MASTER OF ENGINEERING

SPECIALIZATION: CHEMICAL

PROGRAMME SPECIFICATIONS

The Master of Engineering (Chemical) is offered on a full-time basis at UTM Main Campus in Johor Bahru. The duration of study is one and a half (1.5) years to a maximum of four (4) years. This program is open for any bachelor graduate from science, technology and engineering courses. Graduates from other discipline but with relevant experiences are also encouraged to apply. Depending on the candidate's background, pre-requisite courses may be imposed to assist the candidate to comprehend more in-depth advanced courses offered.

The programme is offered on full-time basis and is based on a 2-Semester per academic session. Generally, students are expected to undertake courses equivalent to between three (3) to fifteen (15) credit hours per semester. Assessment is based on courseworks, final examinations and dissertation project given throughout the semester.

General Information

<table>
<tr><td colspan="2">1. Awarding Institution</td><td colspan="2">Universiti Teknologi Malaysia</td></tr>
<tr><td colspan="2">2. Teaching Institution</td><td colspan="2">Universiti Teknologi Malaysia</td></tr>
<tr><td colspan="2">3. Programme Name</td><td colspan="2">Master of Engineering</td></tr>
<tr><td colspan="2">4. Final Award</td><td colspan="2">Master of Engineering
Specialization: Chemical</td></tr>
<tr><td colspan="2">5. Programme Code</td><td colspan="2">MKKK</td></tr>
<tr><td colspan="2">6. Professional or Statutory Body of Accreditation</td><td colspan="2">MQA</td></tr>
<tr><td colspan="2">7. Language(s) of Instruction</td><td colspan="2">English</td></tr>
<tr><td colspan="2">8. Mode of Study (Conventional, distance learning, etc)</td><td colspan="2">Mixed-Mode</td></tr>
<tr><td colspan="2">9. Mode of operation (Franchise, self-govern, etc)</td><td colspan="2">Self-governing</td></tr>
<tr><td colspan="2">10. Study Scheme (Full Time/Part Time)</td><td colspan="2">Full Time</td></tr>
<tr><td colspan="2">11. Study Duration</td><td colspan="2">Minimum : 1.5 years
Maximum: 4 years</td></tr>
<tr><td rowspan="2">Type of Semester</td><td colspan="2">No. of Semesters</td><td colspan="2">No of Weeks/Semester</td></tr>
<tr><td>Full Time</td><td>Part Time</td><td>Full Time</td><td>Part Time</td></tr>
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Normal	3	-	14	-
Short	-	-	-	-

Course Classification

No.	Classification	Credit Hours	Percentage
i.	University General Courses	6	14.29%
ii.	Programme Core	12	28.57%
iii.	Programme Electives	3	7.14%
iv	Dissertation	21	50.00%
	Total Credit Hours	**42**	**100%**

Programme Educational Objectives (PEO)

PEO1:Graduate become the expertise in chemical industry decipline and contribute to national development.
PEO2:Graduate become a creative, innovative and adaptable senior engineer in their organization and society.
PEO3:Graduate contribute toward the environmental well-being and sustainable development.
PEO4: Graduate able to conduct research to add value to existing products.

Programme Learning Outcomes (PLO)

PLO1:Ability to master the knowledge in chemical engineering discipline
PLO2: Ability to apply research skills in chemical engineering discipline.
PLO3: Ability to demonstrate effective communication skills in both written and oral form to report the scientific and technical facts.
PLO4: Ability to conduct professional ethics in research with minimal supervision and adhere to legal, ethical and professional code of practice.
PLO5: Ability to demonstrate leadership qualities and working effectively with peers and stakeholders.
PLO6: Ability to analyze problems in chemical engineering field using scientific and critical thinking approaches.
PLO7: Ability to manage information for lifelong learning and identify business opportunity in chemical engineering field.

GRADUATION CHECKLIST

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

NO	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (√) IF PASSED
SCHOOL OF CHEMICAL AND ENERGY ENGINEERING					
PRE-REQUISITE COURSES (if applicable)					
1	MKKK 0413	Chemical Engineering Thermodynamics	3	HW	
2	MKKK 0423	Chemical Reactions Engineering	3	HW	
3	MKKK 0513	Transport Processes and Unit Operations	3	HW	
4	MKKK 0613	Mass Balance	3	HW	
5	MKKK 0623	Basic Numerical Methods	3	HW	
PROGRAMME CORE COURSES (Compulsory)					
1	MKKK 1413	Advanced Thermodynamic	3	3	
2	MKKK 1423	Advanced Chemical Reaction Engineering	3	3	
3	MKKK 1513	Advanced Transport Phenomena	3	3	
4	MKKK 1643	Numerical Computation in Chemical Engineering	3	3	
	TOTAL CREDIT OF CORE COURSES (a)		**12**	**12**	
PROGRAMME ELECTIVE COURSES (Choose only 1 Course)					
5	MKKK 1613	Energy Analysis and Management	3	3	
6	MKKK 1653	Safety and Health in Chemical Industries			
7	MKKK 1683	Process Integration			
	TOTAL CREDIT OF ELECTIVE COURSE (b)		**3**	**3**	
UNIVERSITY GENERAL COURSES					
8	U*** ***3	University General Course	3	3	
9	UKKP 0013	Research Methodology	3	3	
	TOTAL CREDIT OF UNIVERSITY GENERAL COURSE (c)		**6**	**6**	
DISSERTATION					
10	MKKK **80	Dissertation	0	HL	
	TOTAL CREDIT TO GRADUATE (a+b+c)		**21**	**21**	

COURSE SYNOPSIS

CORE COURSES

MKKK 1413 - Advanced Thermodynamic

This course presents the fundamentals of thermodynamics theories in equilibrium system. Selected equation of states as well as several equilibrium models will be utilised in predicting the chemical properties of chemical components at equilibrium with and without chemical reactions. The course features extensive work group exercises as well as individual project and assignments.

MKKK1423 - Advanced Chemical Reaction Engineering

This course is an advanced course on kinetics and chemical reaction engineering with emphasis on quantitative treatment of chemical reaction engineering. Beginning with basic kinetics for homogeneous reactor design and analysis, students will eventually solve problems on heterogeneous systems. Kinetics of heterogeneous reaction and transport limitation on reaction rates will be covered. Effectiveness factor for different pore geometry for first-order and general order kinetics are derived. Similarly, isothermal and non-isothermal cases for external and internal diffusional limited cases will be covered. Students will also be exposed to many problems requiring numerical solution and software packages such as PolyMath and MATLAB through homeworks, projects and case studies.

MKKK 1513 - Advanced Transport Phenomena

This course presents the laws and mechanism of mass transfer in two and multi-component system, elementary boundary layers in mass transfer and the relationships between heat, mass and momentum transfer.

MKKK 1643 - Numerical Computation in Chemical Engineering

The main objective of this course is to provide the students with the opportunity to improve their programming skills using the MATLAB environment as a tool for solving problems in chemical engineering. This course includes the coverage of basics and application of MATLAB software to solve problems arising in chemical engineering which involve numerical operations like algebraic equations, curve fitting, system of linear and nonlinear equations, integrals and ordinary differential equations. With this foundation of basic MATLAB applications in engineering problem solving, the course provides opportunities to explore advanced topics in application of numerical computation as a powerful engineering tool.

ELECTIVE COURSES

MKKK 1613 - Energy Analysis and Management

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 resource conservation for the ultimate aim of producing

cost effective, clean and energy efficient designs of new and existing chemical process systems.

MKKK1653 - Safety and Health in Chemical Industries
This course presents fundamental principle of safety and health in chemical process industry. The course starts with introduction to associated terms i.e. safety, health, hazard and risk. Then categories of hazards are covered for both safety and health aspects. The course is then progressing into more technical content on hazard and risk assessment. For both safety and health, common techniques widely used for operating processes as well as indices for inherent hazard assessment are dealt with in detail. Finally, a systematic and comprehensive safety and health management systems are also included.

MKKK1683 - Process Integration
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 resource conservation for the ultimate aim of producing cost effective, clean and energy efficient designs of new and existing chemical process systems.

GENERAL COURSES

UKKP 0013 - Research Methodology
The aim of this course is to equip students with the essential knowledge and skills to do a research and write dissertation systematically. This course has 9 modules which will be conducted through weekly 3-hour seminar. Each seminar will be consisted a lecture, discussion and workshop. In the end of course, students need to produce a research proposal and have a mini conference as part of assessment and proposal presentation practice.

DISSERTATION

MKKK XX80 - Dissertation
For Dissertation, student needs to conduct research work in chemical laboratories, computer laboratories or companies and analyse the data critically to solve a research problem. The student then has to write a complete thesis which will be evaluated by examiners at the end of the course. Student also has to present and defend their findings.