

MEDICAL ENGINEERING

SYLLABUS

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

Definitions and Terminology

Each course offered for the BEng in Medical Engineering curriculum 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 generally classified as introductory courses whereas advanced courses includes Level Two and Three courses.

A *Compulsory course* is a course which a student must study. A *Core Engineering course* is a Compulsory course which a student must pass in the manner as stipulated in the Regulations.

The Projects shall include MEDE2008 integrated project and MEDE3002 final-year project. The *training course* in this curriculum consists of MEDE1010 Engineering Training and MEDE2010 Professional Training.

An *Elective course in Medical Engineering* is a Level 2 or Level 3 course offered as an optional course for the curriculum.

Loading

The normal load for a student is 60 credits of courses (excluding summer vacation) per academic year with 30 credits in each semester. Students are allowed to increase the loading by not more than 6 credits in a semester or decrease the loading by the equivalent number of credits which they have previously taken as additional loading and passed.

Curriculum Requirement

The curriculum comprises 186 credits of courses as follows:

- (a) 114 credits of Core Engineering courses
- (b) 30credits of Compulsory courses
- (c) at least 6 credits of elective courses in Medical Engineering
- (d) 21 credits of courses satisfying the UG5 requirements:
 - (i) Professional and technical communication for medical engineering students (3 credits)
 - (ii) Professional and technical oral communication for engineers (3 credits)
 - (iii) Practical Chinese language course for engineering students (3 credits)
 - (iv) Two courses from the Common Core Curriculum, selecting no more than one course from each Area of Inquiry (12 credits)
- (e) at least 9 credits of Complementary Studies courses comprising:
 - (i) Medical engineers in society (3 credits)
 - (ii) Engineering organization and management (3 credits)
 - (iii) Engineering economics and finance (3 credits)
- (f) Engineering training (3 credits)
- (g) Professional training (3 credits)

To complete the degree requirement, a student must obtain at least 186 credits including all courses listed under (a) to (g).

Order of Study

Order of study is dictated by pre-requisite and co-requisite requirements. Generally, Level 1 course should be taken before Level 2 courses, Level 2 courses should be taken before Level 3 courses. Elective course in Medical Engineering can be taken in any order as long as pre-requisites are met.

Degree Classification

The best 180 credits including the courses below shall be taken into account:

- (i) 9 credits of Complementary courses;
 - (ii) 21 credits of courses satisfying the UG5 requirements;
 - (iii) 114 credits of Core Engineering Courses;
 - (iv) the remaining courses with the best results, including at least 6 credits of elective courses in Medical Engineering and 30 credits of Compulsory courses.
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The programme structure is as follows:

FIRST YEAR

Core Engineering Courses (Total 39 credits)

ENGG1015	Introduction to electrical and electronic engineering (6 credits)
ENGG1010	Foundations of engineering mechanics (6 credits)
ENGG1011	Introduction to biomedical engineering (6 credits)
MEDE0001	Life science I (Biochemistry) (6 credits)
MEDE1003	Introduction to engineering materials (3 credits)

either

ENGG1002	Computer programming and applications (6 credits)
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or

ENGG1016	Computer programming and applications I (6 credits)
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either

ENGG1003	Mathematics I (6 credits)
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or

ENGG1004	Mathematics IA (3 credits) and
ENGG1005	Mathematics IB (3 credits)

Complementary Studies Courses (Total 3 credits)

MEDE1018	Medical engineers in society ¹ (3 credits)
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¹ Students pursuing the studies of double-degrees in BEng/BBA are allowed a waiver from taking these courses, the credits of which will be replaced by the required courses in Finance, HRM or Marketing major offered by the Faculty of Business and Economics to satisfy the Medical Engineering Curriculum requirement.

UG5 Requirements (Total 21 credits)

CAES1511	Professional and technical communication for medical engineering students (3 credits) ¹
CAES1515	Professional and technical oral communication for engineers (3 credits)
CENG1001	Practical Chinese language course for engineering students (3 credits) ²
Two Common Core Courses (12 credits)	

Engineering Training (Total 3 credits)

MEDE1010	Engineering training ¹ (3 credits)
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SECOND YEAR**Core Engineering courses (Total 57 credits)**

ELEC1401	Computer organization and microprocessors (6 credits)
or	
ELEC1306	Electric and electronic circuits (6 credits)
MECH2007	Mathematics II (6 credits)
MEDE0002	Life science II (Cell Biology & Physiology) (6 credits)
MEDE2001	Biomechanics for medical engineering (6 credits)
MEDE2002	Electromagnetics in biomedicine (6 credits)
MEDE2004	Biomaterials I (3 credits)
MEDE2005	Thermofluids for medical engineering (6 credits)
MEDE2007	Medical imaging (6 credits)
MEDE2008	Integrated project (6 credits)
MEDE2201	Signals and linear systems (6 credits)

Complementary Studies Courses (Total 3 credits)

MEDE2802	Engineering organization and management ¹ (3 credits)
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Professional Training (Total 3 credits)

MEDE2010	Professional training ¹ (3 credits)
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THIRD YEAR**Core Engineering Course (Total 18 credits)**

MEDE3002	Medical engineering final year project (12 credits)
LIFE2004	Life sciences III (Physiology) (6 credits)

Compulsory Courses (Total 30 credits)

MEDE2006	Statistical planning and analysis for biomedical studies (3 credits)
MEDE2009	Biophotonics (6 credits)
MEDE3001	Tissue engineering (3 credits)

¹ Students pursuing the double degrees in BEng/BBA are required to take CAES1907 in lieu of CAES1511.

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.

MEDE3003	Biomaterials II (3 credits)
MEDE3005	Transport phenomena in biological systems (6 credits)
MEDE3006	Medical devices (3 credits)
MEDE3007	Molecular and cellular biomechanics (6 credits)

Elective Courses in Medical Engineering¹ (Total 6 credits)

Recommended Elective Courses

MECH6040	Foundations of nanotechnology (3 credits)
ELEC6067	Magnetic resonance imaging (MRI) technology & applications (3 credits)
ELEC6079	Biomedical ultrasound (3 credits)
ELEC6081	Biomedical signals and systems (3 credits)
BIOC3608	Introduction to bioinformatics (6 credits)

Additional Elective Course

Group A: Biomechanics, Biomaterials, Tissue Engineering

MECH2001	Applied dynamics (3 credits)
MECH2004	Control (3 credits) (cannot be taken with ELEC2205)
MECH2005	Design and manufacture (6 credits)
MECH6024	Applied mathematics for engineers (3 credits)

Group B: Medical Electronics and Biomedical Imaging

ELEC2204	Digital signal processing (6 credits)
ELEC2205	Control and instrumentation (6 credits) (cannot be taken with MECH2004)
ELEC2302	Digital system design (6 credits)
ELEC2601	Human computer interaction (6 credits)
ELEC3216	Robotics (3 credits)
ELEC3505	Image and video processing (6 credits)
CSIS0278	Introduction to database management systems (6 credits)

Complementary Studies Course (Total 3 credits)

ELEC2804	Engineering economics and finance ¹ (3 credits)
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The list of Elective courses is updated regularly and some courses may not be offered every year. Students are encouraged to consult the Programme Director or other teachers in Medical Engineering for advice on planning their curriculum, especially in the third-year. Due to the interdisciplinary nature of the Medical Engineering Programme, students may be permitted to take courses outside the list of Elective Courses in Medical Engineering subject to the approval of the Programme Director.

Double-degrees in BEng/BBA option

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

¹ Students pursuing the studies of double-degrees in BEng/BBA are allowed a waiver from taking these courses, the credits of which will be replaced by the required courses in Finance, HRM or Marketing major offered by the Faculty of Business and Economics to satisfy the Medical Engineering Curriculum requirement.

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

Exemption rule for students pursuing the BEng/BBA double degrees option:

For students pursuing the double degrees in BEng/BBA option, they are deemed to have satisfied the following courses:

- 9 credits of Complementary Studies
- 6 credits of Elective course in Medical Engineering
- 3 credits of Engineering training
- 3 credits of Professional training
- 3 credits of Compulsory course

after they have successfully completed all the courses from the following list:

Course Code	Course	Credits
BUSI1002	Introduction to accounting	6
BUSI1003	Introduction to management information systems	6
BUSI1004	Marketing	6
BUSI1007	Principles of management	6
ECON1001	Introduction to economics I	6
FINA1003	Corporate finance	6
BUSI0027	Management accounting I	6

COURSE DESCRIPTIONS

Level One

- ENGG1002. Computer programming and applications (6 credits)**
- ENGG1003. Mathematics I (6 credits)**
- ENGG1004. Mathematics IA (3 credits)**
- ENGG1005. Mathematics IB (3 credits)**
- ENGG1010. Foundations of engineering mechanics (6 credits)**
- ENGG1011. Introduction to biomedical engineering (6 credits)**
- ENGG1015. Introduction to electrical and electronic engineering (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.

MEDE0001. Life science I (Biochemistry) (6 credits)

This course presents an overview and an understanding of the basic mechanisms underlying life processes. Topics include chemistry of life – pH, water, etc; fundamental bioenergetics; biomolecules and their functions; intermediary metabolism; enzymes and coenzymes; nucleic acids and genetic information.

Assessment: 30% continuous assessment, 70% examination

MEDE1003. Introduction to engineering materials (3 credits)

Elements of atomic structure and bonding; crystal structure; metals, ceramics and polymers; defects; solidification; plastic deformation and fracture; recrystallization; phase diagrams; alloy properties; service behaviour of plastics and metals.

Assessment: 10% practical work, 90% examination

CAES1511. Professional and technical communication for medical engineering students (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 presentation 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 is wholly by coursework.

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

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.

MEDE1018. Medical engineers in society (3 credits)

Interaction between engineers and society; impact of technologies on society; environmental and safety issues; professional conduct and responsibility; contract law; law of tort; professional negligence and intellectual property law; medical ethics; safety in clinical practice and biomedical research.

Assessment: 100% continuous assessment

MEDE1010. Engineering training (3 credits)

The focus of this course is on practical training. It helps students to appreciate the processes and technologies through demonstrations and hands-on experience. The topics include computer-aided drafting; design; modeling and prototyping; CNC machining principles; metrology equipment; materials processing; strain gauging; virtual instrumentation; microcontroller applications.

Assessment: 100% continuous assessment

12 credits of courses from the Common Core Curriculum**Level Two****ELEC1401. Computer organization and microprocessors (6 credits)**

Integer and floating point number representations; brief introduction to digital circuits; memory cells and systems; basic computer building blocks; register transfers and phases of instruction execution; micro-computer system organization - bus signals, timing, and address decoding; study of a simple model microprocessor: signals, instruction set and addressing modes; subroutines; reentrancy; context switching; I/O programming; interrupt I/O and DMA; exception handling; assembler, linker and loader.

Assessment: Please refer to the information provided by the Department of Electrical and Electronic Engineering

ELEC1306. Electric and electronic circuits (6 credits)

Electric circuits: Kirchhoff's laws, Thevenin and Norton theorems, superposition, mesh and nodal analyses; ideal operational amplifiers; d.c. circuit analysis; a.c. circuit analysis. Electronic circuits: diode circuits; analyses of BJT and FET amplifiers; digital circuits. Combinational logic elements and design; sequential circuits; application examples of digital circuits.

Assessment: Please refer to the information provided by the Department of Electrical and Electronic Engineering

MECH2007. Mathematics II (6 credits)

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

Assessment: Please refer to the information provided by the Department of Mechanical Engineering

MEDE0002. Life Sciences II (Cell Biology and Physiology) (6 credits)

This course introduces cell and tissue functions that impact on physiology of the human body. Topics include chromosome structure and gene expression; plasma membrane and subcellular organelles; cytoskeleton and cell movement; extracellular matrix and cell-matrix interactions; tissue organization; homeostasis involving the cardiovascular, respiratory, musculoskeletal and nervous systems.

Assessment: 25% continuous assessment, 75% examination

MEDE2001. Biomechanics for medical engineering (6 credits)

Kinematic analysis of linkage mechanisms; stress and strain; bending and deflection of beams. Human musculoskeletal system; biomechanical analysis of the human musculoskeletal system; bone fracture & fixation ; biomechanics of the spine; selected topics in biomechanics; biomechanical analysis of the human gait and motion.

Assessment: 15% practical work, 85% examination

MEDE2002. Electromagnetics in biomedicine (6 credits)

The aim of this course is two fold. First, fundamental physics and mathematics in electricity and magnetism are reviewed. Vector analysis is included. Second, emphasis is placed on the biological aspects of electromagnetism and the biomedical applications of electromagnetism.

Assessment: 20% continuous assessment, 80% examination

MEDE2004. Biomaterials I (3 credits)

Definitions in biomaterials science and engineering; history of biomaterials science; review of engineering materials; structure and properties of biological materials; processing, structures and properties of biomaterials; tissue engineering; analytical and testing techniques for developing new biomaterials; interaction between human body environment and biomaterials.

Assessment: 20% practical work, 10% continuous assessment, 70% examination

MEDE2005. Thermofluids for medical engineering (6 credits)

Concepts and definitions; thermodynamic properties; heat and work; first law of thermodynamics; fluid kinematics; constitutive relations; blood rheology; continuity and momentum equations; dimension analysis, similarity and modeling; solute fluxes in mixture; Fick's law; bio-mass transport.

Assessment: 10% practical work, 90% examination

MEDE2007. Medical imaging (6 credits)

Provides an introduction to the clinical non-invasive techniques in studying the functional and pathological aspects of the human body. This course will introduce the principles of conventional (x-ray and ultrasound) and modern (Computer Assisted Tomography – CAT; Magnetic Resonance Imaging – MRI; and Positron Emission Tomography – PET) imaging techniques applied to biological tissues and in medical diagnoses and the interpretations of these images. It will also briefly introduce the hospital PACS (picture archiving computer system) and emerging medical imaging technologies.

Assessment: 15% continuous assessment, 85% examination

MEDE2008. Integrated project (6 credits)

A group project consisting of guided design and implementation of a medical engineering application. This project offers students in small teams an opportunity to integrate their knowledge in engineering techniques and know-how, as well as project management, following a disciplined engineering process, to achieve the final goal.

Assessment: 100% practical work

MEDE2201. Signals and linear systems (6 credits)

Linear time-invariant systems; continuous-time signals; convolution; frequency response; time-domain and frequency-domain representation of discrete-time signals and systems; continuous and discrete Fourier transform; z-transform; A/D and D/A conversion; sampling and reconstruction; digital filters; examples in biomedical engineering applications.

Assessment: 20% practical work, 10% continuous assessment, 70% examination

MEDE2802. Engineering organization and management (3 credits)

Management concepts, decision making processes, project management, leadership, management control, marketing.

Assessment: 30% continuous assessment, 70% examination

MEDE2010. Professional training (3 credits)

Assessment: 100% continuous assessment

Level Three**MEDE3002. Medical engineering final year project (12 credits)**

A dissertation or report on a topic consisting of design, experimental or analytical investigations. Six hours of lecturing will be introduced to discuss topics on (1) biomedical literature search; (2) experimental designs to address medical problems or questions; (3) data analysis and interpretation; and (4) medical engineering report preparation and presentation.

Assessment: 100% continuous assessment

LIFE2004. Life Sciences III (Physiology) (6 credits)

This course focuses on human physiology and pathophysiology. Topics include heart and cardiovascular system and disorders; brain and neurological system and disorders; musculoskeletal system and disorders; respiration and breathing mechanics and will be illustrated with examples of quantitative analyses, where relevant.

Assessment: 30% continuous assessment, 70% examination

MEDE2006. Statistical planning and analysis for biomedical studies (3 credits)

To understand the principles and concepts in statistical methodology commonly used for biomedical investigations; to apply the statistical tools in planning for biomedical studies, managing and analyzing data generated from these studies; to appreciate the principles and concepts for critical appraisal of biomedical literature

Assessment: 20% continuous assessment, 80% examination

MEDE2009. Biophotonics (6 credits)

This is an introductory course in optics and photonics covering the basic concepts of ray optics, imaging system design, electromagnetic waves, propagation characteristics of light through media, Fourier optics, and other optical phenomena such as interference and diffraction. Modern topics in photonics such as optical waveguides, fiber optics, lasers are also discussed. Their applications in biomedical areas are also included, such as optical microscopy and spectroscopy for medical diagnosis, laser therapy, micro-endoscopy, and optical biosensing.

Assessment: 60% continuous assessment, 40% examination

MEDE3001. Tissue engineering (3 credits)

To understand the basic composition of engineered tissues; appreciate the breadth and depth of the engineering considerations when designing tissue substitutes; introduce the current technological advances enabling the tissue engineering sectors and the future trends; review some real examples of engineered tissue, skin and cartilage as the only marketed products and candidates in R&D stage; outline other key issues such as safety and regulations.

Assessment: 20% practical work, 80% examination

MEDE3003. Biomaterials II (3 credits)

Medical devices and tissue replacement; medical device regulations; standards; ethical issues; medical device evaluation; hard tissue replacement; soft tissue replacement; new trends and emerging technologies.

Assessment: 20% continuous assessment, 80% examination

MEDE3005. Transport phenomena in biological systems (6 credits)

Basic fluid flow problems in biomechanics; non-Newtonian rheology; flow in porous media; conservation of mass, momentum and energy; diffusion; diffusion with convection; Taylor dispersion; hemodialysis; biomedical and biotechnological applications.

Assessment: 100% examination

MEDE3006. Medical devices (3 credits)

Provides a practical introduction to various medical devices in modern healthcare industries, including the basic principals and applications of commonly used medical instruments and devices, monitoring and analysis equipment, therapeutic equipment, software systems, and the safety and regulatory issues.

Assessment: 20% practical work, 40% continuous assessment, 40% examination

MEDE3007. Molecular and cellular biomechanics (6 credits)

The focus of this course is on the physics of molecular biology and the mechanics of the cell. Topics include: (1) Biopolymer (actin filaments, microtubules, DNA etc.) conformations and dynamics (random walk model of polymers, worm-like chain model, persistence length, entropic driven elasticity); (2) Basic statistical mechanics and thermodynamics of solutions (entropy of mixing, Osmotic pressure); (3) Introduction to intermolecular interactions (electrostatic force, van der Waals force); and (4) Mechanics of the cell (membrane elasticity, cell shape, cell adhesion).

Assessment: 40% continuous assessment, 60% examination

ELEC2804. Engineering economics and finance (3 credits)

Macroeconomics; financial instruments; accounting concepts and financial statements; costs and profit; economic evaluation.

Assessment: Please refer to the information provided by the Department of Electrical and Electronic Engineering

Elective Courses in Medical Engineering

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: Please refer to the information provided by the Department of Mechanical Engineering

ELEC6067. Magnetic resonance imaging (MRI) technology and applications (3 credits)

Fundamentals of Nuclear Magnetic Resonance (NMR); introduction to MR imaging system; design principle of permanent and super-conducting magnets; RF antennas (probes), gradient coils, RF transmitter and receivers; signal processing and imaging reconstruction; basic pulse sequence design; advanced fast imaging methods; MR spectroscopy and MR imaging applications, including functional MRI in human brain functional research and clinical applications.

Assessment: Please refer to the information provided by the Department of Electrical and Electronic Engineering

ELEC6079. Biomedical ultrasound (3 credits)

Ultrasound physics, imaging modes, data acquisition schemes, transducer modelling; other applications of ultrasound including flow analysis, microscopy, therapy. Previous exposure to medical imaging theory (e.g. MEDE 2007 – Medical Imaging, or equivalent) is highly preferred.

Prerequisite: ELEC2007 Medical imaging

Assessment: Please refer to the information provided by the Department of Electrical and Electronic Engineering

ELEC6081. Biomedical signals and systems (3 credits)

Biomedical signals, ECG, EEG, EMG, spectral analysis, time-frequency analysis, filtering, blind source separation, recognition.

Assessment: Please refer to the information provided by the Department of Electrical and Electronic Engineering

BIOC3608. Introduction to bioinformatics (6 credits)

This course will examine existing programs and services available on the World Wide Web for DNA and protein sequence analysis. Students will also learn how to use the sequence analysis EMBOSS package installed locally. The underlying principles of these analysis programs and services will be presented. Students will learn how to retrieve, analyse, and compare protein and DNA sequence similarities. A basic introduction to protein modeling will also be presented.

Assessment: Please refer to the information provided by the Department of Biochemistry

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: Please refer to the information provided by the Department of Mechanical Engineering

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: Please refer to the information provided by the Department of Mechanical Engineering

MECH2005. Design and manufacture (6 credits)

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

Assessment: Please refer to the information provided by the Department of Mechanical Engineering

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: Please refer to the information provided by the Department of Mechanical Engineering

ELEC2204. Digital signal processing (6 credits)

Applications of digital signal processing, discrete-time signal and system, design of digital filters, DFT and fast algorithms, digital signal processing using Matlab, fundamentals of random signals, spectral estimation, adaptive signal processing, digital signal processors.

Prerequisite: MEDE2201 Signals and linear systems

Assessment: Please refer to the information provided by the Department of Electrical and Electronic Engineering

ELEC2205. Control and instrumentation (6 credits)

Introduction to control systems; principles of feedback; root-locus method; frequency-response design methods; state-space methods; control system software; digital control; measurement systems; electromagnetic compatibility; data acquisition.

Co-requisite: MEDE2201 Signals and linear systems

Assessment: Please refer to the information provided by the Department of Electrical and Electronic Engineering

ELEC2302. Digital system design (6 credits)

Digital system concepts and digital components; digital design using discrete and programmable devices; high speed digital system design considerations; Hardware Description Language (HDL); digital system structures; digital logic and memory testing; fault detection analysis and design; Design for Test (DFT) techniques.

Prerequisites: ELEC1611 Circuit theory and digital logic or (ELEC1301 Circuits & ELEC1303 Electronics)

Assessment: Please refer to the information provided by the Department of Electrical and Electronic Engineering

ELEC2601. Human computer interaction (6 credits)

Human factors of interactive systems, design principles of user-interface, user conceptual models and interface metaphors, information and interactivity structures, interaction devices, presentation styles, information visualization. General features and components of window programming toolkits, event handling and layout management. Strategies for effective human-computer interaction, managing design process, evaluation of human-computer interaction.

Assessment: Please refer to the information provided by the Department of Electrical and Electronic Engineering

ELEC3216. Robotics (3 credits)

Introduction to robot configurations; robot kinematics; robot dynamics and control; robot programming and applications.

Prerequisite: ELEC2205 Control and instrumentation

Assessment: Please refer to the information provided by the Department of Electrical and Electronic Engineering

ELEC3505. Image and video processing (6 credits)

Image acquisition and imaging systems, 2D continuous-time and discrete-time signals and systems, time and frequency representations, sampling and quantization issues; image filtering and convolution, enhancement and restoration; colorimetry; image quality evaluation; image transform and compression; motion and video compression; deinterlacing and super-resolution; applications and computer implementations.

Prerequisite: MEDE2201 Signals and linear systems

Assessment: Please refer to the information provided by the Department of Electrical and Electronic Engineering

CSIS0278. Introduction to database management systems (6 credits)

This course studies the principles, design, administration, and implementation of database management systems. Topics include: entity-relationship model, relational model, relational algebra and calculus, database design and normalization, database query languages, indexing schemes, integrity, concurrency control, query processing. This course may not be taken with BUSI0052.

Prerequisite: ELEC1501 Computer programming and data structures

Assessment: Please refer to the information provided by the Department of Computer Science