and explosion and should know the parameters involved on the initiation of both fire and explosion. The students should be also able to use CFD fire modeling (CFast) to analyze the fire development on the case studies given.

### **SKTG 4283 Corrosion Engineering**

The aim of this course is to provide basic knowledge of corrosion and corrosion protection of metals and alloys from electrochemistry perspective. This course is specially designed for students who want to have a basic understanding of the corrosion process. Students will be introduced to the underlying science of corrosion engineering principles, corrosion management with particular emphasis on the corrosion design of pipeline corrosion protection. Different types of corrosion, methods of corrosion protection and prevention standard corrosion tests will be discussed. This course also covers most traditional and non-traditional tests for corrosion studies, including electrochemical techniques for corrosion, analysis of corrosion phenomenon and corrosion monitoring principles. This course will examine the general mechanisms of corrosion and relate these to specific engineering issues and methods being used to reduce the cost of corrosion. Finally at the end of the course student will be required to do a case study on corrosion problem that shall introduce students on real corrosion problem in industries and group project allow students to become familiar with directing their own investigations of corrosion problem.

### **SKTN 4483 Radiographic Testing**

This course describes Non-Destructive Testing (NDT) which is the process of inspecting, testing or evaluating materials, components or assemblies for discontinuities without destroying their serviceability. The course introduces the six most common NDT methods which are Visual Testing, Liquid Penetrant Testing, Magnetic Particle Testing, Radiographic Testing, Ultrasonic Testing and Eddy Current Testing. Emphasis will be given to Radiographic Testing which is also known as Industrial Radiography. Metal forming and manufacturing processes and possible defects present in each process will be described. The most widely used industry inspection and acceptance standards for NDT such as ASME V, VIII and API 1104 will be described.

### **SETK 4333 Gas Transportation and Storage**

This course enables students to develop an advanced knowledge in gas transportation

and storage facilities. The course module covers a wide range of scope which includes the flow principles, operation and construction and maintenance. Sustainability of supply and storage system is well reviewed to incorporate state-of-the-art technology. The module also integrates the standards design of transportation system and relevant code of practices. Malaysian standard requirements also are highlighted thoroughly.

### **SETK 4223 Smart Materials**

This course will provide deeper understanding of smart materials and smart microstructures, as well as of the increased functionality of both inorganic and organic materials. This course also covers on the material synthesis as well as microstructure and properties relationships.

### **SETK 4613 Fundamentals of Polymer**

Basic terminologies, principles on polymers and structural relationship towards polymer classification are discussed. An overview on the polymer industry is elaborated together with its impact on human life. Molecular weight relationships toward polymer properties and its implication are briefly presented. This course emphasises specifically on the advanced of polymer synthesis including step-growth, chain-growth and co-ordination polymerizations. Kinetic for the polymerization mechanism is described and its relationship to molecular weight is explained in details. The limitations and application for each polymerization mechanism are discussed. The polymerization systems used for the polymerization process are discussed together with their advantages and the disadvantages. Finally, this course also exposed students to the pilot scale set-up of the polymerization systems.

### **SETK 4623 Polymer Physics and Properties**

This course is designed to expose students to the properties of polymer which have great importance. It will emphasize on the mechanical properties, electrical properties, chemical resistance, degradation effects and flammability properties, A strong emphasis will be given on the mechanical properties which include viscoelastic behavior, tensile, flexural and impact properties. Long term test using creep deformation is also included. At the end of the course the student should be able to explain the interrelation between polymer properties, structures and applications. The students should also be able to describe the appropriate test and characterization for each property.

### **SETK 4633 Polymer Rheology and Processing**

This course will discuss about Newtonian and non-Newtonian flow, pseudo-plastic, Bingham, dilatant and thixotropic behavior, origin of non-Newtonian flow. Students will be able to do Modelling of polymer melt flow-isothermal flow of Newtonian and power law fluids (drag and pressure flow) through different channels of uniform cross-section. This course will also cover topic such as measurement of flow properties, melt flow indexer, capillary viscometers, and cone and plate viscometer, characteristics and Rabinowitch correction. Students should be able to explain the application of rheological studies in polymer processing-extruder screw and die, analysis of pressure, drag and leakage flow, characterization and interaction of screw and die, balanced runner molding.