

Master of Science (Aeronautical Engineering)

PROGRAMME SPECIFICATIONS

The Master of Science (Aeronautical 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 (Aeronautical Engineering)			
4. Final Award	Master of Science (Aeronautical Engineering)			
5. Programme Code	MKMK			
6. Professional or Statutory Body of Accreditation	Kementerian Pendidikan Malaysia			
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	MKMF 1213	Advanced Mathematics for Aeronautical Engineering Application	3	30%
	MKMF 1313	Advanced Aerodynamics	3	
	MKMF 2013	Computational Method for Aerostructures	3	
	MKMF 1903	Research Methodology	3	
Project	MKMF 1914	Master Project I	4	25%
	MKMF 2926	Master Project II	6	
Programme Electives (choose 5 courses only)	MKMF 2113	Advanced Aircraft Structures and Materials	3	37.5%
	MKMF 2123	Structural Dynamics & Aeroelasticity	3	
	MKMF 2213	Advanced Aircraft Dynamics & Control	3	
	MKMF 2223	Aircraft Instrumentation and Avionics	3	
	MKMF 2323	Computational Aerodynamics	3	
	MKMF 2333	Compressible Fluid Flow	3	
	MKMF 2343	Industrial Aerodynamics and Wind Engineering	3	
	MKMF 2353	Experimental Aerodynamics	3	
	MKMF 2363	Helicopter Aerodynamics	3	
	MKMF 2413	Fuel and Propellant	3	
	MKMF 2423	Jet Propulsion	3	
	MKMF 2433	Rocket Technology	3	
	MKMF 2443	Gas Turbine Technology	3	
MKMF 2513	Helicopter System & Performance	3		
Total Credit Value			40	100%

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. 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	MKMF 1213	Advanced Mathematics for Aeronautical Engineering Application	3	3	
2	MKMF 1313	Advanced Aerodynamics	3	3	
3	MKMF 2013	Computational Method for Aerostructures	3	3	
4	MKMF 1903	Research Methodology	3	3	
TOTAL CREDIT OF PROGRAMME CORE COURSES (b)			12	12	
MASTER PROJECT COURSES					
1	MKMF 1914	Master Project I	4	4	
2	MKMF 2926	Master Project II	6	6	
TOTAL CREDIT OF MASTER PROJECT COURSES (c)			10	10	
PROGRAMME ELECTIVES (5 COURSES)					
1	MKMF 2##3	Elective 1	3	3	
2	MKMF 2##3	Elective 2	3	3	
3	MKMF 2##3	Elective 1	3	3	
4	MKMF 2##3	Elective 2	3	3	
5	MKMF 2##3	Elective 3	3	3	
TOTAL CREDIT OF ELECTIVES COURSES (d)			15	15	
TOTAL CREDIT TO GRADUATE (a + b + c + d)			40	40	

COURSE SYNOPSIS

CORE COURSES

MKMF 1213 ADVANCED MATHEMATICS FOR AERONAUTICAL ENGINEERING

The primary goal of this course is to get students involved in post-calculus mathematics needed and used by engineers and scientists. Thus this course aims to place at the disposal of the engineer the basis of intelligent working knowledge of facts and techniques relevant to engineering applications which have not been treated in Advanced Calculus. Contents include: ordinary differential equations (ODE), partial differential equations (PDE),

complex analytic functions, complex integrals generally found in practical applications, Volterra and Fredholm integral equations in specific engineering problems.

MKMF 1313 ADVANCED AERODYNAMICS

This course gives a foundation for advanced study in aerodynamics by focussing on the fundamentals as well as the distinctive characteristics of flow around solid boundary. Emphasis will be given to have turbulence flow since this area of study is still a mystery. The course will continue to cover aircraft aerodynamics and high speed aerodynamics.

MKMF 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.

MKMF 2013 COMPUTATIONAL METHOD FOR AEROSTRUCTURES

This course gives an understanding on the principles of the finite element method and its implementation in solving real-life engineering problems. After completing the course, students should be able to explain the theoretical and mathematical basis of finite element method and the basic principles in its implementation; interpret real-life engineering problems accurately, analyse them using the finite element method and evaluate the results obtained correctly; design a simple finite element computer program to solve specific problems; display capability to communicate knowledge and ideas effectively; and demonstrate capability for life-long learning and manage information.

ELECTIVE COURSES

MKMF 2113 ADVANCED AIRCRAFT STRUCTURES AND MATERIALS

This course focuses on the structural analysis of aircrafts and understanding the structural and material behaviour of airframes. The topics covered include plane stress field equations, plate bending and buckling, wing and fuselage analysis of light aircrafts, advanced alloys, advanced composites, and aircraft structural integrity.

MKMF 2123 STRUCTURAL DYNAMICS AND AEROELASTICITY

This course focuses on the dynamic response analysis of aircraft structures especially in interaction with aerodynamic loadings, and covers the theory of

structural dynamics, static aeroelasticity and aeroelastic flutter and dynamic responses.

MKMF 2213 ADVANCED AIRCRAFT DYNAMICS AND CONTROL

This course focuses on the dynamics behaviour of rigid body aircraft and the application of control system theory to design aircraft stability augmentation systems to more complex automatic flight control systems. This include the application of modern multivariable control system design using classical and modern control techniques, the nonlinear aircraft model, transfer function models, numerical solution of the state equations, stability augmentation, control augmentation system, the handling-qualities requirements and autopilots. Examples are demonstrated by using MATLAB. At the end of the course, the aircraft behaviour can be demonstrated by using a simulator.

MKMF 2223 AIRCRAFT INSTRUMENTATION AND AVIONICS

This course discusses fundamental knowledge of aircraft instrumentation design, avionics system design, analysis and development. The course covers topics such as sensor and transducers, signal conditional circuits, data transmission, data acquisition system, measurement errors, reliability study, failure analysis, fault tolerance and aircraft data bus.

MKMF 2323 COMPUTATIONAL AERODYNAMICS

This course deals with the applications of computational methods to the solutions of aerodynamics problems. Emphasis on the introductory concepts in finite difference and finite volume methods as applied to various ordinary and partial differential model equations in aerodynamics; fundamentals of spatial discretization and numerical integration; numerical linear algebra. Introduction to applied engineering and scientific computing environment. Advanced topics may include finite element methods, spectral methods, grid generation, turbulence modelling.

MKMF 2333 COMPRESSIBLE FLUID FLOW

The students will gain knowledge on the elements of compressible flow. Compressible flows are high speed flows in which the fluid velocities are appreciable compared to the velocity of sound that variations in pressure, temperature and density are significant. Knowledge of compressible flow fundamentals is essential for understanding high speed aircraft, missile aerodynamics, gas turbine engine, rocket engines, supersonic wind tunnel design etc.

MKMF 2343 INDUSTRIAL AERODYNAMICS AND WIND ENGINEERING

This course deals with industrial aerodynamics where contents of learning include the physics of the air, wind energy, vehicle and building aerodynamics, and flow induce vibration.

MKMF 2353 EXPERIMENTAL AERODYNAMICS

Wind-tunnel testing is the traditional tool to determine the aerodynamic forces acting on an aircraft. In this course students will perform a number of tests, mainly to compare computational and experimental results when this is possible, but also to show that experimental methods can be used to determine aerodynamic forces in cases where computational results are inaccurate or impossible to obtain. Theory and application of experimental techniques and instrumentation for aerodynamics and fluid mechanics. Computer data acquisition, wind tunnels, force balances, flow visualization, pressure probes, hot wire anemometry, laser Doppler velocimetry, and turbulence measurements.

MKMF 2363 HELICOPTER AERODYNAMICS

This course deals with helicopter aerodynamics where contents of learning include the momentum and blade element theory, wake analysis, rotor aerodynamics, aerodynamic design, performance, stability, control and vibration problems of helicopter.

MKMF 2413 FUEL AND PROPELLANT

This course prepares the students to grasp the fundamentals of fuel and propellant, thermochemistry and their applications, The course shall covers the foundations of pyrodynamics, thermochemistry of combustion, energetic propellant and combustion of various fuel and propellant.

MKMF 2423 JET PROPULSION

Introduction to jet propulsion system including its historical background. Review of thermodynamics and fluid mechanics. Review of gas dynamics. Cycle analysis: air standard cycle and real cycle (with friction). Turbojet engine cycle. Turbofan engine cycle. Gas turbine engine components and their functions. Turbine blades cooling techniques. Gas turbine emissions. Introduction to rocket engines. Types of rocket engines. Rocket basic principles. Chemical rocket engines: solid rocket, liquid rocket, hybrid rocket.

MKMF 2433 ROCKET TECHNOLOGY

Classification of Rocket Propulsion Systems (chemical, electric and nuclear). Performance parameters (thrust equation, propulsive efficiency, characteristic

velocity, thrust coefficient, specific impulse, and nozzle flow). Theoretical rocket performance calculation. Solid propellants and combustion. Grain design. Liquid propellants and combustion. Injector and combustion chamber design. Hybrid rocket. Electric rockets. Nuclear rocket.

MKMF 2443 GAS TURBINE TECHNOLOGY

The course covers gas turbines, theoretical and actual cycle analysis, compressor and turbine performance characteristics, performance and mechanical standards, rotor dynamics, centrifugal and axial-flow compressors, radial-inflow and axial flow turbines and combustors, materials and fuels.

MKMF 2513 HELICOPTER SYSTEM AND PERFORMANCE

This course presents a comprehensive study to rotorcraft technology covering a range of disciplines. Student will be exposed to the theory of helicopter flight which is relevant to the helicopter performance as well as systems configuration. Each student will be given a mini project to enhance his/her understanding in the principle work of helicopter technology.