INDUSTRIAL ENGINEERING AND LOGISTICS MANAGEMENT

SYLLABUS

The syllabus applies to students admitted in the academic year 2024-25 and thereafter under the fouryear curriculum.

Definition and Terminology

Each course offered by the Department of Industrial and Manufacturing Systems Engineering shall be classified as either introductory level course or advanced level course.

A Discipline Core course is a compulsory course which a candidate must pass in the manner provided for in the Regulations.

A Discipline Elective course refers to any technical course offered by the Department of Industrial and Manufacturing Systems Engineering for the fulfillment of the curriculum requirements of the degree of BEng in Industrial Engineering and Logistics Management that are not classified as discipline core course.

Curriculum

The Curriculum comprises 240 credits of courses as follows:

Engineering Core Courses

Students are required to complete at least 42 credits of Engineering Core Courses.

Discipline Core Courses

Students are required to complete ALL discipline core courses (84 credits), comprising 42 credits of introductory core courses and 42 credits of advanced core courses.

Discipline Elective Courses

Students are required to complete at least 36 credits of discipline elective courses offered by the Department of Industrial and Manufacturing Systems Engineering.

Elective Courses

Students are required to complete 12 credits of elective course(s) offered by either the Department of Industrial and Manufacturing Systems Engineering, or other departments within or outside of the Faculty of Engineering.

University Requirements

Students are required to complete:

- a) 12 credits in English language enhancement, including 6 credits in "CAES1000 Core University English" and 6 credits in "CAES95XX Technical English for Industrial and Manufacturing Systems Engineering";
- b) 6 credits in Chinese language enhancement course "CENG9001 Practical Chinese for Engineering Students";
- c) 36 credits of courses in the Common Core Curriculum, comprising at least one and not more than two courses from each Area of Inquiry with not more than 24 credits of courses being selected within one academic year except where candidates are required to make up for failed credits; and
- d) non-credit bearing courses as required by the University.

Capstone Experience

Students are required to complete the 12-credit "IMSE4174 Project" to fulfill the capstone experience requirement for the degree of BEng in Industrial Engineering and Logistics Management.

Internship

Students are required to complete the non-credit bearing internship "IMSE3229 Internship", which normally takes place after their third year of study.

Degree Classification

The degree of Bachelor of Engineering shall be awarded in five divisions in accordance with EN 15 of the Regulations for the Degree of Bachelor of Engineering and UG 9 of the Regulations for First Degree Curricula.

The details of the distribution of the above course categories are as follows:

The curriculum of BEng (Industrial Engineering and Logistics Management) comprises 240 credits of courses with the following structure:

UG 5 Requirements (54 credits)

Course Code	Course	No. of credits
CAES1000	Core University English	6
CAES95XX	Technical English for Industrial and Manufacturing Systems	6
	Engineering	
CENG9001	Practical Chinese for Engineering Students	6
CC##XXXX	University Common Core Course (6 courses)*	36
Non-credit bearing courses as required by the University		0
Total for UG5 Requirements		54

* Students have to complete 36 credits of courses in the Common Core Curriculum, comprising at least one and not more than two courses from each Area of Inquiry with not more than 24 credits of courses being selected within one academic year except where candidates are required to make up for failed credits.

Engineering Core Courses (42 credits)

Course Code	Course	No. of credits
MATH1851	Calculus and ordinary differential equations	6
MATH1853	Linear Algebra, Probability & Statistics	6
ENGG1300	Fundamental Mechanics	6
ENGG1310	Electricity & Electronics	6
ENGG1320	Engineers in the Modern World	6
ENGG1330	Computer programming I	6
Choose one of the following:		
ENGG1340	Computer programming II	6
ENGG1350	Thermofluid mechanics	6
Total for Engineering Core Courses		42

Discipline Core Courses (84 credits)

Introductory Courses (42 credits)

Course Code	Course	No. of credits
IMSE2102	Fundamentals of logistics and operations	6
IMSE2109	Fundamentals of engineering design	6
IMSE2121	Engineering training	6
IMSE2132	Statistical analysis	6
IMSE2134	Operational research	6
IMSE2135	Mathematical optimisation	6
IMSE2144	Fundamentals of robotics	6
Total for Introductory Discipline Core Courses		42

Advanced Courses (42 credits)

Course Code	Course	No. of credits
IMSE3102	Strategic supply chain management	6
IMSE3115	Engineering economics and finance	6
IMSE3126	Engineers in society	6
IMSE3128	Human-machine collaboration	6
IMSE3136	Operations planning and control	6
IMSE4139	Cyber-physical systems and the internet of things	6
IMSE4140	Machine learning and applications	6
Total for Advanced Discipline Core Courses		42

Capstone Experience and Internship (12 credits)

Course Code	Course	No. of credits
IMSE3229	Internship*	0
IMSE4174	Project ⁺	12
Total for Capstone Experience and Internship Courses		12

*Internship

+Capstone Experience

Discipline Elective Courses (36 credits)

Course Code	Course	No. of
		credits
IMSE2112	Engineering technology	6
IMSE2113	Information systems	6
IMSE2114	Product development	6
IMSE3103	Advanced robotics and automation	6
IMSE3106	Manufacturing technology	6
IMSE3107	Systems modelling and simulation	6
IMSE3109	Quality management	6
IMSE3110	Supply chain finance	6
IMSE3111	Data-driven optimisation	6
IMSE3116	Data-driven methods for e-commerce	6
IMSE3118	Industrial organisation and management	6
IMSE3120	Purchasing and supply management	6
Course Code	Course	No. of
		credits

IMSE3137	Virtual reality for systems engineering	6
IMSE3142	Computational methods and applications	6
IMSE3155	Sensors and intelligence for robotic systems	6
IMSE3156	Computer vision and applications	6
IMSE3157	Security of cyber-physical systems	6
IMSE4101	Intelligent manufacturing	6
IMSE4102	Engineering project management	6
IMSE4110	Financial engineering	6
IMSE4119	Digital enterprises and e-commerce	6
IMSE4121	Strategic management of business and technology	6
IMSE4122	Global logistics and transportation systems	6
IMSE4137	Data-driven risk analytics	6
IMSE4141	Digital twin and applications	6
IMSE4145	Data analytics for human-machine systems	6
IMSE4146	Additive manufacturing	6
IMSE4147	Mechatronic systems engineering	6
IMSE4148	Research projects	6
IMSE4149	Natural language processing and applications	6
IMSE4538	Healthcare systems engineering	6
Complete six discipline elective courses for a total of 36 credits		36

Elective Courses (12 credits)

At least 12 credits of courses offered by either the Department of Industrial and Manufacturing Systems Engineering, or other departments within or outside of the Faculty of Engineering. Students may take up to two 6-credit MSc(Eng) courses offered by the Department of Industrial and Manufacturing Systems Engineering as elective courses, subject to the approval of the Head of Department.

Focus

A student may choose to claim any of the following three Focuses, provided that he/she must have taken at least FOUR courses under the corresponding Focus. The maximum number of courses to be taken under each of the IELM "Focuses" is four.

Logistics Engineering (9 courses available)

- IMSE2113 Information systems
- IMSE3106 Manufacturing technology
- IMSE3107 Systems modelling and simulation
- IMSE3109 Quality management
- IMSE3110 Supply chain finance
- IMSE3120 Purchasing and supply management
- IMSE4101 Intelligent manufacturing
- IMSE4102 Engineering project management
- IMSE4122 Global logistics and transportation systems

Intelligent systems and automation (8 courses available)

- IMSE2112 Engineering technology
- IMSE3103 Advanced robotics and automation
- IMSE3137 Virtual reality for systems engineering
- IMSE3155 Sensors and intelligence for robotic systems
- IMSE4141 Digital twin and applications
- IMSE4145 Data analytics for human-machine systems
- IMSE4146 Additive manufacturing
- IMSE4147 Mechatronic systems engineering

Systems Analytics (7 courses available)

- IMSE3107 Systems modelling and simulation
- IMSE3111 Data-driven optimisation
- IMSE3142 Computational methods and applications
- IMSE4110 Financial engineering
- IMSE4119 Digital enterprises and e-commerce
- IMSE4137 Data-driven risk analytics
- IMSE4141 Digital twin and applications

Summary of curriculum structure of BEng (programme)

Course Categories	No. of credits
UG5 Requirements	54
Engineering Core Courses	42
Discipline Core Courses (Introductory)	42
Discipline Core Courses (Advanced)	42
Capstone Experience and Internship	12
Discipline Elective Courses	36
Elective Courses	12
Total	240

A suggested study plan is given as follows:

FIRST YEAR

Engineering Core Courses (42 credits)

MATH1851	Calculus and ordinary differential equations	6
MATH1853	Linear algebra, probability & statistics	6
ENGG1300	Fundamental Mechanics	6
ENGG1310	Electricity & Electronics	6
ENGG1320	Engineers in the Modern World	6
ENGG1330	Computer programming I	6
Choose one of the f	ollowing:	
ENGG1340	Computer programming II	6
ENGG1350	Thermofluid mechanics	6
University Require	ements (UG5) (18 credits)	
CAES1000	Core University English	6
CC##XXXX	Two Common Core Courses	12

SECOND YEAR

Introductory Discipline Core Courses (42 credits)

IMSE2102	Fundamentals of logistics and operations	6
IMSE2109	Fundamentals of engineering design	6
IMSE2121	Engineering training	6
IMSE2132	Statistical analysis	6
IMSE2134	Operational research	6
IMSE2135	Mathematical optimisation	6
IMSE2144	Fundamentals of robotics	6

University Requirements (UG5) (18 credits)

THIRD YEAR

Advanced Disciplin	ne Core Courses (30 credits)	
IMSE3102	Strategic supply chain management	6
IMSE3115	Engineering economics and finance	6
IMSE3126	Engineers in society	6
IMSE3128	Human-machine collaboration	6
IMSE3136	Operations planning and control	6
University Require	ements (UG5) (12 credits)	
CENG9001	Practical Chinese for engineering students (This course should be enrolled in the third year)	6
CC##XXXX	One Common Core Courses	6
Discipline Elective	Courses (18 Credits)	12
Internship (0 credi	t)	
IMSE3229	Internship	0
FOURTH YEAR		
Advanced Disciplin	ne Core Courses (12 credits)	
IMSE4139	Cyber-physical systems and the internet of things	6
IMSE4140	Machine learning and applications	6
University Require	ements (UG5) (6 credits)	
CAES95XX	Technical English for Industrial and Manufacturing Systems Engineering	6
Discipline Elective	Courses (18 Credits)	18
Capstone Experien	ace (12 credits)	
IMSE4174	Project	12
Elective Courses (12 credits)		12

Non-credit bearing courses as required by the University Students will have the flexibility to take the courses in any semester throughout the period of studies.

Minor in Industrial Engineering and Logistics Management [not eligible for BEng(IELM) students]

Candidates who are interested in pursuing minor in Industrial Engineering and Logistics Management must satisfy the following prerequisite:

• Level 4 or above in Mathematics in the Hong Kong Diploma in Secondary Education (HKDSE) Examination, or equivalent

Candidates are required to complete a total of 36 credits of courses in the following manner:

Course Code Course

Credits

18

(i) 12 credits of co	pre courses	
IMSE2102	Fundamentals of logistics and operations	6
IMSE3102	Strategic supply chain management	6
(ii) 24 credits of e	lective courses selected from the following:	
IMSE2132	Statistical analysis	6
IMSE2134	Operational research	6
IMSE3115	Engineering economics and finance	6
IMSE3106	Manufacturing technology	6
IMSE3107	Systems modelling and simulation	6
IMSE4119	Digital enterprises and e-commerce	6
IMSE4122	Global logistics and transportation systems	6

COURSE DESCRIPTIONS

Candidates will be required to do the coursework in the respective courses selected. Not all courses are offered every semester.

Engineering Core Courses

MATH1851	Calculus and ordinary differential equations (6 credits)
MATH1853	Linear algebra, probability & statistics (6 credits)
ENGG1300	Fundamental Mechanics (6 credits)
ENGG1310	Electricity & Electronics (6 credits)
ENGG1320	Engineers in the Modern World (6 credits)
ENGG1330	Computer programming I (6 credits)
ENGG1340	Computer programming II (6 credits)
ENGG1350	Thermofluid mechanics (6 credits)

Please refer to the Engineering Core Courses in the syllabus for the degree of BEng for details.

University Requirements on Language Enhancement Courses

CAES1000.Core University English (6 credits)CENG9001.Practical Chinese for engineering students (6 credits)

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

CAES95XX. Technical English for Industrial and Manufacturing Systems Engineering (6 credits)

This 6-credit English-in-the-Discipline course will introduce IMSE students to professional and technical communication through report writing and oral presentation with a focus on the former. The course will provide an intensive English environment and engage students in activities which help them prepare for the completion of the assessments required by the disciplinary project-based courses as nominated by the Department of Industrial and Manufacturing Systems Engineering. Assessment is wholly by coursework.

Co-requisite: IMSE4174 Project [for BEng(IELM) students only] IMSE4175 Project [for BEng(EngSc) Systems Analytics students only]

University Common Core Curriculum

Successful completion of 36 credits of courses in the Common Core Curriculum, comprising at least one and not more than two courses from each Area of Inquiry with not more than 24 credits of courses being selected within one academic year except where candidates are required to make up for failed credits:

- Science, Technology and Big Data
- Arts and Humanities
- Global Issues
- China: Culture, State and Society

IMSE2102. Fundamentals of logistics and operations (6 credits)

Definition, importance and objectives of operations; modelling operational processes; the roles of logistics in supply chain management; business of production; business environment; transport fundamentals and transport decisions; storage and handling systems and decisions; inventory policies; network planning process; sustainable logistics; purchasing scope and objectives.

Assessment: 20% continuous assessment, 80% examination

IMSE2109. Fundamentals of engineering design (6 credits)

Visualization of technical information; application of CAD software to prepare product design models and drawings; principles of engineering graphics: orthographic projections, isometric views, auxiliary views, sectioning, dimensioning and tolerancing; assembly modelling and drawing; design of components; general principles of product and tool design.

Assessment: 100% continuous assessment

IMSE2112. Engineering technology (6 credits)

Kinematics and dynamics of rigid bodies, centre of percussion, design for reduction of impact stress; analysis, simulation and applications of 4-bar mechanisms, velocity diagram and instantaneous centre of rotation; Geneva mechanism, gear train and motion transmission; analysis and applications of simple harmonic motion, damping of vibrations; fundamental electrical circuit analysis; alternating current electricity, AC circuits and phasors.

Assessment: 20% continuous assessment, 80% examination

IMSE2113. Information systems (6 credits)

Information systems; the strategic role of information technology; data communications and networking; online databases and their applications; development and implementation of information systems.

Prerequisite:ENGG1330 Computer Programming IAssessment:100% continuous assessment

IMSE2114. Product development (6 credits)

Organisation and management, performance measurement; market research, product design specification, product safety, product and the environment, concept generation and selection, design review and improvements; product appraisal from functional, ergonomic and aesthetic, manufacturing and economical aspects; design theory and methodology, information / literature search.

Assessment: 40% continuous assessment, 60% examination

IMSE2121. Engineering training (6 credits)

Metal work, manufacturing practice, practical networking, computing practice, design practice, plastic processing, metrology, CNC programming and CAD/CAM, electronics, work study.

Assessment: 100% practical work

IMSE2132. Statistical analysis (6 credits)

Statistics – probability distributions, mathematical expectation, random sampling, point estimation of parameters, confidence interval, hypothesis testing, analysis of variance, regression analysis. Analytics – data visualization, time series forecasting, decision-making under uncertainty. Introduction to data analytics software. Application of statistics and analytics on engineering problems.

Prerequisite:MATH1851 Calculus and ordinary differential equations or
MATH1853 Linear algebra, probability & statisticsAssessment:40% continuous assessment, 60% examination

IMSE2134. Operational research (6 credits)

Formulation of linear programming; Geometry of linear programming; Simplex method; Sensitivity analysis; Duality theory; Formulation of integer programming; Branch-and-bound; Network flow; Application of queueing models; Poisson process; Birth-and-death process; M/M/1 queue; M/M/k queue

Prerequisite:MATH1851 Calculus and ordinary differential equations or
MATH1853 Linear algebra, probability & statisticsAssessment:30% continuous assessment and 70% examination

IMSE2135. Mathematical optimisation (6 credits)

Multivariable functions, partial derivatives and multiple integrals; multivariable unconstrained optimisation; optimisation problems with equality and inequality constraints; nonlinear optimization; gradient methods and Newton-Raphson method; industrial applications of optimisation techniques.

Prerequisite:MATH1851 Calculus and ordinary differential equationsAssessment:30% continuous assessment, 70% examination

IMSE2144. Fundamentals of robotics (6 credits)

Introduction to robotics and automation, fundamental of robotics; basic components of robotic systems; robot applications including industrial robots, services robots, space robots, and medical robots; robot

intelligence, integration of robotics systems for automation, applications of automation in manufacturing, logistics, and smart city; Global trend and development in robotics and systems automation. The course includes lectures and laboratory experiments.

Prerequisite:MATH1851 Calculus and ordinary differential equationsAssessment:70% continuous assessment, 30% examination

IMSE3102. Strategic supply chain management (6 credits)

Supply chain overview; operating objectives; barriers to internal integration; supply chain performance cycles; logistics positioning; supply chain environmental assessment; time-based supply chains; information flow; alternative supply chain strategies; supply chain integration theory; logistics location structure; warehouse location patterns; transportation economies; inventory economies; least total cost design; formulating supply chain strategy; planning and design supply chain methodology; supply chain administration and dimensions of change management.

Prerequisite:IMSE2102 Fundamentals of logistics and operationsAssessment:20% continuous assessment, 80% examination

IMSE3103. Advanced robotics and automation (6 credits)

Discussing robot kinematics and dynamics modelling; introducing basic robot control and motion planning methods, sensing systems, and applications. The topics also include robot force control, teleoperations and the integration of robots with automation systems. The application examples include manufacturing automation and services. The course includes lectures and laboratory experiments. The course includes lectures and laboratory experiments.

Prerequisite:IMSE2144 Fundamentals of roboticsAssessment:70% continuous assessment, 30% examination

IMSE3106. Manufacturing technology (6 credits)

Introduction to manufacturing, safety in manufacturing, manufacturing and the environment; metrology, measuring standards, limits and fits, geometrical tolerances, limit gauging, surface texture; casting processes, pattern and gating, permanent and non-permanent moulds; forming processes, principles of bulk deformation and sheet metal working; joining processes, fastening, liquid and solid states welding, powder metallurgy; machining processes, cutting and grinding operations, non-traditional machining, cutting conditions; plastics materials and processing.

Assessment: 40% continuous assessment and 60% examination

IMSE3107. Systems modelling and simulation (6 credits)

Basic concepts of modelling and simulation; discrete-event simulation techniques; introduction to computer-aided simulation and the use of simulation packages; methodology of simulation study of industrial systems; model development for industrial systems, analysis of systems; model validation and verification; analysis of simulation results, case studies of industrial and manufacturing systems using discrete event simulations.

Assessment: 60% continuous assessment, 40% examination

IMSE3109. Quality management (6 credits)

Total quality management; management tools for quality; benchmarking; ISO9000 series and ISO14000 series; national quality awards; design of industrial experiments; statistical process control; control charts; acceptance sampling; business process reengineering; customer services quality; Six Sigma; DMAIC process; Poka-yoke; failure mode and effect analysis; reliability engineering.

Assessment: 30% continuous assessment, 70% examination

IMSE3110. Supply chain finance (6 credits)

Financial markets; derivatives for risk transfer in supply chain, forward, futures, options, swap; binomial model and Black-Scholes model for evaluating options; risk measures, value-at-risk (VaR), returns and utility functions. Managing supply chain risks: financial and nonfinancial risks; uncertain customer demand, material price, exchange rates; logistics financing and risks; development of risk hedging models: price models, demand models, optimal hedging policies. Strengthening of financial and risk protection capabilities of supply chain members: financing for optimising members' working capital.

Assessment: 40% continuous assessment and 60% examination

IMSE3111. Data-driven optimisation (6 credits)

Evolutionary computation – overview, genetic algorithms, greedy algorithms, and ant colony optimisation; Data warehousing and mining – overview, probabilistic approaches to compression, and mining with big data; Fuzzy data and systems – modeling, optimisation, and evaluation; Decision table and tree – overview, structure, and limited-entry.

Assessment: 50% continuous assessment and 50% examination

IMSE3115. Engineering economics and finance (6 credits)

Cost accounting - procedures; direct costs, absorption costing; marginal costing. Planning and control – activity-based costing systems; standard costing systems; capital expenditure and investment; health, safety and environmental aspects of company activities; contemporary issues in management accounting; financial accounting - accounting rules; basic financial accounts; manufacturing accounts; company account; financial performance – ratio analysis; interpretation of accounting data.

Assessment: 30% continuous assessment, 70% examination

IMSE3116. Data-driven methods for e-commerce (6 credits)

Overview of e-business and e-commerce; Electronic Business Solutions (EBS) and e-commerce infrastructure; roles and applications of e-commerce solutions; design and development of e-commerce systems: internet programming, web-based system development, online database design and implementation; data acquisition, processing and analytics for e-commerce.

Prerequisite:ENGG1330 Computer programming IAssessment:60% continuous assessment and 40% examination

IMSE3118. Industrial organisation and management (6 credits)

Managing and managers; evolution of management theory; planning - decision making; strategic management; strategy implementation, strategic management; organising - organisational design and structure; power and the distribution of authority; managing organisational change and innovation; leading – motivation, leadership, teams and teamwork; controlling, principles of effective control, operations control.

Prerequisite:IMSE2102 Fundamentals of logistics and operationsAssessment:40% continuous assessment, 60% examination

IMSE3120. Purchasing and supply management (6 credits)

Introduction of purchasing function/process; quality management for goods and service; sourcing and market analysis; make-or-buy decisions and subcontracting; negotiation; controlling price and costs; vendor selection; commodity buying; service buying; capital buying; strategic purchasing; e-procurement and public procurement

Assessment: 40% continuous assessment, 60% examination

IMSE3126. Engineers in society (6 credits)

Responsibilities of professional engineers in society; role of ethics in engineering; engineering health and safety; accident prevention and management; environmental considerations; innovation and technology; the fundamentals of the Hong Kong legal system; legal issues and the laws relevant to engineering practice; meeting with professionals from industry for sharing knowledge about engineering ethics and responsibility.

Assessment: 30% continuous assessment, 70% examination

IMSE3128. Human-machine collaboration (6 credits)

Fundamentals of human-machine collaboration; human-centric theories and methods; design and evaluation of interactive systems through user studies; trust, safety, and health in human-machine collaboration; human sensation, perception, and cognition; information processing; heuristics, biases, and mental models in human decision making; human factors and ergonomics; UX and UI design.

Assessment: 40% continuous assessment, 60% examination

IMSE3136. Operations planning and control (6 credits)

The use of operations planning and control systems in forecasting, scheduling and inventory control; facility location; aggregate production planning; master production scheduling; requirements and capacity planning systems; operations scheduling and control of production systems; Just-In-Time techniques; balancing of assembly lines; network optimisation; information reporting and processing; distribution operations planning and control.

Prerequisite:IMSE2134 Operational researchAssessment:20% continuous assessment, 80% examination

IMSE3137. Virtual reality for systems engineering (6 credits)

Fundamental of virtual reality, concepts of virtual, augmented and mixed reality, visualization and interacting with complex information and systems with virtual reality, applications of virtual reality technology in engineering systems design and analysis, immersive and interactive virtual environments; innovation and consciousness with virtual reality system development and deployment, ethical issues and social impacts of adopting virtual reality in system development. Designing and building virtual systems with immersive virtual reality systems including CAVE-like environment and VR headsets.

Assessment: 60% continuous assessment, 40% examination

IMSE3142. Computational methods and applications (6 credits)

Solution of non-linear equations; Numerical calculus and optimization; Convex programming; Sample size estimation; Variance reduction methods; Parameter estimation techniques; Maximum likelihood estimation; Monte Carlo method; Markov chain Monte Carlo; Generalized additive models; Kernal density estimation; Statistical computing; Applications of computational methods in industry.

Prerequisite:IMSE2132 Statistical analysis and IMSE2135 Mathematical optimisationAssessment:50% continuous assessment, 50% examination

IMSE3155. Sensors and intelligence for robotic systems (6 credits)

Introducing sensors and sensing system for robotic systems and operations; discussing methodologies for decision making in robotic operations including model-based as well as data-driven approaches; focusing on applications in manufacturing automation, services, and smart constructions. The course is a combination of discussions of theoretical knowledge and application examples. It consists of lectures and laboratory experiments.

Pre-requisite:IMSE2144 Fundamentals of roboticsAssessment:70% continuous assessment, 30% examination

IMSE3156. Computer vision and applications (6 credits)

Fundamental principle of computer vision including imaging hardware systems, image processing methods, and pattern recognition; applications of computer vision including image based recognition and visual servo; application examples including industrial inspection, autonomous driving, and robot navigation.

Prerequisite:ENGG1330 Computer programming I or IMSE2113 Information systemsAssessment:60% continuous assessment, 40% examination.

IMSE3157. Security of cyber-physical systems (6 credits)

This course introduces the principles, mechanisms and implementation of Security for Cyber-Physical Systems. Knowledge about understanding instances and detection of major attacks on Cyber-Physical Systems are included. Topics include notion and terms of security; network security; basic cryptography techniques; authentication methods; access control methods; cyberattacks and defenses; system security; security and privacy techniques for Cyber-Physical Systems; security in industry such as smart manufacturing, smart supply chains, and smart energy systems.

Prerequisite:IMSE2135 Mathematical optimization, ENGG1340 Computer programming IIAssessment:50% continuous assessment, 50% examination

IMSE3229. Internship (0 credit)

An internship in an appropriate industry six to twelve weeks duration. All Year 3 students must undergo a 6 to 12-week Internship in the summer immediately after the second semester of Level 3 studies ends. Most students undergo Internships in services or manufacturing companies in Hong Kong or China. The content of such on-the-job training may include engineering design and modification, installation, repairing, computation, programming, site inspection, measurement, quality assurance, warehouse management, etc. In some companies, the training programmes are project-orientated and often predetermined. The Internship is an important part of this 4-year BEng programme, as it gives students an opportunity to gain practical experience in industry and to develop their professional skills.

At the end of the training period, all the sponsoring organisations will complete an appraisal form on the trainees' performance. Students must submit a report after the training, and assessments are based on both the training logbook and performance appraisal.

Prerequisite:IMSE2121 Engineering TrainingAssessment:100% practical work

IMSE4101. Intelligent manufacturing (6 credits)

Overview of Computer Integrated Manufacturing (CIM) and Intelligent Manufacturing (IM); CAD/CAM functions, CNC applications in CAM; intelligent design and machining; intelligent monitoring and control; computer aided process planning, automated process planning; rapid prototyping (3D printing) and virtual manufacturing; digital technologies integration for IM.

Prerequisite:IMSE2109 Fundamentals of engineering designAssessment:40% continuous assessment, 60% examination

IMSE4102. Engineering project management (6 credits)

Fundamentals of engineering project management; project environment; project evaluation; risk management process; project selection and proposal preparation; project scheduling and contingency setting and control; control of variation and claims; project management methodologies and techniques, change management; multi-criteria decision making process; analytic hierarchy process; PERT/GANTT techniques for project control and resources allocation; simulation of critical paths; case studies.

Assessment: 30% continuous assessment, 70% examination

IMSE4110. Financial engineering (6 credits)

Financial markets and financial securities, portfolio management and investment strategies; international finance, foreign exchange markets; project evaluation and financing, present value, cost of capital, cost-benefit ratio and internal rates of return; financial instruments, forwards, futures; swaps, options and hedging strategies; foreign trade and investment in China.

Prerequisite:IMSE3115 Engineering economics and financeAssessment:30% continuous assessment, 70% examination

IMSE4119. Digital enterprises and e-commerce (6 credits)

Enterprise resource management; EDI applications; data mining and warehousing; virtual enterprises; advanced Internet and web applications in product development, industrial applications of virtual reality; digital design and manufacturing technology: 3D printing, virtual prototyping and virtual manufacturing; electronic product and component cataloguing; cryptographic systems and digital watermarking; capability maturity model; social accountability and responsibility standards; E-commerce business models; technological, business planning and social issues of E-commerce; order taking and processing; mobile technology and electronic payment systems, smart cards, RFID and NFC.

Prerequisite:IMSE2113 Information systems or
ENGG1330 Computer programming IAssessment:50% continuous assessment, 50% examination

IMSE4121. Strategic management of business and technology (6 credits)

Analysis of the external environment and industry clusters for local industries – threats and opportunities from government policies as well as the legal, economic, social and technological environment; competitive forces from industry rivals, customers and other sources; analysis of internal weaknesses and strengths – resources, competences and success factors; mission and strategic intent; strategic directions and methods – conditions and implications; implementing and evaluating strategic changes; management for technology innovation.

Prerequisite:IMSE2102 Fundamentals of logistics and operationsAssessment:30% continuous assessment, 70% examination

IMSE4122. Global logistics and transportation systems (6 credits)

Global logistics and transportation strategies; the role of logistics in global operations and marketing strategies; intermodal transportation; logistics and transportation infrastructure operations; transportation network modelling and analysis; traffic management; transportation mode choice; shipment planning; transhipment and consolidation; transportation demand and supply; transportation cost; fleet development and management; vehicle routing problem; scheduling problem; level of service; terminal operations.

Prerequisite:IMSE2134 Operational researchAssessment:40% continuous assessment, 60% examination

IMSE4137. Data-driven risk analytics (6 credits)

Basics of risk management, risk and return, lifecycle of risk management, operational risk management components; risk identification: risk type, risk identification tools, risk map; Risk assessment: parametric loss size models, non-parametric loss size models, loss number models, aggregated loss, jumbo loss, dependent loss, risk model calibration, risk model selection, risk prediction methodology, Bayesian Prediction, Markovian Models for risk prediction; Risk management: decision-making tools, single-stage decision tree, decision matrix, multi-stage decision tree, multi-objective decision tree.

Assessment: 30% continuous assessment, 70% examination

IMSE4139. Cyber-physical systems and the internet of things (6 credits)

Introduction to Cyber-Physical Systems (CPS) and the Internet-of-Things (IoT); IoT network

architecture; sensors and devices; IoT communication techniques; wireless sensor networks; edge computing; embedded systems; cloud computing; data analytics; distributed computing; control and signal processing; integration and interaction between cyber systems and physical systems; design, analysis, optimization of CPSs; security and privacy techniques for CPSs and IoTs; CPS and IoT applications in smart manufacturing, smart supply chains, and smart healthcare.

Pre-requisite:IMSE2135 Mathematical optimisationAssessment:50% continuous assessment, 50% examination

IMSE4140. Machine learning and applications(6 credits)

Introduction to machine learning; Supervised and unsupervised learning; Predictive and classification performance evaluation; Model training, testing, selection, and validation; Regularization and stability; Linear predictors; Boosting; Stochastic gradient descent; Support vector machines; Kernel methods; Decision trees; Neural networks; Dimensionality reduction; Feature selection; Machine learning applications in industry.

Prerequisite:IMSE2132 Statistical analysis, IMSE2135 Mathematical optimisation, and ENGG1340
Computer programming IIAssessment:50% continuous assessment, 50% examination

IMSE4141. Digital twin and applications (6 credits)

Introduction to basic concepts and fundaments of digital twin (DT); Building blocks for DT; DT infrastructures and systems; Sensing technologies; Data twining and cloning; DT modelling; DT-enabled system integration, testing, and maintenance; DT for process monitoring; DT applications in manufacturing, robotics, construction, supply chain management, logistics, transportation, and healthcare.

Assessment: 50% continuous assessment, 50% examination

IMSE4145. Data analytics for human-machine systems (6 credits)

Fundamentals of human-machine systems; data-driven decision-making and statistical modelling in human-machine interaction; analysis and prediction for human-machine system performance and safety; data visualization for human-machine systems; image processing and analysis for human-machine interaction

Assessment: 40% continuous assessment, 60% examination

IMSE4146. Additive manufacturing (6 credits)

Concept, principle, applications, and scope of additive manufacturing (AM); AM fabrication processes: classification, materials, and characteristics; AM workflow: object modelling, material selection, process planning, object fabrication, post-processing, and quality inspection; Design considerations for AM: object geometry, geometry fidelity, surface finish, and mechanical strength; Current limitations and further development of AM.

Prerequisites: IMSE2109 Fundamentals of engineering design Assessment: 40% continuous assessment and 60% examination

IMSE4147. Mechatronic systems engineering (6 credits)

Principles of mechatronics; System integration and design; Sensors and transducers; Circuits and electronics; Embedded systems and microcontrollers; Actuators and drives; Mechanisms and mechanical components; Control systems and PID controllers; Programmable motion control; Artificial intelligence in mechatronics.

Prerequisites:ENGG1310 Electricity & Electronics and
ENGG1330 Computer programming IAssessment:40% continuous assessment and 60% examination

IMSE4148. Research projects (6 credits)

The course emphasizes student-centered learning on systems analysis, design, and integration. The course is based on research and development tasks in experiential learning environments. Students are expected to develop their analytical and implementation skills in industrial systems, such as engineering infrastructure design, data collection and processing, systems modelling and simulation, systems analysis and decision process, and systems monitoring and control.

Assessment: 100% continuous assessment

IMSE4149. Natural language processing and applications (6 credits)

This course introduces the principles and techniques for natural language processing from a machine learning perspective. We will cover the topics including word vectors and language models, neural networks, recurrent neural networks, Transformer, Pretraining and Post-training, BERT, and MultiBERT, which are the key techniques for natural language processing. We will discuss implementation of these techniques and their applications in practice such as syntactic parsing, information extraction, machine translation, dialogue systems, and summarization in the industrial engineering context.

Prerequisites: IMSE4140 Machine learning and applications Assessment: 50% continuous assessment, 50% examination

IMSE4174. Project (12 credits)

A dissertation or report on a topic consisting of design, experimental or analytical investigation in the field of industrial engineering and technology management; logistics engineering and supply chain management.

Assessment: 100% continuous assessment

IMSE4538. Healthcare systems engineering (6 credits)

Introduction to healthcare delivery systems; healthcare technology-human integration; human factors in healthcare; crew resource management; quality of care; economic analysis in healthcare; healthcare logistics; healthcare system test and evaluation; analysis and design for patient safety.

Assessment: 40% continuous assessment, 60% examination