

**BACHELOR OF ENGINEERING (MECHANICAL - MANUFACTURING)
PROGRAMME SPECIFICATIONS**

1.	Programme Name		Bachelor of Engineering (Mechanical - Manufacturing)
2.	Final Award		Bachelor of Engineering (Mechanical - Manufacturing)
3.	Awarding Institution		Universiti Teknologi Malaysia
4.	Teaching Institution		Universiti Teknologi Malaysia
5.	Professional or Statutory Body of Accreditation		Engineering Accreditation Council (EAC)
6.	Language(s) of Instruction		Bahasa Melayu and English
7.	Mode of Study (Conventional, distance learning, etc.)		Conventional
8.	Mode of Operation (Franchise, self-govern, etc.)		Self-govern
9.	Study Scheme (Full Time / Part Time)		Full Time
10.	Study Duration		Minimum : 4 years Maximum : 6 years
	Type of Semester	No of Semesters	No of Weeks/Semester
	Normal	8	14
	Short	1	8
11.	Entry Requirements		Matriculation/STPM/Diploma or equivalent
12.	Programme Objectives (PEO)		
	To produce graduates who are able to:		
	(i) demonstrate their academic and technological excellence professionally and globally, particularly in areas related to mechanical engineering practices and contribute innovatively to the nation's wealth creation.		
	(ii) advance their careers by assuming increasing levels of responsibility, leadership and acquiring professional and advanced academic qualifications.		
	(iii) recognize and practice professional, ethical, environmental and societal responsibilities and value different global and cultural aspects of their work and society.		
	(iv) adapt and communicate effectively and be successful working with multi disciplinary teams.		
13.	Programme Learning Outcomes (PO)		
	(a) Technical Knowledge and Competencies		
	Intended Learning Outcomes	Teaching and Learning Methods	Assessment
	PO1		
	Ability to acquire and apply fundamental knowledge of mathematics, science and engineering principles to solve complex mechanical and manufacturing engineering problems; Keywords: Engineering Knowledge	Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.	Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.
	PO2		
	Ability to identify, formulate and analyse complex mechanical and manufacturing engineering problems; Keywords: Problem Analysis	Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.	Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.
	PO3		
	Ability to design solutions for complex mechanical and manufacturing engineering problems that fulfil health, safety, societal, cultural and environmental needs; Keywords: Design/Development of Solutions	Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.	Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.
	PO4		
	Ability to investigate complex mechanical and manufacturing engineering problems using research-based knowledge and methods to produce conclusive results; Keywords: Investigation	Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.	Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.

(b) Generic Skills		
Intended Learning Outcomes	Teaching and Learning Methods	Assessment
PO5		
Ability to use modern engineering and information technology (IT) tools in complex mechanical and manufacturing engineering activities, with an understanding of limitations; Keywords: Modern Tools Usage	Lectures, tutorials, laboratory works, seminars, studio works, directed reading, final year projects and problem-based learning.	Examinations, laboratory reports, seminar presentations, problem-based exercises, individual and group project reports.
PO6		
Ability to apply professional engineering practice related to societal, health, safety, legal and cultural issues with full responsibility and integrity; Keywords: The Engineer and Society	Lectures, tutorials, seminars, group projects and industrial training.	Industrial training and group project reports.
PO7		
Ability to identify the impact of mechanical and manufacturing engineering solutions on sustainability and demonstrate the needs for sustainable development in societal and environmental contexts. Keywords: Environment and Sustainability	Tutorials, laboratory works, group assignments and projects, final year project presentations and problem-based learning.	Group reports, learning logs/diaries and oral presentations.
PO8		
Ability to apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice; Keywords: Ethics	Lectures, tutorials, seminars, group projects and industrial training.	Industrial training and group project reports.
PO9		
Ability to communicate effectively on complex mechanical and manufacturing engineering activities both orally and in writing; Keywords: Communication	Seminars, assignments and final year projects.	Report and theses.
PO10		
Ability to work productively as an individual, and as a member or leader in a team that may involve multi-disciplinary settings; Keywords: Team Working	Lectures and project assignments.	Demonstrations, reports, tests, examinations and presentations.
PO11		
Ability to undertake life long learning and manage information including conducting literature study; Keywords: Life Long Learning	Lectures and project assignments.	Demonstrations, reports, tests, examinations and presentations.
PO12		
Ability to demonstrate and apply knowledge on finance and management principles and acquire entrepreneurship skill; Keywords: Project Management, Finance & Entrepreneurship	Lectures and project assignments.	Demonstrations, reports, tests, examinations and presentations.

14. Classification of Courses			
No.	Classification	Credit Hours	Percentage
i.	Programme Core	96	70
ii.	Programme Electives	21	15
iii.	Compulsory University Courses	20	15
Total		137	100
Classification of courses for engineering programme			
A	Engineering Courses	117	85
	Total credit hours for Part A	117	
B	Non-Engineering	20	15
	Total credit hours for Part B	20	
Total credit hours for Part A and B		137	100
15. Total Credit Hours to Graduate		137	

AREAS OF STUDY

The study of Manufacturing Engineering involves the selection of machines, tooling, manufacturing systems, system design and product processing parameters. The focus of study will be in the manufacturing technology.

a) Tooling for Production

The manufacturing of products requires appropriate tools. This area covers jig and fixture design, principle of tooling design such as locating and clamping. Theory of metal shearing and sheet metal bending are also introduced.

b) CAD/CAM/CNC/CAE

Computer aided design (CAD) and computer aided manufacturing (CAM) is a field involving the production of models and part programming for computer numerical control (CNC) machines. The principle of computer aided engineering (CAE) and coordinate measuring machine (CMM) are also introduced.

c) Design for Manufacture and Assembly

Design for manufacture and assembly (DFMA) provide students with the necessary concepts and procedures to understand the integration for manufacturing criteria into the product design process such as the principles for design of reliable and easy-to-produce components with having minimal cost, design of machined, powder metallurgy/particulates and casting parts. Materials selection and benefits of DFMA in reduction part and assembly costs will also be discussed.

d) Other Technologies

Elective courses and other technologies taught include welding, casting, metal forming and plastic moulding. Their fundamentals and methods of processing are also described including sustainable engineering and product design.

CAREER PROSPECTS

The programme is designed to fulfill the needs of the manufacturing sector in Malaysia which has grown continuously since 30 years ago and thus required many manufacturing engineers. The Faculty of Mechanical Engineering has contributed immensely towards producing and the development of manufacturing engineers capable of satisfying the need of the manufacturing industry for multi-national companies (ie: Intel, Dyson, Technips, Subsea, Kiswire, Infineon etc) as well the local companies. PROTON, PERODUA, HONDA, YAMAHA, MODENAS, DRB HICOM, Faiza Beras and automotive components and parts manufacturers. Other industries that require the service of a manufacturing engineer are plastic manufacturing, compact disc, fabric, furniture, paper, semiconductor, metal parts, food production and packaging and many others.

Generally, the career of a manufacturing engineer is focused towards improving the efficiency of manufacturing processes uses and management of production system, equipment and human resources in manufacturing a particular product. Today the career opportunity for manufacturing engineers has increased rapidly in facing the challenges of globalization, the national vision 2020 and various trade agreements such as AFTA. These challenges have further placed the manufacturing sector under pressure to ensure the products produced can compete internationally, are inexpensive and of good quality.

A wealth a career opportunity awaits the manufacturing engineering graduate to serve in various industries. Among these are the automotive industries such as other than working in the manufacturing sector, a manufacturing engineer can also find career in the consulting, research and development sectors. The academic field is another opportunity for the manufacturing engineer to serve in universities and colleges throughout the nation in order to produce more highly qualified graduates especially in the area of advanced manufacturing.

The faculty will always ensure that the manufacturing engineering graduate is equipped with interdisciplinary knowledge in order to allow them to participate in various sectors of the industry. Hence, the role of manufacturing engineers is always relevant and we ensure that the manufacturing engineering graduates are equipped with up-to-date knowledge and tools to keep in phase with current development.

CURRICULUM

FIRST YEAR

SEMESTER I

CODE	COURSE	L	T	P/S	CREDIT	PRE-REQUISITE
SKMM 1013	Programming for Engineers	3	0	3	3	
SKMM 1203	Static*	3	1	0	3	
SKMM 1503	Engineering Drawing	1	0	6	3	
SKMM 1922	Introduction to Mechanical Engineering	0	0	3	2	
SSCE 1693	Engineering Mathematics I	3	1	0	3	
ULAB 1122	Academic English Skills	3	0	0	2	
Total					16	

SEMESTER II

CODE	COURSE	L	T	P/S	CREDIT	PRE-REQUISITE
SKMM 1113	Mechanics of Solids I*	3	1	0	3	SKMM 1203
SKMM 1213	Dynamics*	3	1	0	3	SKMM 1203
SKMM 1512	Introduction to Design	1	0	3	2	SKMM 1503
SKMM 1912	Experimental Methods	2	0	3	2	
SKEU 1002	Electrical Technology	2	1	0	2	
SSCE 1793	Differential Equations	3	1	0	3	SSCE 1693
UICI 1012/ ULAM 1012	Islamic and Asian Civilization/ Malay Language for Communication 2#	2	0	0	2	
Total					17	

SECOND YEAR

SEMESTER III

CODE	COURSE	L	T	P/S	CREDIT	PRE-REQUISITE
SKMM 2123	Mechanics of Solids II*	3	1	0	3	SKMM 1113
SKMM 2223	Mechanics of Machines and Vibration*	3	1	0	3	SKMM 1213
SKMM 2313	Mechanics of Fluids I*	3	1	0	3	SKMM 1203
SKMM 2413	Thermodynamics*	3	1	0	3	
SKMM 2921	Laboratory I	0	0	2	1	SKMM 1912
ULAB 2122	Advanced Academic English Skills	3	0	0	2	ULAB 1122
UHAS 1172/ UHAK 1022	Malaysian Dynamics/ Malaysian Studies 3#	2	0	0	2	
Total					17	

SEMESTER IV

CODE	COURSE	L	T	P/S	CREDIT	PRE-REQUISITE
SKMM 2323	Mechanics of Fluids II*	3	1	0	3	SKMM 2313
SKMM 2433	Applied Thermodynamics and Heat Transfer*	3	1	0	3	SKMM 2413
SKMM 2613	Materials Science	3	1	0	3	
SKEU 2012	Electronics	2	0	0	2	SKEU 1002
SSCE 1993	Engineering Mathematics II	3	1	0	3	SSCE 1693
SSCE 2193	Engineering Statistics	3	1	0	3	
Total					17	

Subject to changes

* Core Courses - minimum passing grade is C (50%)

University general course for international student only, international students are not required to take UICI 1012 and UHAS 1172.

Notes: L - Lecture, T - Tutorial, P/S - Practical/Studio

THIRD YEAR

SEMESTER V

CODE	COURSE	L	T	P/S	CREDIT	PRE-REQUISITE
SKMM 2713	Manufacturing Processes	3	1	0	3	
SKMM 3233	Control Engineering	3	0	0	3	SKMM 1213**, SSCE 1793**
SKMM 3623	Materials Engineering	3	0	0	3	SKMM 2613
SKMM 3931	Laboratory II	0	0	3	1	SKMM 2921
SKMP 3813	Manufacturing System	3	0	0	3	
UHAK 1012	Graduate Success Attributes	2	0	0	2	
UHAK 1032	Introduction to Entrepreneurship	2	0	0	2	
Total					17	

SEMESTER VI

CODE	COURSE	L	T	P/S	CREDIT	PRE-REQUISITE
SKMM 3023	Applied Numerical Methods	3	0	0	3	SKMM 1013, SSCE 1793
SKMM 3242	Instrumentation	2	0	0	2	SKEU 2012**
SKMM 3523	Component Design	2	0	3	3	SKMM 2123**, SKMM 1512
SKMP 3712	Design for Manufacture and Assembly	2	0	0	2	
SKMP 3722	Modern Manufacturing	2	0	0	2	
SKMP 3942	Laboratory III CAD/CAM/CNC/CAE	0	0	6	2	SKMM 3931
ULAB 3162	English for Professional Purposes	3	0	2	2	ULAB 1122, ULAB 2122
Total					16	

SHORT SEMESTER

CODE	COURSE	L	T	P/S	CREDIT	PRE-REQUISITE
SKMM 3915	Industrial Training				5	##, SKMM 2123**, SKMM 2223**, SKMM 2323**, SKMM 2433**
Total					5	

FOURTH YEAR

SEMESTER VII

CODE	COURSE	L	T	P/S	CREDIT	PRE-REQUISITE
SKMM 4533	System Design	2	0	3	3	SKMM 3523
SKMM 4912	Undergraduate Project I	0	0	6	2	SKMM 2123**, SKMM 2223**, SKMM 2323**, SKMM 2433**
SKMP 4723	Tooling for Production	3	0	0	3	
SKMP 4xx3	Elective I	3	0	0	3	
SKMP 4xx3	Elective II	3	0	0	3	
UKQX xxx2	Co-curriculum and Service Learning Elective	0	0	3	2	
Total					16	

SEMESTER VIII

CODE	COURSE	L	T	P/S	CREDIT	PRE-REQUISITE
SKMM 4823	Engineering Management, Safety and Economics	3	0	0	3	
SKMM 4902	Engineering Professional Practice	0	0	2	2	Must be 3 rd year
SKMM 4924	Undergraduate Project II	0	0	12	4	SKMM 4912
SKMP 4xx3	Elective III	3	0	0	3	
ULAX 1112	Language Skills Elective (Foreign Language)	2	0	0	2	
UICL 2302	The Thought of Science and Technology	2	0	0	2	
Total					16	

Subject to changes

** Minimum grade D- (30%) in the pre-requisite courses

Obtained minimum of 80 credits

Notes: L - Lecture, T - Tutorial, P/S - Practical/Studio

ELECTIVE COURSES

Students may take up any THREE (3) of the following elective courses subject to them being offered in the respective semester.

- SKMP 4703 Sustainable Manufacturing
- SKMP 4713 Industrial Automation
- SKMP 4723 Product Design and Development
- SKMP 4743 Plastic Technology
- SKMP 4753 Modern Machining
- SKMP 4763 Quality Engineering and Metrology
- SKMP 4783 Quality Engineering
- SKMP 4793 CAD/CAM
- SKMP 4823 Engineering Economy and Accounting
- SKMP 4833 Project Management and Maintenance