MASTER OF SCIENCE (MATERIALS ENGINEERING)

PROGRAMME SPECIFICATION

The Master of Science (Materials Engineering) is offered either on a full-time or part-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru while the part-time programme is offered at various learning centres throughout Malaysia. The normal full-time program can be completed in a minimum of one year, i.e. two long semesters and one short semester. The maximum period for the completion of the full-time program is eight normal semesters (nominally 4 years). The maximum duration allowed for part-time students is also eight normal semesters (nominally 4 years). The full time student is allowed to take a maximum of 20 credits in a normal semester and 10 credits in a short semester. The part time student is allowed to take a maximum of 12 credits in a normal semester and 6 credits in a short semester. Assessment is based on coursework and final examinations given throughout the semester.

General Information

1. Awarding Institution			Universiti Teknologi Malaysia	
2. Teaching Institution			Universiti Teknologi Malaysia	
3. Programme Name			Master of Science (Materials Engineering)	
4. Final Award			Master of Science (Materials Engineering)	
5. Programme Code			MKMC	
6. Professional or Statutory Body of Accreditation			MQA	
7. Language(s) of Instruction			English	
8. Mode of Study			Conventional	
9. Mode of operation			Self-governing	
10. Study Scheme (Full Time/Part Time)			Full Time / Part Time	
11. Study Duration			Minimum : 1 year Maximum : 4 years	
Type of Semester	No. of Semesters		No of Weeks/Semester	
	Full Time	Part Time	Full Time	Part Time
Normal	8	8	14	14
Short	4	4	8	8

Course Classification

Course Category	Code	Course	Credit	Percentage
University General Courses	U### ###3	University Electives	3	7.5%
Programme Core	MKMB 1603	Advanced Technique of Materials Characterization	3	30%
	MKMB 1613	Processing and Fabrication of Materials	3	
	MKMB 1623	Microstructure and Mechanical Properties of Materials	3	
	MKMB 1903	Research Methodology	3	
Project	MKMB 1914	Master Project I	4	25%
	MKMB 2926	Master Project II	6	
Programme Electives (choose 5 courses only)	MKMB 2603	Materials Testing and Quality Control	3	37.5%
	MKMB 2613	Corrosion I	3	
	MKMB 2623	Foundry Engineering	3	
	MKMB 2633	Advanced Materials	3	
	MKMB 2643	Materials Selection	3	
	MKMB 2653	Corrosion II	3	
	MKMB 2663	Surface Engineering	3	
	MKMB 2673	Nanomaterials	3	
	MKMB 2683	Modelling in Materials Engineering	3	
	MKMB 2003	Special Topic 1 (Depend on current research areas and subjected to Faculty approval)	3	
	MKMB 2013	Special Topic 2 (Depend on current research areas and subjected to Faculty approval)	3	
	MKXX xxx3	Option (Any approved engineering course)	3	
Total Credit Value			**40**	**100%**

Program Educational Objectives (PEO)

PEO1: Graduates are able to apply the knowledge gained to identify, develop

solution and solve problems related to **Materials** engineering in various situations, effectively and ethically.

PEO2: Graduates are able to communicate and present ideas intellectually and effectively.

PEO3: Graduates are able to conduct research, manage and publish information and continue life-long learning

Program Learning Objectives (PLO)

PLO1: Demonstrate advanced knowledge and capabilities to further develop or use these for new situations in **materials** engineering.

PLO2: Demonstrate research skills in appraising available information and research evidence, and applying them in **materials** engineering contexts

PLO3: Apply critical thinking and problem solving skills in addressing **materials** engineering problems utilizing relevant tools and techniques.

PLO4: Perform research on **materials** engineering problems professionally, ethically and responsibly.

PLO5: Communicate technical knowledge and ideas effectively in written and oral forms.

PLO6: Adopt the latest relevant knowledge and technologies through life-long learning.

GRADUATION CHECKLIST

Students must pass all the stated courses in this checklist to graduate. 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 GENERAL COURSES					
1	U### ###3	University Course Electives	3	3	
TOTAL CREDIT of UNIVERSITY GENERAL COURSES (a)			3	3	
PROGRAMME CORE COURSES					
1	MKMB 1603	Advanced Technique of Materials Characterization	3	3	
2	MKMB 1613	Processing and Fabrication of	3	3	

		Materials			
3	MKMB 1623	Microstructure and Mechanical Properties of Materials	3	3	
4	MKMB 1903	Research Methodology	3	3	
TOTAL CREDIT OF PROGRAMME CORE COURSES (b)			12	12	
MASTER PROJECT COURSES					
1	MKMB 1914	Master Project I	4	4	
2	MKMB 2926	Master Project II	6	6	
TOTAL CREDIT OF MASTER PROJECT COURSES (c)			10	10	
PROGRAMME ELECTIVES (5 COURSES)					
1	MKMB 2##3	Elective 1	3	3	
2	MKMB 2##3	Elective 2	3	3	
3	MKMB 2##3	Elective 3	3	3	
4	MKMB 2##3	Elective 4	3	3	
5	MKMB 2##3	Elective 5	3	3	
TOTAL CREDIT OF ELECTIVES COURSES (d)			15	15	
TOTAL CREDIT TO GRADUATE (a + b + c + d)			**40**	**40**	

COURSE SYNOPSIS

CORE COURSES

MKMB 1603 - Advanced Techniques for Materials Characterization

This course provides the students with an understanding of the basic principles of advanced techniques of materials characterization which include X-Ray Diffraction, Electron Microscopy, qualitative and quantitative analysis of materials.

MKMB 1613 - Processing and Fabrication of Materials

This course introduces various manufacturing and processing techniques used to produce engineering components from metallic, ceramic and polymeric materials and provides the students with an understanding of the principles and operation of the various fabrication processes.

MKMB 1623 - Microstructure and Mechanical Properties of Materials

By taking this course, students will be able to relate materials microstructure variables to the properties of materials which include metals, polymers, ceramics and composites. The course also provides an understanding of the causes of failure in engineering components and structures, and to introduce methods of fracture control and testing.

MKMB 1903 – Research Methodology

This course aims to provide students with fundamental knowledge of research and the methodologies commonly used in engineering. It encompasses literature review, problem formulation, designing research methods, analysis methods and report writing.

ELECTIVE COURSES

MKMB 2603 - Materials Testing and Quality Control
This course introduces students to the fundamentals of mechanical testing of metallic materials and determines their mechanical properties. It also provides a comprehensive coverage of the various non-destructive testing techniques used to assess the integrity of engineering components and quality of production. The concepts and techniques used in quality control and quality management will be covered.

MKMB 2613 - Corrosion I
The course introduces students to the basic principles of electrochemical corrosion and different forms of corrosion. It provides the students with an understanding of the tools to analyze corrosion problems. The course will also introduce various methods of protection against corrosion.

MKMB 2623 - Foundry Engineering
This course provides an understanding on the principles of solidification of liquid metals and alloys during casting. The course will also provide an understanding of the effect of melt treatment on the structure and properties of cast products.

MKMB 2633 - Advanced Materials
The learning objectives of this course is to provide students an understanding and exposure to the latest development in advanced materials such as special metal alloys, advanced ceramics, composite materials, biomaterials and electronic materials, their properties, processes and applications.

MKMB 2643 - Materials Selection
The course provides students with an understanding of the relationship between the principles of materials engineering and the use of these materials in modern engineering designs and applications. This course will also describe the interaction between the manufacturing process and material selection and the need to adopt concurrent engineering approach.

MKMB 2653 - Corrosion II
After taking Corrosion I, in this course students will be exposed to the various techniques used in corrosion testing and how to successfully manage corrosion in applications such as oil and gas, petroleum and automotive industries.

MKMB 2663 - Surface Engineering
This course gives an appreciation of the importance of materials surfaces in service and to introduce the students to the various techniques of coating and surface modification, the structure and properties produced and their applications. The course will also provide an understanding on the principles of surface modification for better use of engineering materials.

MKMB 2673 - Nanomaterials

This course introduces students to the fundamental aspects of nanomaterials, the importance of the nanoscale materials and their improved properties compare to conventional materials. The course will provide the principles and relative merits of a range of techniques for the production of nanostructures including ultra-thin films and multilayers. The analytical and imaging characterization techniques and the recent applications of nanomaterials in electronics and biomaterials will be briefly discussed.

MKMB 2683 - Modelling in Materials Engineering

The course introduces students to the basic concepts of computer modelling in materials science and engineering. This course covers basic principle in establishing numerical simulation for the evaluation of material properties and phenomena during material processing. It will emphasize on atomistic and microscopic evaluation of material properties and behaviour by computer simulations. In detail, molecular dynamic method will be given as an example of atomistic evaluation method, whereas phase-field method will be introduced as an example of microscopic evaluation method. At the end of the course students should be able to construct simple numerical modelling both in atomistic and microscopic scale.