

MASTER OF ENGINEERING SPECIALIZATION: BIOPROCESS

PROGRAMME SPECIFICATIONS

Master of Engineering (Bioprocess) by Mixed-Mode is a master programme by mode of taught course and research. This programme equips students with technical knowledge in advanced bioprocess engineering field including biotechnology, industrial bioprocessing, facilities and infrastructures in bioprocess engineering and bioproduct development. Course assessment is based on group or individual assignments, reports, presentations, tests, exams and projects. The programme provides students with research exposure via a one-and-a-half semester research project.

This programme is suitable for any bachelor graduates from science, technology and engineering field. Graduates from other discipline 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.

General Information

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

Course Classification

No.	Classification	Credit	Percentage
i.	University Elective (1 course)	3	50%
ii.	Programme Core	15	
iii.	Programme Elective (1 course)	3	
iv	Dissertation	21	50%
	Total	42	100%

Programme Educational Objectives (PEO)

PEO1: Graduate become the expertise in chemical-bioprocess industry and biotechnology discipline and contributes to national development

PEO2: Graduate become creative, innovative and adaptable technology specialist as leaders or team members in their organization and society

PEO3: Graduate contribute toward the environmental well-being and sustainable development

PEO4: Graduate has the ability to conduct research and entrepreneurial innovation

Programme Learning Outcomes (PLO)

PO1: Ability to integrate advanced engineering and scientific knowledge in professional practices for the benefits of bioprocess engineering and biotechnology discipline

PO2: Ability to formulate hypothesis, design and reorganize experiments/research skill scientifically to solve and evaluate observed phenomena

PO3: Ability to analyze problems in bioprocess and biotechnology field using scientific and critical thinking approaches

PO4: Ability to demonstrate professional ethics in research and explain ethics related with biotechnology from spiritual and material aspects

PO5: Ability to analyze situations, justify and react effectively through oral and written to scientific, industry and public communities

PO6: Ability to display lifelong learning skills by conducting independent work with minimum supervision.

PO7: Ability to demonstrate team working skills.

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist with minimum B grade. Students must achieve a total of 42 credit hours with a minimum of cumulative B grade or CGPA of 3.0 and passed master research dissertation project and has submitted the approved dissertation to UTM. 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	
UNIVERSITY ELECTIVE (Choose 1)						
1	UHAP6013	Seminar Pembangunan Isu-Isu Sosial dan Ekonomi Global		3		
2	UHAW6023	Falsafah Sains dan Pembangunan Sosial		3		
3	UHAF6033	Kepimpinan Dinamik		3		
4	UHAZ6113	Budaya Malaysia I		3		
5	UHAZ6123	Budaya Malaysia II		3		
6	UHAZ6313	Bahasa Malaysia Akademik I		3		
7	UHAZ6323	Bahasa Malaysia Akademik II		3		
8	UDPE1123	Organizational Behavior dan Development		3		
9	UCSM1263	Pengurusan Projek IT		3		
10	ULAJ6013	Japanese Language for Postgraduates		3		
TOTAL CREDIT OF UNIVERSITY ELECTIVE				3	3	
PROGRAMME CORE COURSES						
1	MKKB1103	Biotechnology for Engineers		3		
2	MKKB1113	Industrial Bioprocessing		3		
3	MKKB1123	Facilities and Infrastructures in Bioprocess Engineering		3		
4	MKKB1133	Bioproduct Development		3		
5	UKKP0013	Research Methodology		3		
TOTAL CREDIT OF PROGRAM CORE				15	15	

PROGRAMME ELECTIVE COURSES*(Choose 1)					
1	MKKT102 3	Herbal Quality Management	3	3	
2	MKKT103 3	Herbal Processing	3	3	
3	MKKH13 73	Human Factor	3	3	
4	MKKK151 3	Advanced Transport Phenomena	3	3	
5	MKKH15 13	Environmental Management	3	3	
6	MKKH15 23	Pollution Control Technology	3	3	
7	MKKK161 3	Energy Analysis and Management	3	3	
8	MKKK165 3	Safety and Health in Process Industries	3	3	
9	MKKK168 3	Process Integration	3	3	
TOTAL CREDIT OF PROGRAMME ELECTIVE			3	3	
DISSERTATION					
1	MKKB ##80	Dissertation	21	HL	
TOTAL CREDIT OF DISSERTATION			21	21	
TOTAL CREDIT TO GRADUATE			42	42	
<i>*The courses are offered subjected to availability of the courses for the particular semester in the School of Chemical and Energy Engineering</i>					

COURSE SYNOPSIS

CORE COURSES

MKKB 1103 - Biotechnology for Engineers

This course consists of two sections; 1) molecular biology and genetic engineering, and 2) biotechnology application and industrial outreach. Section 1 aimed at providing the fundamentals of biotechnology and knowledge. It covers basic understanding of microorganisms and genetic engineering involved in biotechnology. The concept of protein expression, different expression systems used in biotechnology and the omics technology are also covered. Section 2 covers biotechnology application in different areas (i.e. food, agriculture, medical, and environment), global scenario of biotechnology industry and biotechnology in Malaysia and current issues. It also discusses on how this technology contributes towards the wealth creation, health improvement, environmental protection and issues related to social security globally.

MKKB 1113 - Industrial Bio-Processing

This course introduces students to the fundamentals of various industrial bioprocessing areas based on the sources and applications. Emphasis will be on the technologies in which the students will be guided in being independently acquired and explain information on some key issues in food and bio products engineering, biopharmaceutical engineering, renewable resources and waste management bioprocessing science and technology.

MKKB 1123 - Facilities and Infrastructures In Bioprocess Engineering

This course provides complete overview about the production facility from the beginning of the project up to the production process and how to perform all project steps according to the guidelines of the Good Manufacturing Practice (cGMP). Topics include the primary and details engineering in the production area, flow inside facility (personnel, material, product and waste), the design of HVAC system and clean area according to the cGMP requirements. Besides the engineering and design aspects, the course also encompasses all aspects of the cGMP requirements for the production equipment, from cell bank to the final product. Furthermore, non-design/equipment components of the cGMP such as human resource, process design and operation procedure based on Standard Operation Procedures (SOPs) sheet is also introduced.

MKKB 1133 - Bio-Product Development

This course introduces students to the fundamentals of bio-product development based on the sources and functional applications. Emphasis will be on the technologies in the development of bio-products; various types of materials/bio-materials, design, operations and analysis of desired performances. The course also exposes students to the different stages in the development of a bio-product, from the research and development to manufacturing, bio-product approval and release of the final product.

UKKP 0013 - Research Methodology

The aim of this course is to equip students with the essential knowledge and skills to do a research works 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 present in the class as part of assessment for this course.

ELECTIVE COURSES

MKKT 1023 - Herbal Quality Management

Every herbal product must be subjected to quality assurance and quality control before it can be commercialized. In this course, students will learn about quality, quality management, quality control, standardization procedures of herbal products, good manufacturing practices and hazard and operability study (HAZOP).

MKKT 1033 – Herbal Processing

Herbal processing is an integral part of herbal product development. In this course, students will learn about herbal processing complete cycle starting from cultivation and collection of plant materials, reprocessing, processing, packaging and finally good manufacturing practices.

MKKH 1373 – Human Factor

This course introduces students to a basic knowledge of human factors design principles and the nature of human interaction with physical work environment. The content of this course includes both physical and cognitive conditions, ergonomics, socio-technical systems, and the nature of human performance at the workplace.

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.

MKKH 1513 – Environmental Management

This course covers environmental management system principle, environmental act and international protocols or framework in achieving global sustainable development. The course also includes discussion on the fundamental of environmental cycle, carbon footprint and life cycle assessment. Students will analyse a range of underlying drivers to unsustainable use of the environment, the economics of global climate change, resource consumption, as well as climate change mitigation.

MKKH 1523 – Pollution Control Technology

This course introduces students to the cause, effect and method to control pollution from industries. The course covers the three major categories of industrial pollution: water pollution, air pollution and industrial waste management. In the first part, the course includes the source and types of water pollutants, environmental regulations pertaining to waste water discharge, and techniques to treat raw water and waste water before discharging to the environment. The second part of the course covers the solid and hazardous waste characteristics and effect of air pollution, regulations requirement for air pollution control, technology to control air pollution emissions from industries. The third part covers the management of industrial waste that includes definition of scheduled waste, scheduled waste regulations, and technique to manage the waste.

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.

MKKK 1683 – 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.