

**BACHELOR OF ENGINEERING (MECHANICAL – AERONAUTICS)
PROGRAMME SPECIFICATIONS**

1.	Programme Name		Bachelor of Engineering (Mechanical – Aeronautics)
2.	Final Award		Bachelor of Engineering (Mechanical – Aeronautics)
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 and aeronautical 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 aeronautical 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 aeronautical 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 aeronautical 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 aeronautical 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 aeronautical 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 aeronautical 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 aeronautical 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	72	52
ii.	Programme Electives	45	33
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

Aeronautical engineering encompasses all aspects of studies related to flying. In this aspect, flying includes aerospace flight. The areas of specialisation in Aeronautical Engineering can be divided into the following:-

a) Aerodynamics

Aerodynamics is the relationship between air (wind) and the material (solid) that moves in it. Various principles of Fluid Mechanics are considered in a flying problem. For example, aerodynamic study will determine a suitable shape for an aircraft, missile etc.

b) Structure

This area will determine the integrity (strength) of a flying body such as an aircraft or a missile. Using dimensions and tolerances, strength of material, shear flow and theory of thin plate, the structure of an aircraft can be determined.

c) Propulsion

Propulsion is a study of an aircraft power plant. This study includes design and selection of appropriate power plant for a particular aircraft. This field has developed vastly since the increase in the cost of petroleum. Engineers have been competing to invent lighter and more economic power plants.

d) Aircraft instrumentation and Avionics

Avionics is the acronym for 'Aviation Electronics' and together with aircraft instrumentation they involve a wide range of studies. Flying has been facilitated by the use of various electronic devices. Electronic devices which facilitate flying such as radars ILS (Instrument Landing System) ADF (Automatic Direction Finder) etc were specifically invented by the Avionic/Aircraft Instrument Engineer. The Avionic/Aircraft Instrument Engineer will have to ensure that the instrument fitted on an aircraft will function satisfactorily together with a high degree of reliability.

e) Management

The aircraft industry has expanded tremendously during this decade. The industry requires experts to manage and administer its operation smoothly. Regulations concerning the construction and operations of aircraft have been so devised in order to avoid accidents and mistakes which may sacrifice lives.

f) Transportation

Apart from transporting passengers an aircraft is also used as cargo carriers, ambulance etc. Study in this area trains transportation experts to modify flight schedule and load so that the aircraft can be used economically.

g) Flight Regulations

To avoid accidents the flying fraternity has formulated special laws for flying. Briefly the laws are divided into two, namely military flight regulations and public flight regulations.

h) Materials for Aircraft

This field focuses its study on selecting and determining metals, plastic, composites, etc. which are suitable for building an aircraft, rocket etc.

i) Flight Mechanics

Flight mechanics is an important aspect in the design and operation of an aircraft flight mission. Research area includes aircraft performance (take-off, climbing, cruising, decent and landing) and aircraft static stability and control in steady flight condition.

j) Flight Dynamics and Control

The area is about the dynamics behaviour of rigid body aircraft and the application of control system theory to design simple stability augmentation systems to more complex automatic flight control systems. This includes the application of modern multivariable control system design using state-space methods. The area includes the equation of motion of rigid body including translation aircraft longitudinal and lateral dynamic stability, flying and handling qualities, stability augmentation and automatic flight control system, aerodynamics stability derivatives and multivariable state-space methods.

CAREER PROSPECTS

Graduates of this programme are essentially Mechanical Engineers but those with specialisation to Aeronautical Engineering can easily find job opportunities in various sectors. Alternatively, they can also be known as Aeronautical Engineers depending on their job placements in industries they are in.

The Aeronautical Engineering programme was first offered by UTM during the 1980/81 session, jointly run by UTM and TUDM. Its objective was to fulfil the need for skilled and semi-skilled human resources in the aeronautical field especially in the public sector. TUDM required human resources to operate, maintain, repair, oversee and manage different types of aircraft and UTM had the capability to produce graduates in this field. This need has continued to increase with the development in the airline industry in Malaysia which demands for more trained manpower especially engineers and technical assistants.

The Aeronautical Engineering programme at UTM is offered as a specialisation of Mechanical Engineering and covers five main areas namely Aerodynamics, Aircraft Structure, Flight Dynamics and Control, Propulsion and Aircraft Design. Thus, graduates of this programme satisfy the requirement to graduate as an engineer in Mechanical Engineering as well as in the field of specialisation in aeronautics. Apart from TUDM, the Civil Aviation Department requires trained manpower to supervise flying activities in Malaysia. Other organisations that require graduates in the field of aeronautics include Malaysia Airline System, Air Asia, AIROD, Eagle Aircraft, SME Aviation, Malaysia Helicopter Services (MHS), TLDM and PDRM Air Unit. Several other firms also have working opportunities in the airline industry.

In the field of academic and research opportunities is available for Aeronautical Engineers to serve in any institution that runs courses and research in the field of Aeronautics. Several other universities and institutions in Malaysia have started to offer programme in the field of Aeronautics too. Due to the rapid expansion in the airline industry, many airline companies, flying clubs and firms are prepared to get involved actively in the airline industry of the country by offering more job opportunities to UTM graduates.

CURRICULUM

FIRST YEAR

SEMESTER I

CODE	COURSE	L	T	P/S	CREDIT	PRE-REQUISITE
SKMM 1203	Static*	3	1	0	3	
SKMM 1503	Engineering Drawing	1	0	6	3	
SKMM 1912	Experimental Methods	2	0	3	2	
SKMM 1922	Introduction to Mechanical Engineering	0	0	3	2	
SKEU 1002	Electrical Technology	2	1	0	2	
SSCE 1693	Engineering Mathematics I	3	1	0	3	
ULAB 1122	Academic English Skills	3	0	0	2	
Total					17	

SEMESTER II

CODE	COURSE	L	T	P/S	CREDIT	PRE-REQUISITE
SKMM 1013	Programming for Engineers	3	0	3	3	
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
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					16	

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 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
SSCE 1993	Engineering Mathematics II	3	1	0	3	SSCE 1693
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 2223	Mechanics of Machines and Vibration*	3	1	0	3	SKMM 1213
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	
SKMM 2713	Manufacturing Processes	3	1	0	3	
SKEU 2012	Electronics	2	0	0	2	SKEU 1002
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
SKMA 3333	Aerodynamics	3	1	0	3	SKMM 2323**
SKMM 3023	Applied Numerical Methods	3	0	0	3	SKMM 1013, SSCE 1793
SKMM 3233	Control Engineering	3	0	0	3	SKMM 1213**, SSCE 1793**
SKMM 3622	Materials Technology	2	0	0	2	SKMM 2613
SKMM 3931	Laboratory II	0	0	3	1	SKMM 2921
UHAK 1012	Graduate Success Attributes	2	0	0	2	
UHAK 1032	Introduction to Entrepreneurship	2	0	0	2	
Total					16	

SEMESTER VI

CODE	COURSE	L	T	P/S	CREDIT	PRE-REQUISITE
SKMA 3132	Aircraft Structure I	2	0	0	2	SKMM 2123
SKMA 3212	Flight Mechanics	2	0	0	2	SKMA 3333, SKMM 2323
SKMA 3423	Aerospace Propulsion System	3	0	0	3	SKMM 2413
SKMA 3812	Aviation Management	2	0	0	2	
SKMM 3033	Finite Element Methods	3	0	0	3	SKMM 2123**
SKMM 3941	Laboratory III	0	0	3	1	SKMM 3931
SSCE 2193	Engineering Statistics	3	1	0	3	
ULAB 3162	English for Professional Purposes	3	0	2	2	ULAB 1122, ULAB 2122
Total					18	

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
SKMA 4143	Aircraft Structure II	3	0	0	3	SKMA 3132
SKMA 4223	Flight Dynamics and Control	3	0	0	3	SKMA 3212**, SKMA 3333, SKMM 3233
SKMA 4253	Aircraft Instrumentation and Avionics	3	0	0	3	SKEU 2012
SKMA 4513	Aircraft Design I	2	0	3	3	SKMA 3212, SKMM 1512
SKMM 4912	Undergraduate Project I	0	0	6	2	SKMM 2123**, SKMM 2223**, SKMM 2323**, SKMM 2423**
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
SKMA 4523	Aircraft Design II	2	0	3	3	SKMA 4513
SKMA 4822	Aviation Economy	2	0	0	2	
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
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