

Master of Science in Aeronautical Engineering

1. Program Objectives

A graduate program that leads to the degree of Master of Science (M.Sc.) in Aeronautical Engineering is available in the department. The program is designed to fulfil the needs of the Aeronautical Industry in the Kingdom. It enables qualified engineers to pursue advanced studies in this field of top technology on full-time basis. In addition to a thesis option, a non-thesis option is also available.

2. Study Program

The M. Sc. Thesis option program consists of 34 credit hours, including 10 credit hours of thesis work. The remaining 24 hours are for courses.

The M. Sc. non-thesis option program consists of 42 credit hours, including a 3 hours research project.

List of Courses for the M. Sc. Degree (Thesis Option)

A. University Requirements (1 course 2 units)

Course No.	Course Title	Cr. Hrs
IE 694	Engineering Research Skills and Methodology	2

B. Faculty of Engineering Requirements (2 courses, 6 units)

MATH 639	Advanced Engineering Mathematics	3
MATH 629	Advanced Numerical Analysis	3

A. Compulsory Departmental Courses (5 Courses, 20 units)

Course No.	Course Title	Cr. Hrs	Prerequisite
AE 510	Advanced Aerodynamics (I)	3	AE 311
AE 530	Fracture Mechanics of Aerospace Structures	3	AE 433
AE 570	Aircraft Engine Performance	3	AE 472
AE 597	Seminar	1	Grad. Standing
AE 599	M.S. Thesis	10	Department App.

B. Elective Courses (2 Courses, 6 Units)

Course No.	Course Title	Cr. Hrs	Prerequisite
AE 511	Advanced Aerodynamics II	3	AE 510
AE 512	Missile Aerodynamics	3	AE 412
AE 531	Aircraft Detail Structural Design	3	AE 432
AE 532	Analysis of Aerospace Structures	3	AE 432
AE 535	Aircraft Design I	3	AE 361
AE 536	Aircraft Design II	3	AE 535
AE 551	Integrated Aircraft Navigation Systems	3	AE 452
AE 552	Analysis of Advanced Aircraft Systems	3	AE 452
AE 561	Advanced Aircraft Performance	3	AE 361
AE 562	Aircraft Stability and Control	3	AE 462
AE 563	Flight Dynamics and Control	3	AE 560
AE 571	Aircraft Engine Design I	3	AE 472
AE 572	Aircraft Engine Design II	3	AE 472
AE 581	Advanced Aircraft Reliability	3	AE 481
AE 582	Advanced Aircraft Maintenance Systems	3	AE 481
AE 596	Advanced Special Topics in Aeronautical Engineering	3	Advisor Approval
E.....	Any Master Course from other Engineering or other Dept. of Univ.	3	AE Dept. Approval

**List of Courses for the M. Sc. Degree
(Non-Thesis Option)**

A. University Requirements (1 course 2 units)

Course No.	Course Title	Cr. Hrs
IE 694	Engineering Research Skills and Methodology	2

B. College of Engineering Requirements (2 courses, 6 units)

Course No.	Course Title	Cr. Hrs
MATH 639	Advanced Engineering Mathematics	3
MATH 629	Advanced Numerical Analysis	3

A. Compulsory Departmental Courses (5 Courses, 13 units)

Course No.	Course Title	Cr. Hrs	Prerequisite
AE 510	Advanced Aerodynamics (I)	3	AE 311
AE 530	Fracture Mechanics of Aerospace Structures	3	AE 433
AE 570	Aircraft Engine Performance	3	AE 472
AE 597	Seminar	1	Grad. Standing
AE 598	Research Project in Aerospace Engineering	3	Department Approval

B. Elective Courses (7 Courses, 21Units)

Course No.	Course Title	Cr. Hrs	Prerequisite
AE 511	Advanced Aerodynamics II	3	AE 510
AE 512	Missile Aerodynamics	3	AE 412
AE 531	Aircraft Detail Structural Design	3	AE 432
AE 532	Analysis of Aerospace Structures	3	AE 432
AE 535	Aircraft Design I	3	AE 361
AE 536	Aircraft Design II	3	AE 535
AE 551	Integrated Aircraft Navigation Systems	3	AE 452
AE 552	Analysis of Advanced Aircraft Systems	3	AE 452
AE 561	Advanced Aircraft Performance	3	AE 361
AE 562	Advanced Aircraft Stability and Control	3	AE 462
AE 563	Flight Dynamics and Control	3	AE 560
AE 571	Aircraft Engine Design I	3	AE 472
AE 572	Aircraft Engine Design II	3	AE 472
AE 581	Advanced Aircraft Reliability	3	AE 481
AE 582	Advanced Aircraft Maintenance Systems	3	AE 481
AE 596	Advanced Special Topics in Aeronautical Engineering	3	Advisor Approval
E.....	Any Master Course from other Engineering or other Dept. of Univ.	3	AE Dept. Approval

COURSE DESCRIPTION

IE 694 Engineering Research Skills (2 units)

Science and Research, Selecting Research Topics, Using the Library, Gathering Material, Development of Research Methods, Writing the Thesis, Oral Presentation, Student's Project and Discussions.

MATH 639 Advanced Engineering Math. (3 units)

Infinite Series, Special Functions, Laplace Transform & Z-Transform, Fourier Series and Integrals, Partial Differential Equations, Non-Linear Differential Equations, Matrices..

AE 629 Advanced Aerodynamics (1) (3 units)

An advanced level presentation of the theory and applications of incompressible and compressible aerodynamics. Flow about wing alone and fuselage alone in symmetric and asymmetric flight. Wing-fuselage combination in different flight conditions and determination of interference factors.

Prerequisites: AE 311

AE 511 Advanced Aerodynamics (2) (3 units)

Aerodynamic characteristics of the horizontal and vertical tail without interference. Effect of wing and fuselage on the horizontal and vertical tail. Flaps and control surfaces, Take-off and landing devices. Applied project: Determination of the aerodynamic characteristics and the stability derivatives for a given aircraft.

Prerequisite: AE 510

MATH 511E Advanced Numerical Analysis (3 units)

Nonlinear algebraic equations, Interpolation, Numerical integration, Matrix inversion, Finite difference method, Boundary value problems, Correlation and regression, Curve fitting.

AE 512 Missile Aerodynamics (3 units)

Wing and slender body theories at supersonic speeds. Aerodynamics of the missile components (body alone, fin alone, Tail end control surfaces). Wing-body combination, Wing-body-tail combinations, Aerodynamic forces and moments, Stability derivatives of a missile.

Prerequisite: AE 412

AE 530 Fracture Mechanics of Aerospace Structures (3 units)

Fatigue load spectra, Structural safety, Reliability and life, Crack initiation and growth, Crack arrest and closure, Inspection of structures by NDT (Non-destructive Testing), Repairs of structures.

Prerequisite: AE 433

AE 531 Aircraft Detail Structural Design (3 units)

Stress and strength analysis of : wing, fuselage, tailplane, fin, and landing gear. Structural analysis of ribs, frames, stiffeners, webs, and skins, Diagonal semi-tension field beam.

Prerequisite: AE 432

AE 532 Analysis of Aerospace Structures (3 units)

Theory of elasticity, Analysis of thin plates and shells, Stiffened plates and shells, Buckling and post-buckling of structural assemblies, Optimum structures.

Prerequisite: AE 432

AE 535 Aircraft Design (1) (3 units)

Characteristics of aerospace vehicles, Disciplines within aerospace vehicle design, Design features, Initial sizing, Preliminary configuration design, Design refinement, Performance analysis.

Prerequisite: AE 361

AE 536 Aircraft Design (2) (3 units)

Layout Design of Wing, fuselage and empennage, Aircraft cost estimation: design, development, manufacturing and operation.

Prerequisite: AE 435

AE 551 Integrated Aircraft Navigation Systems (3 units)

Aircraft navigation, Principles of inertial navigation, Inertial navigation analysis, Estimation with discrete dynamics, Navigation measurements, Tracking problems.

Prerequisite: AE 452

AE 552 Analysis of Advanced Aircraft Systems (3 units)

Non-linear system analysis, Stability of non-linear systems, Optimization problems of dynamic systems, Optimal feedback control, Random process, Optimal filtering and prediction, Optimal smoothing, Optimal feedback control in the presence of uncertainty.

Prerequisite: AE 562

AE 561 Advanced Aircraft Performance (3 units)

Airspeed, altitude and temperature measurements, Airplane and engine grid, Flight limitations, Take-off performance, Climb, Unpowered flight, Turning flight, Economy operation, Descent, Approach and landing.

Prerequisite: AE 361

AE 562 Advanced Aircraft Stability and Control (3 units)

History of flight control systems, Aircraft equations of motion, Lateral motion, Aircraft response to control or atmosphere inputs, Automatic control application of conventional control theory.

Prerequisite: AE 462

AE 563 Flight Dynamics and Control (3 units)

Longitudinal autopilots, Lateral autopilots, Internal cross-coupling, Self-adaptive autopilots, Missile control systems, Helicopter control systems.

Prerequisite: AE 562

AE 570 Aircraft Engine Performance (3 units)

Components on and off design performance, Engine on and off design performance, Installed engine performance, Engine performance maps.

Prerequisite: AE 472

AE 571 Aircraft Engine Design (1) (3 units)

Stationary components design, Combustors and afterburners, Subsonic and Supersonic inlets, Exhaust nozzles.

Prerequisite: AE 472

AE 572 Aircraft Engine Design (2) (3 units)

Rotating turbo machinery, Axial and centrifugal compressors, Axial and radial turbines, Engine components matching.

Prerequisite: AE 472

AE 581 Advanced Aircraft Reliability (3 units)

Reliability testing, Censoring, MTTF estimates, Confidence intervals, Bayesian analysis, Renewal theory, Monte Carlo simulation, Loads and capacity, Safety factors, Extreme value distributions, Repetitive loading, Time dependent failure rates, Failure interactions, Markov analysis.

Prerequisite: AE 481

AE 582 Advanced Aircraft Maintenance Systems (3 units)

Reliability Centered Maintenance (RCM), Failure process, Maintenance tasks, Developing initial maintenance program, evolution of RCM program, RCM analysis of aircraft systems, Power plant and structures, The use of operating information, Auditing of RCM program.

Prerequisite: AE 481

AE 596 Advanced Special Topics in Aeronautical Eng. (3 units)

Student's study of a course relevant to his field of specialization and the topic of his thesis as advised by his thesis supervisor.

Prerequisite: Advisor Approval

AE 597 Seminar (1 unit)

MS candidates are required to attend department graduate seminars and contribute to their discussions. Each candidate has to give at least one public seminar before graduation in which he represents his research work. Only the communication skills of the candidate are to be evaluated.

Prerequisite: graduation standing

AE 598 Research Project in Aerospace Eng. (3 units)

Research work conducted by individual MS candidate in one of the areas of Aeronautical Engineering.

Prerequisite: Department Approval

AE 599 M S Thesis (10 units)

Original research work conducted by individual MS candidate in one of the areas of Aeronautical Engineering. The work should contribute new knowledge to the field of Engineering and demonstrates proficiency and creative thinking.

Prerequisite: Department Approval