

# MASTER DEGREE in CHEMICAL ENGINEERING

UNIQUE OPPORTUNITY  
One Year Programme

## List of courses offered:

### CORE COURSES:

#### 1. Advanced Separation Processes (4 units)

- The course covers the concepts of advanced separation methods such as those used in fluid extraction, membrane processes, adsorption, chromatography, complex distillation and solids separation processes.

#### 2. Safety Engineering and Environmental Management (4 units)

- The course introduces the concepts of advanced safety engineering system reliability, qualitative and quantitative risk management and assessment of major hazards. Engineers will also be introduced to the waste management and environmental assessment.

#### 3. Product Design and Development (4 units)

- The course will focus on the chemical product design and development which will be integrated with the design methodology, manufacturing process and marketing functions of the company in creating a new product.

### ELECTIVE COURSES:

#### 1. Reactor Engineering and Industrial Catalysis (4 units)

- The course covers in-depth knowledge of the heterogeneous catalysis, heterogeneous reactors and their application in industrial processes.

#### 2. Model Based Process Control (4 units)

- The course covers the theories of process modeling using linear and non-linear techniques in chemical processes. This course also covers the concept and design of the model based control such as Model Predictive Control (MPC) and Internal Model Control (IMC) of the chemical processes.

#### 3. Process Intensification in Chemical Industries (4 units)

- The course covers process heat integration including pinch technology and applications of process intensification in the industries.

#### 4. Downstream Processing of Biochemical and Pharmaceutical Products (4 units)

- The course outlines the overview of possibilities and problems typically associated with the recovery and isolation of biochemical and pharmaceutical products. The principles, advantages, and limitation of downstream processes such as centrifugation, two-phase extraction and others will be discussed.

#### 5. Current Issues in Chemical Engineering Research (4 units)

- The course covers the introduction to research, research ethics, current issues and topics in chemical engineering research.

#### 6. Chemical Engineering Processes for Microelectronics Industry (4 units)

- The course outlines the overview of microelectronics industry, wafer fabrication process flow and in-depth theories of each process, crystal growth techniques, silicon oxidation, photolithography and etching, diffusion and ion implantation, chemical vapor deposition, EDS control and current issues and future challenges of microelectronics industry.

### RESEARCH (20 units):

Research Methodology and Skills  
Research Article Write-up and Submission  
Research Project and Seminar

### Enquiries

Further information and enquiries should be addressed to:

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## INTRODUCTION

Under the Ninth Malaysia Plan, Malaysian government has focused on knowledge-based economy (k-economy) and human resource development. In order to sustain the competition level in the industry especially in this globalization era, it is vital to possess knowledge in advanced scientific and technology, training and innovative thinking. Research and development is the prime field to expand the industries in this highly competitive world of today.

The School of Chemical Engineering (SCE), Universiti Sains Malaysia has designed a mixed mode Master's programme to fulfill the increase in demand, particularly in the current chemical industries and to provide intuitive knowledge in various core and elective chemical engineering courses related to technology advancement and its application in industries. At the same time, the designed courses offer more opportunity and flexibility in the programme for the students that undertake the programme. Besides, SCE also anticipates that the programme able to attract interest from those who actively involved in research and development, university or private college lecturers as well as graduates in Bachelor of Chemical Engineering, to pursue their studies and to develop their professional qualification.

## COURSE OBJECTIVES

The course is aimed to contribute to the growth and establishment of the chemical industries in our country based on k-economy. Therefore, a chemical engineer is required to have inter-discipline knowledge in research and development to ensure the progress of the chemical industries globally.

Objectives of the offered course include:

- ~ To produce well-trained chemical engineers that are capable to conduct research activities in the chemical industries.
- ~ To produce knowledgeable engineers in chemical engineering research that will contribute to the development of research in academic institutions or industrial organizations.
- ~ To train the professional chemical engineer as an industrial adviser especially in the research areas that focus on innovation, development and identification, and to solve industrial problems related to chemical engineering aspects.
- ~ To train lecturers from the private and government sectors on the current research and development in chemical engineering.
- ~ To produce highly skilled researchers and chemical engineers that are capable to conduct research as to accomplish the mission and vision of a research university.

## ENTRANCE REQUIREMENTS

Applicant should possess a bachelor's degree in Chemical Engineering, preferably with a Second Upper Honours Division or minimum CGPA of 2.75 from a recognized university or equivalent qualifications acceptable to the University Senate. A candidate who does not meet the minimum qualification can also be considered for the admission based on relevant working experience, has at least one (1) publication in the applied field or obtained at least B+ in the final year project.

## UNIQUENESS OF THE COURSE

Chemical industries have been identified as one of the important industry for research and development. Therefore, group of highly skilled manpower in technical aspects is crucial to compete with the industrial development that requires advanced research and development strategies and multidisciplinary approach. This reflects to the structure of the course, in which the majority of the offered courses will enhance the knowledge and skills of the chemical engineers in various aspects. The uniqueness of the programme lies in the followings:

- ~ The course provides option for the candidates to choose their major field in the chemical industries, based on their interest, capabilities and the need of the industries.
- ~ The course focuses on the characteristic of chemical engineers to actively participate in research and development sectors in order to enhance their skills.
- ~ The core and elective courses offered in this programme are unique and not available in any Master programme in other local universities. Moreover, the research course will enhance students' capabilities and skills, such as to derive appropriate research designs and to find alternative solutions on strategic problems or issues relating to chemical engineering.

## COURSE STRUCTURE

The mixed mode MSc. (Chemical Engineering) is a full-time course. For the award of the Master's degree, a candidate has to accumulate 40 units (20 units from courses and 20 units from research project). The minimum period for graduation is 1 year and maximum 2 years.

Students are required to undertake 3 core compulsory courses (12 units) and individual research project (8 units) in Semester 1. In Semester 2 students will proceed with 2 elective courses (8 units) and the individual research project (12 units). The followings are the programme plan (Table 1) and summary of course contents:

Table 1: Programme plan

Semester 1	Unit
3 core courses	12
Accumulated unit	12

Semester 2	Unit
3 elective courses	8
Research Project	20
• Research Methodology and Skills	
• Research Article Write-up and Submission	
• Research Project (Thesis and Oral Exam or Viva)	
Accumulated unit	28