

MECHANICAL ENGINEERING (with optional Environmental Engineering Stream)

SYLLABUS

This syllabus applies to students admitted in the academic year 2010-11 and thereafter.

Definitions and Terminology

Each course offered by the Department shall be classified as either introductory level course or advanced level course, and be assigned a Level --- One, Two or Three, in which Level One courses are introductory courses whereas advanced courses includes Level Two and Three courses.

A *Discipline Core Course* is a compulsory course which a candidate must pass in the manner provided in the Regulations. A *Project Course* is also a compulsory course which a candidate must pass. A *Breadth* course is a Level 1 or Level 2 course that is offered normally as an optional course for the curriculum. A *Depth* course is a Level 3 course offered as an optional course for the curriculum. An *Elective course* is a course offered by the Department of Mechanical Engineering, other departments under the Faculty of Engineering, or by other faculties.

The Curriculum

The curriculum comprises 180 credits of courses as follows:

- (a) 24 credits from General Engineering courses, including:
 - (i) either ENGG1002 Computer programming and applications (6 credits) or ENGG1016 Computer programming and applications I (6 credits); AND
 - (ii) either ENGG1003 Mathematics I (6 credits) or ENGG1004 Mathematics IA (3 credits) and ENGG1005 Mathematics IB (3 credits); AND
 - (iii) ENGG1010 Foundations of engineering mechanics; AND
 - (iv) ENGG1006 Engineering for sustainable development; OR an equivalent course ENGG10XX
- (b) 72 credits of Discipline Core courses (Main stream students); OR
84 credits of Discipline Core courses (for Environmental Engineering stream students)
- (c) 18 credits of Project courses
- (d) 9 credits of Complementary Studies courses
- (e) 36 credits of Discipline Elective courses (Main stream students); OR
24 credits of Discipline Elective courses (for Environmental Engineering stream students)
- (f) UG5 requirements (21 credits), including:
 - (i) CAES1513 Professional and technical written communication for engineers (3 credits)¹
 - (ii) CAES1515 Professional and technical oral communication for engineers (3 credits)
 - (iii) CENG1001 Practical Chinese language course for engineering students (3 credits)²
 - (iv) 12 credits of courses from the University Common Core Curriculum, selecting no more than one course from each Area of Inquiry

¹ Students pursuing the double-degrees in BEng/BBA should take CAES1907 in lieu of CAES1513

² Putonghua-speaking students should take CUND0002 or CUND0003. Students who have not studied Chinese language during their secondary education / who have not attained the requisite level of competence in the Chinese language to take CENG1001 can apply (i) to take credit-bearing Cantonese or Putonghua language courses offered by the School of Chinese especially for international and exchange students; OR (ii) to be exempted from the Chinese language requirement and take an elective course in lieu.

To complete the degree curriculum, a candidate must pass all the courses listed under (a) to (f) for a combination totaling to at least 180 credits, and satisfy any other requirements as stipulated in the University or Faculty of Engineering regulations.

Degree Classification

The best 180 credits satisfying the Curriculum described above shall be taken into account for degree classification.

Order of Study

There are no course prerequisites but lower level courses should preferably be taken before higher level courses.

First Year

The first-year syllabus shall normally include the following courses:

General Engineering Courses (Total 24 credits)

Either

ENGG1002 Computer programming and applications (6 credits); or
ENGG1016 Computer programming and applications I; AND

Either

ENGG1003 Mathematics I (6 credits) or
both ENGG1004 Mathematics IA (3 credits) and ENGG1005 Mathematics IB (3 credits); AND

ENGG1010 Foundations of engineering mechanics (6 credits); AND
ENGG1006 Engineering for sustainable development (6 credits); OR
an equivalent course ENGG10xx (6 credits)

Discipline Core Courses (Total 27 credits)

MECH1004 Drawing and elements of design and manufacture (6 credits)
MECH1005 Fundamentals of electrical and electronic engineering (6 credits)
MECH1009 Properties of materials I (3 credits)
MECH1013 Engineering mechanics (6 credits)
MECH1014 Thermofluids (6 credits)

UG5 requirements (Total 9 credits)

CAES1513 Professional and technical written communication for engineers (3 credits)
CAES1515 Professional and technical oral communication for engineers (3 credits)
CENG1001 Practical Chinese language course for engineering students (3 credits)

Discipline Elective Course (Total 6 credits)

MECH1018 Engineering training (6 credits) (Summer semester)¹

¹ MECH1018 can be used to fulfill the requirement of 36 credits of Discipline Elective courses

Second Year**Main Stream**

The second-year syllabus for Main Stream students shall normally include the following courses:

Discipline Core Courses (Total 45 credits)

- MECH2001 Applied dynamics (3 credits)
- MECH2002 Engineering thermodynamics (6 credits)
- MECH2004 Control (3 credits)
- MECH2005 Design and manufacture (6 credits)
- MECH2006 Electrical and electronic engineering (6 credits)
- MECH2007 Mathematics II (6 credits)
- MECH2008 Mechanics of fluids (6 credits)
- MECH2009 Mechanics of solids (6 credits)
- MECH2010 Properties of materials II (3 credits)

Complementary Studies Course (Total 3 credits)

- MECH2011 Engineering economics (3 credits)

UG5 requirements (Total 12 credits)

- 2 University Common Core Courses (12 credits)

Discipline Elective Course (Total 6 credits)

- MECH2017 Industrial training (6 credits) (Summer semester)¹

Environmental Engineering Stream

The second-year syllabus for Environmental Engineering Stream students shall normally include the following courses:

Discipline Core Courses (Total 45 credits)

- MECH2001 Applied dynamics (3 credits)
- MECH2002 Engineering thermodynamics (6 credits)
- MECH2004 Control (3 credits)
- MECH2005 Design and manufacture (6 credits)
- MECH2007 Mathematics II (6 credits)
- MECH2008 Mechanics of fluids (6 credits)
- MECH2009 Mechanics of solids (6 credits)
- MECH2010 Properties of materials II (3 credits)
- CIME2001 Water and air quality: concepts and measurement (6 credits)

Complementary Studies Course (Total 3 credits)

- MECH2011 Engineering economics (3 credits)

¹ MECH2017 can be used to fulfill the requirement of 36 credits of Discipline Elective courses

UG5 requirements (Total 12 credits)

2 University Common Core Courses (12 credits)

Discipline Elective Course (Total 6 credits)

MECH2017 Industrial training (6 credits) (Summer semester)¹

Third Year**Main Stream**

The third-year syllabus for Main Stream students shall normally include the following courses:

Project Courses (Total 18 credits)

MECH3008 Design (6 credits)
MECH3022 Project (12 credits)

Complementary Studies Course (Total 6 credits)

MECH3010 Engineering and technology management (6 credits)

Discipline Elective Courses (Total 36 credits)

Students are required to complete 36 credits of Discipline Elective courses in the following manner:

- (i) Elective Depth Courses (at least 6 credits)
- (ii) Elective Breadth/Depth Courses (up to 30 credits)
- (iii) Elective Complementary Studies Course (up to 3 credits)
- (iv) Elective MSc(Eng) Courses (up to 6 credits)
- (v) Elective Course (up to 6 credits)

Elective Depth Courses (at least 6 credits from the following)

MECH3007 Computer-aided design and manufacture (CAD/CAM) (6 credits)
MECH3011 Heat transfer (6 credits)
MECH3015 Applied stress and strength analysis (6 credits)
MECH3020 Vibration (6 credits)
MECH3021 Viscous flow (6 credits)

Elective Breadth/Depth Courses (up to 30 credits from the following)

BBSE3005	Inter-disciplinary building services design (6 credits)
MECH2016	Fundamentals of aeronautical engineering (6 credits)
MECH3001	Acoustics (3 credits)
MECH3002	Air pollution control (6 credits)
MECH3004	Automatic control (6 credits)
MECH3005	Building Services (6 credits)
MECH3006	Case studies of failure investigations (6 credits)
MECH3009	Energy conversion systems (6 credits)
MECH3012	Product design and development (6 credits)

¹ MECH2017 can be used to fulfill the requirement of 24 credits of Discipline Elective courses

MECH3013 Marine propulsion systems (6 credits)
 MECH3014 Materials for engineering applications (6 credits)
 MECH3016 Waves in fluids (6 credits)
 MECH3017 Mechatronic design methodology (6 credits)
 MECH3023 Building energy management and control systems (6 credits)

Elective Complementary Studies Course (up to 3 credits)

BBSE3007 Project and contract management (3 credits)

Elective MSc(Eng) courses (up to 6 credits)

MECH6024 Applied mathematics for engineers (3 credits)
 MECH6028 Processing and properties of engineering plastics (3 credits)
 MECH6040 Foundations of nanotechnology (3 credits)

Elective Course (up to 6 credits)

Any other elective course as approved by the department (6 credits)

Environmental Engineering stream

The third-year syllabus for Environmental Engineering Stream students shall normally include the following courses:

Project Courses (Total 18 credits)

MECH3008 Design (6 credits)
 MECH3022 Project (12 credits)

Discipline Core Courses (Total 12 credits)

MECH2006 Electrical and electronic engineering (6 credits)
 MECH3002 Air pollution control (6 credits)

Complementary Studies Course (Total 6 credits)

MECH3010 Engineering and technology management (6 credits)

Discipline Elective Courses (Total 24 credits)

Students are required to complete 24 credits of Discipline Elective courses in the following manner:

- (i) Elective Depth Courses (at least 6 credits)
- (ii) Elective Breadth/Depth Courses (up to 18 credits)
- (iii) Elective Complementary Studies Course (up to 3 credits)
- (iv) Elective MSc(Eng) Courses (up to 6 credits)
- (v) Elective Course (up to 6 credits)

Elective Depth Courses (at least 6 credits)

MECH3007 Computer-aided design and manufacture (CAD/CAM) (6 credits)
 MECH3011 Heat transfer (6 credits)
 MECH3015 Applied stress and strength analysis (6 credits)
 MECH3020 Vibration (6 credits)

MECH3021 Viscous flow (6 credits)

Elective Breadth/Depth Courses (up to 18 credits)

BBSE3005	Inter-disciplinary building services design (6 credits)
CIVL3011	Municipal and industrial waste treatment (6 credits)
CIVL3015	Solid and hazardous waste management (6 credits)
CIVL3022	Wind engineering (6 credits)
MECH2016	Fundamentals of aeronautical engineering (6 credits)
MECH3001	Acoustics (3 credits)
MECH3004	Automatic control (6 credits)
MECH3005	Building Services (6 credits)
MECH3006	Case studies of failure investigations (6 credits)
MECH3009	Energy conversion systems (6 credits)
MECH3012	Product design and development (6 credits)
MECH3013	Marine propulsion systems (6 credits)
MECH3016	Waves in fluids (6 credits)
MECH3023	Building energy management and control systems (6 credits)

Elective Complementary Studies Course (up to 3 credits)

BBSE3007 Project and contract management (3 credits)

Elective MSc(Eng) courses (up to 6 credits)

MECH6024	Applied mathematics for engineers (3 credits)
MECH6028	Processing and properties of engineering plastics (3 credits)
MECH6040	Foundations of nanotechnology (3 credits)

Elective Course (up to 6 credits)

Any other elective course as approved by the department (6 credits)

COURSE DESCRIPTIONS

Level One

MECH1004. Drawing and elements of design and manufacture (6 credits)

Engineering drawing techniques; orthographic and pictorial projections; dimensioning and tolerancing, limits and fits, screw fasteners; cam; gears; computer aided drafting, with 3D CAD modeling; manufacturing processes, process selection, design for manufacturability.

Assessment: 100% continuous assessment

MECH1005. Fundamentals of electrical and electronic engineering (6 credits)

Basic circuit principles; steady-state A.C. circuit theory; magnetic circuits; transformers; bipolar junction transistors; field effect transistors; direct-current motors; solid-state controller for D.C. motors; combinational logic circuits.

Assessment: 15% practical work; 85% examination

MECH1009. Properties of materials I (3 credits)

Elements of atomic structure and bonding; crystal structure; defect theory; solidification; plastic deformation; recrystallization; phase diagrams; alloy properties; TTT diagrams; heat treatment.

Assessment: 15% practical work; 85% examination

MECH1013. Engineering Mechanics (6 credits)

Stress and strain; bending of beams; deflection of beams; thin-walled pressure vessels; kinematics of particles with different forms of accelerations; momentum and energy conservation; applications of kinetic principles to particles and vehicles with mass variation; velocity-dependent resistance and the action of central forces; undamped and damped free vibration; simple and epicyclic gear trains.

Assessment: 10% practical work; 10% continuous assessment; 80% examination

MECH1014. Thermofluids (6 credits)

Concepts and definitions; properties of pure substance; heat and work; first law of thermodynamics; second law of thermodynamics; entropy; basic concepts on fluids and flows; dimensional analysis, similarity and modelling; momentum theorems and pipe flow analysis.

Assessment: 10% practical work; 90% examination

MECH1018. Engineering training (6 credits)

Practical work in manufacturing processes; the use of hand and machine tools; joining and fastening of metals; basic electrical engineering training, programmable logic controllers; virtual instrumentation; design; modeling and prototyping, CNC machining and metrology.

Assessment: 100% continuous assessment.

ENGG1002. Computer programming and applications (6 credits)

ENGG1003. Mathematics I (6 credits)

ENGG1004. Mathematics IA (3 credits)

ENGG1005. Mathematics IB (3 credits)

ENGG1006. Engineering for sustainable development (6 credits)

ENGG1010. Foundations of engineering mechanics (6 credits)

ENGG1016. Computer programming and applications I (6 credits)

Please refer to the General Engineering courses in the syllabus for the degree of BEng for details.

CENG1001. Practical Chinese language course for engineering students (3 credits)

Please refer to the University Language Enhancement Courses in the syllabus for the degree of BEng for details.

CAES1513. Professional and technical written communication for engineers (3 credits)

The focus of this course is the function and importance of professional and technical communication in English and specifically understanding and using written English. Topics include accessing, abstracting, analysing, organizing and summarizing information; making effective grammatical and lexical choices; technical report writing; small-scale project design and implementation.

Assessment: 100% continuous assessment

CAES1515 Professional and technical oral communication for engineers (3 credits)

This course focuses on students developing technical and professional spoken English skills. Throughout the course, the students will give a series of presentations which will help them to improve skills such as accessing, abstracting, analyzing, organizing and summarizing information; asking questions and negotiating meanings; making effective grammatical and lexical choices and using visual aids to ensure meaning is clear. The presentations give the students an opportunity to develop the skills to talk about general issues in Engineering in the Hong Kong context, engineering theories and their practical applications and also requires them to present a detailed exploration of one aspect of engineering related to their chosen major.

Assessment: 100% continuous assessment

CCXXxxxx University Common Core course (6 credits)**CCXXxxxx University Common Core course (6 credits)****Level Two****MECH2001. Applied dynamics (3 credits)**

Advanced rotational motion; balancing of rotating and reciprocating masses; vibration isolation and control; vibration of multi degree-of-freedom in-line systems; free transverse vibration of beams.

Assessment: 10% practical work; 10% continuous assessment; 80% examination

MECH2002. Engineering thermodynamics (6 credits)

Steam and gas power plant; refrigeration; jet propulsion and turbomachinery; gas mixture; psychrometry and air-conditioning; introduction to heat transfer.

Assessment: 10% practical work; 10% continuous assessment; 80% examination

MECH2004. Control (3 credits)

Modelling of physical systems; time response analysis of dynamical systems; feedback control systems; control system design and applications; stability; root locus method; analogue computer programming

Assessment: 20% continuous assessment; 80% examination

MECH2005. Design and manufacture (6 credits)

Materials selection; joining and fastening; mechanism design; tooling system design; power transmission systems design; CNC machining; rapid prototyping.

Assessment: 100% continuous assessment

MECH2006. Electrical and electronic engineering (6 credits)

Analog electronics; sequential logic circuits; digital-to-analog and analog-to-digital converters; introduction to microcontrollers; three-phase power systems; induction motors; synchronous motors; step motors; solid-state controllers for A.C. motors.

Assessment: 10% practical work; 90% examination

MECH2007. Mathematics II (6 credits)

Complex variables; Fourier series and Fourier transforms; partial differential equations; introduction to probability and statistics; elementary numerical analysis.

Assessment: 20% continuous assessment; 80% examination

MECH2008. Mechanics of fluids (6 credits)

Navier-Stokes equations; pipe and channel viscous flows; lubrication; boundary layer flows; two-dimensional potential flows; open-channel flows; fluid machines.

Assessment: 10% practical work; 10% continuous assessment; 80% examination

MECH2009. Mechanics of solids (6 credits)

Two-dimensional theory of elasticity; thermal stress and rotating disks; energy methods; introduction to the finite element method; experimental methods; bending of circular plate.

Assessment: 10% practical work; 10% continuous assessment; 80% examination

MECH2010. Properties of materials II (3 credits)

Testing and service behaviour of materials; metallurgy of fatigue; theory of creep resistant alloys; the ductile/brittle transition; corrosion resistance; surface treatment; selection criteria for common alloys; structure of polymers; properties of compounded plastics; service behaviour of plastics.

Assessment: 10% practical work; 90% examination

MECH2011. Engineering economics (3 credits)

Time value of money; interest and interest formulas; equivalent analysis; bases for comparison of alternatives; present worth analysis; annual equivalent worth analysis; rate of return analysis; project cash flow analysis; decision making among alternatives; applications to real-world economy.

Assessment: 10% continuous assessment; 90% examination

MECH2016 Fundamentals of aeronautical engineering (6 credits)

History of aeronautical science; wing aerodynamics; propulsion; flight mechanics; systems and airframe structures; lightweight materials, failure modes, high-temperature materials, creep damage; maintenance.

Assessment: 10% practical work; 10% continuous assessment; 80% examination

MECH2017. Industrial training (6 credits)

Training in industry for a nominal period of at least six weeks during the summer vacation of the Second Year of Study

Assessment: 100% continuous assessment

CIME2001. Water and air quality: concepts and measurement (6 credits)

Water quality and water pollution; standard methods of water and wastewater examination; air quality and air pollution control principles; measurement techniques in air pollution.

Assessment: 20% practical work; 80% examination

Level Three**BBSE3005. Inter-disciplinary building services design (6 credits)**

Inter-disciplinary building services design; design rationales; conceptual design of air conditioning, plumbing and drainage, fire services, electrical power supply, vertical transportation, and lighting systems; detailed design; requirements for teamwork and integration; tectonics considerations.

Assessment: 50% practical work ; 50% continuous assessment

BBSE3007. Project and contract management (3 credits)

Characteristics of building services projects and contracts; role of architect, consultants, quantity surveyor, builder and subcontractors; statutory requirements; project planning, scheduling and control; contract documentation and contractual arrangement; estimating and tendering; site organization and supervision; measurement and valuation of work; claim management and settlement; alternative dispute resolution.

Assessment: 20% continuous assessment; 80% examination

MECH3001. Acoustics (3 credits)

Human hearing; environmental noise measurement and legislation; source mechanisms; duct acoustics; sound reverberation in rooms; noise transmission through walls and windows; active and passive noise control.

Assessment: 10% practical work; 90% examination

MECH3002. Air pollution control (6 credits)

Particulate and aerosol abatement technology; gas absorption - plate and packed columns; adsorption for the removal of odours and trace gases; combustion fundamentals and abatement of volatile organic compounds using incineration techniques.

Assessment: 10% continuous assessment; 90% examination

MECH3004. Automatic control (6 credits)

Control of mechanical, hydraulic and pneumatic systems; frequency domain analysis, Nyquist stability criterion; linear control system design; computer control systems, state-space analysis of multivariable linear system, controllability and observability, stability analysis; state feedback.

Assessment: 10% practical work; 90% examination

MECH3005. Building services (6 credits)

Introduction to the construction industry; electrical supply and lighting system design; lifts and escalators; air conditioning and refrigeration; cold and hot water supply systems; stormwater and sanitary drainage systems; fire safety and protection.

Assessment: 15% practical work; 85% examination

MECH3006. Case studies of failure investigations (3 credits)

General introduction to failure investigation procedures, purpose, scope, and limitation; failure mode detected from component examination; cause of failure determination through system case studies; design codes for large structures; fracture mechanics techniques; legislation affecting safety of equipment; roles of a mechanical engineer as an expert witness.

Assessment: 20% practical work; 30% continuous assessment; 50% examination

MECH3007. Computer-aided design and manufacture (CAD/CAM) (6 credits)

Basic data structure techniques; transformation techniques; mathematical bases for surface modeling; principles of solid modeling and applications; numerical control; computer-aided production technologies; computer-integrated manufacturing.

Assessment: 30% continuous assessment; 70% examination

MECH3008. Design (6 credits)

Design methodology; engineering design; design for manufacturability; prototyping; project management; design project.

Assessment: 100% continuous assessment

MECH3009. Energy conversion systems (6 credits)

Energy calculations; solar thermal power plant; energy storage; solar photovoltaic systems; wind energy systems; nuclear energy and power plants; nuclear waste management; urban waste.

Assessment: 10% continuous assessment; 90% examination

MECH3010. Engineering and technology management (6 credits)

Quantitative methods for engineering and technology management; managing technology through the product life cycle; planning; organizing; staffing; leading; controlling; quantitative methods for analyzing / solving decision making involving engineering and technology management problems; quantitative methods for forecasting; resource allocations subject to constraints; linear programming and simplex method; decision theory with the application of decision trees; inventory control models; queuing theory; transportation and resource allocation for business operations.

Assessment: 20% continuous assessment; 80% examination

MECH3011. Heat transfer (6 credits)

Fourier's law; heat-conduction equation; steady and unsteady conduction; basic convection principles; laminar and turbulent heat transfer in tubes and over plates; Reynolds analogy; log mean temperature difference; effectiveness-NTU method; heat exchanger design; exergy analysis; optimisation of heat transfer process and system.

Assessment: 10% practical work; 90% examination

MECH3012. Product design and development (6 credits)

Product design and product development process; methods and tools for design, analysis and testing; prototype making methods and practices; design for tooling; design of electromechanical products.

Assessment: 20% practical work; 80% examination

MECH3013. Marine propulsion systems (6 credits)

Marine vehicles and marine prime movers; marine machinery systems; marine propulsors; propeller/engine design integration; waste heat recovery and advanced energy concepts; dynamics and vibrations of marine systems; speed and power control in marine systems.

Assessment: 10% practical work; 90% examination

MECH3014. Materials for engineering applications (6 credits)

Materials for high strength/weight ratio; high and low temperature service; resistance to corrosion resistance and protection; residual stresses; composite and ceramic materials; manufacturing properties; problem based learning module; introduction to materials classification.

Assessment: 100% examination

MECH3015. Applied stress and strength analysis (6 credits)

Theory of elasticity, bending of cantilever beams, torsion of non-circular members; finite element methods; analysis of rectangular plates; fracture mechanics; elasto-plastic analysis.

Assessment: 10% practical work; 90% examination

MECH3020. Vibration (6 credits)

Vibration measurement; single- and two-plane balancing of rotors in situ, machinery condition monitoring; random vibration; digital signal analysis; matrix analysis of free and forced vibrations of multi-degree-of-freedom systems; classical analysis of beam vibration; energy methods for approximate vibration analysis.

Assessment: 10% practical work; 10% continuous assessment; 80% examination

MECH3021. Viscous flow (6 credits)

Eulerian and Lagrangian descriptions; Navier-Stokes equations; low-Reynolds-number flows; laminar boundary layers; laminar stability theory; turbulent flows.

Assessment: 10% practical work; 10% continuous assessment; 80% examination

MECH3022. Project (12 credits)

A dissertation or report on a topic consisting of design, experimental or analytical investigations.

Assessment: 100% continuous assessment

MECH3023. Building energy management and control systems (6 credits)

Concepts of distributed computer-based monitoring and control; hardware and software development; communication protocols; application to maintenance, energy management and control; system design and performance evaluation; computer simulation and emulation techniques; analysis of dynamic building services systems.

Assessment: 10% practical work; 10% continuous assessment; 80% examination

MECH6024. Applied mathematics for engineers (3 credits)

Statistical and numerical methods in engineering; hypothesis testing; estimation of parameters and confidence intervals; correlation coefficient; direct and iterative methods for systems of equations; numerical analysis; finite difference and finite element schemes; wave propagation and vibration; normal modes.

Assessment: 100% examination

MECH6028. Processing and properties of engineering plastics (3 credits)

Viscosity of polymer melts; extrusion; injection moulding; blow moulding; joining; plating; yield criteria; environmental stress cracking; UV degradation; flame retardation; biodegradable polymers; viscoelastic behaviour of plastics; dynamic behaviour; design methods for plastics based on creep data.

Assessment: 100% examination

MECH6040. Foundations of nanotechnology (3 credits)

Characteristic length scales, nanomaterials, nanostructures, physical properties of nanostructures, deposition techniques of nanofabrication, high resolution analysis and characterization, scanning probe methods, nanoindentation, deformation of nanostructures, mechanical behaviours of nanocrystalline solids, ultra-high strength of nanostructures, sensors, actuators, MEMS, NEMS, functional nanomaterials, nano-scale devices, modelling and computer-aided designs, bio-nanotechnology

Assessment: 100% examination

CIVL3022. Wind engineering (6 credits)**CIVL3015. Solid and hazardous waste management (6 credits)****CIVL3011. Municipal and industrial wastewater treatment (6 credits)**

For course descriptions, please refer to the syllabuses of the Civil Engineering programme

MECHANICAL ENGINEERING (BUILDING SERVICES ENGINEERING)

SYLLABUS

This syllabus applies to students admitted in the academic year 2010-11 and thereafter.

Definitions and Terminology

Each course offered by the Department of Mechanical Engineering shall be classified as either introductory level course or advanced level course, and be assigned a Level --- One, Two or Three, in which Level One courses are introductory courses whereas advanced courses includes Level Two and Three courses.

A *Discipline Core Course* is a compulsory course which a candidate must pass in the manner provided in the Regulations. A *Project Course* is also a compulsory course which a candidate must pass. A *Breadth* course is a Level 1 or Level 2 course that is offered as an optional course for the curriculum. A *Depth* course is a Level 3 course offered as an optional course for the curriculum. An *Elective course* is a course offered by the Department of Mechanical Engineering, other departments under the Faculty of Engineering, or by other faculties.

The Curriculum

The curriculum comprises 180 credits of courses as follows:

- (a) 24 credits from General Engineering courses, including:
 - (i) either ENGG1002 Computer programming and applications (6 credits) or ENGG1016 Computer programming and applications I (6 credits); AND
 - (ii) either ENGG1003 Mathematics I (6 credits) or ENGG1004 Mathematics IA (3 credits) and ENGG1005 Mathematics IB (3 credits); AND
 - (iii) ENGG1010 Foundations of engineering mechanics; AND
 - (iv) ENGG1006 Engineering for sustainable development; OR an equivalent course ENGG10XX
- (b) 90 credits of Discipline Core courses
- (c) 18 credits of Project courses
- (d) 9 credits of Complementary Studies courses
- (e) 18 credits of Discipline Elective courses
- (f) UG5 requirements (21 credits), including:
 - (i) CAES1513 Professional and technical written communication for engineers (3 credits)¹
 - (ii) CAES1515 Professional and technical oral communication for engineers (3 credits)
 - (iii) CENG1001 Practical Chinese language course for engineering students (3 credits)²
 - (iv) 12 credits of courses from the University Common Core Curriculum, selecting no more than one course from each Area of Inquiry

To complete the degree curriculum, a candidate must pass all the courses listed under (a) to (f) for a combination totaling to at least 180 credits, and satisfy any other requirements as stipulated in the University or Faculty of Engineering regulations.

¹ Students pursuing the double-degrees in BEng/BBA should take CAES1907 in lieu of CAES1513

² Putonghua-speaking students should take CUND0002 or CUND0003. Students who have not studied Chinese language during their secondary education / who have not attained the requisite level of competence in the Chinese language to take CENG1001 can apply (i) to take credit-bearing Cantonese or Putonghua language courses offered by the School of Chinese especially for international and exchange students; OR (ii) to be exempted from the Chinese language requirement and take an elective course in lieu.

Degree Classification

The best 180 credits satisfying the Curriculum described above shall be taken into account for degree classification.

Order of Study

There are no course prerequisites but lower level courses should preferably be taken before higher level courses.

First Year

The first-year syllabus shall normally include the following courses:

General Engineering Courses (Total 24 credits)

Either

ENGG1002 Computer programming and applications (6 credits); or
ENGG1016 Computer programming and applications I; AND

Either

ENGG1003 Mathematics I (6 credits) or
both ENGG1004 Mathematics IA (3 credits) and ENGG1005 Mathematics IB (3 credits); AND

ENGG1010 Foundations of engineering mechanics (6 credits); AND
ENGG1006 Engineering for sustainable development (6 credits); OR
an equivalent course ENGG10xx (6 credits)

Discipline Core Courses (Total 27 credits)

MECH1004 Drawing and elements of design and manufacture (6 credits)
MECH1005 Fundamentals of electrical and electronic engineering (6 credits)
MECH1009 Properties of materials I (3 credits)
MECH1013 Engineering mechanics (6 credits)
MECH1014 Thermofluids (6 credits)

UG5 requirements (Total 9 credits)

CAES1513 Professional and technical written communication for engineers (3 credits)
CAES1515 Professional and technical oral communication for engineers (3 credits)
CENG1001 Practical Chinese language course for engineering students (3 credits)

Discipline Elective Course (Total 6 credits)

BBSE1012 Engineering training (6 credits) (Summer semester)¹

¹ BBSE1012 can be used to fulfill the requirement of 18 credits of Discipline Elective courses

Second Year

The second-year syllabus shall normally include the following courses:

Discipline Core Courses (Total 45 credits)

- BBSE2001 Utility services (6 credits)
- BBSE2002 Electrical power supply and lighting engineering (3 credits)
- BBSE2005 Air conditioning and refrigeration I (3 credits)
- MECH2001 Applied dynamics (3 credits)
- MECH2002 Engineering thermodynamics (6 credits)
- MECH2004 Control (3 credits)
- MECH2006 Electrical and electronic engineering (6 credits)
- MECH2007 Mathematics II (6 credits)
- MECH2008 Mechanics of fluids (6 credits)
- MECH2010 Properties of materials II (3 credits)

Complementary Studies Course (Total 3 credits)

- MECH2011 Engineering economics (3 credits)

UG5 requirements (Total 12 credits)

- 2 University Common Core Courses (12 credits)

Discipline Elective Course (Total 6 credits)

- BBSE2006 Industrial training (6 credits) (Summer semester)¹

Third Year

The third-year syllabus shall normally include the following courses:

Project Courses (Total 18 credits)

- BBSE3002 Applied research project (12 credits)
- BBSE3005 Inter-disciplinary building services design (6 credits)

Complementary Studies Course (Total 6 credits)

- MECH3010 Engineering and technology management (6 credits)

Discipline Core Courses (Total 18 credits)

- BBSE3003 Fire protection engineering (6 credits)
- BBSE3006 Air conditioning and refrigeration II (3 credits)
- BBSE3007 Project and contract management (3 credits)
- MECH3023 Building energy management and control systems (6 credits)

Discipline Elective Courses (Total 18 credits)

Students are required to complete 18 credits of Discipline Elective courses in the following manner:

¹ BBSE2006 can be used to fulfill the requirement of 18 credits of Discipline Elective courses

- (i) Elective Breadth/Depth Courses (up to 18 credits)
- (ii) Elective MSc(Eng) courses (up to 6 credits)
- (iii) Elective Course (up to 6 credits)

Elective Breadth/Depth Courses (up to 18 credits)

MECH2016	Fundamentals of aeronautical engineering (6 credits)
MECH3001	Acoustics (3 credits)
MECH3002	Air pollution control (6 credits)
MECH3004	Automatic control (6 credits)
MECH3006	Case studies of failure investigations (6 credits)
MECH3007	Computer-aided design and manufacture (CAD/CAM) (6 credits)
MECH3009	Energy conversion systems (6 credits)
MECH3011	Heat transfer (6 credits)
MECH3012	Product design and development (6 credits)
MECH3014	Materials for engineering applications (6 credits)
MECH3020	Vibration (6 credits)
MECH3021	Viscous flow (6 credits)

Elective MSc(Eng) courses (up to 6 credits)

MECH6024	Applied mathematics for engineers (3 credits)
MECH6028	Processing and properties of engineering plastics (3 credits)
MECH6040	Foundations of nanotechnology (3 credits)

Elective Course (up to 6 credits)

Any other elective course as approved by the department (6 credits)

Minor Programmes

From 2010-11 academic year, candidates from other than the Department of Mechanical Engineering may pursue a Minor in Mechanical Engineering or Minor in Mechanical Engineering – Building Services Engineering. Candidates who are interested in pursuing minor in Mechanical Engineering must satisfy the following prerequisites:

- Passed in HKALE Pure Mathematics and
- Passed in HKAL/AS Physics/Engineering Science

Minor in Mechanical Engineering

Candidates are required to complete a total of 36 credits of courses comprising:

- (a) Introductory courses (12 credits)

Students are required to complete:

ENGG1010	Foundations of engineering mechanics (6 credits)*
MECH1014	Thermofluids (6 credits)

(b) Advanced Elective courses (24 credits)

Students must complete 24 credits of advanced elective courses to be chosen from the following list:

MECH1004	Drawing and elements of design and manufacture (6 credits)
MECH1013	Engineering mechanics (6 credits)
MECH2001	Applied dynamics (3 credits)
MECH2002	Engineering thermodynamics (6 credits)
MECH2004	Control (3 credits)
MECH2005	Design and manufacture (6 credits)
MECH2008	Mechanics of fluids (6 credits)
MECH2009	Mechanics of solids (6 credits)

Minor in Mechanical Engineering – Building Services Engineering

Candidates are required to complete a total of 36 credits of courses comprising:

(a) Introductory courses (12 credits)

Students are required to complete:

ENGG1010	Foundations of engineering mechanics (6 credits)*
MECH1014	Thermofluids (6 credits)

(b) Advanced Elective courses (24 credits)

Students must complete 24 credits of advanced elective courses to be chosen from the following list with at least 9 credits of courses selected from those with course code BBSExxx:

MECH1004	Drawing and elements of design and manufacture (6 credits)
MECH1013	Engineering mechanics (6 credits)
MECH2002	Engineering thermodynamics (6 credits)
MECH2008	Mechanics of fluids (6 credits)
BBSE2001	Utility services (6 credits)
BBSE2002	Electrical power supply and lighting engineering (3 credits)
BBSE2005	Air conditioning and refrigeration I (3 credits)
BBSE3006	Air conditioning and refrigeration II (6 credits)

*Students opting for the Minor cannot use the course “ENGG1010 Foundations of engineering mechanics” as satisfying the requirements of the General Engineering Course.

Double-Degrees in BEng/BBA

Candidates pursuing studies for the double-degrees in BEng/BBA curriculum are required to satisfy all the requirement of the above BEng curriculum and pass 54 credits of courses as listed below:

Course Code	Course	Credits
BUSI1002	Introduction to accounting	6
BUSI1003	Introduction to management information system	6
BUSI1004	Marketing	6
BUSI1007	Principles of management	6
ECON1001	Introduction to economics I	6

FINA1003	Corporate finance	6
BUSI0027	Management accounting I	6
	Business Electives (Any 2 courses in Finance, HRM or Marketing major)	12
	Total	54

Candidates pursuing studies for the double-degrees in BEng/BBA curriculum are granted exemptions from the following courses:

Courses in the BEng curriculum to be exempted	Corresponding Business courses completed
CAES1513 Professional and technical written communication for engineers (3 credits)	CAES1907 Business communication (3 credits)
MECH2011 Engineering economics (3 credits) MECH3010 Engineering and technology management (6 credits) BBSE3007 Project and contract management (3 credits) One Elective Course (6 credits)	ECON1001 Introduction to Economics I (6 credits) BUSI1003 Introduction to management information system (6 credits) BUSI1007 Principles of management (6 credits)

COURSE DESCRIPTIONS

Level One

BBSE1012. Engineering training (6 credits)

Knowledge and use of hand and machine tools; sheet metal work; welding; fixing and jointing of cables and pipes; construction, assembly and appreciation of electrical and mechanical systems; properties of metals and other building materials.

Assessment: 100% practical work

MECH1004. Drawing and elements of design and manufacture (6 credits)

Engineering drawing techniques; orthographic and pictorial projections; dimensioning and tolerancing, limits and fits, screw fasteners; cam; gears; computer aided drafting, with 3D CAD modeling; manufacturing processes, process selection, design for manufacturability.

Assessment: 100% continuous assessment

MECH1005. Fundamentals of electrical and electronic engineering (6 credits)

Basic circuit principles; steady-state A.C. circuit theory; magnetic circuits; transformers; bipolar junction transistors; field effect transistors; direct-current motors; solid-state controller for D.C. motors; combinational logic circuits.

Assessment: 15% practical work; 85% examination

MECH1009. Properties of materials I (3 credits)

Elements of atomic structure and bonding; crystal structure; defect theory; solidification; plastic deformation; recrystallization; phase diagrams; alloy properties; TTT diagrams; heat treatment.

Assessment: 15% practical work; 85% examination

MECH1013. Engineering Mechanics (6 credits)

Stress and strain; bending of beams; deflection of beams; thin-walled pressure vessels; kinematics of particles with different forms of accelerations; momentum and energy conservation; applications of kinetic principles to particles and vehicles with mass variation; velocity-dependent resistance and the action of central forces; undamped and damped free vibration; simple and epicyclic gear trains.

Assessment: 10% practical work; 10% continuous assessment; 80% examination

MECH1014. Thermofluids (6 credits)

Concepts and definitions; properties of pure substance; heat and work; first law of thermodynamics; second law of thermodynamics; entropy; basic concepts on fluids and flows; dimensional analysis, similarity and modelling; momentum theorems and pipe flow analysis.

Assessment: 10% practical work; 90% examination

- ENGG1002. Computer programming and applications (6 credits)**
- ENGG1003. Mathematics I (6 credits)**
- ENGG1004. Mathematics IA (3 credits)**
- ENGG1005. Mathematics IB (3 credits)**
- ENGG1006. Engineering for sustainable development (6 credits)**
- ENGG1010. Foundations of engineering mechanics (6 credits)**
- ENGG1016. Computer programming and applications I (6 credits)**

Please refer to the General Engineering courses in the syllabus for the degree of BEng for details.

CENG1001. Practical Chinese language course for engineering students (3 credits)

Please refer to the University Language Enhancement Courses in the syllabus for the degree of BEng for details.

CAES1513. Professional and technical written communication for engineers (3 credits)

The focus of this course is the function and importance of professional and technical communication in English and specifically understanding and using written English. Topics include accessing, abstracting, analysing, organizing and summarizing information; making effective grammatical and lexical choices; technical report writing; small-scale project design and implementation.

Assessment: 100% continuous assessment

CAES1515 Professional and technical oral communication for engineers (3 credits)

This course focuses on students developing technical and professional spoken English skills. Throughout the course, the students will give a series of presentations which will help them to improve skills such as accessing, abstracting, analyzing, organizing and summarizing information; asking questions and negotiating meanings; making effective grammatical and lexical choices and using visual aids to ensure meaning is clear. The presentations give the students an opportunity to develop the skills to talk about general issues in Engineering in the Hong Kong context, engineering theories and their practical applications and also requires them to present a detailed exploration of one aspect of engineering related to their chosen major.

Assessment: 100% continuous assessment

CCXXxxxx University Common Core course (6 credits)**CCXXxxxx University Common Core course (6 credits)****Level Two****BBSE2001. Utility services (6 credits)**

Characteristics and design of different service installations: cold, hot and flushing water supply systems; steam supply, sanitary and stormwater; drainage systems; vertical transportation system; L.V. electrical system; communication systems; security and alarm systems.

Assessment: 20% continuous assessment; 80% examination

BBSE2002. Electrical power supply and lighting engineering (3 credits)

Design of electricity distribution in buildings; earthing and bonding requirements; protective devices; standby generators and power supplies; lightning protection; I.E.E. regulations and codes of practice; light production and measurement; photometry and colorimetry; human perception; artificial lighting and daylighting; lighting design for interior and exterior lighting.

Assessment: 20% continuous assessment; 80% examination

BBSE2005. Air conditioning and refrigeration I (3 credits)

Air conditioning systems; psychrometry; thermal comfort criteria; fresh air requirement; indoor air quality and pollutants; heating and cooling load estimation; energy consumption estimation; air conditioning processes and systems; refrigerants and refrigeration systems; refrigeration cycles and components.

Assessment: 10% practical work; 10% continuous assessment; 80% examination

BBSE2006. Industrial training (6 credits)

Training in industry for a nominal period of at least six weeks during the summer vacation of the Second Year of Study

Assessment: 100% practical work

MECH2001. Applied dynamics (3 credits)

Advanced rotational motion; balancing of rotating and reciprocating masses; vibration isolation and control; vibration of multi degree-of-freedom in-line systems; free transverse vibration of beams.

Assessment: 10% practical work; 10% continuous assessment; 80% examination

MECH2002. Engineering thermodynamics (6 credits)

Steam and gas power plant; refrigeration; jet propulsion and turbomachinery; gas mixture; psychrometry and air-conditioning, introduction to heat transfer.

Assessment: 10% practical work; 10% continuous assessment; 80% examination

MECH2004. Control (3 credits)

Modelling of physical systems; time response analysis of dynamical systems; feedback control systems; control system design and applications; stability; root locus method; analogue computer programming

Assessment: 20% continuous assessment; 80% examination

MECH2006. Electrical and electronic engineering (6 credits)

Analog electronics; sequential logic circuits; digital-to-analog and analog-to-digital converters; introduction to microcontrollers; three-phase power systems; induction motors; synchronous motors; step motors; solid-state controllers for A.C. motors.

Assessment: 10% practical work; 90% examination

MECH2007. Mathematics II (6 credits)

Complex variables; Fourier series and Fourier transforms; partial differential equations; introduction to probability and statistics, elementary numerical analysis.

Assessment: 20% continuous assessment; 80% examination

MECH2008. Mechanics of fluids (6 credits)

Navier-Stokes equations; pipe and channel viscous flows; lubrication; boundary layer flows; two-dimensional potential flows; open-channel flows; fluid machines.

Assessment: 10% practical work; 10% continuous assessment; 80% examination

MECH2010. Properties of materials II (3 credits)

Testing and service behaviour of materials; metallurgy of fatigue; theory of creep resistant alloys; the ductile/brittle transition; corrosion resistance; surface treatment; selection criteria for common alloys; structure of polymers; properties of compounded plastics; service behaviour of plastics.

Assessment: 10% practical work; 10% continuous assessment; 80% examination

MECH2011. Engineering economics (3 credits)

Time value of money; interest and interest formulas; equivalent analysis; bases for comparison of alternatives; present worth analysis; annual equivalent worth analysis; rate of return analysis; project cash flow analysis; decision making among alternatives; applications to real-world economy.

Assessment: 10% continuous assessment; 90% examination

MECH2016. Fundamentals of aeronautical engineering (6 credits)

History of aeronautical science; wing aerodynamics; propulsion; flight mechanics; systems and airframe structures; lightweight materials, failure modes, high-temperature materials, creep damage; maintenance.

Assessment: 10% practical work; 10% continuous assessment; 80% examination

Level Three**BBSE3002. Applied research project (12 credits)**

The project aims at the application of knowledge acquired during the course of the programme to a research investigation in building services systems targeted at achieving a novel design or an improvement in functionality, performance or cost savings.

Assessment: 100% continuous assessment

BBSE3003. Fire protection engineering (6 credits)

Fire behaviour and characteristics; compartment fires; fire hazards; automatic fire detection and alarm systems; automatic fixed water-based and gas-based fire extinguishing systems; special fire extinguishing systems; portable fire extinguishers; smoke production; smoke management and control systems; staircase pressurization systems; building evacuation; LPC/FOC rules; FSD and NFPA codes; prescriptive and performance-based approaches; fire risk management.

Assessment: 10% practical work; 10% continuous assessment; 80% examination

BBSE3005. Inter-disciplinary building services design (6 credits)

Inter-disciplinary building services design; design rationales; conceptual design of air conditioning, plumbing and drainage, fire services, electrical power supply, vertical transportation, and lighting systems; detailed design; requirements for teamwork and integration; tectonics considerations.

Assessment: 50% practical work ; 50% continuous assessment

BBSE3006. Air conditioning and refrigeration II (3 credits)

Air-side systems; fan design and control; major components and equipment; air duct design; space air diffusion; water-side systems; piping system design; pump design and operation; flow rate

measurements; analysis of thermal load and energy consumption; mechanical and natural ventilation; ventilation efficiency; design of refrigeration systems; refrigeration system components and performance.

Assessment: 10% practical work; 10% continuous assessment; 80% examination

BBSE3007. Project and contract management (3 credits)

Characteristics of building services projects and contracts; role of architect, consultants, quantity surveyor, builder and subcontractors; statutory requirements; project planning, scheduling and control; contract documentation and contractual arrangement; estimating and tendering; site organization and supervision; measurement and valuation of work; claim management and settlement; alternative dispute resolution.

Assessment: 20% continuous assessment; 80% examination

MECH3001. Acoustics (3 credits)

Human hearing; environmental noise measurement and legislation; source mechanisms; duct acoustics; sound reverberation in rooms; noise transmission through walls and windows; active and passive noise control.

Assessment: 10% practical work; 90% examination

MECH3002. Air pollution control (6 credits)

Particulate and aerosol abatement technology; gas absorption - plate and packed columns; adsorption for the removal of odours and trace gases; combustion fundamentals and abatement of volatile organic compounds using incineration techniques.

Assessment: 10% continuous assessment; 90% examination

MECH3004. Automatic control (6 credits)

Control of mechanical, hydraulic and pneumatic systems; frequency domain analysis, Nyquist stability criterion; linear control system design; computer control systems, state-space analysis of multivariable linear system, controllability and observability, stability analysis; state feedback.

Assessment: 10% practical work; 90% examination

MECH3006. Case studies of failure investigations (3 credits)

General introduction to failure investigation procedures, purpose, scope, and limitation; failure mode detected from component examination; cause of failure determination through system case studies; design codes for large structures; fracture mechanics techniques; legislation affecting safety of equipment; roles of a mechanical engineer as an expert witness.

Assessment: 20% practical work; 30% continuous assessment; 50% examination

MECH3007. Computer-aided design and manufacture (CAD/CAM) (6 credits)

Basic data structuring techniques; transformation techniques; mathematical bases for surface modeling; principles of solid modeling and applications; numerical control; computer-aided production technologies; computer-integrated manufacturing.

Assessment: 30% continuous assessment; 70% examination

MECH3009. Energy conversion systems (6 credits)

Energy calculations; solar thermal power plant; energy storage; solar photovoltaic systems; wind energy systems; nuclear energy and power plants; nuclear waste management; urban waste.

Assessment: 10% continuous assessment; 90% examination

MECH3010. Engineering and technology management (6 credits)

Quantitative methods for engineering and technology management; managing technology through the product life cycle; planning; organizing; staffing; leading; controlling, quantitative methods for analyzing / solving decision making involving engineering and technology management problems; quantitative methods for forecasting; resource allocations subject to constraints; linear programming and simplex method; decision theory with the application of decision trees; inventory control models; queuing theory; transportation and resource allocation for business operations.

Assessment: 20% continuous assessment; 80% examination

MECH3011. Heat transfer (6 credits)

Fourier's law; heat-conduction equation; steady and unsteady conduction; basic convection principles; laminar and turbulent heat transfer in tubes and over plates; Reynolds analogy; log mean temperature difference; effectiveness-NTU method; heat exchanger design; exergy analysis; optimisation of heat transfer process and system.

Assessment: 10% continuous assessment; 90% examination

MECH3014. Materials for engineering applications (6 credits)

Materials for high strength/weight ratio; high and low temperature service; resistance to corrosion resistance and protection; residual stresses; composite and ceramic materials; manufacturing properties; problem based learning module; introduction to materials classification.

Assessment: 10% practical work; 10% continuous assessment; 80% examination

MECH3020. Vibration (6 credits)

Vibration measurement; single- and two-plane balancing of rotors in situ, machinery condition monitoring; random vibration; digital signal analysis; matrix analysis of free and forced vibrations of multi-degree-of-freedom systems; classical analysis of beam vibration; energy methods for approximate vibration analysis.

Assessment: 10% practical work; 10% continuous assessment; 80% examination

MECH3021. Viscous flow (6 credits)

Eulerian and Lagrangian descriptions; Navier-Stokes equations; low-Reynolds-number flows; laminar boundary layers; laminar stability theory; turbulent flows.

Assessment: 10% practical work; 10% continuous assessment; 80% examination

MECH3023. Building energy management and control systems (6 credits)

Concepts of distributed computer-based monitoring and control; hardware and software development; communication protocols; application to maintenance, energy management and control; system design and performance evaluation; computer simulation and emulation techniques; analysis of dynamic building services systems.

Assessment: 10% practical work; 10% continuous assessment; 80% examination

MECH6024. Applied mathematics for engineers (3 credits)

Statistical and numerical methods in engineering; hypothesis testing; estimation of parameters and confidence intervals; correlation coefficient; direct and iterative methods for systems of equations; numerical analysis; finite difference and finite element schemes; wave propagation and vibration; normal modes.

Assessment: 100% examination

MECH6028. Processing and properties of engineering plastics (3 credits)

Viscosity of polymer melts; extrusion; injection moulding; blow moulding; joining; plating; yield criteria; environmental stress cracking; UV degradation; flame retardation; biodegradable polymers; viscoelastic behaviour of plastics; dynamic behaviour; design methods for plastics based on creep data.

Assessment: 100% examination

MECH6040. Foundations of nanotechnology (3 credits)

Characteristic length scales, nanomaterials, nanostructures, physical properties of nanostructures, deposition techniques of nanofabrication, high resolution analysis and characterization, scanning probe methods, nanoindentation, deformation of nanostructures, mechanical behaviours of nanocrystalline solids, ultra-high strength of nanostructures, sensors, actuators, MEMS, NEMS, functional nanomaterials, nano-scale devices, modelling and computer-aided designs, bio-nanotechnology.

Assessment: 100% examination