



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

SCHOOL OF MECHANICAL ENGINEERING
Faculty of Engineering

Master of Science Aeronautical Engineering



Programme Objective

The objective of Master of Science (Aeronautical Engineering) program is to enhance participants with further knowledge and skills in Aeronautical Engineering. After completion of the program, graduates should be able to develop, integrate and utilise ideas to solve complex problems in the field in an ethical and professional manner, demonstrate leadership attributes and maintain cooperative networking and team-working, communicate ideas intellectually and effectively, and conduct research activities, manage information and pursue life-long learning.

Programme Duration

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 six normal semesters (nominally 3 years). The maximum duration allowed for part-time students is 8 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.

Admission Requirement

The normal requirement for admission to the programme is a four-year bachelor degree recognized by the university in either engineering or sciences with a minimum overall grade point average of 3.0 or equivalent. Students applying for admission with an overall grade point average of less than 3.0 but with relevant professional experiences may however be considered.

Graduation Requirement

Students must obtain a minimum grade of B- (60%) for each course and overall average grade of B (65%) to graduate. Students are required to complete a minimum of 40 credits (12 credits of the core aeronautical engineering courses; 15 credits of the elective mechanical engineering courses; 10 credits of the master project and 3 credits of the university compulsory course). For the award of Master of Science (Aeronautical Engineering), the students should achieve a total minimum of 40 credit hours with minimum CPA of 3.0, including the completion of Master Project.

Programme

Description

Aeronautical Engineering programme offers a broad and diverse subject that derives its breadth from the need to enhance knowledge and skills relevant to aeronautical engineering applications. Throughout the period of study, students may improve the knowledge related to aircraft aerodynamics, structures, avionics, dynamics & control and jet propulsion. Students may also expose to helicopter aerodynamics, system & performance, gas turbine, rocket technology and fuel & propellant. The versatility of this program allows students a variety of career options.

Programme Structure:

Code	Course Name	Credits
UNIVERSITY COMPULSORY COURSE (3 Credits)		
UCSM 1263	Information Technology Project Management	3*
UHAP 6013	Seminar on Global Development, Economics and Social Issues	3*
UHAF 6033	Dynamics of Leadership	3*
UHAZ 6323	Malay Language and Scientific Writing	3*
UDPE 1123	Organization Behaviour and Development	3*
UVJ 6013	Japanese Language for Postgraduates	3*
(or other courses Uxxx xxx3)		
* Choose 1 Course Only		Sub Total Credits
		3
PROGRAM CORE COURSES (12 credits) (Compulsory)		
MKMF 1213	Advanced Mathematics for Aeronautical Engineering Applications	3
MKMF 1313	Advanced Aerodynamics	3
MKMF 2013	Computational Method for Aerostructures	3
MKMF 1903	Research Methodology	3
		Sub Total Credits
		12
ELECTIVES COURSES (15 credits)		
MKMF 2323	Computational Aerodynamics	3*
MKMF 2113	Advanced Aircraft Structures and Materials	3*
MKMF 2223	Aircraft Instrumentation and Avionics	3*
MKMF 2123	Structural Dynamics and Aeroelasticity	3*
MKMF 2213	Advanced Aircraft Dynamics and Control	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 and Performance	3*
MKMF 2613	Aviation Management and Airworthiness	3*
MKMF 2763	Advanced Manufacturing	3*
*Choose 5 Courses Only		Sub Total Credits
		15
Master Project (Compulsory)		
MKMF 1914	Master Project I	4
MKMF 2926	Master Project II	6
		Sub Total Credits
		10
TOTAL CREDIT		40

* Elective courses are offered based on availability of academic staff and facilities

List of Academic Staff

Ir. Dr. Shuhaimi bin Mansor

Professor

PhD (L'boro), MSc (Flight Dynamics) (Cranfield), BSc (Aero) (Glasgow)

Interests: unsteady aerodynamics; vehicle stability and control; wind-tunnel testing

Email : shuhaimi@mail.fkm.utm.my

Ir. Dr. Wan Khairuddin bin Wan Ali

Professor

PhD (Microwave, Antennas and Propagation) (Cranfield), MSc (Avionics) (Cranfield), BEng (Hons) (Mech & Elec) (Tasmania)

Interests: avionics and antennae, rocket propulsion - solid and liquid propellants

Email : wankhai@mail.fkm.utm.my

Dr. Mohammad Nazri bin Mohd Jaafar

Professor

PhD (Leeds), MSc (Aero) (Wichita), BSc (Aero) (Wichita)

Interests: combustion technologies, low emission combustor; biofuel

Email : nazri@mail.fkm.utm.my

Ainullotfi bin Abdul Latif

Associate Professor

MEngSc (UNSW), BE (Aero) (UNSW)

Interests: aircraft structures, analysis of composites, finite elements method

Email : lotfi@mail.fkm.utm.my

Dr. Tholudin bin Mat Lazim

Associate Professor

PhD (Leeds), MSc (Thermofluids) (Strathclyde), BSc (Aero) (Salford)

Interests: aerodynamics, computational fluids dynamics, combustion

Email : tholudin@mail.fkm.utm.my

Dr. Wan Zaidi Bin Wan Omar

Senior Lecturer

PhD (UTM), MSc (Applied Inst. & Control)(Glasgow), BSc (Aero Eng.)(Manchester)

Interests: aerodynamics, aircraft design, wind-tunnel testing

Email : wanzaidi@mail.fkm.utm.my

Dr. Md. Nizam Bin Dahalan

Senior Lecturer

PhD (UTM), MEng (Mech) (UTM), BEng (Mech-Aero) (UTM)

Interests: aerodynamics, flow control

Email : nizam@mail.fkm.utm.my

Dr. Iskandar Shah bin Ishak

Senior Lecturer/MSc (Aero) Program Coordinator

PhD (UTM), Master Spec. (Tech. of Aeronautics & Space) (Sup'aero, France), BEng (Mech-Aero) (UTM)

Interests: unsteady aerodynamics, helicopter aerodynamics, wind-tunnel testing

Email : shah@mail.fkm.utm.my

Ir. Dr. Istas Fahrurrazi bin Nusyirwan

Senior Lecturer

PhD (RMIT), MEng (Mech) (UTM), BEng (Mech-Aero) (UTM)

Interests: flight simulation; airspace safety monitoring system; performance-based fire engineering

Email : istaz@mail.fkm.utm.my

Ir. Dr. Shabudin bin Mat

Senior Lecturer, Head of Aerolab

PhD (Glasgow), Master Spec. (Tech. of Aeronautics & Space) (ENSICA, France), BEng (Mech-Aero) (UTM)

Interests: aerodynamics, including of blended wing

Email : shabudin@mail.fkm.utm.my

Dr. Nik Ahmad Ridhwan bin Mohd

Senior Lecturer

PhD (Liverpool), MEng (Mech) (UTM), BEng (Mech-Aero) (UTM)

Interests: aerodynamics, computational fluid dynamics

Email : ridhwan@mail.fkm.utm.my

Dr. Haris Ahmad bin Israr Ahmad

Senior Lecturer/ Academic Research Manager

PhD (ISAE), MSc. (Aerospace Mechanics & Avionics) (ISAE), BEng(Mech-Aero) (UTM)

Interest: *Composite, Impact and Crashworthiness, FEM*

Email : haris@mail.fkm.utm.my

Dr. Norazila Binti Othman

Senior Lecturer

PhD (Aerospace System), MEng. (Mechanical) (UTM), BEng. (Mech-Aero) (UTM)

Interest: *Applied Aerodynamics, Solid and Liquid Propulsion, Bio-Mass Combustion, Design Optimization*

Email : norazila@mail.fkm.utm.my

Dr. Mastura Binti Ab Wahid

Senior Lecturer

PhD (ENAC), MSc. (Aeronautical System) (ISAE), BEng(Mech-Aero) (UTM)

Interest: *UAV system, Flight dynamics and control, Aircraft guidance and navigation, Embedded System*

Email : masturawahid@utm.my

Dr. Ing. Mohd Nazri bin Mohd Nasir

Senior Lecturer/ UG (Aero) Program Coordinator

PhD (Tu Darmstad), MSc. (Tu Delft), BEng(UMist)

Interest: *UAS flight test, unsteady flight and perturbation, aerodynamics of insect flight and kinematics*

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Course Description

COMPULSORY 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 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.

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.

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 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 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 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 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 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.

ELECTIVE COURSES

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 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 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.

MKMF 2763 ADVANCED MANUFACTURING

This course introduces automation and advanced techniques used in the modern manufacturing. Types of automation systems, applications, advantages and disadvantages are discussed. It also includes discussion on the principle of CAD/CAM/CNC and other applications in various manufacturing automation systems such as GT, FMS and CIM. This course will also allow student to carry out small case studies in the real environments for exposing them on certain issues related to manufacturing automation.

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 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 2433 ROCKET TECHNOLOGY

Classification of Rocket Propulsion Systems (chemical, electric and nuclear). Performance parameters (thrust equation, propulsive efficiency, characteristic velocity, thrust coefficient, specific impulse, 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 2613 AVIATION MANAGEMENT AND AIRWORTHINESS

This course is about the management of the aviation industry. It covers the basic concepts of management, project management, human factors, airspaces, airport management, air traffic management and airworthiness. The course shall use documents from the International Civil Aviation Organisation (ICAO) and Civil Aviation Authority Malaysia (CAAM). Site visits to the established aviation organisations will be part of the course.

Registered as Graduated Engineer with BEM

Students from the **Technologist Track** are eligible to be registered as Graduate Engineer with BEM provided they pass the following elective courses:

- 1.MKMF 2323 Computational Aerodynamics
- 2.MKMF 2223 Aircraft Instrumentation And Avionics
- 3.MKMF 2213 Advanced Aircraft Dynamics And Control



How to apply

Information on the procedures, regulations and application form can be obtained from the Student Recruitment & Admission Division (SRAD),

website:

admission.utm.my

Tuition fees

Type of Students	2019 Tuition Fees (MYR) Valid Until 31 December 2019		2020 Tuition Fees (MYR) For New Students Effective 1 January 2020	
	Coursework & Mixed-Mode (RM)	Research (RM)	Coursework & Mixed-Mode (RM)	Research (RM)
Local Students	9 697	8 697	10 660	9 560
International Students	27 525	25 100	28 900	25 000

Note : Fees are subject to changes. The fees exclude the accommodations, Convocation, Bench Fees, Visa & Personal Bond. The rates are subject to change

Facilities & Labs

We provide excellent facilities for the undergraduate and postgraduate teachings. Most of these facilities are also developed and designed for postgraduate-level research activities.

- Aeronautics Laboratory, incorporating UTM Low-Speed Wind Tunnel
- Gas Turbine and Combustion Laboratory
- Centre for Composites
- Helicopter Hangar

- Rocket Propulsion Laboratory, including both solid and liquid propellant laboratories
- Computational Mechanics Laboratory
- Flight Simulation Laboratory
- Avionics Laboratory
- Laser Diagnostics Laboratory
- Aircraft Structures Laboratory
- Software to support courses (Fluent, Abaqus, Matlab etc.)

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