UNIVERSITI TEKNOLOGI MARA

UNDERGRADUATE STUDENT HANDBOOK

THIRD EDITION

FACULTY OF CHEMICAL ENGINEERING

UNIVERSITI TEKNOLOGI MARA

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1.0 INTRODUCTION TO FACULTY

1.1 Message From The Dean

Assalamualaikum and Good Day,

Welcome and congratulations on your acceptance to Universiti Teknologi MARA (UiTM). The Faculty of Chemical Engineering is thrill to be part of your self-discovery and personal growth journey which in return prepares you for a rewarding and productive career ahead.

The degree programs in the Faculty are design as such that they remain relevant to the industry and future demand. The combination of industrial exposures and up to date research collaboration creates cooperative learning environment that complement the teaching and learning process. We provide avenues for engagement and interaction via multidisciplinary approaches to inculcate cross border exploration. Thus, I encourage students to fully embrace and take full advantage of the rich learning environment available here. The Faculty is committed to provide a high standard teaching and learning experience that clearly manifested by the accreditation from internationally recognized body, Engineering Accreditation Council (EAC).

Your enrolling at Faculty of Chemical Engineering marks the beginning of exciting learning and self-development quest. Take this opportunity to discover your potential and it shall significantly enrich your educational experience. I therefore strongly urge you to associate and interact with the university community at large and not to restrict your network only among the fellow faculty members.

The Faculty upholds moral values and ethical principles in conducting its business. Thus, as a student you must now take responsibility for your future and that requires diligence, discipline and commitments. You can only experience immense personal transformation and enlightenment if you keep the core values intact and allow yourself to take part actively in the learning activities.

We will continue to assist you in realizing your dreams and aspiration and we look forward to celebrating your success.

Activating dreams and catalyzing excellence for a sustainable future.

ASSOC. PROF. DR NORAZAH ABD RAHMAN

Dean of Faculty of Chemical Engineering

1.2 Faculty of Chemical Engineering in Brief

Welcome to the Faculty of Chemical Engineering. The faculty was established on 16th June 2003 in Universiti Teknologi MARA, Shah Alam. The faculty may be relatively young but chemical engineering has existed in UiTM since 1972. Increasing demand for chemical engineers along with the nation's economic growth has contributed to the launching of Bachelor of Chemical Engineering programme at the Faculty of Mechanical Engineering in the year 2000.

The academic programmes offered at the faculty are in line with science and technology developments and current industrial needs to provide the highest level of chemical engineering courses. The programmes provide students with powerful problem solving skills comprising a high level of synthesis of mathematics, computation, chemistry, physics, and molecular biology with the engineering core of thermodynamics, transport, control, and design.

Apart from producing graduates at the diploma and first degree levels, the faculty also offers postgraduate programmes. The MSc. And PhD in chemical engineering began its intake in May 2003. Our research interests cover a wide range of topics from Green Technology and Sustainable Development, Novel Material Processing, Industrial Biotechnology, Process System and Oil and Gas Engineering.

1.3 What is Chemical Engineering

A chemical engineer is involved in the design, development, construction and operation of industrial processes for the production of a diverse range of products, as well as in commodity and specialty chemicals. Relevant industries include oil and gas, pharmaceuticals, energy, water treatment, food and drink, plastics and toiletries. Modern chemical engineering is also concerned with pioneering valuable new materials and techniques, such as nanotechnology, fuel cells and biomedical engineering.

The field of chemical engineering may focus on one of the following: researching new products from trial through to commercialization; managing scale-up processes from plant to full industrial-scale manufacturing; improving product lines; modifying the processing plant that produces the products; and designing and commissioning new plants.

1.4 Job Description and Responsibilities of a Chemical Engineer

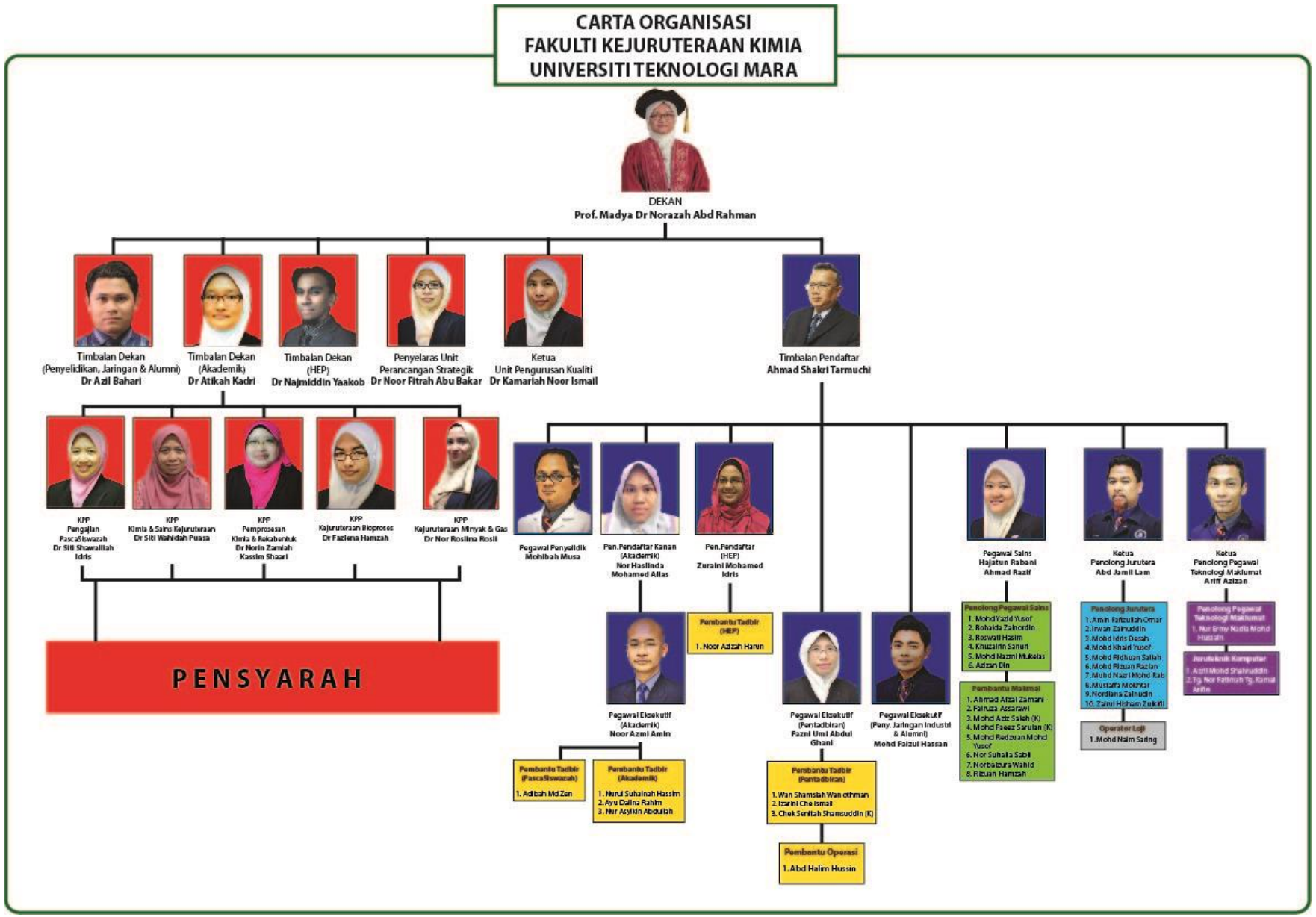
The activities as chemical engineers are extremely diverse, depending on the role and the sector, which include:

- working closely with process chemists and control engineers to ensure the process plant is set up to provide maximum output levels and efficient running of the production facility.
- designing plant and equipment configuration so that they can be readily adapted to suit the product range and the process technologies involved, taking environmental and economic aspects into account.
- instituting scale-up and scale-down processes including appropriate changes to equipment design and configuration.
- assessing options for plant expansion or reconfiguration by developing and testing process simulation models.
- designing, installing and commissioning new production plants, including monitoring developments and troubleshooting.
- optimising production by analysing processes and compiling de-bottleneck studies;
- applying new technologies.
- ensuring that potential safety issues related to the project operator, the environment, the process and the product are considered at all stages.

Chemical engineers from the faculty can engage their skills across these many apparently disparate industries because of the breadth and depth of their training in the engineering core and the enabling sciences. Chemical engineers can tackle a range of problems based on their solid foundation in quantitative logical thinking and problem solving. It is not surprising, therefore, that chemical engineers can have promising careers in the following areas:

Absorption & Adsorption Engineer, Anatomist, Biochemist, Biophysicist, Botanist, Brewery Processing, Chemical Design Engineer, Chemical Equipment Sales Engineer, Chemical Test Engineer, Cytologist, Environmental Epidemiologist, Facilities Design Engineer, Food Technologist, Geneticist, Histopathologist, Microbiologist, Nuclear Engineer, Petroleum Engineer, Pharmacologist, Physiologist, Polymer Engineer, Process Engineer, Public Health, Research Engineer and Technical Director

1.5 Managements Administrative Chart



DEAN
Assoc. Prof. Dr Norazah Abd Rahman
Tel : 03 5543 6301
Email: noraz695@salam.uitm.edu.my

Deputy Dean

Academic Affairs
Dr Atikah Kadri
Tel: 03 5543 6351 / 6319
Email: atikahkadri@salam.uitm.edu.my

Student Affairs
Dr Najmiddin Yaakob
Tel: 03 5543 8006 / 6307
Email: najmiddin@salam.uitm.edu.my

Research, Industrial Linkage And Alumni
Dr Azil Bahari Alias
Tel: 03 5543 6307
Email: azilbahari@salam.uitm.edu.my

Head of Quality Unit
Assoc. Prof. Dr Kamariah Noor Ismail
Tel: 03 5543 6332
Email: knoor@salam.uitm.edu.my

Head of Studies Centre

Chemical and Sciences Engineering
Dr Siti Wahidah Puasa
Tel: 03 5543 6327
Email: sitiwahida@salam.uitm.edu.my

Chemical Processing and Design
Dr Norin Zamiah Kassim Shaari
Tel: 03 5543 6329
Email: norinzamiah@salam.uitm.edu.my

Oil and Gas Engineering
Dr Nor Roslina Rosli
Tel: 03 5543 6346 / 6311
Email: nroslina@salam.uitm.edu.my

Bioprocess Engineering
Dr Fazlena Hamzah
Tel: 03 5543 66264
Email: fazlena@salam.uitm.edu.my

Postgraduate
Dr Shawalliah Idris
Tel: 03 5543 6312
Email: shawal075@salam.uitm.edu.my

Deputy Registrar

Ahmad Shakri Tarmuchi
Tel: 03 55448004
Office room : B5-A10-6
ashakri742@salam.uitm.edu.my

Executive Officer (Admin)

Fazni Umi Abdul Ghani
Tel: 03 55436552
Office room : B5-A10-6
fazni420@salam.uitm.edu.my

Assistant Registrar (Academic Affairs)

Nor Haslinda Mohamed Alias
Tel: 03 55436335
Office room : B5-A10-5
linda616@salam.uitm.edu.my

Research Officer

Mohibah Musa
Tel: 03 55434858
Office room : Environmental Lab, ROTU
mohibah@salam.uitm.edu.my

Science Officer

Hajatun Rabani Ahmad Razif
Tel: 03 55436549
Office room : B5-A6-21
hajatun@salam.uitm.edu.m

Clerk (Academic)

Ayu Dalina Rahim
Tel: 03 55438422
Office room : B5-A10-9
ayu_dalina@salam.uitm.edu.my

Executive Officer (Academic Affairs)

Noor Azmi Amin
Tel: 03 55436304
Office room : B5-A10-9
noorazmi@salam.uitm.edu.my

Administrative Clerk

Nur Asyikin Abdullah
Tel: 03 55438367
Office room : B5-A10-9
norasy176@salam.uitm.edu.my

Executive Officer (ICAN)

Mohd Faizul Hassan
Tel: 03 55436545
Office room : B5-A10-9
faizulhassan@salam.uitm.edu.my

Administrative Clerk

Wan Shamsiah Wan Othman
Tel: 03 55436303
Office room: B5-A10-9
wansha222@salam.uitm.edu.my

Administrative Clerk

Chek Senitah Shamsuddin
Tel: 03 55436371
Office room : B5-A10-6
cheks029@salam.uitm.edu.my

Administrative Clerk

Izarini Che Ismail
Tel: 03 55438419
Office room : Pej. Pengurusan
Izarini5682@salam.uitm.edu.my

Clerk (Academic)

Nurul Suhainah Hassim
Tel: 03 55436356
Office room : B5-A10-9
nuruls@salam.uitm.edu.my

Clerk (Post Graduate)

Adibah Md Zen
Tel: 03 55438202
Office room : Pej. Pengursan
adibah220@salam.uitm.edu.my

Clerk (Student Affairs)

Noor Azizah Harun
Tel: 03 55438414
Office room : B5-A10-6
azizah029@salam.uitm.edu.my

Senior General Office Assistant

Abd Halim Hussin
Tel: 03 55436356
Office room : B5-A10-9
ahalim134@salam.uitm.edu.my

Assistant Science Officer

Khuzairin Sanuri
Tel: 03 55436353
Office room : B5-A6-24
khuzairin@salam.uitm.edu.my

Assistant Science Officer

Mohd Yazid Yusof
Tel: 03 55436535
Office room : B5-A6-9
mohdy313@salam.uitm.edu.my

Assistant Science Officer

Rohaida Zainordin
Tel: 03 55436354
Office room : B5-A6-20
rohaida9282@salam.uitm.edu.my

Assistant Science Officer

Roswati Hasim
Tel: 03 55436364
Office room : B5-A6-24
roswati@salam.uitm.edu.my

Senior Lab Assistant

Azizan Din
Tel: 03 55436217
Office room : B5-A6-28
izandin@salam.uitm.edu.my

Assistant Engineering

Abd Jamil Lam
Tel: 019-2396933
Office room : DVL FKK
ajal@salam.uitm.edu.my

Senior Lab Assistant

Mohd Faeez Sarulan
Tel: 03 55436368
Office room : B5-A6-21
mohdfaeez@salam.uitm.edu.my

Senior Lab Assistant

Mohd Aziz Saleh
Tel: 03 55436368
Office room : B5-A6-21
mohda119@salam.uitm.edu.my

Assistant Engineer

Mohd Khairi Yusof
Tel: 03 55436541
Office room : B5-A5-17
mohdk904@salam.uitm.edu.my

Assistant Engineer

Irwan Zainuddin
Tel: 019-2788723
Office room : DVL FKK
irwan338@salam.uitm.edu.my

Assistant Engineer (Pilot Plant Lab)

Mohd Rizuan Mohd Razlan
Tel: 03 55436339
Office room : B5-A5-21
rizuan_razlan@salam.uitm.edu.my

Assistant Engineer

Mohd Ridhuan b. Salleh
Tel: 03 55436543
Office room : B5-A5-9
mridhuan8872@salam.uitm.edu.my

Assistant Engineer

Mustaffa Mokhtar
Tel: 03 55436336
Office room : B5-A5-9
mustaffa_m@salam.uitm.edu.my

Assistant Engineer

Muhamad Nazri Md Aris
Tel: 016-3426024
Office room : DVL FKK
m_nazri@salam.uitm.edu.my

Assistant Engineer

Nordiana Zainudin
Tel: 03 55435205
Office room : B1-G-3A
azianaz@salam.uitm.edu.my

Assistant Engineer

Zairul Hisham b. Zullkfli
Tel: 03 55436539
Office room : B5-A5-4
zairul@salam.uitm.edu.my

Assistant Engineer

Amin Fafizullah Omar
Tel: 03 55436550
Office room : B5-A6-13
aminfafizullah@salam.uitm.edu.my

Assistant Engineer

Mohd Idris Md Desah
Tel: 03 55436336
Office room : B5-A5-9
idris45@salam.uitm.edu.my

Computer Technician

Tg Nor Fatimah Tg. Kamal Ariffin
Tel: 03 55436485
Office room : B5-A9-15A
tengk391@salam.uitm.edu.my

Assistant Officer (IT)

Ariff bin Azizan
Tel: 03 55436367
Office room : B5-A9-15B
ariffazizan@salam.uitm.edu.my

Computer Technician

Azril Mohamed Sharuddin
Tel: 03 55436337
Office room : B5-A9-C
azril_m@salam.uitm.edu.my

Assistant Officer (IT)

Nur Ermy Nadia Mohd Hussain
Tel: 03 55436544
Office room : B5-A9-D
nurer472@salam.uitm.edu.my

Lab Assistant

Fairuza Assarawi
Tel: 03 55435205
Office room : B1-G-1
fairuz689@salam.uitm.edu.my

Lab Assistant

Mohd Nazmi Mukelas
Tel: 03 55436355
Office room : B5-A6-9
nazmi354@salam.uitm.edu.my

Lab Assistant

Mohd Redzuan Mohd Yusof
Tel: 03 55436338
Office room : B5-A5-22
mredzuan625@salam.uitm.edu.my

Lab Assistant

Nor Suhaila Sabli
Tel: 03 55436542
Office room : B5-A5-9
norsuhaila@salam.uitm.edu.my

Lab Assistant

Rizuan Hamzah
Tel: 03 55436540
Office room : B5-A5-1
rizuan325@salam.uitm.edu.my

Lab Assistant

Norbaizura Wahid
Tel: 03 55436354
Office room : B5-A6-20
norba341@salam.uitm.edu.my

Lab Assistant

Ahmad Afzal Zamani
Tel: 03 55435204
Office room : B5-A6-1
afzal@salam.uitm.edu.my

1.7 UNIVERSITY MOTTO, PHILOSOPHY, VISION, MISSION AND OBJECTIVES

MOTTO

Endeavour, Religious, Dignified

PHILOSOPHY

Every individual has the ability to attain excellence through the transfer of knowledge and assimilation of moral values so as to become professional graduates capable of developing knowledge, self, society and nation.

VISION

To establish UiTM as a premier university of outstanding scholarship and academic excellence capable of providing leadership to Bumiputera dynamic involvement in all professional fields of world-class standards in order to produce globally competitive graduates of sound ethical standing.

MISSION

To enhance the knowledge and expertise of Bumiputera in all fields of study through professional programmes, research work and community service based on moral values and professional ethics

OBJECTIVES

1. To provide maximum opportunities for Bumiputera to pursue professionally-recognized programmes of study in science, technology, industry, business, arts and humanities.
2. To provide quality and innovative programmes of study relevant to current market needs and customer demands, and in line with policies of national development.
3. To establish a human resource development programme as a tool for the assimilation of a value system within the university community.
4. To ensure that UiTM graduates are adequately prepared to join the local as well as the global workforce.
5. To establish UiTM as a center of excellence that is accountable for the effective and efficient management of its human resources, finances and assets in order to achieve its educational objectives, while playing its role as a catalyst in community development.

1.8 FACULTY OF CHEMICAL ENGINEERING'S VISION, MISSION AND QUALITY OBJECTIVES STATEMENT

VISION

To be the leader in providing the highest standard of learning towards producing ethical and professional engineers for chemical and related industries.

MISSION

To impart knowledge to students by offering comprehensive engineering programmes in chemical and its associated fields through effective teaching and training in line with global technological advancement.

QUALITY OBJECTIVES STATEMENT

Faculty of Chemical Engineering, UiTM is committed to providing quality programmes and ensuring continuous improvement in teaching and learning with the aim of producing excellent professional chemical engineers to meet customers' demand and in line with UiTM'S vision. In supporting the vision and mission, the faculty's quality objectives are as follows:

1. To achieve full time students enrolment according to the Centre of Strategic Planning by the year 2015.
2. To achieve excellence in teaching and learning by:
    a) Ensuring all curriculums (course work) to be reviewed every 3 years.\
    b) Ensuring at least 90% of full time students for Diploma and Bachelor Degree level to graduate within the stipulated time.
    c) Ensuring at least 70% PhD students to graduate on time.
    d) Ensuring Graduate Employability which is more than 80% (Bachelor),95% (diploma) and 2.2% (self employed).
3. To increase excellence in research through:
    a) Achieving 250 publications by 2015.
    b) Achieving RM10 million grants by 2015.
4. To ensure excellence in knowledge transfer and commercialization of at least 2 research products by 2015.

2.0 DEFINITION OF TERMS

	Programme	A programme is an arrangement of modules that are structured for a specified duration and learning volume to achieve the stated learning outcomes, which usually leads to an award of a qualification.
	Accredited Programme	An engineering programme whose graduates are acceptable for graduate registration with BEM and for admission to Graduate membership of IEM
	Course	Subject offered in the programme.
	Graduate Engineer	A person registered under Section 10(1), Registration of Engineers (Amendment) Act 2002.
	Professional Engineer	A person registered under Section 10(2). Registration of Engineers (Amendment) Act 2002.
OBE	**Outcome-Based Education**	Outcome-Based Education is an approach that focuses on outcomes, i.e. the achievements of students that are measurable, proven, and can be improved.
PEO	**Programme Educational Objectives**	Programme Educational Objectives are statements that describe the knowledge skills and attitude acquired 3 – 5 years after graduation.
PO	**Programme Outcomes**	Programme Outcomes are statements that describe what students are expected to know and be able to perform or attain by the time of graduation. These relate to the skills, knowledge, and behaviours that students acquire through the programme.
CO	**Course Outcome**	What students will be able to do upon the completion of a course
LO	**Learning Outcomes**	Learning outcomes are statements on what a learner should

		know, understand and can do upon the completion of a period of study.
MOHE-LOKI	**MOHE Soft Skill Learning Outcomes (LOKI)**	Are observable indicators or evidence of actual students' learning (with direct measures – through students' knowledge and performance [test papers, projects, demonstrations etc.] or indirect measures – students' behaviors, attitudes or values [alumni, interviews, focus groups etc.]) The learning outcomes are: 1. Knowledge 2. Practical Skills 3. Thinking and scientific skills 4. Communication skills 5. Social skills, teamwork and responsibility 6. Values, ethics, moral and professionalism 7. Information management and lifelong learning skills 8. Managerial and entrepreneurial skills 9. Leadership skills
SLT	**Student Learning Time**	Amount of time available per week for learning and teaching activities. These activities include lecture, tutorial, seminar, practical, self-study, retrieval of information, research, fieldwork, as well as preparing for and sitting for an examination The recommended SLT per week varies according to student band and it can range between 40-55 hours.
SLE	**Student Learning Experience**	Student Learning Experience comprises the entire educational experience of a student whilst studying for a programme.
SCL	**Student-Centered Learning**	Student-Centered Learning in OBE means students will be equally responsible for their own learning. Engagement of both students and lecturers will be visible in the teaching and learning process.

3.0 PROGRAMMES OFFERED

3.1 Bachelor of Engineering (Hons.) Chemical (EH220)

Chemical engineering is the synergy of science and engineering. This programme develops skills enabling students to analyze, assess and solve engineering problems using modern engineering tools through the provision of the robust fundamental background in the fields of engineering-chemistry, mathematics and physics, which underpin this engineering discipline. This programme is accredited by both the Board of Engineering Malaysia (BEM) and the Institution of Chemical Engineers (IChemE), United Kingdom.

3.2 Bachelor of Engineering (Hons.) Oil and Gas (EH243)

Oil and Gas Engineering is the first of its kind to be introduced in a Malaysian university to cater for the ever-demanding oil and gas industry. The Oil and Gas Engineering programme is a unique programme that combines petroleum, gas and exploration engineering in the study and is specially designed to produce graduates who wish to take advantage of the exciting and highly rewarding career prospects in this area. This programme prepares individuals to apply engineering principles to the design, development and operation of systems for locating, extracting of crude petroleum and natural gas, drilling systems, processing systems and facilities, storage facilities, transportation systems, and related environmental and safety systems. The programme also exposes the students to latest technologies in enhanced oil recovery (EOR), exploration and to global contemporary issues related to geopolitics and economics of oil and gas industry. This programme received its pioneer batch of students in July 2008. The courses are conducted via lectures, tutorials, open-ended practical work laboratories and simulation laboratories where appropriate based on “Outcome-Based Education” (OBE). Assessment for the courses includes tests, quizzes, assignments, research projects, and examinations. The courses sum up to 133 credit units, spreading over a four-year study period of eight semesters.

4.0 FACULTY OF CHEMICAL ENGINEERING, UITM PROGRAMME OUTCOMES & PROGRAMME EDUCATIONAL OBJECTIVES

4.1 PROGRAMME OUTCOMES (PO) FOR BOTH EH220 & EH243

PO	PO STATEMENT
PO1	Apply knowledge of mathematics, sciences, engineering fundamentals and engineering specialization to solve **complex engineering problems**.
PO2	Identify, formulate, research literature and analyze **complex chemical/oil and gas engineering problems** reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3	Conduct investigations of **complex problems** via literature review, design of experiments, analysis and interpretation of data as well as synthesis of information to provide valid conclusions.
PO4	Create, select and apply appropriate techniques, resources, modern engineering and IT tools, and including prediction and modelling to solve **complex chemical/oil and gas engineering problems** with an understanding of the limitations.
PO5	Design solutions for **complex chemical/oil and gas engineering problems** and design systems, components or processes that meet specified needs with appropriate consideration on health, safety, society and environment.
PO6	Understand and evaluate the sustainability and impact of professional engineering work in the solution of **complex engineering problems** in societal and environmental contexts.
PO7	Communicate effectively in dealing with **complex engineering activities** to all level of society via effective reports or design documentation and oral communication.
PO8	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**.
PO9	Function effectively as an individual and as a team member with the capacity to be a leader in multi-disciplinary settings.
PO10	Understand and demonstrate knowledge of engineering management, business acumen and entrepreneurship, with the capability to manage projects as a leader and a team member in multidisciplinary fields.
PO11	Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO12	Recognize the necessity for independent and life-long learning to cater for future technological advancement.

4.2 PROGRAMME EDUCATIONAL OBJECTIVE (PEO)

Programme Educational Objectives are statements that describe the knowledge skills and attitude acquired 3 to 5 years after graduation.

To produce graduates who, during the first several years of engineering practice:

4.1.1 Bumiputra graduates who are imbued with moral and cultural values committed to the sustainable development for nation building.

4.1.2 Established a career progression in chemical process or, oil and gas industries.

PEO 1	**Indicators**
Bumiputra graduates who are imbued with moral and cultural values committed to the sustainable development for nation building.	Involvement in sustainable development issues in terms of social, economic or environment in any organization
	Contribute and/or volunteer in any social and welfare activities.
	Contribute to creative and innovative ideas at work place.
PEO 2	**Indicators**
Established a career progression in chemical process or, oil and gas industries.	Graduates working in chemical process or, oil and gas industries at a senior position.
	Working towards attaining professional engineer status.

5.0 BACHELOR OF ENGINEERING (HONS) CHEMICAL (EH220)

5.1 Bachelor of Engineering (Hons) Chemical: Academic Staff

Head of Studies Centre
Chemical and Engineering Sciences

Dr. Siti Wahidah Puasa
Tel: 03 5543 6372
E-mail: sitiwahida@salam.uitm.edu.my

Dr Nornizar Anuar
Tel: 03 5543 6351
E-mail: nornizar@salam.uitm.edu.my

Prof. Dr Md Asadullah Md Abul Hossain
Tel: 03 5543 6359
E-mail: asadullah@salam.uitm.edu.my

Assoc. Prof. Dr Ruzitah Mohd Salleh
Tel: 03 5543 6316
E-mail: ruzitah@salam.uitm.edu.my

Dr Norhuda Ismail
Tel: 03 5543 6309
E-mail: norhuda475@salam.uitm.edu.my

Assoc. Prof. Dr Junaidah Jai
Tel: 03 5543 6330
E-mail: junejai@salam.uitm.edu.my

Assoc. Prof. Dr Noor Fitrah Abu Bakar
Tel: 03 5543 6224
Email: fitrah@salam.uitm.edu.my

Dr Istikamah Subuki
Tel: 03 5543 6537
E-mail: istikamah@salam.uitm.edu.my

Dr Abdul Hadi
Tel: 03 5543 6532
E-mail: hadi9598@salam.uitm.edu.my

Dr Sharif Abdul Bari Ali
Tel: 03 5543 6553
E-mail: abdulbari@salam.uitm.edu.my

Noorhaliza Aziz
Tel: 03 5544 6343
E-mail: noorh823@salam.uitm.edu.my

Norhayati Talib
Tel: 03 5543 8376
E-mail: norhayati0653@salam.uitm.edu.my

Fauziah Marpani*
Tel: 03 5543 6376
E-mail: fauziah176@salam.uitm.edu.my

Hanafiah Zainal Abidin
Tel: 03 5543 6303
E-mail: hanafiah299@salam.uitm.edu.my

Nur Faeqah Idrus*
Tel: 03 5543 6536
E-mail: norfaeqah@salam.uitm.edu.my

Noorsuhana Mohd Yusof*
Tel: 03 5543 6341
E-mail: noorsuhana@salam.uitm.edu.my

Nurhaslina Che Radzi
Tel: 03 5543 6407
E-mail: nurhaslina483@salam.uitm.edu.my

Nur Azrini Ramlee*
Tel: 03 5543 6405
E-mail: azrini@salam.uitm.edu.my

Rabiatul Adawiyah Abdol Aziz
Tel: 03 5543 8377
E-mail: rabia1338@salam.uitm.edu.my

Nor Hazelah Kasmuri*
Tel: 03 5544 8379
E-mail: norhazelah@salam.uitm.edu.my

Rafeqah Raslan*
Tel: 03 5543 6551
E-mail: rafeqah@salam.uitm.edu.my

Norasmah Mohamed Manshur
Tel: 03 5543 6333
E-mail: norasmah@salam.uitm.edu.my

Sharmeela Matali*
Tel: 03 5543 6328
E-mail: sharmeela@salam.uitm.edu.my

SitiNoor Adeib Binti Idris
Tel: 03 5543 6362
E-mail: adeib@salam.uitm.edu.my

Dr Norliza Ibrahim
Tel: 03 5543 6404
E-mail:norli816@salam.uitm.edu.my

Siti Khatijah Jamaludin
Tel: 03 5543 8015
E-mail: sitikhatijah@salam.uitm.edu.my

Zalizawati Abdullah*
Tel: 03 5544 8380
E-mail: zalizawati8653@salam.uitm.edu.my

Siti Norazian Ismail*
Tel: 03 5543 8015
E-mail: azian83@salam.uitm.edu.my

Ana Najwa Mustapa*
Tel: 03 5543 6406
E-mail: anajwa@salam.uitm.edu.my

Norashikin Ahmad Zamanhuri*
Tel: 03 5544 8408
E-mail: shikin.zamanhuri@salam.uitm.edu.my

Lim Ying Pei
Tel: 03 55438018
E-mail: yingpei@salam.uitm.edu.my

Dr Siti Shawalliah Idris
Tel: 03 55436312
E-mail: shawal075@salam.uitm.edu.my

Habsah Alwi
Tel: 03 55436408
E-mail: habsahalwi@salam.uitm.edu.my

Nadia Kamarrudin*
Tel: 03 55436375
E-mail: nadia3132@salam.uitm.edu.my

Norhasyimi Rahmat*
Tel: 03 55436322
E-mail: norhasyimi@salam.uitm.edu.my

Sakinah Mohd Alauddin*
Tel: 03 55436372
E-mail: sakinah3676@salam.uitm.edu.my

Suffiyana Akhbar*
Tel: 03 55436323
E-mail: suffiyana@salam.uitm.edu.my

Suhaiza Hanim Hanipah*
Tel: 03 55436373
E-mail: suhaizahanim@salam.uitm.edu.my

Syafiza Abd Hashib
Tel: 03 5543 6376
E-mail: syafiza0358@salam.uitm.edu.my

Assoc. Prof. Dr Mohd Amin Hashim
Tel: 03 5543 8005
E -mail: aminhashim@salam.uitm.edu.my

Assoc. Prof. Dr Norazah Abd Rahman
Tel: 03 5543 6308
E -mail: noraz695@salam.uitm.edu.my

Prof. Dr Ku Halim Ku Hamid
Tel: 03 5543 6315
E-mail: Kuhalim@salam.uitm.edu.my

Prof. Ir. Dr Jailani Salihon
Tel: 03 5544 6340
E-mail: jailani@salam.uitm.edu.my

Dr Tan Huey Ling
Tel: 03 5543 6310
E-mail: hueyling@salam.uitm.edu.my

Dr Jefri Jaapar
Tel: 03 5544 8201
E-mail: jefrijaapar@salam.uitm.edu.my

Amizon Azizan
Tel: 03 5543 6365
E-mail: amizon@salam.uitm.edu.my

Shareena Fairuz Abdul Manaf*
Tel: 03 5544 8405
E-mail: shareenafairuz@salam.uitm.edu.my

Nur Shahidah Ab Aziz*
Tel: 03 5543 7822
E-mail: shahidah_aziz@salam.uitm.edu.my

Miradatul Najwa Mohd Rodhi*
Tel: 03 55436488
E-mail: miradatul@salam.uitm.edu.my

Dr Fazlena Hamzah
Tel: 03 5544 6264
E-mail: fazlena@salam.uitm.edu.my

Dr Syed Shatir Asghrar Syed Hassan
Tel: 03 5543 6344
E-mail: shatir@salam.uitm.edu.my

Abdul Aziz Ishak
Tel: 03 55436317
E-mail: aabi@salam.uitm.edu.my

Assoc. Prof. Dr Ayub Md Som
Tel: 03 5543 6351
E -mail: ayub522@salam.uitm.edu.my

Dr Rusmi Alias
Tel: 03 55436318
E-mail: rusmi@salam.uitm.edu.my

Dr Norin Zamiah Kassim Shaari
Tel: 03 55436329
E-mail: norinzamiah@salam.uitm.edu.my

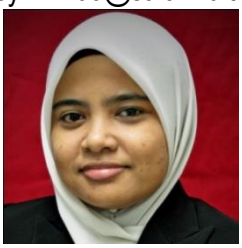
Nor Sharliza Mohd Safaai
Tel: 03 5543 6550
E-mail: sharliza972@salam.uitm.edu.my

Dr Rahida Wati Sharudin
Tel: 03 5544 8012
E-mail: rahida@salam.uitm.edu.my

Assoc. Prof Hasnora Jafri
Tel: 03 5543 6320
E-mail: hasnora@salam.uitm.edu.my

Dr Azil Bahari Alias
Tel: 03 5543 6307
E-mail: azilbahari@salam.uitm.edu.my

Nurul Asyikin Md Zaki
Tel: 03 5543 6489
E-mail: asyikin760@salam.uitm.edu.my



Dr Radziah Wahid
Tel: 03 5543 6405
E-mail: radziah@salam.uitm.edu.my

Fariza Hamidon
Tel: 03 5544 8017
E-mail: fariza286@salam.uitm.edu.my

Ummi Kalthum Ibrahim
Tel: 03 55436357
E-mail: ummi985@salam.uitm.edu.my

Dr Siti Noor Suzila Maqsood ul Haque
Tel: 03 5543 6406
E-mail: suzihaque@salam.uitm.edu.my

Dr. Zulkifli Abdul Rashid
Tel: 03 5543 6373
E-mail: zulkifli466@salam.uitm.edu.my

Dr Safari Zainal
el: 03 5544 6374
E-mail: drsafari@salam.uitm.edu.my

Ammar Mohd Akhir*
Tel: 03 5543 6345
E-mail: ammar@salam.uitm.edu.my

Suhaila Mohd Sauid
Tel: 03 55438417
suhaila_sauid@salam.uitm.edu.my

Fuzieah Subari*
Tel: 03 5544 8011
E-mail: fuzieahsubari@salam.uitm.edu.my

*** On Study Leave**

5.2 PROGRAMME STRUCTUE & PROGRAMME OUTCOMES (PO) VERSUS COURSE

FACULTY OF CHEMICAL ENGINEERING
Bachelor of Engineering (Hons.) Chemical (EH220) - package 8

SEM	CODE	COURSE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	KKR1	Co-curriculum I							√	√	√			
	ELC590	English for Oral Presentation							√					√
	CPE414	Engineering Drawing	√			√								
	CHE413	Fluid Mechanics for Chemical Engineers	√	√										
	CHE434	Process Chemistry	√	√										
	CPE420	Introduction to Chemical Engineering	√						√	√				
	MAT435	Calculus For Engineers	√	√										
2	KKR2	Co-curriculum II							√	√	√			
	CTU551	Tamadun Islam dan Tamadun Asia I							√	√				√
	CHE433	Thermodynamics	√	√										
	CHE471	Chemical Process Principles I	√	√										
	MAT455	Further Calculus for Engineers	√	√										
	CHE430	Organic Chemistry	√	√										
	CHE485	Chemistry Laboratory		√	√						√			
3	KKR3	Co-curriculum III							√	√	√			
	BKE1	Third Language I							√					√
	CHE463	Heat Transfer	√	√										
	CHE545	Mass Transfer	√	√										
	CHE486	Fluids and Thermodynamics Laboratory		√	√						√			
	CHE531	Chemical Process Principles II	√	√										
	CHE555	Numerical Methods and Optimization	√	√		√								
4	BKE2	Third Language II							√					√
	CPE520	Project Management									√	√		
	CHE553	Chemical Engineering Thermodynamics	√	√										
	CHE502	Reaction Engineering I	√	√										
	CHE504	Heat and Mass Transfer Laboratory		√	√						√			
	CHE544	Separation process	√	√										
	EWC661	English for Report Writing	√					√						
5	BKE3	Third Language III							√					√
	CHE522	Transport Phenomena	√	√										
	CPE501	Chemical Process Control	√	√	√									
	CHE505	Reaction Engineering II	√	√										
	CHE506	Reaction Engineering Laboratory		√	√						√			
	CPE604	Plant Design and Economics					√				√	√		
		Elective I	√	√				√						
6	CPE601	Materials and Design of Process Equipment	√	√										
	CPE615	Process Safety							√	√	√			
	CPE603	Process Modelling and Simulation	√	√		√								
	CPE622	Process Control Practices		√	√		√							
	CPE614	Process Integration	√				√							
		Elective II	√	√				√						
Inter session	**CPE670**	**Industrial Training**		√					√				√	
7	CPE644	Design Project I		√			√		√		√	√		
	CHE687	Research Project I			√				√					√
	ENT600	Technopreneurship										√		√
	CPE649	Environmental Engineering	√					√		√				
		Elective III	√	√				√						
8	CPE664	Design Project II					√		√	√	√	√		
	CHE697	Research Project II		√	√				√					√
	CPE680	Leadership and Professional Ethics for Engineers						√	√		√		√	
	CTU555	Malaysian History							√	√	√			
		Elective IV	√	√				√						

5.3 EH220 COURSE DESCRIPTION

SEMESTER 1

CODE : CPE414
COURSE : ENGINEERING DRAWING
COURSE DESCRIPTION:
This course deals with the application of technical drawing to engineering design. AutoCAD® software is fully used in this course. Students are preliminarily introduced to the drawing principles such as 2D drawing, modify and edit tools, orthographic projection, sectioning, isometric drawing, geometrical constructions and 3D drawing. Application in P&ID diagram, basic plant layout techniques and process flow diagram inclusive of standard symbols in chemical process plants are also taught.

CODE : CHE413
COURSE : FLUID MECHANICS FOR CHEMICAL ENGINEERS
COURSE DESCRIPTION:
This course is a core subject in most engineering disciplines. The chapters in this course focus on several important topics related to fluid static and fluid dynamics. It is designed to provide the students with the principles of fluid flow through flow meters and pipes. Common rotating devices such as pumps and compressor are also introduced.

CODE : CHE434
COURSE : PROCESS CHEMISTRY
COURSE DESCRIPTION:
This course is an advanced course in chemistry. The topics covered include acid-base reactions, chemical equilibrium, thermochemistry, electrochemistry and kinetics.

CODE : CPE420
COURSE : INTRODUCTION TO CHEMICAL ENGINEERING
COURSE DESCRIPTION:
This course emphasizes on knowledge in the processing of important natural resources such as petroleum, gas and palm oil. The lecture starts with discussion on the introduction of chemical engineering and the basics principles and calculation in chemical engineering. Topics on utilities and current issues related to sustainability of industrial processes are also discussed. Processing of materials of other relevant chemical industries such as rubber, textile, glass and palm oleo-chemicals are also included as topic of discussion. This course ends with the explanation on the past major accidents in chemical process industry as exposure to students on the importance of safety and health in process industry.

SEMESTER 2

CODE : CHE433
COURSE : THERMODYNAMICS
COURSE DESCRIPTION:
Thermodynamics is commonly encountered in many engineering systems. This course covers the knowledge of science of energy especially the aspect of heat and power interaction, energy and energy transformation and relationship among the properties of matter. Student will be equipped with the conservation of energy principle, the first law and the second law of thermodynamics. Other topics include the properties of pure substance, application of the first and second law of thermodynamics in open and closed system, heat engines, entropy, Carnot and Rankine cycles and etc.

CODE : CHE471
COURSE : CHEMICAL PROCESS PRINCIPLES I
COURSE DESCRIPTION:
This is a fundamental course for chemical engineering. It involves the knowledge of unit and dimensions, conversion as applied in engineering and sciences between various systems such as SI, American and British. Then students are introduced to the principles of steady state material balances and apply the techniques of solving balances on single and multiple unit processes (non-reactive and reactive systems) including recycle and bypass. Calculations on ideal and non-ideal / real gases mixture are also learned in this course.

CODE : CHE430
COURSE : ORGANIC CHEMISTRY
COURSE DESCRIPTION:
This course provides a chemical background of sufficient depth to facilitate an understanding of the organic chemical processes, which occur in industry. Topics covered include organic nomenclature, reaction types and mechanisms, and biomolecules.

CODE : CHE485
COURSE : CHEMISTRY LABORATORY
COURSE DESCRIPTION:
This course provides a complimentary practical experience to the theoretical work studied in the physical, inorganic and organic chemistry courses. The course comprises of open-ended laboratory investigations, which require effective communication, delegation and time-management skills to achieve the experimental.

SEMESTER 3

CODE : CHE463
COURSE : HEAT TRANSFER
COURSE DESCRIPTION:
This course introduces topics on the different kinds of heat transfer i.e. conduction, convection and radiation. Types and designs of heat exchangers which are important to chemical process industries are included. In addition, the introduction on boiling and condensation is also discussed.

CODE : CHE545
COURSE : MASS TRANSFER
COURSE DESCRIPTION:
This subject introduces the students to one of the fundamental knowledge that the students must acquire in mass transfer and mass transfer operations. The topics covered include the concepts of mass transfer and equipment design for gas absorption, adsorption and drying.

CODE : CHE486
COURSE : FLUIDS AND THERMODYNAMICS LABORATORY
COURSE DESCRIPTION:
This course involves series of experiments that deals with the principles and concepts of thermodynamics and fluid mechanics.

CODE : CHE531
COURSE : CHEMICAL PROCESS PRINCIPLES II
COURSE DESCRIPTION:
This course is a continuation of Chemical Process Principle I. The students are exposed to advanced material and energy balance concepts to solve problems of unit operations in chemical processing for both steady and unsteady state systems. The students are also exposed to the application of specific chemical engineering software to solve material and energy balances.

CODE : CHE555
COURSE : NUMERICAL METHODS AND OPTIMIZATION
COURSE DESCRIPTION:
This course provides basic knowledge of numerical methods with the aid of MATLAB and MS Excel including root-finding, elementary numerical linear algebra, solving systems of linear equations, curve fitting, numerical solution to ordinary equations and optimization. The numerical techniques acquired in this course will enable students to solve chemical engineering problems.

SEMESTER 4

CODE : CPE520
COURSE : PROJECT MANAGEMENT
COURSE DESCRIPTION:
This course will take a comprehensive view of project management, addressing both the technical and the social or human sides of the field. Furthermore, the course will provide intensive coverage of management in a wide range of project applications from concept through operations. Planning, scheduling, controlling, economic analysis, quality control and customer satisfaction are stressed in this course.

CODE : CHE553
COURSE : CHEMICAL ENGINEERING THERMODYNAMICS
COURSE DESCRIPTION:
The course deals with the advanced principles of chemical engineering thermodynamics: thermodynamics of mixtures, vapor-liquid equilibria, chemical reaction equilibria and thermodynamic analysis of steady state flow processes and the details of their application to the chemical engineering processes.

CODE : CHE502
COURSE : REACTION ENGINEERING I
COURSE DESCRIPTION:
This course deals with the principles of reaction engineering and reactor design. It is one of the core subjects in the chemical engineering curriculum in which students learn how to apply stoichiometry in combination with a rate law to design a chemical reactor that produces the desired conversion of reactants. The design of various types of chemical reactors is discussed at length, including continuous stirred-tank (CSTR), plug-flow (PFR), packed bed reactor (PBR) for continuous-operation and batch-operation reactors. Additional topics include multiple reaction and complex kinetics, heterogeneous reactors, simple catalytic systems, non-ideal reactors and introduction to biochemical reactions. The course also integrates heat transfer to the design and analysis of isothermal and non-isothermal reactors.

CODE : CHE504
COURSE : HEAT AND MASS TRANSFER LABORATORY
COURSE DESCRIPTION:
This course covers experiments related to heat transfer principles as well as mass transfer operations in chemical engineering field.

CODE : CHE544
COURSE : SEPARATION PROCESS
COURSE DESCRIPTION:
This subject introduces the students to one of the fundamental knowledge that the students must acquire in separation theory with respect to mass transfer principles in various unit operation i.e membrane, crystallizer, distillation, leaching and liquid-liquid extraction.

SEMESTER 5

CODE : CHE522
COURSE : TRANSPORT PHENOMENA
COURSE DESCRIPTION:
This course introduces the topic of transport phenomena, which involves the development of mathematical models and physical understanding of the transfer of momentum, energy and mass.

CODE : CPE501
COURSE : CHEMICAL PROCESS CONTROL
COURSE DESCRIPTION:
This course begins with a discussion of principle concept, theory and terminologies of process control. It moves on to discuss the product hardware and software that implement the theory, and then proceeds to describe instrumentation examples and the system-design approaches suitable for variety of production processes.

CODE : CHE505
COURSE : REACTION ENGINEERING II
COURSE DESCRIPTION:
This course introduces the principles and analysis of complex and catalysed reactions involving chemical and biological reacting systems. The students will also be exposed to the design and development of heterogeneous catalytic reactors, multiphase reactors and biochemical reactors via the application of chemical kinetics and transport phenomena.

CODE : CHE506
COURSE : REACTION ENGINEERING LABORATORY
COURSE DESCRIPTION:
This course involves series of experiments that deals with the principles and concepts of chemical and biochemical reaction engineering.

CODE : CPE604
COURSE : PLANT DESIGN AND ECONOMICS
COURSE DESCRIPTION:
This course covers the chemical process and plant design through topics relating to the flow sheeting, product design, heuristics and guidelines in design, preliminary sizing of equipment, pinch technology, economic evaluations and the operation of chemical processes.

SEMESTER 6

CODE : CPE601
COURSE : MATERIAL AND DESIGN OF PROCESS EQUIPMENT
COURSE DESCRIPTION:
This course imparts the knowledge of the mechanical properties of materials needed for designing engineering equipment. The topics covered include theories of failure, mechanical design of pressure vessel, as well as other process equipment and supports.

CODE : CPE615
COURSE : PROCESS SAFETY
COURSE DESCRIPTION:
The course offers a detailed study on applications of engineering principles to process safety and hazards analysis and mitigation. It covers issues relevant to chemical process safety covering Occupational Safety and Health laws and regulations, the regulatory process and methods and techniques for proactively identifying, assessing and eliminating or controlling hazards to acceptable levels. The course also discusses the national and international safety and health regulatory provisions, and principles and techniques for identifying, analyzing and controlling hazards which are required on any process plant to ensure safe and efficient operation. The course also emphasizes on risk assessment and management, maintenance program, emergency response planning, occupational safety and health management system and relevant case studies.

CODE : CPE603
COURSE : PROCESS MODELLING AND INSTRUMENTATION
COURSE DESCRIPTION:
This course introduces the dynamic behavior of processes involved in chemical and biochemical systems through mathematical models derived from the processes. The students will be thought to solve the unknown parameters of the dynamic equations using selected iterative methods (Newton Raphson, False position and Wegstein); and ODE solution methods (Euler algorithm and Runge-Kutta 4th order). The students will also be exposed to computational simulation technique of selected chemical engineering units, and chemical process plant (steady state systems and dynamic systems).

CODE : CPE622
COURSE : PROCESS CONTROL PRACTICES
COURSE DESCRIPTION:
This course introduces the application of process control. The theoretical area of process control is being integrated with the practical area. This course exposed the students towards the problem solving using actual industrial control system. The current technology of control software is used so that the students can have an advanced knowledge of control prior going for the real situations of controlling the processes.

CODE : CPE614
COURSE : PROCESS INTEGRATION
COURSE DESCRIPTION:
This course presents the principles and methodology to develop an understanding of Pinch Analysis technique and acquire the skills to apply the technique for optimal heat and mass recovery for the ultimate aim of producing cost effective, clean and energy efficient designs of new and existing chemical process systems.

SEMESTER 7

CODE : CPE644
COURSE : DESIGN PROJECT I
COURSE DESCRIPTION:
The Design Project course is the pinnacle of the Chemical Engineering program. Students are required to carry out a project on related topic to chemical engineering. Although this course is designed as a team work, much emphasis is given to the individual effort in carrying out of the task. This course focuses on the literature study of the project including process background, market analysis, site selection, environmental & safety consideration, detailed mass & energy balances and process simulation.

CODE : CHE687
COURSE : RESEARCH PROJECT I
COURSE DESCRIPTION:
The Research Project 1 provides an introduction to research study by giving students the experience in planning a research-based project, literature searching, methodology development, oral presentation and report writing. The task in Research Project 1 will be carried out individually.

CODE : CHE649
COURSE : ENVIRONMENTAL ENGINEERING
COURSE DESCRIPTION:
Topics covered include wastewater treatment, air pollution control, solid waste management and environmental impact assessment and audit. Special emphasis will be given on EMS.

CODE : CPE670
COURSE : INDUSTRIAL TRAINING
COURSE DESCRIPTION:
Industrial training is an important component in engineering curriculum. Theories learnt in all the core and non-core courses will have to be applied into the real working environment in chemical industries. Prior to the actual training in industries, students are trained to make job applications before stepping into the real working environment.

SEMESTER 8

CODE : CPE664
COURSE : DESIGN PROJECT II
COURSE DESCRIPTION:

Design Project II is a group project which evaluates the ability of the students to apply and integrate fundamental principles of Chemical Engineering in designing a chemical process plant. An important ability of the Design Project II is to assess the students in the planning and execution of a project. In general, the Design Project II is mainly focusing on the individual work in carrying out the prescribed task including equipment design (mechanical and chemical design), process control and instrumentation, process economic analysis, plant safety, process integration and environment & waste treatment.

CODE : CHE697
COURSE : RESEARCH PROJECT II
COURSE DESCRIPTION:

The Research Project II provides the continuation to research study by giving students the experience in executing the planned research based project, analyzing and interpreting data, concluding the findings, oral presentation, report and journal writing. The task in Research Project II will be carried out individually.

CODE : CPE680
COURSE : LEADERSHIP AND PROFESSIONAL ETHICS FOR ENGINEERS
COURSE DESCRIPTION:

Leadership and professional ethics for engineers is designed to introduce engineering students to the concepts, theory and practice of engineering leadership; engineering leadership characteristics, individual differences and self-awareness; developing and building teams; managing change, conflicts, and crises; and understanding real-world ethics and core values.

This course is designed to contain two (2) parts. The first part concentrates on major theories of leadership and detailed study of the “Thoughts and Policies of Tun Dr. Mahathir Mohamed” and Toyota Manufacturing System. The second part incorporates “Engineers in Society” syllabus of The Institute of Engineers (Malaysia). In addition, students will be exposed to the professional ethics concepts that can be applied in real engineering world.

6.0 BACHELOR OF ENGINEERING (HONS) OIL AND GAS (EH243)

6.1 Bachelor of Engineering (Hons) Oil and Gas: Academic Staff

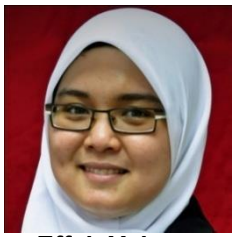
Head of Studies Centre
Oil and Gas

Dr Nor Roslina Rosli
Tel: 03 5543 6346
E-mail: nroslina@salam.uitm.edu.my

Dr Ahmad Rafizan Mohamad Daud
Tel: 03 5543 6306
E-mail: ahmad2057@salam.uitm.edu.my

Rohani Mohd Zin*
Tel: 03 5543 6313
E-mail: rohanimz@salam.uitm.edu.my

Azlinda Azizi*
Tel: 03 5543 8009
E-mail: azlinda68@salam.uitm.edu.my



Effah Yahya
Tel: 03 5543 8008
E-mail: effahyahya@salam.uitm.edu.my

Dr Hazlina Husin
Tel: 03 5544 6554
E-mail: hazlina858@salam.uitm.edu.my

Munawar Zaman Shahruddin*
Tel: 03 5544 8019
E-mail: munawar_zaman@salam.uitm.edu.my

Rozana Azrina Sazali*
Tel: 03 5543 6325
E-mail: rozana592@salam.uitm.edu.my

Nur Hashimah Alias*
Tel: 03 5543 8208
E-mail: nurhashimah@salam.uitm.edu.my

Nurul Aimi Ghazali*
Tel: 03 5543 8013
E-mail: nurulaimi@salam.uitm.edu.my

Tengku Amran Tengku Mohd*
Tel: 03 5543 6534
E-mail: amran865@salam.uitm.edu.my

Siti Rafidah Ab Rashid*
Tel: 03 5543 6324
E-mail: sitirafidah660@salam.uitm.edu.my

Wan Zairani Wan Bakar*
Tel: 03 5543 6530
E-mail: zairani@salam.uitm.edu.my

Prof. Dr Sharifah Aishah Syed A. Kadir
Tel: 03 55436321
E -mail: drsharifah@salam.uitm.edu.my

Arina Sauki
Tel: 03 5544 8010
E-mail: arina_sauki@salam.uitm.edu.my

Dr Atikah Kadri
Tel: 03 5543 6319
E-mail: atikahkadri@salam.uitm.edu.my

Dr Kamariah Noor Ismail
Tel: 03 5543 6332
E-mail: knoor@salam.uitm.edu.my

Erfan Mohammadian
Tel: 03 5543 8404
E-mail: erfan@salam.uitm.edu.my

6.2 Programme Structure: Bachelor of Engineering (Hons) Oil and Gas (EH243)

Study Plan EH243 pakej 3 (ID 5549)

This study plan is used by Semester 1 and Semester 3 students (from Diploma EH110) started from Semester 1 2013/2014 Session. The following are the details on the courses offered:

Number of Faculty courses: 36
Number of Faculty courses with final examination: 26
Number of Faculty courses with continuous assessment: 10

YEAR	SEMESTER	KOD	NAMA KURSUS	KREDIT
	1	CTU551	Tamadun Islam dan Asia	2
		KKR 1	Co curriculum I	1
		ELC400	Preparatory College English	2
		MAT435	Calculus For Engineers	3
		CGE416	Introduction to Petroleum Technology (BL)	3
		CHE495	Hydrocarbon Chemistry	3
		CGE535	Electrical and Instrumentation Technology (BL)	3
	2	CTU553	Ethnic Relationship	2
		KKR2	Co-Curriculum II	1
		MAT455	Further Calculus for Engineers	3
		CPE414	Engineering Drawing	1
		CHE493	Fluid Mechanics	3
		CGE410	Statics and Dynamics	3
		CGE526	Petroleum Geology (BL)	3
		CGE478	Basic Petroleum Engineering Laboratory	1
	3	ELC501	English for Critical Academic Reading	2
		KKR3	Co-Curriculum III	1
		MAT565	Advanced Differential Equations	3
		CHE433	Thermodynamics	3
		CGE577	Drilling Engineering I	3
		CGE674	Formation Evaluation	3
		CGE536	Thermofluids Laboratory	1
		CGE558	Geology and Drilling Laboratory	1
	4	BKE1	Bahasa Ketiga I	2
		CHE515	Instrumental Chemistry For Engineers	3
		CGE653	Health, Safety and Environment (HSE) (BL)	3
		CGE652	Heat & Mass Transfer in Oil and Gas Unit Operations	3
		CGE578	Drilling Engineering II	3
		CGE567	Reservoir Engineering I	3
		CGE617	Reservoir and Gas Laboratory	1
	5	BKE2	Bahasa Ketiga II	2
		CPE680	Leadership And Professional Ethics For Engineers	3
		CGE443	Computer Applications in Oil and Gas	3
		CGE588	Reservoir Engineering II	3
		CGE656	Oil and Gas Simulation Laboratory	1
		CGE659	Petroleum Production Engineering (BL)	3
			Specialization Course I (BL)	3
	6	BKE3	Bahasa Ketiga III	2
		CGE665	Facilities Engineering (BL)	3
		CGE666	Process Design (BL)	3
		CGE660	Engineering Economics of Oil and Gas Operations (BL)	3
		CGE686	Pollution Control and Waste Management (BL)	3

			Specialization Course II (BL)	3
	7	CGE681	Final Year Project I	2
		CGE688	Industrial Training	10
	8	CGE691	Final Year Project II	4
		CGE671	Petroleum Project Management (BL)	3
		CGE601	Field Development Project	4
		ENT600	Technopreneurship	3
			Specialization Course III (BL)	3

SPECIALIZATION COURSES							
SEM	CODE	COURSE	PRA-SYARAT	JAM KT	Jam Temu K	T	M
PETROLEUM ENGINEERING							
5	CGE616	Enhanced Oil Recovery	CGE567	3	3	1	-
6	CGE618	Advanced Production Engineering	CGE659	3	3	1	-
8	CGE696	Well Testing	CGE588	3	3	1	-
GAS ENGINEERING							
5	CGE667	Gas Process Engineering		3	3	1	-
6	CGE677	Gas Utilization		3	3	1	-
8	CGE687	Gas Transmission and Distribution		3	3	1	-
FACILITIES ENGINEERING							
5	CGE676	Maintenance and Reliability Engineering		3	3	1	-
6	CGE658	Platform Architecture		3	3	1	-
8	CGE668	Materials, Codes and Standards		3	3	1	-
OIL & GAS PROCESS							
5	CGE667	Gas Process Engineering		3	3	1	-
6	CPE656	Petroleum Refining Engineering		3	3	1	-
8	CGE697	Process Optimization		3	3	1	

Study Plan EH243 Pakej 2 (ID 4075)

This study plan is used by Semester 1 and Semester 3 students (from Diploma EH110) started from Semester 1 2009/2010 Session. The following are the details on the courses offered:

Number of Faculty courses: 38
Number of Faculty courses with final examination: 25
Number of Faculty courses with continuous assessment: 13

YEAR	SEMESTER	CODE	COURSE	CREDIT
1	1	CTU551	Tamadun Islam dan Asia	2
		KKR 1	Co curriculum I	1
		MAT435	Calculus For Engineers	3
		CHE414	Engineering Drawing	2
		CHE433	Thermodynamics	3

		CGE535	Electrical and Instrumentation Technology	3
		CHE495	Hydrocarbon Chemistry	3
	2	KKR2	Co-Curriculum II	1
		CGE416	Introduction to Petroleum Technology	3
		CHE493	Fluid Mechanics	3
		CGE410	Statics and Dynamics	3
		CGE426	Fundamentals of Geoscience	3
		CGE478	Basic Petroleum Engineering Laboratory	1
		MAT455	Further Calculus for Engineers	3
2	**3**	KKR 3	Co-Curriculum III	1
		BKE1	Bahasa Ketiga I	2
		BEL422	Report Writing	2
		CGE576	Drilling Engineering	3
		CGE567	Reservoir Engineering I	3
		CGE526	Petroleum Geology	3
		CGE558	Geology and Drilling Laboratory	1
		MAT565	Advanced Differential Equations	3
	4	BKE2	Bahasa Ketiga II	2
		BEL499	Communication and Interpersonal Skills	2
		CTU553	Ethnic Relationship	2
		CGE443	Programming and Computer Applications	3
		CGE654	Well Completion	3
		CGE674	Formation Evaluation	3
		CGE586	Reservoir Engineering II	2
		CGE617	Reservoir and Gas Laboratory	1
3	**5**	CHE680	Leadership And Professional Ethics For Engineers	3
		CGE651	Process Unit Operations	2
		CGE653	Health, Safety and Environment (HSE)	3
		CGE656	Oil and Gas Simulation Laboratory	1
		CGE659	Petroleum Production Engineering	3
		BKE3	Bahasa Ketiga III	2
			Specialization Course I	3
	6	CGE662	Materials and Applications	3
		CGE665	Facilities Engineering	3
		CGE666	Pipeline & Subsea Engineering	3
		CGE660	Engineering Economics of Oil and Gas	2
			Specialization Course II	3
		ENT600	Technopreneurship	3
4	**7**	CHE690	Industrial Training	5
		CGE680	Final Year Project I	3
		CGE600	Field Development Plan	3
		CGE670	Petroleum Project and Operations Management	3
			Specialization Course III	3
	8	CGE690	Final Year Project II	3
		CGE610	Economics and Geopolitics of Oil and Gas	3
			Specialization Course IV	3
		CGE655	Field Review and Rejuvenation	3

6.3 EH243 COURSE DESCRIPTION

SEMESTER 1	
CGE416	**INTRODUCTION TO PETROLEUM TECHNOLOGY**
Course Description	This course introduces an overview of the main disciplines and fundamental concepts of upstream petroleum industry. The course comprises of several main topics which include petroleum geology, overview of petroleum play and petroleum exploration, reservoir engineering concepts, drilling and completion concepts development, production and petroleum economic. The importance of petroleum industry in aspect of economic and technology advancement is also included in this course.
Course Outcomes	At the end of the course students are able to: • Describe the chronology of events and overall disciplines of oil and gas industry and development • Analyze the basic calculations in oil and gas measurement units, conversion factors and dimensions as the fundamentals of engineering and its applications • Evaluate the sequence of activities in oil and gas industry and its importance towards economic, development and technology advancement
CGE535	**ELECTRICAL & INSTRUMENTATION TECHNOLOGY**
Course Description	Electrical and instrumentation technology is a course that studies the basic knowledge of electrical engineering in the context of applications in introduction to the basic concepts of electricity which leads to DC circuits and analysis. Also taught in this course are semiconductor electronic devices, simple AC circuit, transformers, electrical motors and instrumentation, safety and electrical power transmission and distribution.
Course Outcomes	At the end of the course students are able to: • Explain the processes in electricity transmission and distribution, safety and the regulations. • Analyze and describe the operation of transformers, motors and electrical measuring instruments in different types of applications. • Analyze simple electric circuit and propose electrical and electronic components in different type of circuits.
SEMESTER 2	
CHE434	**STATICS AND DYNAMICS** This course has been designed to introduce students to the basic principles and concepts in static and dynamics. The course is divided into two parts. The first part deals with the analysis of particle and rigid body in static. It covers the resultant and resolution of forces 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, analysis of structure, forces in beams, analysis of friction and moments of inertia. The second part deals analysis of particles in motion. It includes the kinematic and kinetic of rigid bodies. It will cover the rectilinear and curvilinear motion of particles, Newton's Second Law of particles, work and energy for particles.

Course Outcomes	At the end of the course students are able to: • Explain basic knowledge of statics and dynamics • Analyze the mechanic principle of the kinematics and kinetic of rigid bodies, analysis of truss, beams and law of friction • Assess the mechanic principle on the kinematics and kinetic of rigid bodies, the principle of work, energy and conversation of energy
CGE526	**PETROLEUM GEOLOGY**
Course Description	This subject is covered the geological foundations of petroleum formation and exploration is essential to any career in the hydrocarbon industry. It also provides a basic introduction to geology and develops the knowledge and skills necessary for understanding petroleum formation, migration and accumulation, and methods of detecting, measuring and developing petroleum reserves.
Course Outcomes	At the end of the course students are able to: • Describe the structures, tectonic, traps and lithology and identify geological factors that lead to accumulation of oil and gas • Analyze properties of petroleum formation • Evaluate geological and geophysical data to perform volumetric calculations, identify risk and uncertainties
CGE478	**RESERVOIR FLUID AND ROCK PROPERTIES LAB**
Course Description	This course involves series of experiments that deals with the principles of properties measurement of certain liquids and gases and fluid mechanics unit.

SEMESTER 3

CGE577	**DRILLING ENGINEERING I**
Course Description	This course provides a basic knowledge on the mechanical components of oil and gas drilling rig to familiarize student with the drilling equipment and processes. It is also designed to facilitate an understanding of drilling techniques and problems employed in general drilling operation.
Course Outcomes	At the end of the course students are able to: • Explain the functions and principles of drilling system and operational procedures. • Differentiate various types of drilling components, systems and processes used in drilling operation. • Develop well plan for a successful drilling operation.
CGE674	**FORMATION EVALUATION**
Course Description	This course deals with principles and techniques in reservoir rock evaluation, which can be applied to assess for the potential reservoirs. Students will be exposed to the various type of logging tools and the log interpretation techniques used to evaluate the important petrophysical parameters of the reservoirs. The course begins with the introduction to conventional open hole logging tools and the log interpretation techniques calibrated with core analysis to evaluate petrophysical parameters in detailing reservoir description. Students will also be introduced to cased hole and advanced logging tools which are unique and fundamentally different from conventional logging tools.
Course Outcomes	At the end of the course students are able to: • Describe the basic principles of formation evaluation and various openhole logging tools to evaluate reservoir rock and fluid properties. • Evaluate the potential reservoirs through log interpretation techniques integrated with core analysis in detailing reservoir description and diagnose the production performance problem.

- Analyze non-conventional cased hole and advanced logging tools for reservoir saturation monitoring and evaluating more complex rock and fluid properties.

CGE536 **THERMOFLUIDS LAB**

Course Description This course involves series of experiments that deals with the principles of thermodynamic units, as well as fluid flow concept

CGE558 **GEOLOGY AND DRILLING LABORATORY**

Course Description This module is designed with series of laboratory exercises that will supplement to lectures and offer practical experience to equip the students with a basic understanding of the concepts and method in drilling and geology.

SEMESTER 4

CGE655 **MASS AND HEAT TRANSFERS IN OIL AND GAS UNIT OPERATION**

Course Description This course introduces the students the fundamental knowledge of mass transfer and heat transfer operations. The topics covered include the concept of mass transfer and equipment design for distillation and absorption, the concept of heat transfer and exposure to heat exchanger design. Students are also exposed to several types and designs of equipment employing the principle which are important to oil and gas industries.

Course Outcomes At the end of the course students are able to:

- Describe the concept of mass transfer and heat transfer in oil and gas unit operations.
- Analyze engineering calculations involving mass and heat transfer principles in oil and gas unit operations.
- Justify the design of thermal recovery technique, handling systems, separation systems, heat exchangers and facilities in oil and gas operations.

CGE578 **DRILLING ENGINEERING II**

Course Description Drilling Engineering II is an advanced course from Drilling Engineering I. This course is designed to introduce and comprehend the students to the more advance concept and technique in well planning and drilling operations. Topics covered include directional drilling, directional surveying, hole problems, hydraulic and wellbore integrity, special operation, drilling program and special topics, which introduces new and advanced technologies in drilling.

Course Outcomes At the end of the course students are able to:

- Explain the process, procedures and equipment as part of the planning in advanced well drilling operation.
- Analyze the problems related to drilling operation and suggest the suitable preventive and corrective methods.
- Propose and construct a program for a well drilling operation.

CGE567 **RESERVOIR ENGINEERING I**

Course Description The course begins with overview of reservoir rock and fluid properties before focusing in details on concepts of fluid flow through porous media. The course also include study of rock-fluid interactions, hydrocarbon phase behavior and PVT analysis. Finally, the course discusses on reservoir fluid identification with analysis of dry gas behavior and black oil properties.

Course Outcomes	At the end of the course students are able to: • Describe and relate the fundamental of reservoir rock and fluid properties in term of their interaction, fluid flow, and accumulation in porous media. • Apply and analyze the fundamental of reservoir rock and fluid properties in term of their interaction, fluid flow, and accumulation in porous media. • Evaluate and interpret the reservoir fluid properties through applications of charts, correlations and oil field standards.
CGE617	**RESERVOIR AND GAS LABORATORY**
Course Description	This course involves series of experiments that deals with the principles application of gas engineering and reservoir engineering

SEMESTER 5

CGE443	**COMPUTER APPLICATION IN OIL AND GAS**
Course Description	This is a fundamental computing course focusing on computational mathematics for the use in oil and gas engineering applications. This course also aims to introduce the fundamentals of reservoir simulation to solve real reservoir engineering problems.
Course Outcomes	At the end of the course students are able to: • Identify MATLAB and C++ for engineering problem solutions" • Analyze numerical solution in oil and gas engineering • Interpret reservoir simulation results and estimate well performance
CGE588	**RESERVOIR ENGINEERING II**
Course Description	This course covers concepts of reservoir engineering, flow through porous media, reserve estimation, drive mechanism, material balance equations, water influx and immiscible displacement.
Course Outcomes	At the end of the course students are able to: • Describe the concepts of fluid flow in porous media to appraise reservoir flow behavior. • Analyze oil and gas material balance concepts for reserve and recovery factor estimation. • Interpret the fundamentals of reservoir engineering for prudent development of oil and gas fields.
CGE656	**OIL AND GAS SIMULATION LABORATORY**
Course Description	This course deals with the application of oil and gas simulation tools to solve different engineering problems. Tempest/Eclipse, Prosper/WellFlo and ICON software are used in this laboratory course. Students are preliminarily introduced to the fundamental of reservoir simulation such as the mathematical derivation of material balance equation as well as application of Darcy's equation to solve basic reservoir engineering associated with fluid flow for different conditions. Then, they are introduced to Tempest/Eclipse software from the basic knowledge to the analysis of each input data file to run simulation of various cases in reservoir engineering problems. This includes simulating the static and dynamic models, as well as performing sensitivity analysis for optimum field development strategies. After that, Prosper/WellFlo software is introduced in order to solve production problems, performing sensitivity analysis on the selection of optimum tubing size, as well as simulating different production enhancement methods for optimum production strategies. Last but not least, the introduction to the ICON software and its application. Students are given several individual and group assignments including mini projects for assessment.

CGE659	**PETROLEUM PRODUCTION ENGINEERING**
Course Description	This course introduces the petroleum production systems including reservoir's inflow performance and well's outflow performance concepts, formation damage mechanisms; surface production facilities and operation; tubing performance analysis, design and selection; basic well completion design concepts and familiarization of downhole completion equipment; overview of artificial lift systems including technologies, equipment and fundamental mechanisms of each system, selection criteria, design and analysis of artificial lift systems including gas lift, and pump lift; Analysis and optimization of total petroleum production systems using conventional and nodal analysis. The connecting theme of the topics is to follow flow of fluids from the reservoir/well interface through the well and surface facilities, with emphasis on hardware components, their functions and importance.
Course Outcomes	At the end of the course students are able to: • Describe the principles, components and methods used to complete and produce oil and gas wells, production processes, separation, surface facilities, well stimulation technologies and other advances in oil and gas production processes. • Analyze overall system performance using the appropriate tools and determine appropriate size and materials for components of tubings, flowlines and separation facility equipment. • Evaluate artificial lift based upon well construction, fluid properties and production scenario.

SEMESTER 6

CGE665	**FACILITIES ENGINEERING**
Course Description	This course deals with the ability of students to apply fundamental science and engineering knowledge to solve knowledge in the area of offshore engineering and further their understanding of the multidisciplinary nature of offshore oil and gas engineering. This course provides study on surface equipment related to Exploration and Production (E&P) processes and introduce the conception of the overall facilities setup as well as designing of some of the critical equipment. As part of the assignment work, students have the opportunity to work as individuals and as part of a team.
Course Outcomes	At the end of the course students are able to: • Describe and identify suitable equipment and processing techniques for petroleum production and export facilities • Compare and illustrate type of platform and equipment/facilities used in oil & gas production platform • Design pipeline, horizontal and vertical separator (process equipment) based on the interpretation on process requirement.
CGE666	**PROCESS DESIGN**
Course Description	This course covers the concepts of process design, economic decision making, input information, process flow diagram, piping and instrumentation diagram, process simulation, process integration and plant wide control. Besides, students will be exposed to the computational software to guide them in designing and simulating the processes.
Course Outcomes	At the end of the course students are able to: • Describe steps in various process designs. • Analyze the fundamental of process designs for oil and gas applications. • Evaluate process designs for oil and gas applications.

CGE660	**ENGINEERING ECONOMICS OF OIL AND GAS OPERATIONS**
Course Description	This course outlines the fundamentals of general economic principles. It introduces topics related to upstream operation petroleum economics and give an overview to the students on exploration and production (E&P) projects. This course also covers on overview of E&P project economic evaluation, risks & uncertainty and various economic representations.
Course Outcomes	At the end of the course students are able to: • Describe economic aspects of upstream petroleum project. • Perform sensitivity and decision analysis. • Estimate upstream petroleum project's worth by employing profitability measures.
CGE686	**POLLUTION CONTROL AND WASTE MANAGEMENT**
Course Description	This course includes introductory topics on general overview of oil pollution occurrences, oil compositions and properties as well as remote sensing and detection technology used. Oil spill effects on the environment and oil pollution management is discussed in the subsequent topics. Fundamentals of oil spillage are covered in the behavior of oil spilled topic. Natural weathering processes, oil spreading and trajectory models are elaborated. This is followed by topics on oil containment and recovery methods which include physical, chemical and biological approach. At this juncture, students will be introduced to booms, skimmers, chemical dispersant and biodegradation aspects in dealing with oil spillage. Also included is the topic on oil pollution spill response and preparedness. Finally the course discusses the broader aspect of wastes generated from oil and gas industries. This includes treatments and management hierarchy involved in treating these wastes.
Course Outcomes	At the end of the course students are able to: • Identify the types of oil pollution and the resulting negative impacts on the environment. • Demonstrate understanding on the fate of the oil spilled in terms of spreading and weathering effects and its relationship with the selection and deployment of oil containment and recovery countermeasures. Analyze the waste streams generated in the oil and gas industry and the waste management practiced within the industry.

SEMESTER 7

CGE681	**FINAL YEAR PROJECT I**
Course Description	The Final Year Project I (FYP I) provides an introduction to engineering study by giving students experience in project planning, literature searching, methodology development, oral presentation, report writing and plagiarism checking that is done in the first semester of the fourth year. It is a prerequisite for Final Year Project II course and is conducted concurrently with the industrial training course that runs off-campus. The outcome of this course is a research proposal related to oil and gas area.
CGE688	**INDUSTRIAL TRAINING**
Course Description	Industrial training is an important component in engineering curriculum. Theories learnt in the entire core and non-core courses will have to be applied into the real working environment in engineering industries, specifically to get them involved in chemical or relevant engineering projects. Prior to the actual training in industries, students are required to make job applications before stepping into the real working environment.

SEMESTER 8

CGE690	**FINAL YEAR PROJECT II**
Course Description	The Final Year Project II provides the continuation to research study by giving students the experience in executing the planned research based project, analyzing and interpreting data, concluding the findings, poster presentation, report and journal writing. The task in Final Year Project II will be carried out individually.
CGE671	**PETROLEUM PROJECT MANAGEMENT**
Course Description	This course aims at providing student a general exposure to petroleum project and operations management theories and practices.
Course Outcomes	At the end of the course students are able to: • Describe project management concepts and discuss project planning, procurement, risk assessment and control. • Demonstrate proficiency in applying network techniques for project management. • Evaluate various aspects of petroleum project engineering management.
CGE601	**FIELD DEVELOPMENT PLAN**
Course Description	This is a capstone course which integrates key learning outcomes from previous taught courses. Students work in a team to perform a technical and economic study of a given field by considering latest viable technology, economics, environmental and political conditions. Each team is expected to work collectively with other student groups and/or industry players to ensure that production and development costs are optimized. Finally, students must produce a written report and present their findings to a panel of examiners to convince their case. This course also covers front-end engineering design of new production facilities for a potentially viable oil/gas field. Various oil/gas processing systems are studied, including gas dehydration, condensate handling, acid gas removal, LPG extraction and crude oil stabilization. Design task include process simulation, preparation of process flow diagrams/piping & instrumentation diagrams, HAZOP studies, and project management arrangements. Students to carry out an example facilities scoping study and submit as their final design report.

SPECIALIZATION COURSE SEMESTER 5, 6 & 8

ELECTIVE I PETROLEUM ENGINEERING

CGE616	**ENHANCED OIL RECOVERY**
Course Description	This course aims to introduce the students the fundamentals knowledge of enhanced oil recovery (EOR) processes used or proposed to be used in the petroleum industry. Basic concepts and theories of enhanced oil recovery, such as water flooding, polymer flooding, surfactant flooding, miscible and immiscible gas flooding and thermal recovery processes and strategies will be taught in this course.
Course Outcomes	At the end of the course, students should be able to: • Explain the principles of EOR and to describe the miscible and immiscible displacement processes • Compare different mobility-control processes • Compare the environmental concerns of different chemical and thermal EOR processes.
CGE616	**ADVANCED PRODUCTION ENGINEERING**
Course Description	This course provides understanding about common problems and scenarios encountered in oil and gas industry and provides insight about how to deal with them. More Over design of gas lift and sand control process will be discussed in details.

Course Outcomes

At the end of the course, students should be able to:

- Comprehend complex problems of production operation
- Design basic process of production operation
- Deal with flow assurance problems

CGE616 WELL TESTING

Course Description

This course provides discussions on line source solution, an introduction to well test analysis in oil and gas reservoirs. The syllabus covers the general well tests commonly conducted in the industry. Moreover interpretation of the tests using various methods and their applications will be covered in this course.

Course Outcomes

At the end of the course, students should be able to:

- Comprehend basics of well testing
- Interpret various types of well testing in oil wells
- Solve problems of gas well testing

ELECTIVE II GAS ENGINEERING

CGE667 GAS PROCESS ENGINEERING

Course Description

This course aims to introduce students the scientific fundamentals and engineering practice of natural gas processing. The course starts with a short introduction on natural gas and natural gas industry, including the review on the use of natural gas and its transportation practices. The course will then provide an overview of natural gas processing objectives and activities and introduce the phenomenon of gas hydrate formation as well as hydrate inhibition strategies. Strong emphasis will then be given on the principles governing the techniques and technologies used in processing and liquefying natural gas. Processes to be covered include phase separation, gas compression, gas conditioning, gas dehydration and gas liquefaction.

Course Outcomes

At the end of the course, students should be able to:

- Describe knowledge and comprehension of natural gas science, technology and industry and discuss the fundamental of natural gas field processing as well as hydrate formation and inhibition
- Apply the fundamental concepts of phase separation, natural gas compression, treating and dehydration.
- Appraise the natural gas liquid recovery process, the non-hydrocarbon component recovery/removal processes and the liquefaction of natural gas.

CGE677 GAS UTILIZATION

Course Description

This course enables students to understand the basic concepts of gas utilization, combustion of natural gas, flame properties and structure, equipment for gas utilization, design principles and characteristics, power production from gas, waste heat recovery as well as safety in gas utilization facilities.

Course Outcomes

At the end of the course, students should be able to:

- Describe the basic concept of gas utilization, combustion of natural gas and flame properties and structures.
- Apply the fundamentals equipment for gas utilization, design principle and characteristics as well as power production from gas.
- Evaluate the waste heat recovery and safety in gas utilization facilities.

CGE687	**GAS TRANSMISSION AND DISTRIBUTION**
Course Description	This course has been designed to expose students to hydrocarbon gas pipeline system used locally and overseas. The course contents include an introduction to gas industry, types of gas transmission and distribution system, the related gas floe equations, methods used to design gas pipeline system, gas pipeline network analysis and the construction materials and procedures
Course Outcomes	At the end of the course, students should be able to: • Describe gas transmission and distribution system. • Apply general gas flow equation by incorporating low pressure system and high pressure piping system and apply concept of network analysis. • Evaluate various material properties for pipe construction, piping construction and maintenance and justify the gas regulation and measurement.

ELECTIVE III FACILITIES ENGINEERING

CGE676	**MAINTENANCE & RELIABILITY ENGINEERING**
Course Description	In this unit, we will focus on the fundamental reliability terms and concepts, basic mathematics of probability and statistics, reliability analysis as well as tools used for reliability evaluation (FMEA, FMECA, etc) and its applications. This is supplemented by the maintenance strategies which include reliability-centered maintenance (RCM), risk based inspection and total productive maintenance (TPM).
Course Outcomes	At the end of the course, students should be able to: • Describe the terms and concepts of reliability and explain the principles and objectives of reliability engineering. • Analyze the maintenance and reliability engineering problems and compare the best tools or solutions. • Select the best tools to be used in maintenance and reliability engineering and justify its applications.
CGE658	**PLATFORM ARCHITECTURE**
Course Description	This course has been designed to expose students to hydrocarbon gas pipeline system used locally and overseas. The course contents include an introduction to gas industry, types of gas transmission and distribution system, the related gas floe equations, methods used to design gas pipeline system, gas pipeline network analysis and the construction materials and procedures
Course Outcomes	At the end of the course, students should be able to: • Describe and identify basic principles of platform architecture • Analyze design of platform architecture • Design and compare several types of platform architecture
CGE668	**MATERIAL CODES AND STANDARDS**
Course Description	This course covers principles of materials codes and Standards by American Society of Mechanical Engineers (ASME), American Petroleum Institute (API), National Association of Corrosion Engineers (NACE), Ingress Protection Code (IP), British Standard (BS), National Fire Protection Association (NFPA) and International Conventions for Maritime Safety (SOLAS and MARPOL) for oil and gas facilities engineering.
Course Outcomes	At the end of the course, students should be able to: • Describe and recognize material codes and Standard used for oil and gas facilities engineering. • Apply and differentiate the principles of codes and standards to design engineering facilities. • Evaluate and justify the codes and standards to design engineering facilities.

ELECTIVE IV OIL & GAS PROCESS

CGE697	**PROCESS OPTIMIZATION**
Course Description	This course covers concepts of process optimization that covers the fundamentals of optimization, convexity, constrained and unconstrained problems, linear programming (LP), and mixed integer linear programming (MILP).
Course Outcomes	At the end of the course, students should be able to: • Describe the several types of optimization problems (LP, NLP, MILP, MINLP) • Select various methods to solve optimization problems. • Formulate optimization problems.

7,0 IMPORTANT ACADEMIC INFORMATION

7.1 Plagiarism: Statement

Plagiarism is using other people's ideas such as words, opinions, thoughts, products, information and findings/results, (both spoken or written) inclusive of assignments, project papers, thesis/dissertations, research, proposals, tests and examination papers and pass them off as your own without giving credit to them in the form of citation, acknowledgement and referencing.

The penalties for plagiarism include the following:

A fail grade of work
Suspension from academic session
Expulsion from the University
Withdrawal or revocation of Degree

7.2 Requirements of Class Attendance

Students must attend all lectures including other forms of learning activities such as workshops/ tutorials/ laboratory work/ studio work/ fieldwork/ practical work/ practicum/ industrial or clinical training as stipulated in the syllabus. Students with less than 80% attendance from the total contact hours for;

1. courses with final examinations, are not allowed to sit for the final examination of that course.
2. courses with no final examinations, the course work will not be evaluated.

This is true for every course if the written approval for absence is not sought from the Faculty/Branch Campus/Learning Centre.

Students affected will be given a Grade F or fail with a ZZ status and are required to pay a processing fee of RM100.00.

7.3 Award of Degree

A Bachelor's (Honours) Degree will be conferred on a student who fulfills the following requirements:

1. acquired a CGPA of at least 2.00
2. passed all the courses required by the Programme of Study and obtained a Completed status (ANC, TS or TM)
3. fulfilled all conditions and requirements of the University
4. endorsed by the Senate

7.4 Class of Degree

Class	Range of CGPA
First	3.50-4.00
Second (Upper)	3.00-3.49
Second (Lower)	2.20-2.99
Third	2.00-2.19

Students will be given the following status based on their CGPA:

ANC : Completed with Vice Chancellor's Award
TS : Completed with Dean's List Award
TM : Completed
AD : Dean's List Award
LU : Pass
P : Probation (Unsatisfactory)
D : Failed and Terminated

7.5 Vice Chancellor's Award

The Vice Chancellor's Award is a distinction award for students who completed their studies and obtained the Dean's List Award every semester (not including practical training semesters) throughout the duration of their studies at the University.

7.6 Dean's List Award

The Dean's List award is a distinction award for students who obtained a minimum GPA of 3.50 for at least 12 credit units (excluding courses with Pass/Fail status) in a semester.

7.7 Marking Scheme

The official marking scheme of the university and its stipulations are as follows. Students will be given a grade according to this marking scheme.

Grade	Marks	Grade Points	Interpretation
A+	100 - 90	4.00	Excellent
A	89 - 80	4.00	Excellent
A-	79 - 75	3.67	Excellent
B+	74 - 70	3.33	Good
B	69 - 65	3.00	Good
B-	64 -60	2.67	Good
C+	59 - 55	2.33	Pass
C	54 - 50	2.00	Pass
C-	49 - 47	1.67	Fail
D+	46 - 44	1.33	Fail
D	43 - 40	1.00	Fail
E	39 - 30	0.67	Fail
F	29 - 0	0.00	Fail

LU Pass

F1 Fail a course on first (1st) attempt

F2 Fail a course on second (2nd) attempt

F3 Fail a course on third (3rd) attempt

PD Credit Transfer

PC Credit Exemption

TL Incomplete

UD Audit

FD Disciplinary Action

XX Absent from final examination with permission

YY Absent from final examination without permission

ZZ Barred from taking the final examination for courses with final examination; or not given the assessment marks for courses without the final examination

8.0 Student Facilities

8.1 Library

Perpustakaan Tun Abdul Razak

The library was established in 1960 under the Rural and Industrial Development Authority (RIDA) in Petaling Jaya. In 1972, a new main library building was completed in Shah Alam and named Perpustakaan Tun Abdul Razak 1. To date, the library collections have more than 600,500 volumes comprising books, pamphlets, conference papers, bibliographies, calendars and other non-print materials in microform format. The library also holds about 5,000 periodical titles currently subscribed or received through requests/donations. A number of more than 50 online databases are subscribed from various journals. In addition to the main library, there are eight other component libraries namely:

Perpustakaan Tun Abdul Razak 2 (1986)

The library specializes in Business and Law Collections besides providing reading and reference materials for the off campus and distance learning students.

Perpustakaan Tun Abdul Razak 3 (2003)

The library specializes in collections on Chemical Engineering, Mechanical Engineering, Civil Engineering and Electrical Engineering. Materials available in the library cater to subjects offered by these Faculties.

Perpustakaan Tun Abdul Razak 4 (2004)

The library specializes in collections on Medicine, Pharmacy, Computer Science, Performing Arts and Sport Science. Materials available in the library cater to subjects offered by the Faculties.

Library Services	
Counter Services PTAR	Counter 1: charging, discharging & renewals. Counter 2: registration, cancellation of membership, overdue payments and enquiries.
Book Reservation	Books that are needed but are on loan can be reserved through Infotrack (ILMU) and also through **PTAR Web** (Online Patron Enquiry).
Inter-Library Loans	Books which are not available in our library may be borrowed from other libraries via Inter-library Loans (ILL).
Past years final papers	Past years question papers, student and staff thesis can be accessed via **digital collections.**
Membership Registration	Registration of members will be done at the counter service or otherwise their details can be uploaded from Pusat Sistem Maklumat Bersepadu (PSMB) in case of full-time students.
Serial Services	Procurement of periodicals in printed - journal, magazine, etc. Procurement of electronic form (Online Database) relating to the curriculum of studies in UiTM. E-journals Journals with impact factor Open access journals Indexing of locally based UiTM publications journal articles UiTM publications Newsletter & Bulletin

Tun Abdul Razak Library (PTAR)

Universiti Teknologi MARA,
40450, Shah Alam Selangor,
MALAYSIA
(603) - 5544 3714 , (603) - 5544 3743 , (603) - 5544 3718 , (603) - 5521 1704
Faxs: (603) 5544 3730

8.2 Class, Meeting Room, Computer Lab and Lecture Theatre

The faculty offers a wide choice of facilities to help the students in their learning process. It has well developed laboratories for teaching and research. High technology equipment are available in specialized laboratories with recent facilities for unit operations, chemical reaction, heat transfer, fluid flow, particle technology, industrial process, control and instrumentation. There are four courses that takes care the hands-on practice in the laboratory.

Chemical Engineering Laboratory syllabi are constructed to help the students understand the theory through experiments, which they have learned in their classes through lectures. There are also other equipment stationed in the laboratory which are used for research activities and consultancy work by our academic staff.

In line with recent development of new technologies, the faculty also provides the Computer Lab to enhance student's skill and knowledge towards computer. The Computer Lab is also equipped with the up to date software which can assist the students to develop their knowledge in modelling and simulation as required by the processes in the chemical industries such as HYSIS, AutoCAD, Vantage PID and MATLAB suitable for teaching and research activities. Students also can make use of the computer facilities to prepare their assignments and reports.

10.2.1 Lecture Class		
B5-A11-1B (22)	B5-A11-6A& (20)	B5-A12-1A& (27)
B5-A11-2A (22)	B5-A11-7A (20)	B5-A12-2B (26)
B5-A11-3A (34)	B5-A11-8A& (23)	B5-A12-4B (33)
B5-A11-4B (32)	B5-A11-9B (23)	B5-A12-5A (34)
B5-A11-5A (36)	B5-A12-3A (36)	B5-A12-6B& (21)
	B5-A12-8B (25)	B5-A12-7B (21)

10.2.2 Lecture Theatre	
Lecture Theatre H (DKH) (200)	Lecture Theatre G (DKG) (100)

10.2.3 Meeting Room	
Oval Meeting room (Level 10) (30) B5-A10-10	Mini Meeting Room (Leval 6) (15) B5-A6-18A

10.2.4 Computer Lab				
Computer Lab	**Location**	**Person in charge**	**Number of Computer**	**Available Software**
Computer Lab A	B5-A9-15A	**Tengku Nor Fatimah Tengku Kamal Ariffin** Tel: 03 55436485	30	MATLAB & AUTOCAD
Computer Lab B	B5-A9-15B	**Ariff bin Azizan** Tel: 03 55436367	30	MATLAB & AUTOCAD
Computer Lab C	B5-A9-C	**Azril Mohamed Sharuddin** Tel: 03 55436337	30	MATLAB &HYSIS
Computer Lab D	B5-A9-D	**Nur Ermy Nadia Mohd Hussain** Tel: 03 55436544	30	MATLAB & HYSIS
Computer Lab Bioprocess	B5-A5-13A	**Mohd Khairi Yusof** Tel: 03 55436541	20	SUPERPRO

* (Number) : Capacity

Coding System Used

The location of classes and laboratories within the faculty are prescribed by the following coding system:

: Example : B5-A11-1A
B5 : Block 5
A11 : Level 11
1A : Room No.

8.3 Laboratory safety

All students must read and understand the information in this document with regard to laboratory safety and emergency procedures prior to the first laboratory session. Effort has been made to address situations that may pose a hazard in the lab but the information and instructions provided cannot be considered all-inclusive.

Students must adhere to written and verbal safety instructions throughout the academic term. Since additional instructions may be given at the beginning of laboratory sessions, it is important that all students arrive at each session on time.

Safety training and/or information should be provided by a faculty member, teaching assistant, lab safety contact, or staff member at the beginning of a new assignment or when a new hazard is introduced into the workplace.

8.3.1 Personal and General Laboratory safety Regulations

1. Never eat, drink, or smoke while working in the laboratory.
2. Read labels carefully.
3. Do not use any equipment unless you are trained and approved as a user by your supervisor.
4. Wear safety glasses or face shields when working with hazardous materials and/or equipment.
5. Wear gloves when using any hazardous or toxic agent.
6. Clothing: wear gloves, laboratory coats (white), safety shield or glasses and shoes are required when working in a Lab
7. If you have long hair or loose clothes, make sure it is tied back or confined.
8. Keep the work area clear of all materials except those needed for your work. Hang your coats in the hall or placed them in a locker. Extra books, purses, etc. should be kept away from equipment, that requires air flow or ventilation to prevent overheating.
9. Disposal - Students are responsible for the proper disposal of used material if any in appropriate containers.

10. Equipment Failure - If a piece of equipment fails while being used, report it immediately to your Lab Assistant or Tutor. Never try to fix the problem yourself because you could harm yourself and others.
11. If leaving a lab unattended, turn off all ignition sources and lock the doors.
12. Never pipette anything by mouth.
13. Clean up your work area before leaving.
14. Wash hands before leaving the lab and before eating.
15. Never do unauthorized experiments.
16. Never work alone in laboratory.
17. Keep your lab space clean and organized.
18. Do not leave an on-going experiment unattended.
19. Always inform your instructor if you break a thermometer. Do not clean mercury yourself!!
20. Never taste anything. Never pipette by mouth; use a bulb.
21. Never use open flames in laboratory unless instructed by the Technical Assistant.
22. Check your glassware for cracks and chips each time you use it. Cracks could cause the glassware to fail during use and cause serious injury to you or lab mates.
23. Maintain unobstructed access to all exits, fire extinguishers, electrical panels, emergency showers, and eye washes.
24. Do not use corridors for storage or work areas.
25. Do not store heavy items above table height. Any overhead storage of supplies on top of cabinets should be limited to lightweight items only. Also, remember that a 36" diameter area around all fire sprinkler heads must be kept clear at all times.
26. Areas containing lasers, biohazards, radioisotopes, and carcinogens should be posted accordingly. However, do not post areas unnecessarily and be sure that the labels are removed when the hazards are no longer present.
27. Be careful when lifting heavy objects. Only trained staff may operate forklifts or cranes.
28. Clean your lab bench and equipment, and lock the door before you leave the laboratory.
29. Treat every chemical as if it were hazardous.

Make sure all chemicals are clearly and currently labeled with the substance name, concentration, date, and name of the individual responsible.

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