

## **INDUSTRIAL ENGINEERING AND LOGISTICS MANAGEMENT**

### **SYLLABUS**

The syllabus applies to students admitted in the academic year 2019-20 and thereafter under the four-year 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 36 credits of introductory core courses and 48 credits of advanced core courses.

#### Discipline Elective Courses

Students are required to complete at least 36 credits of advanced 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 “CAES9532 Technical English for Industrial and Manufacturing Systems Engineering”;
- b) 6 credits in Chinese language enhancement course “CENG9001 Practical Chinese for Engineering Students”; and
- 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 during the whole period of study.

### 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
CAES9532	Technical English for Industrial and Manufacturing Systems Engineering	6
CENG9001	Practical Chinese for Engineering Students	6
CC##XXXX	University Common Core Course (6 courses)*	36
<b>Total for UG5 Requirements</b>		<b>54</b>

\* 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 (42credits)**

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
<b>Total for Engineering Core Courses</b>		<b>42</b>

#### **Discipline Core Courses (84 credits)**

#### **Introductory Courses (36 credits)**

Course Code	Course	No. of credits
IMSE2102	Fundamentals of supply chain management	6

IMSE2109	Fundamentals of engineering design	6
IMSE2121	Engineering training	6
IMSE2132	Statistical analysis	6
IMSE2134	Operational research	6
IMSE2135	Mathematical optimisation	6
<b>Total for Introductory Discipline Core Courses</b>		<b>36</b>

**Advanced Courses (48 credits)**

Course Code	Course	No. of credits
IMSE3102	Strategic supply chain management	6
IMSE3115	Engineering economics and finance	6
IMSE3126	Engineers in society	6
IMSE3134	Innovation and entrepreneurship	6
IMSE3136	Operations planning and control	6
IMSE4122	Global logistics systems	6
IMSE4135	Systems integration	6
IMSE4136	Transportation and distribution planning	6
<b>Total for Advanced Discipline Core Courses</b>		<b>48</b>

**Capstone Experience and Internship (12 credits)**

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

+Capstone Experience

\*Internship

**Discipline Elective Courses (36 credits)**

Course Code	Course	No. of credits
IMSE2112	Engineering technology	6
IMSE2113	Information systems	6
IMSE2114	Product development	6
IMSE3103	Systems automation	6
IMSE3106	Manufacturing technology	6
IMSE3107	Systems modelling and simulation	6
IMSE3109	Quality management	6
IMSE3110	Supply chain finance	6
IMSE3111	Intelligent optimisation	6
IMSE3116	Internet technology for e-commerce	6
IMSE3118	Industrial organisation and management	6
IMSE3120	Purchasing and supply management	6
IMSE3128	Human factors engineering	6
IMSE3137	Virtual reality for systems engineering	6
IMSE3138	Warehousing and terminal operations	6
IMSE3139	Cyber-physical systems	6
IMSE4101	Computer integrated 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
IMSE4137	Operational risk management	6
IMSE4138	Asset and portfolio management	6
<b>Complete six discipline elective courses for a total of 36 credits</b>		<b>36</b>

### 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.

### Elective MSc(Eng) courses

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.

### Summary of curriculum structure of BEng (programme)

Course Categories	No. of credits
UG5 Requirements	54
Engineering Core Courses	42
Discipline Core Courses (Introductory)	36
Discipline Core Courses (Advanced)	48
Capstone Experience and Internship	12
Discipline Elective Courses	36
Elective Courses	12
<b>Total</b>	<b>240</b>

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 following:		
ENGG1340	Computer programming II	6
ENGG1350	Thermofluid mechanics	6

#### University Requirements (UG5) (18 credits)

CAES1000	Core University English	6
CC##XXXX	Two Common Core Courses	6

### SECOND YEAR

#### Introductory Discipline Core Courses (36 credits)

IMSE2102	Fundamentals of supply chain management	6
IMSE2109	Fundamentals of engineering design	6

IMSE2121	Engineering training	6
IMSE2132	Statistical analysis	6
IMSE2134	Operational research	6
IMSE2135	Mathematical optimisation	6

**University Requirements (UG5) (18 credits)**

CC##XXXX	Three Common Core Courses	
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**Discipline Elective Courses (6 Credits)**

**THIRD YEAR**

**Advanced Discipline Core Courses (30 credits)**

IMSE3102	Strategic supply chain management	6
IMSE3115	Engineering economics and finance	6
IMSE3126	Engineers in society	6
IMSE3134	Innovation and entrepreneurship	6
IMSE3136	Operations planning and control	6

**University Requirements (UG5) (18 credits)**

CENG9001	Practical Chinese for engineering students (This course should be enrolled in the third year)	6
CAES9532	Technical English for Industrial and Manufacturing Systems Engineering	6
CC##XXXX	One Common Core Courses	6

**Discipline Elective Courses (12 Credits)**

**Internship (0 credit)**

IMSE3229	Internship	0
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**FOURTH YEAR**

**Advanced Discipline Core Courses (18 credits)**

IMSE4122	Global logistics systems	6
IMSE4135	Systems integration	6
IMSE4136	Transportation and distribution planning	6

**Discipline Elective Courses (18 Credits)**

**Capstone Experience (12 credits)**

IMSE4174	Project	12
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**Elective Courses (12 credits)**

**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:

<u>Course Code</u>	<u>Course</u>	<u>Credits</u>
<i>(i) 12 credits of core courses</i>		
IMSE2102	Fundamentals of supply chain management	6
IMSE4136	Transportation and distribution planning	6
<i>(ii) 24 credits of elective courses selected from the following:</i>		
IMSE2132	Statistical analysis	6
IMSE3102	Strategic supply chain management	6
IMSE3115	Engineering economics and finance	6
IMSE3106	Manufacturing technology	6
IMSE3107	Systems modelling and simulation	6
IMSE4119	Digital enterprises and e-commerce	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.

### **CAES9532. 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: IMSE3134 Innovation and entrepreneurship  
Adjunct course: IMSE3134 Innovation and entrepreneurship  
Assessment: 100% continuous assessment

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### **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:

- Scientific and Technology Literacy
  - Humanities
  - Global Issues
  - China: Culture, State and Society
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### **IMSE2102. Fundamentals of supply chain management (6 credits)**

Definition, importance and objectives of logistics; 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; forecasting logistics requirements; facility location analysis; network planning process; purchasing scope and objectives; purchasing structure and organisation; purchasing variables – price, time and quality; buying commodities; buying capital goods; buying services; purchasing systems.

Assessment: 20% continuous assessment, 80% examination

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### **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

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### **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

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**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 I

Assessment: 60% continuous assessment, 40% examination

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**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

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**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

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**IMSE2132. Statistical analysis (6 credits)**

Discrete and continuous random variables; some important probability distributions; joint probability distributions; mathematical expectation; random sampling and sampling distributions; point estimation of parameters, confidence interval; tests of hypotheses; analysis of variance; linear regression; logistic regression and classification problems.

Prerequisite: MATH1851 Calculus and ordinary differential equations or  
MATH1853 Linear algebra, probability & statistics

Assessment: 20% continuous assessment, 80% examination

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**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 & statistics

Assessment: 30% continuous assessment and 70% examination

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**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 equations

Assessment: 30% continuous assessment, 70% examination

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### **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 supply chain management

Assessment: 20% continuous assessment, 80% examination

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### **IMSE3103. Systems automation (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.

Prerequisite: MATH1851 Calculus and ordinary differential equations

Assessment: 30% continuous assessment, 70% examination

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### **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

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### **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

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**IMSE3109. Quality management (6 credits)**

Total quality management; management tools for quality; benchmarking; ISO9000 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

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**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

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**IMSE3111. Intelligent optimisation (6 credits)**

Evolutionary computation overview; Genetic algorithms; Particle swarm optimisation; data warehousing; data mining overview; probabilistic approach to data mining; data compression approach; Data mining with big data; fuzzy information and fuzzy system; fuzzy modeling; fuzzy optimisation; Fuzzy evaluation; Decision table overview; Decision table structure; Limited-entry decision table.

Assessment: 30% continuous assessment and 70% examination

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**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

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**IMSE3116. Internet technology for e-commerce (6 credits)**

Overview of e-Business and e-Commerce; Electronic Business Solutions (EBS) and technology; roles and applications of e-business solutions; design and development of e-business systems: adoption and implementation: internet programming, web-based system development, online database design and implementation.

Prerequisite: ENGG1330 Computer programming I

Assessment: 60% continuous assessment and 40% examination

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**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 supply chain management

Assessment: 40% continuous assessment, 60% examination

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**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

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**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; 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

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**IMSE3128. Human factors engineering (6 credits)**

Human-organization interaction; human-technology interface usability and design; workplace safety and health; applied anthropometry and biomechanics; physical work and manual material handling; time and motion study; workplace and environmental design, illumination, noise, thermal; information processing; display and control; skills and learning; job design and shift work.

Assessment: 40% continuous assessment, 60% examination

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**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.

Assessment: 100% practical work

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### **IMSE3134. Innovation and entrepreneurship**

The course is designed to apply industrial engineering principles and methodologies in an integrated manner for formulating strategies for innovation and entrepreneurship. The main element of the course is a group project on developing a conceptual product, or a service, or a system with innovative ideas and designing a start-up business plan. This project serves as a vehicle for integrated applications of various topics, including product and system design methodologies, project management, product life-cycle management, manufacturing and business logistics, cost accounting, scheduling, process planning and workflow, human factors, distribution and marketing.

The students will learn about entrepreneurship in the new world economy, general characteristics of entrepreneurs, marketing of products and services, business plan, venture capital, environmental and contingency factors, time management, communication, systematic problem solving, group work, negotiating and assertiveness, coping with pressure, and leadership.

Pre-requisite: IMSE2109 Fundamentals of engineering design

Co-requisite: CAES9532 Technical English for Industrial and Manufacturing Systems Engineering

Adjunct course: CAES9532 Technical English for Industrial and Manufacturing Systems Engineering

Assessment: 100% continuous assessment

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### **IMSE3136. Operations planning and control (6 credits)**

The use of operations planning and control systems in forecasting, scheduling and inventory control; functions and organisation of production and inventory control systems; demand forecasting; deterministic and stochastic inventory control problems; 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; information reporting and processing; supply chain management.

Prerequisite: IMSE2134 Operational research

Assessment: 20% continuous assessment, 80% examination

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### **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

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### **IMSE3138. Warehousing and terminal operations (6 credits)**

Introduction to warehousing; material handling technologies, MH principles, container and unitizing equipment, storage and retrieval equipment, AS/RS, material transport equipment, automatic data collection and communication equipment, packaging; warehouse management system, receiving, cycle counting, order processing, picking, replenishment, shipping; warehouse planning and design: simulation model and software; design procedures.

Introduction to container terminal and air cargo terminal, basic operation flow at ship, quay, container yard, gate and CFS, container handling equipment and operation modes organization structure of a terminal and its various functions, container ship structure and generations, terminal management system, terminal planning and design methodology and analysis tools.

Prerequisite: IMSE2102 Fundamentals of supply chain management  
Assessment: 30% continuous assessment, 70% examination

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### **IMSE3139. Cyber-physical systems (6 credits)**

Cyber systems: integration of computation, communication and control; Physical systems: natural and man-made systems governed by the laws of physics; Concept and characteristics of cyber-physical systems (CPSs): integration of cyber systems and physical systems; Architecture of CPSs: integration of cyber components with physical processes, interfaces, converters and networks in CPSs; Technologies of CPSs: distributed computing and networking, internet-of-things (IoT), sensing and smart identification, embedded technologies, data collection, control and signal processing, and location tracking; Applications of CPSs: smart manufacturing, smart supply chains, healthcare and medical services; smart buildings and smart cities; Trends of CPSs: challenges, research and development of software, hardware and applications.

Assessment: 30% continuous assessment, 70% examination

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### **IMSE4101. Computer integrated manufacturing (6 credits)**

Overview of Computer Integrated Manufacturing (CIM) system and CAD/CAM functions; geometric modelling in CAD - principles of surface and solid modelling; CNC applications in CAM; computer aided process planning, automated process planning; rapid prototyping (3D printing) and virtual manufacturing; CAD and CAM integration.

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

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### **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

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### **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 finance

Assessment: 30% continuous assessment, 70% examination

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#### **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 I

Assessment: 50% continuous assessment, 50% examination

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#### **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 supply chain management

Assessment: 30% continuous assessment, 70% examination

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#### **IMSE4122. Global logistics systems (6 credits)**

Global operations and logistics strategies, strategic changes required by globalisation, the strategic framework for integrating global operations, the role of logistics in global operations and marketing strategies; global operations and logistics planning, supplier network development, physical distribution, global logistics network design, global supply chain management, foreign exchange risk management in global operations; operations analysis of global supply chains, information management for global logistics, performance measurement and evaluation in global logistics.

Prerequisite: IMSE2102 Fundamentals of supply chain management

Assessment: 20% continuous assessment, 80% examination

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#### **IMSE4135. Systems integration (6 credits)**

Student-centred learning on industrial systems analysis, design and integration. The course is based on case studies and capstone projects in experiential learning environments. Students are expected to develop their industrial systems integration skills in systems modelling and simulation, systems analysis and decision process, systems integration requirement analysis, systems integration strategies and planning, implementation and organizational issues for systems integration. The course involves industrial systems analysts and practitioners from manufacturing, logistics and service sectors to share best practices for systems integration at different levels such as supply chain, enterprise, information, infrastructure, process and decision.

Assessment: 100% continuous assessment

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### **IMSE4136. Transportation and distribution planning (6 credits)**

The evolution of transportation and distribution; traffic management; transportation alternatives and technologies; transportation infrastructure; transportation and distribution performance analysis; total distribution cost analysis; fleet development and management; fleet performance indicators; routing and scheduling; shipment planning; containerisation-alternatives and selection criteria; mode selection criteria; distribution management and information systems requirements; international transportation and distribution strategies; distribution centre; warehousing and terminal operations; implementation organisational issues.

Prerequisite: IMSE2134 Operational Research  
Assessment: 30% continuous assessment, 70% examination

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### **IMSE4137. Operational risk management (6 credits)**

Basics of risk management, risk and return, lifecycle of risk management, operational risk management (ORM) components; risk management framework: standards, management environment, management processes; operational risk assessment: assessment, identification, scale of assessment; risk reporting: risk indicators, risk map. Risk management strategies: risk avoidance, mitigation, transfer and acceptance; applications: supply chain management, product development, environment, health and safety risks; crisis management.

Assessment: 30% continuous assessment, 70% examination

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### **IMSE4138. Asset and portfolio management (6 credits)**

Statistics of asset and portfolio management: univariate statistics, multivariate statistics, modelling the market; portfolio selection theories: mean-variance analysis, asset pricing theory; factor model: arbitrage pricing theory, factor model estimation, principal component analysis; asset price dynamics; portfolio management strategies: tracking error, information ratio, passive and active strategies; portfolio monitor and adjustment; rebalancing; basic machine learning algorithms.

Assessment: 30% continuous assessment, 70% examination

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### **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

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