MASTER OF SCIENCE
SPECIALIZATION: POLYMER TECHNOLOGY

PROGRAMME SPECIFICATIONS

The Master of Science Specialization in Polymer Technology 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.

The assessment is based on course works, final examinations and dissertation project given throughout the semester.

General Information

1. Awarding Institution	Universiti Teknologi Malaysia
2. Teaching Institution	Universiti Teknologi Malaysia
3. Programme Name	Master of Science
4. Final Award	Master of Science Specialization: Polymer Technology
5. Programme Code	MKKA
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	
	Full Time	Part Time	Full Time	Part Time
Normal	3	-	14	-
Short	-	-	-	-

Course Classification

No.	Classification	Credit Hours	Percentage
i.	University General Courses	3	7.14%
ii.	Programme Core	15	35.71%
iii.	Programme Electives	3	7.14%
iv	Dissertation	21	50.00%
	Total Credit Hours	42	100%

Programme Educational Objectives (PEO)

POE1 Graduate become the expertise in polymer technology decipline and contribute to national development.

POE2 Graduate become creative, innovative and adaptable technology specialist as leaders or team members in their organization and society.

POE3 Graduate contribute toward the environmental well-being and sustainable development.

Programme Learning Outcomes (PLO)

PLO1 Ability to master the knowledge in polymer technology discipline.

PLO2 Ability to apply research skills in polymer technology discipline.

PLO3 Ability to analyze problems in polymer technology field using scientific and critical thinking approaches.

PLO4 Ability to conduct professional ethics in research with minimal supervision and adhere to legal, ethical and professional code of practice.

PLO5 Ability to associate ideas through communication on societal issues in polymer technology discipline.

PLO6 Ability to manage information for lifelong learning in polymer technology field.

PLO7 Ability to demonstrate team working qualities and working effectively with peers and stakeholders.

GRADUATION CHECKLIST

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

NO	CODE	COURSE	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (√) IF PASSED
SCHOOL OF CHEMICAL & ENERGY ENGINEERING					
CORE COURSES (Compulsory)					
1	MKKR 1113	Polymer Characterization	3	3	
2	MKKR 1123	Polymer Synthesis	3	3	
3	MKKR 1133	Polymer Physic and Properties	3	3	
4	MKKR 1143	Polymer Additives, Blends and Rheology	3	3	
5	MKKR 1153	Polymer Processing	3	3	
		TOTAL CREDIT OF CORE COURSES (a)	**15**	**15**	
ELECTIVE COURSE (Choose only 1 Course)					
6	MKKR 1223	Rubber and Latex Technology	3	3	
7	MKKR 1243	Surface and Foam Technology			
		TOTAL CREDIT OF ELECTIVE COURSE (b)	**3**	**3**	
UNIVERSITY GENERAL COURSE					
8	U*** ***3	University General Course	3	3	
9	UKKP 0010	Research Methodology	0	HL	
		TOTAL CREDIT OF UNIVERSITY GENERAL COURSE (c)	**3**	**3**	
DISSERTATION					
10	MKKR **80	Dissertation	0	HL	
		TOTAL CREDIT TO GRADUATE (a+b+c)	**21**	**21**	

COURSE SYNOPSIS

CORE COURSES

MKKR 1113 - Polymer Characterization
This course introduces students with comprehensive knowledge of the various techniques available to characterize polymeric materials, the underlying principles of each characterization methods, the use and the limitations of each technique. This course will focus mainly four approaches of characterization, which are characterization of polymers in solution, spectroscopy, thermal analysis and microscopy. In characterization of polymers in solution, it will cover measurements of molecular weight and molecular weight distribution. In spectroscopy student will learn classification of spectroscopic methods and different type of spectroscopy instruments. This topic will also focus on fundamental concept in Infra-red (IR) spectroscopy for polymer applications. In thermal analysis students will learn various techniques of thermal analysis such as differential scanning calorimeter (DSC), thermal gravimetric analysis (TGA), and dynamic mechanical analysis (DMA). The microscopy topic will cover various techniques of microscopy analysis such as optical microscopy, scanning electron microscopy (SEM), transmission electron microscopy (TEM) and atomic force microscopy (AFM).

MKKR 1123 - Polymer Synthesis
Basic terminologies, principles on polymers and structural relationship towards polymer classification are discussed. An overview on the polymer industry is elaborated together with its impact on human life. Molecular weight relationships toward polymer properties and its implication are briefly presented. This course emphasis specifically on the advanced of polymer synthesis including step-growth, chain-growth and co-ordination polymerizations. Kinetic for the polymerization mechanism is described and its relationship to molecular weight is explained in details. The limitations and application for each polymerization mechanism are discussed. The polymerization systems used for the polymerization process are discussed together with their advantages and the disadvantages. Finally, this course also exposed students to the pilot scale set-up of the polymerization systems.

MKKR 1133 - Polymer Physic and Properties
This course is designed to expose students to the properties of polymer which have great importance. It will emphasize on the mechanical properties, electrical properties, polymer characterization and rubber elasticity. A strong emphasis will be given on the mechanical properties which include viscoelastic behavior, tensile and impact properties. Plastics design using creep deformation data is also included. At the end of the course students should be able to explain the interrelation between polymer properties, structures and applications. The students should also be able to describe the appropriate test and characterization for each property.

MKKR 1143 - Polymer Additives, Blends and Rheology
This course consists of three parts: (a) Polymer Additives (b) Blending (c) Rheology. Polymer additives cover the topics on fillers and fibres, heat stabiliser, impact modifiers, antioxidants, lubricants, plasticizer, flame retardants and other. The theory and mechanism of each additive

will be explained in details. Polymer blending explains the methods of blending, compatibilizing mechanism and current development in polymer blends. Whilst polymer rheology elaborates the behaviour of polymer flow in a pipe as well as between plate.

MKKR 1153 - Polymer Processing

This course introduces students to processing of thermoplastic and composite materials in general. Details fundamental of polymer processing such as extrusion and injection moulding will be emphasized. Element of product design will also be covered in this course. The course will further discuss and explain the preparation and manufacture of fibre reinforced polymer composite. At the end of the course, students should be able to derive, calculate stress, strain and modulus for a given problem of unidirectional composite and composites materials design.

ELECTIVE COURSES

MKKR 1223 - Rubber and Latex Technology

The course will provide students with a basic knowledge of rubber technology covering the important characteristics of common rubber materials, applications of rubbers, fundamental principles of rubber compounding, and basic mixing techniques to produce good rubber compounds. Emphasis will be given to discuss on material selection to formulate a rubber compound and its curing system especially with regard to sulfurs curing practice. Furthermore, a laboratory work on compounding and curing of rubber compounds will be demonstrated. This course will also introduce the students with a fundamental understanding of latex technology highlighting on compounding and processing of latex.

MKKR 1243 - Surface and Foam Technology

This course is designed to introduce students to the basic principles and concepts in adhesion and adhesives. It will deal with the various types of adhesives, joining of polymers/plastics by means of welding, solvent bonding, coupling agents and also introduce the various applications of adhesives. This course includes various aspects of polymer coatings and paints including the coating methods and polymer coatings industry, types of paints, pigments in paints, paint compounding and preparation and characterization techniques of paints and coatings. This course also introduces the formation of foams of various polymers including thermoset, thermoplastic and reinforced foams.

GENERAL COURSES

UKKP 0010 - 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

MKKR 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.