BEngHons Mechanical Engineering (12240052)

Minimum duration of study	1 year
Total credits	128

Programme information

Also consult the General Regulations G.16 to G.29.

The curriculum is determined in consultation with the relevant heads of departments. A student is required to pass modules to the value of at least 128 credits.

The degree is awarded on the basis of examinations only.

Admission requirements

Subject to the stipulations of Reg. G.1.3 and G.54, a BEng degree or equivalent qualification is required for admission.

Other programme-specific information

All students must complete the module MSS 732 Research study 732 listed below.

A limited number of appropriate modules from other departments are allowed. Not all modules liste are presented each year. Please consult the departmental post- grad brochure.

Examinations and pass requirements

i. The examination in each module for which a student is registered, takes place during the normal examination period after the conclusion of lectures (i.e. October/November or May/June).
ii. A student registered for the honours degree must complete his or her studies within two years (full-time), or within three years (part-time) after first registration for the degree: Provided that the Dean, on recommendation of the relevant head of department, may approve a stipulated limited extension of this period.
iii. A student must obtain at least 50% in an examination for each module where no semester or year mark is required. A module may only be repeated once.
iv. In modules where semester or year marks are awarded, a minimum examination mark of 40% and a final mark of 50% is required.
v. No supplementary or special examinations are granted at postgraduate level.

Pass with distinction

A student passes with distinction if he or she obtains a weighted average of at least 75% in the first 128 credits for which he or she has registered (excluding modules which were discontinued timeously). The degree is not awarded with distinction if a student fails any one module (excluding modules which were discontinued timeously).

Curriculum: Final year

Minimum credits: 128

MSS 732 compulsory module / verpligte module

Core modules

Aircraft propulsion 780 (MAY 780)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1 or Semester 2

Module content

Review of thermodynamic cycles applicable to aircraft propulsion with emphasis on turbocharged piston cycles and gas turbine cycles. Optimisation of gas turbine cycles, 2D and 3D turbomachinery design and fluid mechanics and loss mechanisms in gas turbines.

Control Systems 780 (MBB 780)

Module credits	16.00
Prerequisites	Working knowledge of MATLAB/OCTAVE
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1

Module content

Introduction to state space methods, full state feedback design, disturbances and tracking systems, linear observers, compensator design by the separation principle, linear quadratic optimum control, Kalman filter, linear quadratic Gaussian compensator.

Non-destructive testing 780 (MCT 780)

Module credits	16.00
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1 or Semester 2

Module content

Probabilty, design and management in non-destructive testing (NDT). Fundamental theory of commonly used NDT methods: Ultrasonic testing, Electromagnetic testing (MT and ACFM). Radiographic testing, Penetrant testing, Eddy current testing. Other NDT technologies, including phased array UT, time-of flight diffraction. Digital (RT and Acoustic emission. Monitoring.

Advanced finite element methods 781 (MEE 781)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1 or Semester 2

Module content

Non-linear statics: Overview of non-linear effects: geometric, material and boundary conditions. Continuum mechanics: tensors, indicial notation, deformation gradients, stress and strain measures, transformations and rotations, stress-strain relationships, constitutive models. Principles of virtual work. Solution methods: direct iteration, Newton methods, incremental/iterative procedures. Lagrange engineering strains. Large displacement finite element analysis of continua: total Lagrangian formulation. Small strain plasticity: Additive decomposition, flow rule, hardening laws, continuum and consistent tangents.

Mechatronics 780 (MEG 780)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	13 lectures per week
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 2

Module content

Sensors: mechanical and optical limit switches, encoders, thermocouples, strain gauges, CCD cameras, IR sensors, piezo-electric sensors, capacitive sensors, torque sensors, tactile sensors, gyroscope and ultrasonic sensors. Actuators: DC motors, stepper motors, AC motors, pneumatic actuators, hydraulic actuators, memory shape alloys. Signal conditioning: component interconnection, amplifiers, analogue filters, modulators and demodulators, analogue-digital conversion, sample-and-hold circuitry, multiplexers, software and hardware implementation of digital filters and Wheatstone bridge. Control: H-Bridge motor control, PWM motor control, control of stepper motors, non-linear control of hydraulic and pneumatic actuators, PLCs, SCADA systems, industrial Fieldbus, micro-processor control.

Vibration-based condition monitoring 781 (MEV 781)

Module credits	16.00

Prerequisites	Working knowledge of MATLAB/OCTAVE
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1

Module content

Vibration measurement: conventional and optical technique, digital signal processing in vibrations, vibration monitoring: diagnostics and prognostics, artificial intelligence in vibration monitoring, human vibration.

Advanced heat and mass transfer 780 (MHM 780)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1 or Semester 2

Module content

Convection correlations: high speed flows, boundary layers, similarity, conservation equations, scale analysis. Thermal radiation: physics, exchange between surfaces, solar, directional characteristics, spectral characteristics, radiation through gasses. Convection, evaporation and boiling: film condensation, film evaporation, pool boiling, forced-convection boiling and condensation, flow regime maps, phase change at low pressures, heatpipes. Heat exchangers: types, regenerators, heat exchanger design. Mass transfer: Fick’s Law, mass diffusion, mass convection, simultaneous heat and mass transfer, porous catalysts. High mass transfer rate theory. Mass exchangers.

Condition-based maintenance 780 (MIC 780)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1 or Semester 2

Module content

Theory and practical applications of condition based maintenance techniques. Pitfalls of the various condition based maintenance techniques. Acoustic emission, wear debris monitoring, oil analysis, thermography and non-destructive testing.

Maintenance practice 780 (MIP 780)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1

Module content

Failure characteristics and analysis. Maintenance economics – Budgeting and cost control. Life cycle partnering and maintenance contracting. Legal aspects and case study. Performance measurement and benchmarking. Maintenance programming – Network analysis. Variability analysis. Maintenance strategy, plan, and protocol design – a new look at RCM. Maintenance tactic selection techniques. Introduction to condition-based maintenance. Tribology and contamination control presented with case studies. Maintenance Maturity Indexing and Variable Relationships development.

Maintenance logistics 782 (MIP 782)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1 or Semester 2

Module content

Introduction to Logistics, RAM (Reliability, Maintainability, and Availability), Measures of Logistics, Inventory Systems,
Systems Engineering and Supportability Analysis: Systems Engineering Process, Supportability Analysis,
Aspects of Logistical Design: Logistics in the Design and Development Phase, Just-in-Time Systems, Facility Layout, Job Design and Work Measurement,
Logistics from the Development to the Retirement Phase: Logistics in the Production/Construction Phase, Logistics in the Utilisation and Support Phase,
Planning and Scheduling: Forecasting, Planning, Maintenance Scheduling, Project Management, Theory of Constraints,
Logistics Management: Quality Management, Supply Chain Management, Logistics Management.

Reliability engineering 781 (MIR 781)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English

Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1

Module content

Introduction to probabilistic distributions, computation of system reliability, building reliability models and optimisation of system reliability; Fault Tree Analysis; Failure Modes, Effects and Criticality Analysis (FMECA), Monte Carlo Simulation; probability-based design.

Aerodynamics 780 (MLD 780)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1 or Semester 2

Module content

Review of the fundamentals of thermodynamics. Introduction to compressible flows. Advanced topics in compressible flows: transonic flow and supersonic flow. Oblique shock waves, expansion waves, shock-expansion theory, wave interactions and wave drag. Linearized compressible-flow theory. Effects of heat and friction on gas flow. Design aspects of high speed aeroplanes and viscous effects. Fundamentals of hypersonic flow and high temperature gas dynamics. On completion of this module the student will be able to understand the fundamental phenomena associated with compressible flow and competently apply analytical theory to compressible flow problems

Missile aerodynamics and design 781 (MLD 781)

Module credits	16.00
Prerequisites	(recommended) aircraft design, aerodynamics, flight mechanics
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1 or Semester 2

Module content

The aerodynamic discipline of missiles or slender bodies and general configuration design concepts, submarine, airship and munition development. Slender body theory, aerodynamics of bodies, aerodynamics of low aspect ratio wings, vortices, wing body interference, downwash, the wake and wing tail interference, aerodynamic controls, drag, stability derivatives, design considerations, performance, manoeuvering flight, store carriage and separation. Prerequisites for the course are aircraft design, subsonic and supersonic aerodynamics (including the concepts of potential flow, vortex theory, thin aerofoil theory, finite wing theory, compressible gas dynamics and shock wave theory) and flight dynamics.

Experimental methods 782 (MLD 782)

Module credits	16.00
Prerequisites	(recommended) any module where experiments are frequent (such as Physics 1)
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1 or Semester 2

Module content

Terminology, Data analysis, Uncertainty, Displacement, Strain, Pressure, Flow measurements Temperature measurements. Emphasis will be placed on the experimental process from calibration through to analyses. Different experimental techniques will be covered to showcase the process.

Unmanned aircraft systems technology 783 (MLD 783)

Module credits	16.00
Prerequisites	No prerequisites
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1 or Semester 2

Module content

Introduction to Unmanned Aerial Systems, applications and examples. System breakdown and major components. Airframe and systems. Core avionics, architecture, flight control, navigation, health monitoring. Mission systems, sensors, weapons and stores, electronic warfare. Aircraft installation and integration. Ground segment, control station, take off / launch support system, landing and recovery. Command and Control, data and video link. Logistic support system. Safety and regulatory elements.

Avionics 784 (MLD 784)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1 or Semester 2

Module content

Introduction to the functions performed by the avionics system in modern aircraft; the way in which these functions are mapped to the avionics components, starting from a presentation of the major avionics function, and the associated equipment and technologies: Human / Machine Interface, Flight Sensing (attitude, altitude, airspeed), Navigation (INS, SATNAV, Radio Nav), Flight Control and Guidance (autopilot), Radio Communication, Engine Management, Mission Sensors (radar, optronics), Health and Usage Monitoring. The main engineering challenges in Avionics System design, system integration, flight testing, safety justification and certification.

Air conditioning and refrigeration 780 (MLR 780)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1 or Semester 2

Module content

Comfort and indoor air quality. Psychometrics. System types and selection. Cooling and heating load calculations: conduction, radiation, convection, internal loads and thermal storage. Design of air handling unit, ducts, plant and reticulation. Control systems. Introduction to integrated system simulation.

Flight mechanics 780 (MLV 780)

Module credits	16.00
Prerequisites	Working knowledge of MATLAB/OCTAVE/Python or similar
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1 or Semester 2

Module content

Drag: friction, pressure, induced, interference, cooling, trim, drag estimation and reduction, piston engines, propellers, gas turbines, turbojet, turboprop and turbofan engines, propfan engines, aircraft performance, take off, climb, level flight, range, flight and manoeuvre envelopes, landing, energy methods, static stability and control: stick fixed, stick free, lateral stability and control, dihedral effect, coupling, dynamic longitudinal stability, short period oscillations, phugoid oscillations, dynamic damping, flight characteristics.

Optimum design 780 (MOO 780)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 2

Module content

Introduction to design and elements of computer aided design. Optimum design problem formulation. Optimum design concepts. Linear programming methods. Integer programming. Numerical methods for unconstrained and constrained optimum design. Model reduction. Interactive and practical design optimisation.

Fracture mechanics 780 (MSF 780)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 2

Module content

Historical development; Linear Elastic Fracture Mechanics (LEFM): Stress concentrations and singularities, stress intensity factor, stability of crack propagation; Elasto-plastic fracture mechanics: crack tip plasticity, small scale yielding, measurement of Kic, J-integral; Fatigue crack growth: Paris Law; life prediction; combined mode fracture, strain energy density methods.

Numerical thermoflow 780 (MSM 780)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English

Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1

Module content

Fluid Mechanics refresher (governing equations, boundary conditions, application of inviscid, laminar and turbulent flow). Methods of weighted residuals (finite element, finite volume and difference methods). Mesh generation and boundary conditions: Types of mesh structured and unstructured mesh generation and application (inviscid flow, heat conduction etc.). Heat conductions: Governing equations, discretisation, finite approximation, solution methods (Gauss-Seidel, Tri-diagonal matrix algorithm) etc. This module is suited to postgraduate students doing research in thermofluids and who wants to use available CFD codes or who wants to write their own codes to solve fluid mechanics, heat and mass transfer problems.

Numerical thermoflow 781 (MSM 781)

Module credits	16.00
Prerequisites	MSM 780 Numerical thermoflow 780
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 2

Module content

The Efficient Solvers: Background, muligrid theory and detailed description of the algorithm. Finite Volume method: Understand the governing equations, general form of the transport equations, Gauss's theorem and the finite volume discretisation. Iterative solution algorithm: Pressure-velocity coupling, types of grids, unsteady flows, multiple phases. Finite Volume Discretisation: Diffusion term, convection term and source term for steady flows. Convection-diffusion problems: Boundary conditions, higher order discretisation, accuracy / stability. Solution Algorithm for Pressure-Velocity coupling: SIMPLE, SIMPLER, SIMPLEC and PISO. Laminar, transitional and turbulent flow: Background and theory. Turbulence modelling and examples: Definition of turbulence, turbulence modelling approaches, turbulence models (zero-equation models, one equation, two equation, Reynolds Stress Model (RSM), Large Eddy Simulation, wall function approach), turbulence modelling guidelines. Recent CS developments: Current state of the art in turbulence modelling etc. Viscous boundary meshes: Background and objectives, internal and external flow, turbulence modelling considerations.

Research study 732 (MSS 732)

Module credits	32.00
Prerequisites	No prerequisites.
Contact time	12 other contact sessions per week
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1 or Semester 2

Module content

*This is a compulsory research module.

This module allows a student to do research on a certain topic in mechanical or aeronautical engineering, as specified by a lecturer in the Department of Mechanical and Aeronautical Engineering, on an individual basis, under the supervision of that lecturer. The study should be seen as a precursor to the master's degree research that may follow the honours degree. The total volume of work that is to be invested in this module by an average student must be 320 hours. The body of knowledge studied must be of an advanced nature, at the level of the other postgraduate modules offered by the Department. Normal requirements for assessment that include the use of an external examiner apply to this module also.

Fatigue 780 (MSV 780)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1 or Semester 2

Module content

Fatigue principles addressing both elasticity and plasticity; notch effects; variable amplitude loading conditions; multi-axial fatigue and weld fatigue.

Fluid mechanics 780 (MSX 780)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1

Module content

Mathematical preliminaries: historical overview, scalar, vector and tensor algebra (in context of partial differential equations), Green's lemma and the Divergence theorem, Eularian/Lagrangian representations, derivative of a function, Reynolds transport theorem. Governing equations: viscous compressible and incompressible flow, derivation of conservation of mass, derivation of conservation of momentum, boundary conditions, mathematical characteristics, non-dimensionalisation. Viscous compressible and incompressible flow: derivation of conservation of mass, derivation of conservation of momentum, boundary conditions, mathematical characteristics, non-dimensionalisation.

Advanced fluid mechanics 781 (MSX 781)

Module credits	16.00

Prerequisites	MSX 780 Fluid mechanics 780
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 2

Module content

Exact solutions: potential flow, Couette flow, Poiseuille flow and combined Couette-Poiseuille flow, laminar boundary layers (similarity solutions for flat plate flow). Stability of laminar flows: introduction, linearised stability, transition to turbulence, approximate prediction of transition. Turbulent flow: Reynolds averaged equations, two-dimensional turbulent-boundary-layer equations, velocity profiles, turbulent flow in ducts, flat plate flow, turbulence modelling.

Advanced thermodynamics and energy systems 781 (MTX 781)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1 or Semester 2

Module content

Fundamental concepts of thermodynamics, total flow exergy, restricted dead state and unconstrained equilibrium state, heat transfer, fluid flow and chemical irreversibilities, thermodynamic optimisation, irreversibility distribution ratio, lost exergy, application of entropy generation minimisation (EGM) technique to the fundamentals of power generation, solar power, wind power, and low temperature refrigeration.

Reactor coolant flow and heat transfer 782 (MUA 782)

Module credits	16.00
Prerequisites	MUA 783
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 2

Module content

Design of reactor coolant system, heat sources in reactor systems, heat transmission principles, heat transmission in systems with internal sources, temperature distribution along path of reactor coolant flow, heat transfer characteristics of fluids, heat transfer to boiling liquids, heat transfer characteristics of gasses.

Reactor engineering science 783 (MUA 783)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1

Module content

Atomic structure, nuclear energy and nuclear forces, nuclear fission, nuclear reactions and radiation, energy removal, nuclear reactor systems, radiation protection, radiation shielding, meteorology, reactor safety analysis.

Reactor physics 784 (MUA 784)

Module credits	16.00
Prerequisites	MUA 783 Reactor engineering science 783#
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1

Module content

Probability concepts and nuclear cross sections, multiplication factor and neutron flux, slowing-down process in the infinite medium, diffusion theory the homogeneous one-velocity reactor, Fermi age theory: the homogeneous multi-velocity reactor, transport theory, reflected reactors, reactor kinetics, heterogeneous reactors, control-rod theory.

Reactor materials engineering 785 (MUA 785)

Module credits	16.00
Prerequisites	MUA 783 Reactor engineering science 783#
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1

Module content

Overview of the functions of the various classes of nuclear materials, elastic deformation, yielding and use of texture in nuclear components, atomic processes in plastic deformation and radiation damage, strength of engineering materials.

Reactor materials engineering 786 (MUA 786)

Module credits	16.00
Prerequisites	MUA 785 Reactor materials engineering 785
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 2

Module content

Creep deformation, fracture processes and metallurgical fracture mechanics, fatigue fracture in nuclear materials, fabrication processes of nuclear materials.

Fossil fuel power stations 781 (MUU 781)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	13 lectures per week
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 2

Module content

This module contains a comprehensive study of all mechanical systems and processes of a fossil fuel power station. The module will include the analysis of steam cycles, combined cycle power generation, fuels and combustion, combustion mechanisms, combustion equipment and firing methods, the draught group, steam generators, steam turbines, condenser, feed water and circulating water systems, coal handling, ash handling, compressor plant, water treatment, the importance of HVAC, control and instrumentation, control philosophies and environmental considerations.

Vehicle dynamics 780 (MVI 780)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1

Module content

Tyres: Characteristics and tyre models used in simulation of ride comfort and handling. Road inputs: Classification of roads. Road profiles. Road roughness. Suspension components: springs, dampers. Controllable suspension systems. Modelling aspects. Human reaction: Human response to vibration. Driver models. Human reaction times. Vertical vehicle dynamics (ride comfort): Vibration levels in a vehicle. Simulation of ride comfort. Effect of seat characteristics on vibration levels. Test and evaluation procedures. Lateral vehicle dynamics (handling): Simulation of steady state and dynamic handling. Rollover propensity. Test procedures. Computer applications: Application of computer codes in the analysis of vehicle dynamics.

Numerical methods 780 (MWN 780)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1 or Semester 2

Module content

Solving systems of linear algebraic equations using direct and iterative methods from small to large scale systems. Numerical solutions of nonlinear systems of equations. Solving eigenvalue problems. Numerical approximation strategies. Numerical differentiation. Numerical Integration. Numerical solutions to initial-value problems for ordinary differential equations. Numerical solutions to boundary-value problems for ordinary differential equations. Numerical solutions to partial-differential equations.