THE UNIVERSITY OF HONG KONG
FACULTY OF ENGINEERING

Master of Science in Engineering (Energy Engineering)

Regulations & Syllabuses

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REGULATIONS FOR THE DEGREES OF
MASTER OF SCIENCE IN ENGINEERING (MSc[Eng])
MASTER OF SCIENCE IN COMPUTER SCIENCE (MSc[CompSc]), AND
MASTER OF SCIENCE IN ELECTRONIC COMMERCE AND INTERNET COMPUTING (MSc[ECom&IComp])

(Applicable to students admitted in the academic year 2018-19 to 2021-22)

(See also General Regulations and Regulations for Taught Postgraduate Curricula)

The degrees of MSc(Eng), MSc(CompSc) and MSc(ECom&IComp) are each a postgraduate degree awarded for the satisfactory completion of a prescribed curriculum in the Faculty of Engineering.

For the MSc(Eng) degree, the major part of the curriculum must include courses offered in one of the following fields: building services engineering, electrical and electronic engineering, energy engineering, environmental engineering, geotechnical engineering, industrial engineering and logistics management, infrastructure project management, mechanical engineering, structural engineering, and transportation engineering.

The MSc(Eng), MSc(CompSc) and MSc(ECom&IComp) curricula are offered in part-time and full-time modes.

MSc 1   Admission requirements

To be eligible for admission to the curriculum leading to the degree of MSc(Eng) / MSc(CompSc) / MSc(ECom&IComp), a candidate shall:

    (a)   comply with the General Regulations;

    (b)   comply with the Regulations for Taught Postgraduate Curricula;

    (c)   hold (i) a Bachelor's degree of this University in a relevant field; or

            (ii) a relevant qualification of equivalent standard from this University or from another university or comparable institution accepted for this purpose; and

    (d)   satisfy the examiners in a qualifying examination if required.

MSc 2   Qualifying Examination

    (a)   A qualifying examination may be set to test the candidate's academic ability or his/her ability to follow the curriculum prescribed. It shall consist of one or more written papers or their equivalent and may include a dissertation.

    (b)   A candidate who is required to satisfy the examiners in a qualifying examination shall not be permitted to register until he/she has satisfied the examiners in the examination.

MSc 3   Period of Study

The curriculum of the degree of MSc(Eng)/MSc(CompSc)/MSc(ECom&IComp) shall normally extend over one academic year of full-time study or two academic years of part-time study. Candidates shall

not be permitted to extend their studies beyond the maximum period of registration of two academic years of full-time study or three academic years of part-time study, unless otherwise permitted or required by the Board of Faculty. For both full-time and part-time modes, the period of study shall include any assessment to be held during and/or at the end of each semester.

MSc 4   Curriculum Requirements

To complete the curriculum, a candidate shall, within the prescribed maximum period of registration stipulated in Regulation MSc3 above:

(a)   satisfy the requirements prescribed in TPG6 of the Regulations for Taught Postgraduate Curricula;

(b)   take not fewer than 72 credits of courses, in the manner specified in these regulations and syllabuses and pass all courses as specified in the syllabuses;

(c)   follow courses of instruction and complete satisfactorily all prescribed practical / laboratory work; and

(d)   satisfy the examiners in all forms of assessment as may be required in either

(i)   72 credits of courses which must include a dissertation of 24 credits or a project of 12 credits as capstone experience; or

(ii)   at least 60 credits of courses successfully completed at this University (which must include a dissertation of 24 credits or a project of 12 credits) and not more than 12 credits of courses successfully completed at this or another university before admission to the MSc(Eng) / MSc(CompSc) / MSc(ECom&IComp) and approved by the Board of the Faculty.

MSc 5   Dissertation or project report

(a)   A candidate who is permitted to select a dissertation or a project is required to submit the dissertation or the project report by a date specified by the Board of Examiners.

(b)   All candidates shall submit a statement that the dissertation or the project report represents his/her own work undertaken after the registration as a candidate for the degree.

MSc 6   Selection of Courses

(a)   A candidate shall select courses according to the guidelines stipulated in the syllabuses for the degree of MSc(Eng)/MSc(CompSc)/MSc(ECom&IComp).

(b)   Selection of study patterns, as stipulated in the respective syllabus, shall be subject to the approval of the Head of the Department concerned.

(c)   Candidates shall select their courses in accordance with these regulations and the guidelines specified in the syllabuses before the beginning of each academic year.

(d)   Changes to the selection of courses may be made only during the add/drop period of the semester in which the course begins, and such changes shall not be reflected in the transcript of the candidate.

(e)   Subject to the approval of the Committee on Taught Postgraduate Curricula on the recommendation of the Head of the Department concerned, a candidate may in exceptional circumstances be permitted to select additional course(s).

(f)   Requests for changes after the designated add/drop period of the semester shall be   subject to the approval of the Committee on Taught Postgraduate Curricula. Withdrawal from courses beyond the designated add/drop period will be subject to the approval of   the Committee on Taught Postgraduate Curricula.

MSc 7   Assessment

(a)   The written examination for each course shall be held after the completion of the prescribed course of study for that course, and not later than January, May or August immediately following the completion of the course of study for that course unless otherwise specified in the syllabuses.

(b)   A candidate, who is unable to complete the requirements within the prescribed maximum period of registration specified in Regulation MSc3 because of illness or circumstances beyond his/her control, may apply for permission to extend his/her period of studies.

(c)   A candidate who has failed to satisfy the examiners in any course(s) is required to make up for failed course(s) in the following manners:

   (i)   undergoing re-assessment/re-examination in the failed course(s); or

   (ii) repeating the failed course(s) by undergoing instruction and satisfying the assessments; or

   (iii) taking another course in lieu and satisfying the assessment requirements.

(d)   A candidate who has failed to satisfy the examiners in his/her dissertation or project   report may be required to submit or resubmit a dissertation or a project report on the   same subject within a period specified by the Board of Examiners.

(e)   In accordance with G9(h) of the General Regulation and TPG8(d) of the Regulations for Taught Postgraduate Curricula, there shall be no appeal against the results of   examinations and all other forms of assessment.

MSc 8   Grading system

Individual courses shall be graded according to the following grading system as determined by the Board of Examiners:

Standard	Grade	Grade Point
Excellent	A+	4.3
	A	4.0
	A-	3.7
Good	B+	3.3
	B	3.0
	B-	2.7
Satisfactory	C+	2.3
	C	2.0
	C-	1.7
Pass	D+	1.3
	D	1.0
Fail	F	0

MSc 9   Discontinuation of Studies

Unless otherwise permitted by the Board of the Faculty, a candidate will be recommended for discontinuation of their studies in accordance with General Regulation G12 if he/she has:

(a)   failed to pass 12 credits in an academic year; or

(b)   failed to satisfy the examiners at a second attempt in his/her dissertation or project report within the specified period; or

(c)   failed to achieve a cumulative grade point average* (CGPA) of 1.0 or higher for two consecutive semesters with course enrolment; or

(d)   exceeded the maximum period of registration specified in Regulation MSc3.

At the end of each semester, a cumulative grade point average (CGPA) for all courses, except cross-listed undergraduate courses and outside curriculum requirement optional courses as specified in the syllabuses, taken by a student (including failed courses) at the time of calculation is computed.

MSc 10   Advanced Standing

Advanced standing may be granted to candidates in recognition of studies completed successfully before admission to the curriculum in accordance with TPG3 of the Regulations for Taught Postgraduate Curricula. Candidates who are awarded Advanced Standing will not be granted any further   credit transfer for those studies for which Advanced Standing has been granted. The amount of   credits to be granted for Advanced Standing shall be determined by the Board of the Faculty, in accordance with the following principles:

(a)   a candidate may be granted a total of not more than 20% of the total credits normally required under a curriculum for Advanced Stranding unless otherwise approved by the Senate; and

(b)   credits granted for advanced standing shall not be included in the calculation of the GPA but will be recorded on the transcript of the candidate.

MSc 11   Award of Degree

To be eligible for the award of the degree of MSc(Eng) / MSc(CompSc) / MSc(ECom&IComp), a candidate shall:

(a)   comply with the General Regulations and the Regulations for Taught Postgraduate Curricula;

(b)   complete the curriculum and satisfy the examiners in accordance with the regulations set   out; and

(c)   achieve a cumulative grade point average (CGPA) of 1.0 or higher

MSc 12   Assessment results

On successful completion of the curriculum, candidates who have shown exceptional merit of achieving a cumulative grade point average (CGPA) of 3.6 or higher may be awarded a mark of distinction, and this mark shall be recorded on the candidates' degree diploma.

SYLLABUS FOR THE DEGREE OF MASTER OF SCIENCE IN ENGINEERING

MSC(ENG) IN ENGINEERING IN INDUSTRIAL ENGINEERING AND LOGISTICS MANAGEMENT

[This syllabus is applicable to students admitted to the curriculum in the academic year 2021-22 and thereafter.]

Definition and Terminology

Discipline course – any course offered by the curriculum of the MSc(Eng) in Industrial Engineering and Logistics Management (IELM).

Fundamental courses – a specific number of discipline courses in the curriculum that a student must pass.

Elective course – any course offered by the Departments of the Faculty of Engineering for the fulfilment of the curriculum requirements of the degree of MSc(Eng) in Industrial Engineering and Logistics Management that are not classified as discipline courses.

Capstone Experience – a dissertation or a project which is a compulsory and integral part of the curriculum.

Curriculum Structure

Candidates are required to complete 72 credits of courses, as set out below.

	Enrolment Mode	
Course Category	**8 Courses + Dissertation**	**10 Courses + Project**
Discipline Courses (including at least 2 Fundamental Courses)	Not less than 36 credits	Not less than 48 credits
Elective Courses	Not more than 12 credits	
Capstone	Dissertation (24 credits)	Project (12 credits)
Total	72 credits	

Candidates are permitted to select courses in accordance with Regulations MSc4, MSc5 and MSc6. The curriculum provides two enrolment modes for candidates to choose from either (i) 8 courses plus a dissertation, or (ii) 10 courses plus a project. In choosing the enrolment mode (i), candidates must complete a 24-credit dissertation and at least 6 discipline courses (including at least 2 fundamental courses); for enrolment mode (ii), candidates must complete a 12-credit project and at least 8 discipline courses (including at least 2 fundamental courses). Candidates choosing any enrolment mode can take no more than 2 elective courses out of Taught Postgraduate level courses offered by other curricula in the Faculty of Engineering. All selection will be subjected to approval by the Course Coordinator.

The curriculum is offered in both part-time and full-time modes. For the part-time mode of study, the curriculum shall extend over not less than two and not more than three academic years of study. For the full-time mode of study, the curriculum shall extend over not less than one and not more than two

academic years of study.

The curriculum provides advanced education and training in the philosophy, methods and techniques of Industrial Engineering, Logistics and Supply Chain Management and Financial Engineering, which are essential for industrial and service organizations in both the private and the public sectors.

All courses are assessed through examination and / or coursework assessment, the weightings of which are subject to approval by the Board of Examiners.

The courses are streamlined into five categories:
- Fundamental or Capstone course (coded with IMSE70xx),
- Industrial Engineering-focused course (coded with IMSE71xx),
- Logistics and Supply Chain Management-focused course (coded with IMSE72xx),
- Financial Engineering-focused course (coded with IMSE73xx), and
- Leadership-training course (coded with IMSE79xx).

It should be noted that not all of the courses listed below are offered every year:

List of Discipline Courses

Fundamental Courses (Students are required to choose at least 2 out of 3):
IMSE7015 Engineering economics and finance
IMSE7020 Supply chain management
IMSE7034 Operational research

Capstone Courses (Students are required to choose either one):
IMSE7098 Project (12 credits)
IMSE7099 Dissertation (24 credits)

Other Discipline Courses:
IMSE7111 Intelligent optimization
IMSE7119 Digital enterprises and e-commerce
IMSE7128 Human factors engineering
IMSE7138 Healthcare systems engineering
IMSE7139 Cyber-physical systems

IMSE7212 Physical internet
IMSE7221 Warehousing and city logistics
IMSE7222 Global logistics and transportation systems
IMSE7251 Fundamentals of law for logistics

IMSE7310 Financial engineering
IMSE7315 Supply chain and logistics finance
IMSE7337 Operational risk management
IMSE7339 Financial technologies
IMSE7340 Asset and portfolio management

IMSE7902 Project management
IMSE7909 Quality management
IMSE7929 Frontiers in industrial engineering and logistics management
IMSE7936 Operations planning and control

Elective Courses

Please consult courses offered for other MSc curricula in the Faculty of Engineering.

Calendar entries of discipline courses offered by the curriculum of MSc(Eng) in IELM

IMSE7015.   Engineering economics and finance (6 credits)

Engineering economics fundamentals: cost concepts, money-time relationships, comparing alternatives, depreciation and income taxes, cost estimation, price changes and exchange rates, replacement analysis, effects of uncertainties; financial statements, ratio analysis, financial performance, financial planning and growth; capital budgeting: investment criteria, project analysis and evaluation, project cash flow; cost of capital, long-term financial policy, financial leverage and capital structure policy.

IMSE7020.   Supply chain management (6 credits)

Supply chain characterisation; operation objectives; distribution channels; channel design considerations; logistics network design. Inventory management; risk pooling; distribution strategies. Strategic alliances; international issues in supply chain management; coordinating product and supply chain design; customer value. Information technology; decision support systems; the value of information in supply chains. Case studies and contemporary topics on supply chain management; the beer game.

IMSE7034.   Operational research (6 credits)

The philosophy and methodology of Operational Research: problem analysis, model building, and implementation of solutions. Mathematical programming and its applications in logistics and supplies: vehicle scheduling, transportation and transhipments problems. Replacement models for capital equipment and preventive replacement for components of low capital value. Risk analysis for capital expenditure proposals. Queuing theory and event simulation with applications in serial and parallel supply chains.

IMSE7098.   Project (12 credits)

A group of students will work on a supervised project that relates to major research and/or industrial projects and initiatives that supervisors have recently carried out. Groups are expected to generate project deliverables of a variety of forms including patents, software copyrights, research papers, proof-of-the-concept solutions and products, consultancy reports / whitepapers, etc. This course will provide students with a range of opportunities to engage in academic research, industrial innovation and entrepreneurship development.

IMSE7099.   Dissertation (24 credits)

Student individuals or groups will undertake a supervised project which will be assessed. The dissertation module must relate to the subject matter and be agreed by the Department of Industrial and Manufacturing Systems Engineering. The Dissertation can be related to research projects within the department or industry-related projects.

IMSE7111.   Intelligent optimization (6 credits)

Overview of intelligent optimization and intelligent analytics; Genetic algorithms; Simulated annealing algorithm; Tabu search algorithm; Particle swarm optimization; Ant colony optimization; Predatory search strategy; Computational techniques and intelligent optimization strategies for dynamic systems; Data mining, decision analytics; Applications in multiple objective optimization; Applications in constraint problems; Multiple level optimization; Case studies in supply chain, logistics, manufacturing and service applications.

IMSE7119.   Digital enterprises and e-commerce (6 credits)

Overview and development of e-business; e-business technologies and solutions: appraisal and selection, implementation and adoption; Enterprise information and knowledge portals, virtual enterprises; Roles of e-business in enterprise development and integration; corporate social accountability and responsibility standards; digital technologies for product design and development; cryptographic algorithms for corporate data and IP protection; mobile technology and electronic payment, smart cards, RFID and NFC.

IMSE7128.   Human factors engineering (6 credits)

Ergonomics and systems design. Physical ergonomics, anthropometry, biomechanics. Human information processing, person-machine interface design, displays and controls. The visual environment and visual performance. Thermal environment and effects on performance, indices of comfort. Noise; noise measurement, effects of noise, control of noise. Vibration and acceleration; human tolerance.

IMSE7138.   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.

IMSE7139.   Cyber-physical systems (6 credits)

This course mainly consists of lectures and projects. The topics include introduction to cyber-physical systems (CPS), sensors and sensor networks, robotics and automation, communications for CPS, data analytics in CPS, digital twins, cloud computing for CPS, and system integrations. By completion of the projects, the topics will be discussed in the related lectures and hands-on experiments. The outcomes of the each individual projects will be integrated at the end to address CPS from system point of view as well in applications related settings.

IMSE7212.   Physical internet (6 credits)

Logistics network history and topology, organisation and performance, logistics networks sustainability, asset utilization. Interconnection principles; Digital Internet, Physical Internet, Internet of Things. Physical Internet components: containerisation diversity, modularity, handling and sorting. Logistics information capture, publication, EPCglobal standards. Flow routing and assets management in open-loop supply networks. Collaborative logistics business models, small scale cooperative game with transferable utility,

Shapley value and core solution, big scale collaboration models, mechanism design, combinatorial optimisation. Case studies, web search, serious game.

IMSE7221. Warehousing and city logistics (6 credits)

Materials handling systems, automated storage and distribution systems, hardware and software, routing. Case studies from cargo terminals. Warehouse management systems, missions, functions, receiving and shipping operations planning, dock design, storage space, layout and location planning, order picking. Cost and performance analysis in logistics and warehouse management. Material handling principles, system design, selection of handling equipment, unit load design. Automation of warehouse and material handling systems, costing and audits. Applications of modelling and simulation for warehouse design and optimisation. Logistics security, logistics park and third party logistics service providers.

IMSE7222. Global logistics and transportation systems (6 credits)

Global operations and logistics strategies, strategic changes required by globalization, the strategic framework for 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, risk management in global operations; management of global operations and logistics, operations analysis of global supply chains, information management for global logistics, performance measurement and evaluation in global logistics.

IMSE7251. Fundamentals of law for logistics (6 credits)

The course focuses on five areas of law essential to industrial and logistics managers: contracts, agency, shipping law, negligence and dispute resolution; overview of sources of law and legal structure of businesses; elements of a binding contract; duties of an agent, including common carriers, employees and professionals; claims arising in international shipment of goods, arbitration, mediation or litigation and venue for dispute resolution.

IMSE7310. Financial engineering (6 credits)

Basics of financial markets; cash flow analysis; capital asset pricing model (CAPM); portfolio optimisation; arbitrage and fundamental theorem of asset pricing; types of derivatives including forward, futures and options for various underlying assets; returns, value-at-risk (VaR), utility functions; pricing and hedging of derivative securities; numerical studies.

IMSE7315. Supply chain and logistics finance (6 credits)

Basics of financial markets; sources and channels for supply chain and logistics finance; financing conditions. Financial derivatives for managing risks; risk measures; theories and methods of financial hedging. Supply chain risks arising from global manufacturing, trading and logistics activities: uncertain price, demand and exchange rates; financing of logistics businesses and risks; development of risk hedging models: price models, demand models, optimal hedging policies.

IMSE7337. 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.

IMSE7339.   Financial technologies (6 credits)

Applications of the state-of-the-art technologies that drive the rapid growth and disruptive innovations in the financial services sector: big data analytics and predictive modelling, mobility, payments and transactions, infrastructure and operational technologies for financial investments, P2P lending and crowdfunding, and cybersecurity. Understanding on how the financial technology innovations are disrupting traditional established business models and reshaping the way financial services are structured, provisioned and consumed.

IMSE7340.   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.

IMSE7902.   Project management (6 credits)

Fundamental of project management; PMBOK's project management framework; Project initiating, planning, executing, monitoring and controlling, and closing; Project integration management; Project scope management; CPM/PERT techniques for project time management, resource allocation and cost management; Earned value analysis for project tracking; Application of techniques such as EMV, decision tree analysis, and Monte Carlo simulation in project risk management, human resource management, communication, procurement and quality management for industrial projects; Project change control and management; Project team-building; Case studies in logistics and manufacturing industries.

IMSE7909.   Quality management (6 credits)

The principals of Total Quality Management and BS 7850. Basic tools of quality management, the Japanese approaches to quality management, 5S and Kaizen. Deming's approach to quality management. International quality assurance management system -- the ISO 9000 series, quality documentation, quality audit. Zero defects and Six Sigma. The American Malcolm Baldrige quality award. Quality Function Deployment. The Taguchi Methods.

IMSE7929.   Frontiers in industrial engineering and logistics management (6 credits)

Advanced Industrial Engineering Technology refers to the four Research and Development Areas of focus in the Department of Industrial and Manufacturing Systems Engineering, namely, Industrial/ Service Engineering, Systems Engineering, Intelligent Systems and Digital Enterprise Technology.
The general aim of this course is to provide students with a deeper understanding of those advance topics under the four research and development focuses. Through the course, graduate students are expected to

have a holistic view of the scope of these research focuses.

IMSE7936.   Operations planning and control (6 credits)

Elements of operations strategies; quantitative forecasting models; strategic decisions; planning products, processes, technologies, and facilities; selection and management of production technology; capacity planning and facility location; production planning systems; aggregate planning; master production scheduling; inventory systems; material requirement planning; shop floor planning and control; Just-In-Time manufacturing.

SYLLABUS FOR THE DEGREE OF MASTER OF SCIENCE IN ENGINEERING

MSC(ENG) IN INDUSTRIAL ENGINEERING AND LOGISTICS MANAGEMENT

[This syllabus is applicable to students admitted to the curriculum in the academic year 2019-20 and 2020-21.]

Definition and Terminology

Discipline course – any course on a list of courses in the discipline of curriculum which a candidate must pass at least a certain number of credits as specified in the Regulations.

Fundamental courses – a specific number of discipline courses in the curriculum that a student must pass.

Elective course – any course offered by the Departments of the Faculty of Engineering for the fulfilment of the curriculum requirements of the degree of MSc(Eng) in Industrial Engineering and Logistics Management that are not classified as discipline courses.

Capstone Experience – a 24-credit dissertation which is a compulsory and integral part of the curriculum.

Curriculum Structure

Candidates are required to complete 72 credits of courses, as set out below, normally over one academic year of full-time study or two academic years of part-time study:

Course Category	No. of Credits
Discipline Courses (including at least 2 Fundamental Courses)	Not less than 36
Elective Courses	Not more than 12
Capstone (Dissertation)	24
Total	72

The curriculum is offered in both part-time and full-time modes. For the part-time mode of study, the curriculum shall extend over not less than two and not more than three academic years of study. For the full-time mode of study, the curriculum shall extend over not less than one and not more than two academic years of study. It provides advanced education and training in the philosophy, methods and techniques of Industrial Engineering and Industrial / Logistics Management which are appropriate to industrial and service organizations in both the private and the public sectors.

Candidates are permitted to select courses in accordance with Regulations MSc4, MSc5 and MSc6. Candidates must complete the following categories of courses: (i) at least 6 discipline courses (including at least 2 fundamental courses); (ii) 24 credits of capstone course and (iii) no more than 2 elective courses. He / she can select no more than two Taught Postgraduate level courses offered by other curricula in the Faculty of Engineering as electives. All selection will be subjected to approval by the Course Coordinator.

The following is a list of discipline courses offered by the Department of Industrial and Manufacturing Systems Engineering. The list below is not final and some courses may not be offered every year.
All courses are assessed through examination and / or coursework assessment, the weightings of which are

subject to approval by the Board of Examiners.

List of Discipline Courses

Fundamental Courses (Students are required to choose at least 2 out of 3):
IELM6034 Operational research techniques (fundamental course)
IELM6044 Supply chain management (fundamental course)
IELM7016 Engineering economics and finance (fundamental course)

IELM6001 Concurrent engineering
IELM6002 Operations management
IELM6004 Industrial project management
IELM6028 Enterprise logistics and facilities design
IELM6030 Ergonomics
IELM6037 Costing and finance
IELM6042 Quality management
IELM6046 Supply management
IELM6048 Terminal and warehousing operations
IELM6050 Industrial applications of radio frequency identification technologies
IELM6051 Fundamentals of law for logistics
IELM7002 Frontiers in industrial engineering and logistics management
IELM7011 Supply chain and logistics finance
IELM7012 Physical internet
IELM7013 Digital enterprises and e-commerce
IELM7014 Organisation management and strategy
IELM7015 Global logistics
IELM7017 Operational risk management
IELM7018 Financial engineering
IELM7019 Financial technologies
IELM7020 Asset and portfolio management
IELM7021 Computational optimization and intelligent analytics
IELM7022 Advanced cyber-physical systems
IELM7023 Systems integration and analytics
IMSE7138 Healthcare systems engineering (To be offered from the academic year 2021-22 and thereafter)

Capstone (Dissertation)
IELM7045 Dissertation

The following is a list of discipline courses offered by the Department of Industrial and Manufacturing Systems Engineering. The list below is not final and some courses may not be offered every year.

All courses are assessed through examination and / or coursework assessment, the weightings of which are subject to approval by the Board of Examiners.

IELM6001.   Concurrent engineering (6 credits)

Product development process analysis and reengineering: performance measurement, organisation and management issues and extended enterprises. Formal methods and techniques, "Design for X", arc conjoint analysis. Product management, product variety, and engineering changes. Collaborative product commerce: information/task sharing, customer/supplier involvement and e-commerce/e-business applications. Case studies in logistics, service and manufacturing industries.

IELM6002.   Operations management (6 credits)

Elements of operations strategies; quantitative forecasting models; strategic decisions; planning products, processes, technologies, and facilities; selection and management of production technology; capacity planning and facility location; production planning systems; aggregate planning; master production scheduling; inventory systems; material requirement planning; shop floor planning and control; Just-In-Time manufacturing.

(Students who have passed this course are not allowed to take "IMSE7936 Operations planning and control".)

IELM6004.   Industrial project management (6 credits)

Fundamental of project management; PMBOK's project management framework; Project initiating, planning, executing, monitoring and controlling, and closing; Project integration management; Project scope management; CPM/PERT techniques for project time management, resource allocation and cost management; Earned value analysis for project tracking; Application of techniques such as EMV, decision tree analysis, and Monte Carlo simulation in project risk management, human resource management, communication, procurement and quality management for industrial projects; Project change control and management; Project team-building; Case studies in logistics and manufacturing industries.

(Students who have passed this course are not allowed to take "IMSE7902 Project management".)

IELM6028.   Enterprise logistics and facilities design (6 credits)

Enterprise logistics: materials handling systems, storage and warehousing operations, competitive manufacturing, modelling and analysis of enterprise logistics systems; location analysis; methodologies for facilities planning: systematic layout planning approaches (SLP); manufacturing strategies; layout planning algorithms.

IELM6030.   Ergonomics (6 credits)

Ergonomics and systems design. Physical ergonomics, anthropometry, biomechanics. Human information processing, person-machine interface design, displays and controls. The visual environment and visual performance. Thermal environment and effects on performance, indices of comfort. Noise; noise measurement, effects of noise, control of noise. Vibration and acceleration;

human tolerance.

(Students who have passed this course are not allowed to take "IMSE7128 Human factors engineering".)

IELM6034.   Operational research techniques (6 credits) (fundamental course)

The philosophy and methodology of Operational Research: problem analysis, model building, and implementation of solutions. Mathematical programming and its applications in logistics and supplies: vehicle scheduling, transportation and transhipments problems. Replacement models for capital equipment and preventive replacement for components of low capital value. Risk analysis for capital expenditure proposals. Queuing theory and event simulation with applications in serial and parallel supply chains.

(Students who have passed this course are not allowed to take "IMSE7034 Operational research".)

IELM6037.   Costing and finance (6 credits)

Cost terms and purposes, allocation and absorption of overheads, cost volume analysis, product costing, activity-based costing, budgetary control and standard costing, variance analysis, cost for decision making. Capital investment appraisal including discount cash flow, net present value and internal rate of return, risk analysis. Interpretation of financial statements, ratio analysis, fund flow statement, sources of funds, management of working capital.

IELM6042.   Quality management (6 credits)

The principals of Total Quality Management and BS 7850. Basic tools of quality management, the Japanese approaches to quality management, 5S and Kaizen. Deming's approach to quality management. International quality assurance management system -- the ISO 9000 series, quality documentation, quality audit. Zero defects and Six Sigma. The American Malcolm Baldrige quality award. Quality Function Deployment. The Taguchi Methods.

(Students who have passed this course are not allowed to take "IMSE7909 Quality management".)

IELM6044.   Supply chain management (6 credits) (fundamental course)

Supply chain characterisation; operation objectives; distribution channels; channel design considerations; logistics network design. Inventory management; risk pooling; distribution strategies. Strategic alliances; international issues in supply chain management; coordinating product and supply chain design; customer value. Information technology; decision support systems; the value of information in supply chains. Case studies and contemporary topics on supply chain management; the beer game.

(Students who have passed this course are not allowed to take "IMSE7020 Supply chain management".)

IELM6046.   Supply management (6 credits)

Purchasing in the supply chain, strategic purchasing, implementation and evaluation of strategy; purchasing organisation in a corporation, impact of e-procurement; out-sourcing, supplier selection, partnership with suppliers; pricing agreement, price analysis; global sourcing.

IELM6048. Terminal and warehousing operations (6 credits)

Materials handling systems, automated storage and distribution systems, hardware and software, routing. Case studies from cargo terminals. Warehouse management systems, missions, functions, receiving and shipping operations planning, dock design, storage space, layout and location planning, order picking. Cost and performance analysis in logistics and warehouse management. Material handling principles, system design, selection of handling equipment, unit load design. Automation of warehouse and material handling systems, costing and audits. Applications of modelling and simulation for warehouse design and optimisation. Logistics security, logistics park and third party logistics service providers.

(Students who have passed this course are not allowed to take "IMSE7221 Warehousing and city logistics".)

IELM6050. Industrial applications of radio frequency identification technologies (6 credits)

Introduction to radio frequency identification (RFID); features and characteristics of readers and tags, typical frequencies, materials and orientations, middleware, standards for electronic product coding, and physical markup language. Design, development and implementation of RFID solutions; business process analysis, technology and vendor selection, deployment of readers and tags, infrastructure architecture, integration with enterprise application systems, and cost-benefits and constraints. RFID case studies and applications in object identification and tracking, asset management, warehouse management, supply chain integration, and manufacturing automation.

IELM6051. Fundamentals of law for logistics (6 credits)

The course focuses on five areas of law essential to industrial and logistics managers: contracts, agency, shipping law, negligence and dispute resolution; overview of sources of law and legal structure of businesses; elements of a binding contract; duties of an agent, including common carriers, employees and professionals; claims arising in international shipment of goods, arbitration, mediation or litigation and venue for dispute resolution.

(Students who have passed this course are not allowed to take "IMSE7251 Fundamentals of law for logistics".)

IELM7002. Frontiers in industrial engineering and logistics management (6 credits)

Advanced Industrial Engineering Technology refers to the four Research and Development Areas of focus in the Department of Industrial and Manufacturing Systems Engineering, namely, Industrial/ Service Engineering, Systems Engineering, Intelligent Systems and Digital Enterprise Technology.
The general aim of this course is to provide students with a deeper understanding of those advance topics under the four research and development focuses. Through the course, graduate students are expected to have a holistic view of the scope of these research focuses.

(Students who have passed this course are not allowed to take "IMSE7929 Frontiers in industrial engineering and logistics management".)

IELM7011.   Supply chain and logistics finance (6 credits)

Basics of financial markets; sources and channels for supply chain and logistics finance; financing conditions. Financial derivatives for managing risks; risk measures; theories and methods of financial hedging. Supply chain risks arising from global manufacturing, trading and logistics activities: uncertain price, demand and exchange rates; financing of logistics businesses and risks; development of risk hedging models: price models, demand models, optimal hedging policies.

(Students who have passed this course are not allowed to take "IMSE7315 Supply chain and logistics finance".)

IELM7012.   Physical internet (6 credits)

Logistics network history and topology, organisation and performance, logistics networks sustainability, asset utilization. Interconnection principles; Digital Internet, Physical Internet, Internet of Things. Physical Internet components: containerisation diversity, modularity, handling and sorting. Logistics information capture, publication, EPCglobal standards. Flow routing and assets management in open-loop supply networks. Collaborative logistics business models, small scale cooperative game with transferable utility, Shapley value and core solution, big scale collaboration models, mechanism design, combinatorial optimisation. Case studies, web search, serious game.

(Students who have passed this course are not allowed to take "IMSE7212 Physical internet".)

IELM7013.   Digital enterprises and e-commerce (6 credits)

Overview and development of e-business; e-business technologies and solutions: appraisal and selection, implementation and adoption; Enterprise information and knowledge portals, virtual enterprises; Roles of e-business in enterprise development and integration; corporate social accountability and responsibility standards; digital technologies for product design and development; cryptographic algorithms for corporate data and IP protection; mobile technology and electronic payment, smart cards, RFID and NFC.

(Students who have passed "IELM6047 Digital enterprises" or this course are not allowed to take "IMSE7119 Digital enterprises and e-commerce".)

IELM7014.   Organisation management and strategy (6 credits)

The role of the manager, teams and task design, team based systems, team leadership, measuring the performance of teams. Theories of motivation with case studies from industry. Theories of organisation design, socio-technical theory, contingency and markets and clans theory. Behavioural control and change issues, organisation dynamics. Understanding organisational structures. Classifying types of system, Mintzberg typologies and configurations. The Global Business: Strategic decisions in the global business, global culture, leadership, vision, ethics and corporate social responsibility. The design of organisations. The systems view of organisations. Global business issues. Specify appropriate organisation structures to match market needs. Explain cultural implications for global organisations. The fundamentals of strategic management.

(Students who have passed "IELM6027 Organisation theory and behavioural science" are not allowed to take this course.)

IELM7015.   Global logistics (6 credits)

Global operations and logistics strategies, strategic changes required by globalization, the strategic framework for 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, risk management in global operations; management of global operations and logistics, operations analysis of global supply chains, information management for global logistics, performance measurement and evaluation in global logistics.

(Students who have passed "IELM6045 Global operations and logistics" or this course are not allowed to take "IMSE7222 Global logistics and transportation systems".)

IELM7016.   Engineering economics and finance (6 credits) (fundamental course)

Engineering economics fundamentals: cost concepts, money-time relationships, comparing alternatives, depreciation and income taxes, cost estimation, price changes and exchange rates, replacement analysis, effects of uncertainties; financial statements, ratio analysis, financial performance, financial planning and growth; capital budgeting: investment criteria, project analysis and evaluation, project cash flow; cost of capital, long-term financial policy, financial leverage and capital structure policy.

(Students who have passed this course are not allowed to take "IMSE7015 Engineering economics and finance".)

IELM7017.   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.

(Students who have passed "IELM6052 Operational risk management practices" or this course are not allowed to take "IMSE7337 Operational risk management".)

IELM7018.   Financial engineering (6 credits)

Basics of financial markets; cash flow analysis; capital asset pricing model (CAPM); portfolio optimisation; arbitrage and fundamental theorem of asset pricing; types of derivatives including forward, futures and options for various underlying assets; returns, value-at-risk (VaR), utility functions; pricing and hedging of derivative securities; numerical studies.

(Students who have passed this course are not allowed to take "IMSE7310 Financial engineering".)

IELM7019.   Financial technologies (6 credits)

Applications of the state-of-the-art technologies that drive the rapid growth and disruptive innovations in the financial services sector: big data analytics and predictive modelling, mobility, payments and transactions, infrastructure and operational technologies for financial investments, P2P lending and crowdfunding, and cybersecurity. Understanding on how the financial technology innovations are disrupting traditional established business models and reshaping the way financial services are structured, provisioned and consumed.

(Students who have passed this course are not allowed to take "IMSE7339 Financial technologies".)

IELM7020.   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.

(Students who have passed this course are not allowed to take "IMSE7340 Asset and portfolio management".)

IELM7021.   Computational optimization and intelligent analytics (6 credits)

Overview of Intelligent optimization and intelligent analytics; Genetic algorithms; Simulated annealing algorithm; Tabu search algorithm; Particle swarm optimization; Ant colony optimization; Predatory search strategy; Computational techniques and Intelligent optimization strategies for dynamic systems; Data mining, decision analytics; Applications in multiple objective optimization; Applications in constraint problems; Multiple level optimization; Case studies in supply chain, logistics, manufacturing and service applications.

(Students who have passed this course are not allowed to take "IMSE7111 Intelligent optimization".)

IELM7022.   Advanced cyber-physical systems (6 credits)

This course mainly consists of lectures and projects. The topics include introduction to cyber-physical systems (CPS), sensors and sensor networks, robotics and automation, communications for CPS, data analytics in CPS, digital twins, cloud computing for CPS, and system integrations. By completion of the projects, the topics will be discussed in the related lectures and hands-on experiments. The outcomes of the each individual projects will be integrated at the end to address CPS from system point of view as well in applications related settings.

(Students who have passed this course are not allowed to take "IMSE7139 Cyber-physical systems".)

IELM7023.   Systems integration and analytics (6 credits)

This course is mainly based on group projects enhanced by a series of invited guest lectures. Project topics are related to major research and/or industrial projects and initiatives that supervisors have recently carried out. Groups are expected to generate project deliverables of a variety of forms including patents, software

copyrights, research papers, proof-of-the-concept solutions and products, consultancy reports / whitepapers, etc.

(Students who have passed this course are not allowed to take "IMSE7098 Project".)

Capstone courses

IELM7045.   Dissertation (24 credits)

Student individuals or groups will undertake a supervised project which will be assessed. The dissertation module must relate to the subject matter and be agreed by the Department of Industrial and Manufacturing Systems Engineering. The Dissertation can be related to research projects within the department or industry-related projects.

(Students who have passed this course are not allowed to take "IMSE7099 Dissertation".)

Calendar entries of discipline courses offered by the curriculum of MSc(Eng) in IELM from the academic year of 2021-2022

IMSE7020.   Supply chain management (6 credits)

Supply chain characterisation; operation objectives; distribution channels; channel design considerations; logistics network design. Inventory management; risk pooling; distribution strategies. Strategic alliances; international issues in supply chain management; coordinating product and supply chain design; customer value. Information technology; decision support systems; the value of information in supply chains. Case studies and contemporary topics on supply chain management; the beer game.

(Students who have passed "IELM6044 Supply chain management" are not allowed to take this course.)

IMSE7015.   Engineering economics and finance (6 credits)

Engineering economics fundamentals: cost concepts, money-time relationships, comparing alternatives, depreciation and income taxes, cost estimation, price changes and exchange rates, replacement analysis, effects of uncertainties; financial statements, ratio analysis, financial performance, financial planning and growth; capital budgeting: investment criteria, project analysis and evaluation, project cash flow; cost of capital, long-term financial policy, financial leverage and capital structure policy.

(Students who have passed "IELM7016 Engineering economics and finance" are not allowed to take this course.)

IMSE7034.   Operational research (6 credits)

The philosophy and methodology of Operational Research: problem analysis, model building, and implementation of solutions. Mathematical programming and its applications in logistics and supplies: vehicle scheduling, transportation and transhipments problems. Replacement models for capital equipment and preventive replacement for components of low capital value. Risk analysis for capital expenditure proposals. Queuing theory and event simulation with applications in serial and parallel supply chains.

(Students who have passed "IELM6034 Operational research techniques" are not allowed to take this course.)

IMSE7098.   Project (12 credits)*

A group of students will work on a supervised project that relates to major research and/or industrial projects and initiatives that supervisors have recently carried out. Groups are expected to generate project deliverables of a variety of forms including patents, software copyrights, research papers, proof-of-the-concept solutions and products, consultancy reports / whitepapers, etc. This course will provide students with a range of opportunities to engage in academic research, industrial innovation and entrepreneurship development.

(Students who have passed "IELM7023 Systems integration and analytics" are not allowed to take this course.)

IMSE7099.   Dissertation (24 credits)

Student individuals or groups will undertake a supervised project which will be assessed. The dissertation module must relate to the subject matter and be agreed by the Department of Industrial and Manufacturing Systems Engineering. The Dissertation can be related to research projects within the department or industry-related projects.

(Students who have passed "IELM7045 Dissertation" are not allowed to take this course.)

IMSE7111.   Intelligent optimization (6 credits)

Overview of intelligent optimization and intelligent analytics; Genetic algorithms; Simulated annealing algorithm; Tabu search algorithm; Particle swarm optimization; Ant colony optimization; Predatory search strategy; Computational techniques and intelligent optimization strategies for dynamic systems; Data mining, decision analytics; Applications in multiple objective optimization; Applications in constraint problems; Multiple level optimization; Case studies in supply chain, logistics, manufacturing and service applications.

(Students who have passed "IELM7021 Computational optimization and intelligent analytics" are not allowed to take this course.)

IMSE7119.   Digital enterprises and e-commerce (6 credits)

Overview and development of e-business; e-business technologies and solutions: appraisal and selection, implementation and adoption; Enterprise information and knowledge portals, virtual enterprises; Roles of e-business in enterprise development and integration; corporate social accountability and responsibility standards; digital technologies for product design and development; cryptographic algorithms for corporate data and IP protection; mobile technology and electronic payment, smart cards, RFID and NFC.

(Students who have passed "IELM6047 Digital enterprises" or "IELM7013 Digital enterprises and e-commerce" are not allowed to take this course.)

IMSE7128.   Human factors engineering (6 credits)

Ergonomics and systems design. Physical ergonomics, anthropometry, biomechanics. Human information processing, person-machine interface design, displays and controls. The visual environment and visual

performance. Thermal environment and effects on performance, indices of comfort. Noise; noise measurement, effects of noise, control of noise. Vibration and acceleration; human tolerance.

(Students who have passed "IELM6030 Ergonomics" are not allowed to take this course.)

IMSE7138.   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.

IMSE7139.   Cyber-physical systems (6 credits)

This course mainly consists of lectures and projects. The topics include introduction to cyber-physical systems (CPS), sensors and sensor networks, robotics and automation, communications for CPS, data analytics in CPS, digital twins, cloud computing for CPS, and system integrations. By completion of the projects, the topics will be discussed in the related lectures and hands-on experiments. The outcomes of the each individual projects will be integrated at the end to address CPS from system point of view as well in applications related settings.

(Students who have passed "IELM7022 Advanced cyber-physical systems" are not allowed to take this course.)

IMSE7212.   Physical internet (6 credits)

Logistics network history and topology, organisation and performance, logistics networks sustainability, asset utilization. Interconnection principles; Digital Internet, Physical Internet, Internet of Things. Physical Internet components: containerisation diversity, modularity, handling and sorting. Logistics information capture, publication, EPCglobal standards. Flow routing and assets management in open-loop supply networks. Collaborative logistics business models, small scale cooperative game with transferable utility, Shapley value and core solution, big scale collaboration models, mechanism design, combinatorial optimisation. Case studies, web search, serious game.

(Students who have passed "IELM7012 Physical internet" are not allowed to take this course.)

IMSE7221.   Warehousing and city logistics (6 credits)

Materials handling systems, automated storage and distribution systems, hardware and software, routing. Case studies from cargo terminals. Warehouse management systems, missions, functions, receiving and shipping operations planning, dock design, storage space, layout and location planning, order picking. Cost and performance analysis in logistics and warehouse management. Material handling principles, system design, selection of handling equipment, unit load design. Automation of warehouse and material handling systems, costing and audits. Applications of modelling and simulation for warehouse design and optimisation. Logistics security, logistics park and third party logistics service providers.

(Students who have passed "IELM6048 Terminal and warehousing operations" are not allowed to take this course.)

IMSE7222.   Global logistics and transportation systems (6 credits)

Global operations and logistics strategies, strategic changes required by globalization, the strategic framework for 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, risk management in global operations; management of global operations and logistics, operations analysis of global supply chains, information management for global logistics, performance measurement and evaluation in global logistics.

(Students who have passed "IELM6045 Global operations and logistics" or "IELM7015 Global logistics" are not allowed to take this course.)

IMSE7251.   Fundamentals of law for logistics (6 credits)

The course focuses on five areas of law essential to industrial and logistics managers: contracts, agency, shipping law, negligence and dispute resolution; overview of sources of law and legal structure of businesses; elements of a binding contract; duties of an agent, including common carriers, employees and professionals; claims arising in international shipment of goods, arbitration, mediation or litigation and venue for dispute resolution.

(Students who have passed "IELM6051 Fundamentals of law for logistics" are not allowed to take this course.)

IMSE7310.   Financial engineering (6 credits)

Basics of financial markets; cash flow analysis; capital asset pricing model (CAPM); portfolio optimisation; arbitrage and fundamental theorem of asset pricing; types of derivatives including forward, futures and options for various underlying assets; returns, value-at-risk (VaR), utility functions; pricing and hedging of derivative securities; numerical studies.

(Students who have passed "IELM7018 Financial engineering" are not allowed to take this course.)

IMSE7315.   Supply chain and logistics finance (6 credits)

Basics of financial markets; sources and channels for supply chain and logistics finance; financing conditions. Financial derivatives for managing risks; risk measures; theories and methods of financial hedging. Supply chain risks arising from global manufacturing, trading and logistics activities: uncertain price, demand and exchange rates; financing of logistics businesses and risks; development of risk hedging models: price models, demand models, optimal hedging policies.

(Students who have passed "IELM7011 Supply chain and logistics finance" are not allowed to take this course.)

IMSE7337.   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.

(Students who have passed "IELM6052 Operational risk management practices" or "IELM7017 Operational risk management" are not allowed to take this course.)

IMSE7339. Financial technologies (6 credits)

Applications of the state-of-the-art technologies that drive the rapid growth and disruptive innovations in the financial services sector: big data analytics and predictive modelling, mobility, payments and transactions, infrastructure and operational technologies for financial investments, P2P lending and crowdfunding, and cybersecurity. Understanding on how the financial technology innovations are disrupting traditional established business models and reshaping the way financial services are structured, provisioned and consumed.

(Students who have passed "IELM7019 Financial technologies" are not allowed to take this course.)

IMSE7340. 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.

(Students who have passed "IELM7020 Asset and portfolio management" are not allowed to take this course.)

IMSE7902. Project management (6 credits)

Fundamental of project management; PMBOK's project management framework; Project initiating, planning, executing, monitoring and controlling, and closing; Project integration management; Project scope management; CPM/PERT techniques for project time management, resource allocation and cost management; Earned value analysis for project tracking; Application of techniques such as EMV, decision tree analysis, and Monte Carlo simulation in project risk management, human resource management, communication, procurement and quality management for industrial projects; Project change control and management; Project team-building; Case studies in logistics and manufacturing industries.

(Students who have passed "IELM6004 Industrial project management" are not allowed to take this course.)

IMSE7909. Quality management (6 credits)

The principals of Total Quality Management and BS 7850. Basic tools of quality management, the Japanese approaches to quality management, 5S and Kaizen. Deming's approach to quality management. International quality assurance management system -- the ISO 9000 series, quality documentation, quality audit. Zero defects and Six Sigma. The American Malcolm Baldrige quality award. Quality Function Deployment. The Taguchi Methods.

(Students who have passed "IELM6042 Quality management" are not allowed to take this course.)

IMSE7929.   Frontiers in industrial engineering and logistics management (6 credits)

Advanced Industrial Engineering Technology refers to the four Research and Development Areas of focus in the Department of Industrial and Manufacturing Systems Engineering, namely, Industrial/ Service Engineering, Systems Engineering, Intelligent Systems and Digital Enterprise Technology.
The general aim of this course is to provide students with a deeper understanding of those advance topics under the four research and development focuses. Through the course, graduate students are expected to have a holistic view of the scope of these research focuses.

(Students who have passed "IELM7002 Frontiers in industrial engineering and logistics management" are not allowed to take this course.)

IMSE7936.   Operations planning and control (6 credits)

Elements of operations strategies; quantitative forecasting models; strategic decisions; planning products, processes, technologies, and facilities; selection and management of production technology; capacity planning and facility location; production planning systems; aggregate planning; master production scheduling; inventory systems; material requirement planning; shop floor planning and control; Just-In-Time manufacturing.

(Students who have passed "IELM6002 Operations management" are not allowed to take this course.)

Mapping Table

The new course codes and/or course titles listed as below will be adopted from the 2021-22 intake and thereafter. The courses taking in the academic year of 2020-21 and before are equivalent to the respective courses with new course codes and/or new course titles offered from the academic year of 2021-22.

2020-21 academic year and before		2021-22 academic year and after	
Course Code	**Course Title**	**New Course Code**	**New Course Title**
Fundamental Courses			
IELM6034	Operational research techniques	IMSE7034	Operational research
IELM6044	Supply chain management	IMSE7020	Supply chain management
IELM7016	Engineering economics and finance	IMSE7015	Engineering economics and finance
Other Discipline Courses			
IELM6002	Operations management	IMSE7936	Operations planning and control
IELM6004	Industrial project management	IMSE7902	Project management
IELM6030	Ergonomics	IMSE7128	Human factors engineering
IELM6042	Quality management	IMSE7909	Quality management
IELM6048	Terminal and warehousing operations	IMSE7221	Warehousing and city logistics
IELM6051	Fundamentals of law for logistics	IMSE7251	Fundamentals of law for logistics
IELM7002	Frontiers in industrial engineering and logistics management	IMSE7929	Frontiers in industrial engineering and logistics management
IELM7011	Supply chain and logistics finance	IMSE7315	Supply chain and logistics finance
IELM7012	Physical internet	IMSE7212	Physical internet
IELM7013	Digital enterprises and e-commerce	IMSE7119	Digital enterprises and e-commerce
IELM7015	Global logistics	IMSE7222	Global logistics and transportation systems
IELM7017	Operational risk management	IMSE7337	Operational risk management
IELM7018	Financial engineering	IMSE7310	Financial engineering
IELM7019	Financial technologies	IMSE7339	Financial technologies
IELM7020	Asset and portfolio management	IMSE7340	Asset and portfolio management
IELM7021	Computational optimization and intelligent analytics	IMSE7111	Intelligent optimization
IELM7022	Advanced cyber-physical systems	IMSE7139	Cyber-physical systems
Capstone Courses			
IELM7023	Systems integration and analytics	IMSE7098	Project*
IELM7045	Dissertation	IMSE7099	Dissertation

* This course is offered to students admitted in 2021-22 and thereafter.

SYLLABUS FOR THE DEGREE OF MASTER OF SCIENCE IN ENGINEERING

MSC(ENG) INDUSTRIAL ENGINEERING AND LOGISTICS MANAGEMENT

[This syllabus is applicable to students admitted to the curriculum in the academic year 2017-18 and 2018-19.]

<u>Definition and Terminology</u>

Discipline course – any course on a list of courses in the discipline of curriculum which a candidate must pass at least a certain number of credits as specified in the Regulations.

Core courses - a set of discipline courses in the curriculum that a student must take and pass.

Elective course – any course offered by the Departments of the Faculty of Engineering for the fulfilment of the curriculum requirements of the degree of MSc(Eng) in Industrial Engineering and Logistics Management that are not classified as discipline courses.

Capstone Experience – a 24-credit dissertation which is a compulsory and integral part of the curriculum.

<u>Curriculum Structure</u>

Candidates are required to complete 72 credits of courses, as set out below, normally over one academic year of full-time study or two academic years of part-time study:

Course Category	No. of Credits
Core Courses	18
Discipline Courses	Not less than 18
Elective Courses	Not more than 12
Capstone (Dissertation)	24
Total	72

The curriculum is offered in both part-time and full-time modes. For the part-time mode of study, the curriculum shall extend over not less than two and not more than three academic years of study. For the full-time mode of study, the curriculum shall extend over not less than one and not more than two academic years of study. It provides advanced education and training in the philosophy, methods and techniques of Industrial Engineering and Industrial / Logistics Management which are appropriate to industrial and service organizations in both the private and the public sectors.

Candidates are permitted to select courses in accordance with Regulations MSc4, MSc5 and MSc6. Candidates must complete the following categories of courses: (i) 18 credits of core courses; (ii) 24 credits of capstone course and (iii) 5 discipline or elective courses. He / she can select no more than two Taught Postgraduate level courses offered by other curricula in the Faculty of Engineering as electives. All selection will be subjected to approval by the Course Coordinator.

The following is a list of discipline courses offered by the Department of Industrial and Manufacturing Systems Engineering. The list below is not final and some courses may not be offered every year. All courses are assessed through examination and / or coursework assessment, the weightings of which are

subject to approval by the Board of Examiners.

Core courses
IELM6034 Operational research techniques
IELM6044 Supply chain management
IELM7016 Engineering economics and finance

Discipline Courses
IELM6001 Concurrent engineering
IELM6002 Operations management
IELM6004 Industrial project management
IELM6028 Enterprise logistics and facilities design
IELM6030 Ergonomics
IELM6037 Costing and finance
IELM6042 Quality management
IELM6046 Supply management
IELM6048 Terminal and warehousing operations
IELM6050 Industrial applications of radio frequency identification technologies
IELM6051 Fundamentals of law for logistics
IELM7002 Frontiers in industrial engineering and logistics management
IELM7011 Supply chain and logistics finance
IELM7012 Physical internet
IELM7013 Digital enterprises and e-commerce
IELM7014 Organisation management and strategy
IELM7015 Global logistics
IELM7017 Operational risk management
IELM7018 Financial engineering
IELM7019 Financial technologies
IELM7020 Asset and portfolio management
IELM7021 Computational optimization and intelligent analytics
IELM7022 Advanced cyber-physical systems
IELM7023 Systems integration and analytics
IMSE7138 Healthcare systems engineering (To be offered from the academic year 2021-22 and thereafter)

Capstone (Dissertation)
IELM7045 Dissertation

The following is a list of discipline courses offered by the Department of Industrial and Manufacturing Systems Engineering. The list below is not final and some courses may not be offered every year.

All courses are assessed through examination and / or coursework assessment, the weightings of which are subject to approval by the Board of Examiners.

IELM6001.   Concurrent engineering (6 credits)

Product development process analysis and reengineering: performance measurement, organisation and management issues and extended enterprises. Formal methods and techniques, "Design for X", arc conjoint analysis. Product management, product variety, and engineering changes. Collaborative product commerce: information/task sharing, customer/supplier involvement and e-commerce/e-business applications. Case studies in logistics, service and manufacturing industries.

IELM6002.   Operations management (6 credits)

Elements of operations strategies; quantitative forecasting models; strategic decisions; planning products, processes, technologies, and facilities; selection and management of production technology; capacity planning and facility location; production planning systems; aggregate planning; master production scheduling; inventory systems; material requirement planning; shop floor planning and control; Just-In-Time manufacturing.

(Students who have passed this course are not allowed to take "IMSE7936 Operations planning and control".)

IELM6004.   Industrial project management (6 credits)

Fundamental of project management; PMBOK's project management framework; Project initiating, planning, executing, monitoring and controlling, and closing; Project integration management; Project scope management; CPM/PERT techniques for project time management, resource allocation and cost management; Earned value analysis for project tracking; Application of techniques such as EMV, decision tree analysis, and Monte Carlo simulation in project risk management, human resource management, communication, procurement and quality management for industrial projects; Project change control and management; Project team-building; Case studies in logistics and manufacturing industries.

(Students who have passed this course are not allowed to take "IMSE7902 Project management".)

IELM6028.   Enterprise logistics and facilities design (6 credits)

Enterprise logistics: materials handling systems, storage and warehousing operations, competitive manufacturing, modelling and analysis of enterprise logistics systems; location analysis; methodologies for facilities planning: systematic layout planning approaches (SLP); manufacturing strategies; layout planning algorithms.

IELM6030.   Ergonomics (6 credits)

Ergonomics and systems design. Physical ergonomics, anthropometry, biomechanics. Human information processing, person-machine interface design, displays and controls. The visual environment and visual performance. Thermal environment and effects on performance, indices of

comfort. Noise; noise measurement, effects of noise, control of noise. Vibration and acceleration; human tolerance.

(Students who have passed this course are not allowed to take "IMSE7128 Human factors engineering".)

IELM6034.   Operational research techniques (6 credits)

The philosophy and methodology of Operational Research: problem analysis, model building, and implementation of solutions. Mathematical programming and its applications in logistics and supplies: vehicle scheduling, transportation and transhipments problems. Replacement models for capital equipment and preventive replacement for components of low capital value. Risk analysis for capital expenditure proposals. Queuing theory and event simulation with applications in serial and parallel supply chains.

(Students who have passed this course are not allowed to take "IMSE7034 Operational research".)

IELM6037.   Costing and finance (6 credits)

Cost terms and purposes, allocation and absorption of overheads, cost volume analysis, product costing, activity-based costing, budgetary control and standard costing, variance analysis, cost for decision making. Capital investment appraisal including discount cash flow, net present value and internal rate of return, risk analysis. Interpretation of financial statements, ratio analysis, fund flow statement, sources of funds, management of working capital.

IELM6042.   Quality management (6 credits)

The principals of Total Quality Management and BS 7850. Basic tools of quality management, the Japanese approaches to quality management, 5S and Kaizen. Deming's approach to quality management. International quality assurance management system -- the ISO 9000 series, quality documentation, quality audit. Zero defects and Six Sigma. The American Malcolm Baldrige quality award. Quality Function Deployment. The Taguchi Methods.

(Students who have passed this course are not allowed to take "IMSE7909 Quality management".)

IELM6044.   Supply chain management (6 credits)

Supply chain characterisation; operation objectives; distribution channels; channel design considerations; logistics network design. Inventory management; risk pooling; distribution strategies. Strategic alliances; international issues in supply chain management; coordinating product and supply chain design; customer value. Information technology; decision support systems; the value of information in supply chains. Case studies and contemporary topics on supply chain management; the beer game.
(Students who have passed this course are not allowed to take "IMSE7020 Supply chain management".)

IELM6046.   Supply management (6 credits)

Purchasing in the supply chain, strategic purchasing, implementation and evaluation of strategy; purchasing organisation in a corporation, impact of e-procurement; out-sourcing, supplier selection, partnership with suppliers; pricing agreement, price analysis; global sourcing.

IELM6048.   Terminal and warehousing operations (6 credits)

Materials handling systems, automated storage and distribution systems, hardware and software, routing. Case studies from cargo terminals. Warehouse management systems, missions, functions, receiving and shipping operations planning, dock design, storage space, layout and location planning, order picking. Cost and performance analysis in logistics and warehouse management. Material handling principles, system design, selection of handling equipment, unit load design. Automation of warehouse and material handling systems, costing and audits. Applications of modelling and simulation for warehouse design and optimisation. Logistics security, logistics park and third party logistics service providers.

(Students who have passed this course are not allowed to take "IMSE7221 Warehousing and city logistics".)

IELM6050.   Industrial applications of radio frequency identification technologies (6 credits)

Introduction to radio frequency identification (RFID); features and characteristics of readers and tags, typical frequencies, materials and orientations, middleware, standards for electronic product coding, and physical markup language. Design, development and implementation of RFID solutions; business process analysis, technology and vendor selection, deployment of readers and tags, infrastructure architecture, integration with enterprise application systems, and cost-benefits and constraints. RFID case studies and applications in object identification and tracking, asset management, warehouse management, supply chain integration, and manufacturing automation.

IELM6051.   Fundamentals of law for logistics (6 credits)

The course focuses on five areas of law essential to industrial and logistics managers: contracts, agency, shipping law, negligence and dispute resolution; overview of sources of law and legal structure of businesses; elements of a binding contract; duties of an agent, including common carriers, employees and professionals; claims arising in international shipment of goods, arbitration, mediation or litigation and venue for dispute resolution.

(Students who have passed this course are not allowed to take "IMSE7251 Fundamentals of law for logistics".)

IELM7002.   Frontiers in industrial engineering and logistics management (6 credits)

Advanced Industrial Engineering Technology refers to the four Research and Development Areas of focus in the Department of Industrial and Manufacturing Systems Engineering, namely, Industrial/ Service Engineering, Systems Engineering, Intelligent Systems and Digital Enterprise Technology.
The general aim of this course is to provide students with a deeper understanding of those advance topics under the four research and development focuses. Through the course, graduate students are expected to have a holistic view of the scope of these research focuses.

(Students who have passed this course are not allowed to take "IMSE7929 Frontiers in industrial

engineering and logistics management".)

IELM7011.   Supply chain and logistics finance (6 credits)

Basics of financial markets; sources and channels for supply chain and logistics finance; financing conditions. Financial derivatives for managing risks; risk measures; theories and methods of financial hedging. Supply chain risks arising from global manufacturing, trading and logistics activities: uncertain price, demand and exchange rates; financing of logistics businesses and risks; development of risk hedging models: price models, demand models, optimal hedging policies.

(Students who have passed this course are not allowed to take "IMSE7315 Supply chain and logistics finance".)

IELM7012.   Physical internet (6 credits)

Logistics network history and topology, organisation and performance, logistics networks sustainability, asset utilization. Interconnection principles; Digital Internet, Physical Internet, Internet of Things. Physical Internet components: containerisation diversity, modularity, handling and sorting. Logistics information capture, publication, EPCglobal standards. Flow routing and assets management in open-loop supply networks. Collaborative logistics business models, small scale cooperative game with transferable utility, Shapley value and core solution, big scale collaboration models, mechanism design, combinatorial optimisation. Case studies, web search, serious game.

(Students who have passed this course are not allowed to take "IMSE7212 Physical internet".)

IELM7013.   Digital enterprises and e-commerce (6 credits)

Overview and development of e-business; e-business technologies and solutions: appraisal and selection, implementation and adoption; Enterprise information and knowledge portals, virtual enterprises; Roles of e-business in enterprise development and integration; corporate social accountability and responsibility standards; digital technologies for product design and development; cryptographic algorithms for corporate data and IP protection; mobile technology and electronic payment, smart cards, RFID and NFC.

(Students who have passed "IELM6047 Digital enterprises" or this course are not allowed to take "IMSE7119 Digital enterprises and e-commerce".)

IELM7014.   Organisation management and strategy (6 credits)

The role of the manager, teams and task design, team based systems, team leadership, measuring the performance of teams. Theories of motivation with case studies from industry. Theories of organisation design, socio-technical theory, contingency and markets and clans theory. Behavioural control and change issues, organisation dynamics. Understanding organisational structures. Classifying types of system, Mintzberg typologies and configurations. The Global Business: Strategic decisions in the global business, global culture, leadership, vision, ethics and corporate social responsibility. The design of organisations. The systems view of organisations. Global business issues. Specify appropriate organisation structures to match market needs. Explain cultural implications for global organisations.

The fundamentals of strategic management.

(Students who have passed "IELM6027 Organisation theory and behavioural science" are not allowed to take this course.)

IELM7015.   Global logistics (6 credits)

Global operations and logistics strategies, strategic changes required by globalization, the strategic framework for 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, risk management in global operations; management of global operations and logistics, operations analysis of global supply chains, information management for global logistics, performance measurement and evaluation in global logistics.

(Students who have passed "IELM6045 Global operations and logistics" or this course are not allowed to take "IMSE7222 Global logistics and transportation systems".)

IELM7016.   Engineering economics and finance (6 credits)

Engineering economics fundamentals: cost concepts, money-time relationships, comparing alternatives, depreciation and income taxes, cost estimation, price changes and exchange rates, replacement analysis, effects of uncertainties; financial statements, ratio analysis, financial performance, financial planning and growth; capital budgeting: investment criteria, project analysis and evaluation, project cash flow; cost of capital, long-term financial policy, financial leverage and capital structure policy.

(Students who have passed this course are not allowed to take "IMSE7015 Engineering economics and finance".)

IELM7017.   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.

(Students who have passed "IELM6052 Operational risk management practices" or this course are not allowed to take "IMSE7337 Operational risk management")

IELM7018.   Financial engineering (6 credits)

Basics of financial markets; cash flow analysis; capital asset pricing model (CAPM); portfolio optimisation; arbitrage and fundamental theorem of asset pricing; types of derivatives including forward, futures and options for various underlying assets; returns, value-at-risk (VaR), utility functions; pricing and hedging of derivative securities; numerical studies.

(Students who have passed this course are not allowed to take "IMSE7310 Financial engineering".)

IELM7019.   Financial technologies (6 credits)

Applications of the state-of-the-art technologies that drive the rapid growth and disruptive innovations in the financial services sector: big data analytics and predictive modelling, mobility, payments and transactions, infrastructure and operational technologies for financial investments, P2P lending and crowdfunding, and cybersecurity. Understanding on how the financial technology innovations are disrupting traditional established business models and reshaping the way financial services are structured, provisioned and consumed.

(Students who have passed this course are not allowed to take "IMSE7339 Financial technologies".)

IELM7020.   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.

(Students who have passed this course are not allowed to take "IMSE7340 Asset and portfolio management".)

IELM7021.   Computational optimization and intelligent analytics (6 credits)

Overview of Intelligent optimization and intelligent analytics; Genetic algorithms; Simulated annealing algorithm; Tabu search algorithm; Particle swarm optimization; Ant colony optimization; Predatory search strategy; Computational techniques and Intelligent optimization strategies for dynamic systems; Data mining, decision analytics; Applications in multiple objective optimization; Applications in constraint problems; Multiple level optimization; Case studies in supply chain, logistics, manufacturing and service applications.

(Students who have passed this course are not allowed to take "IMSE7111 Intelligent optimization".)

IELM7022.   Advanced cyber-physical systems (6 credits)

This course mainly consists of lectures and projects. The topics include introduction to cyber-physical systems (CPS), sensors and sensor networks, robotics and automation, communications for CPS, data analytics in CPS, digital twins, cloud computing for CPS, and system integrations. By completion of the projects, the topics will be discussed in the related lectures and hands-on experiments. The outcomes of the each individual projects will be integrated at the end to address CPS from system point of view as well in applications related settings.

(Students who have passed this course are not allowed to take "IMSE7139 Cyber-physical systems".)

IELM7023.   Systems integration and analytics (6 credits)

This course is mainly based on group projects enhanced by a series of invited guest lectures. Project topics are related to major research and/or industrial projects and initiatives that supervisors have recently carried out. Groups are expected to generate project deliverables of a variety of forms including patents, software copyrights, research papers, proof-of-the-concept solutions and products, consultancy reports / whitepapers, etc.

(Students who have passed this course are not allowed to take "IMSE7098 Project".)

Capstone courses

IELM7045.   Dissertation (24 credits)

Student individuals or groups will undertake a supervised project which will be assessed. The dissertation module must relate to the subject matter and be agreed by the Department of Industrial and Manufacturing Systems Engineering. The Dissertation can be related to research projects within the department or industry-related projects.

(Students who have passed this course are not allowed to take "IMSE7099 Dissertation".)

Calendar entries of discipline courses offered by the curriculum of MSc(Eng) in IELM from the academic year of 2021-2022

IMSE7020.   Supply chain management (6 credits)

Supply chain characterisation; operation objectives; distribution channels; channel design considerations; logistics network design. Inventory management; risk pooling; distribution strategies. Strategic alliances; international issues in supply chain management; coordinating product and supply chain design; customer

value. Information technology; decision support systems; the value of information in supply chains. Case studies and contemporary topics on supply chain management; the beer game.

(Students who have passed "IELM6044 Supply chain management" are not allowed to take this course.)

IMSE7015. Engineering economics and finance (6 credits)

Engineering economics fundamentals: cost concepts, money-time relationships, comparing alternatives, depreciation and income taxes, cost estimation, price changes and exchange rates, replacement analysis, effects of uncertainties; financial statements, ratio analysis, financial performance, financial planning and growth; capital budgeting: investment criteria, project analysis and evaluation, project cash flow; cost of capital, long-term financial policy, financial leverage and capital structure policy.

(Students who have passed "IELM7016 Engineering economics and finance" are not allowed to take this course.)

IMSE7034. Operational research (6 credits)

The philosophy and methodology of Operational Research: problem analysis, model building, and implementation of solutions. Mathematical programming and its applications in logistics and supplies: vehicle scheduling, transportation and transhipments problems. Replacement models for capital equipment and preventive replacement for components of low capital value. Risk analysis for capital expenditure proposals. Queuing theory and event simulation with applications in serial and parallel supply chains.

(Students who have passed "IELM6034 Operational research techniques" are not allowed to take this course.)

IMSE7098. Project (12 credits)*

A group of students will work on a supervised project that relates to major research and/or industrial projects and initiatives that supervisors have recently carried out. Groups are expected to generate project deliverables of a variety of forms including patents, software copyrights, research papers, proof-of-the-concept solutions and products, consultancy reports / whitepapers, etc. This course will provide students with a range of opportunities to engage in academic research, industrial innovation and entrepreneurship development.

(Students who have passed "IELM7023 Systems integration and analytics" are not allowed to take this course.)

IMSE7099. Dissertation (24 credits)

Student individuals or groups will undertake a supervised project which will be assessed. The dissertation module must relate to the subject matter and be agreed by the Department of Industrial and Manufacturing Systems Engineering. The Dissertation can be related to research projects within the department or industry-related projects.

(Students who have passed "IELM7045 Dissertation" are not allowed to take this course.)

IMSE7111. Intelligent optimization (6 credits)

Overview of intelligent optimization and intelligent analytics; Genetic algorithms; Simulated annealing algorithm; Tabu search algorithm; Particle swarm optimization; Ant colony optimization; Predatory search strategy; Computational techniques and intelligent optimization strategies for dynamic systems; Data mining, decision analytics; Applications in multiple objective optimization; Applications in constraint problems; Multiple level optimization; Case studies in supply chain, logistics, manufacturing and service

applications.

(Students who have passed "IELM7021 Computational optimization and intelligent analytics" are not allowed to take this course.)

IMSE7119. Digital enterprises and e-commerce (6 credits)

Overview and development of e-business; e-business technologies and solutions: appraisal and selection, implementation and adoption; Enterprise information and knowledge portals, virtual enterprises; Roles of e-business in enterprise development and integration; corporate social accountability and responsibility standards; digital technologies for product design and development; cryptographic algorithms for corporate data and IP protection; mobile technology and electronic payment, smart cards, RFID and NFC.

(Students who have passed "IELM6047 Digital enterprises" or "IELM7013 Digital enterprises and e-commerce" are not allowed to take this course.)

IMSE7128. Human factors engineering (6 credits)

Ergonomics and systems design. Physical ergonomics, anthropometry, biomechanics. Human information processing, person-machine interface design, displays and controls. The visual environment and visual performance. Thermal environment and effects on performance, indices of comfort. Noise; noise measurement, effects of noise, control of noise. Vibration and acceleration; human tolerance.

(Students who have passed "IELM6030 Ergonomics" are not allowed to take this course.)

IMSE7138. 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.

IMSE7139. Cyber-physical systems (6 credits)

This course mainly consists of lectures and projects. The topics include introduction to cyber-physical systems (CPS), sensors and sensor networks, robotics and automation, communications for CPS, data analytics in CPS, digital twins, cloud computing for CPS, and system integrations. By completion of the projects, the topics will be discussed in the related lectures and hands-on experiments. The outcomes of the each individual projects will be integrated at the end to address CPS from system point of view as well in applications related settings.

(Students who have passed "IELM7022 Advanced cyber-physical systems" are not allowed to take this course.)

IMSE7212. Physical internet (6 credits)

Logistics network history and topology, organisation and performance, logistics networks sustainability, asset utilization. Interconnection principles; Digital Internet, Physical Internet, Internet of Things. Physical Internet components: containerisation diversity, modularity, handling and sorting. Logistics information capture, publication, EPCglobal standards. Flow routing and assets management in open-loop supply

networks. Collaborative logistics business models, small scale cooperative game with transferable utility, Shapley value and core solution, big scale collaboration models, mechanism design, combinatorial optimisation. Case studies, web search, serious game.

(Students who have passed "IELM7012 Physical internet" are not allowed to take this course.)

IMSE7221. Warehousing and city logistics (6 credits)

Materials handling systems, automated storage and distribution systems, hardware and software, routing. Case studies from cargo terminals. Warehouse management systems, missions, functions, receiving and shipping operations planning, dock design, storage space, layout and location planning, order picking. Cost and performance analysis in logistics and warehouse management. Material handling principles, system design, selection of handling equipment, unit load design. Automation of warehouse and material handling systems, costing and audits. Applications of modelling and simulation for warehouse design and optimisation. Logistics security, logistics park and third party logistics service providers.

(Students who have passed "IELM6048 Terminal and warehousing operations" are not allowed to take this course.)

IMSE7222. Global logistics and transportation systems (6 credits)

Global operations and logistics strategies, strategic changes required by globalization, the strategic framework for 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, risk management in global operations; management of global operations and logistics, operations analysis of global supply chains, information management for global logistics, performance measurement and evaluation in global logistics.

(Students who have passed "IELM6045 Global operations and logistics" or "IELM7015 Global logistics" are not allowed to take this course.)

IMSE7251. Fundamentals of law for logistics (6 credits)

The course focuses on five areas of law essential to industrial and logistics managers: contracts, agency, shipping law, negligence and dispute resolution; overview of sources of law and legal structure of businesses; elements of a binding contract; duties of an agent, including common carriers, employees and professionals; claims arising in international shipment of goods, arbitration, mediation or litigation and venue for dispute resolution.

(Students who have passed "IELM6051 Fundamentals of law for logistics" are not allowed to take this course.)

IMSE7310. Financial engineering (6 credits)

Basics of financial markets; cash flow analysis; capital asset pricing model (CAPM); portfolio optimisation; arbitrage and fundamental theorem of asset pricing; types of derivatives including forward, futures and options for various underlying assets; returns, value-at-risk (VaR), utility functions; pricing and hedging of derivative securities; numerical studies.

(Students who have passed "IELM7018 Financial engineering" are not allowed to take this course.)

IMSE7315.   Supply chain and logistics finance (6 credits)

Basics of financial markets; sources and channels for supply chain and logistics finance; financing conditions. Financial derivatives for managing risks; risk measures; theories and methods of financial hedging. Supply chain risks arising from global manufacturing, trading and logistics activities: uncertain price, demand and exchange rates; financing of logistics businesses and risks; development of risk hedging models: price models, demand models, optimal hedging policies.

(Students who have passed "IELM7011 Supply chain and logistics finance" are not allowed to take this course.)

IMSE7337.   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.

(Students who have passed "IELM6052 Operational risk management practices" or "IELM7017 Operational risk management" are not allowed to take this course.)

IMSE7339.   Financial technologies (6 credits)

Applications of the state-of-the-art technologies that drive the rapid growth and disruptive innovations in the financial services sector: big data analytics and predictive modelling, mobility, payments and transactions, infrastructure and operational technologies for financial investments, P2P lending and crowdfunding, and cybersecurity. Understanding on how the financial technology innovations are disrupting traditional established business models and reshaping the way financial services are structured, provisioned and consumed.

(Students who have passed "IELM7019 Financial technologies" are not allowed to take this course.)

IMSE7340.   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.

(Students who have passed "IELM7020 Asset and portfolio management" are not allowed to take this course.)

IMSE7902.   Project management (6 credits)

Fundamental of project management; PMBOK's project management framework; Project initiating, planning, executing, monitoring and controlling, and closing; Project integration management; Project scope management; CPM/PERT techniques for project time management, resource allocation and cost management; Earned value analysis for project tracking; Application of techniques such as EMV, decision tree analysis, and Monte Carlo simulation in project risk management, human resource management, communication, procurement and quality management for industrial projects; Project change control and management; Project team-building; Case studies in logistics and manufacturing industries.

(Students who have passed "IELM6004 Industrial project management" are not allowed to take this course.)

IMSE7909.   Quality management (6 credits)

The principals of Total Quality Management and BS 7850. Basic tools of quality management, the Japanese approaches to quality management, 5S and Kaizen. Deming's approach to quality management. International quality assurance management system -- the ISO 9000 series, quality documentation, quality audit. Zero defects and Six Sigma. The American Malcolm Baldrige quality award. Quality Function Deployment. The Taguchi Methods.

(Students who have passed "IELM6042 Quality management" are not allowed to take this course.)

IMSE7929.   Frontiers in industrial engineering and logistics management (6 credits)

Advanced Industrial Engineering Technology refers to the four Research and Development Areas of focus in the Department of Industrial and Manufacturing Systems Engineering, namely, Industrial/ Service Engineering, Systems Engineering, Intelligent Systems and Digital Enterprise Technology.
The general aim of this course is to provide students with a deeper understanding of those advance topics under the four research and development focuses. Through the course, graduate students are expected to have a holistic view of the scope of these research focuses.

(Students who have passed "IELM7002 Frontiers in industrial engineering and logistics management" are not allowed to take this course.)

IMSE7936.   Operations planning and control (6 credits)

Elements of operations strategies; quantitative forecasting models; strategic decisions; planning products, processes, technologies, and facilities; selection and management of production technology; capacity planning and facility location; production planning systems; aggregate planning; master production scheduling; inventory systems; material requirement planning; shop floor planning and control; Just-In-Time manufacturing.

(Students who have passed "IELM6002 Operations management" are not allowed to take this course.)

Mapping Table

The new course codes and/or course titles listed as below will be adopted from the 2021-22 intake and thereafter. The courses taking in the academic year of 2020-21 and before are equivalent to the respective courses with new course codes and/or new course titles offered from the academic year of 2021-22.

2020-21 academic year and before		2021-22 academic year and after	
Course Code	Course Title	New Course Code	New Course Title
Fundamental Courses			
IELM6034	Operational research techniques	IMSE7034	Operational research
IELM6044	Supply chain management	IMSE7020	Supply chain management
IELM7016	Engineering economics and finance	IMSE7015	Engineering economics and finance
Other Discipline Courses			
IELM6002	Operations management	IMSE7936	Operations planning and control
IELM6004	Industrial project management	IMSE7902	Project management
IELM6030	Ergonomics	IMSE7128	Human factors engineering
IELM6042	Quality management	IMSE7909	Quality management
IELM6048	Terminal and warehousing operations	IMSE7221	Warehousing and city logistics
IELM6051	Fundamentals of law for logistics	IMSE7251	Fundamentals of law for logistics
IELM7002	Frontiers in industrial engineering and logistics management	IMSE7929	Frontiers in industrial engineering and logistics management
IELM7011	Supply chain and logistics finance	IMSE7315	Supply chain and logistics finance
IELM7012	Physical internet	IMSE7212	Physical internet
IELM7013	Digital enterprises and e-commerce	IMSE7119	Digital enterprises and e-commerce
IELM7015	Global logistics	IMSE7222	Global logistics and transportation systems
IELM7017	Operational risk management	IMSE7337	Operational risk management
IELM7018	Financial engineering	IMSE7310	Financial engineering
IELM7019	Financial technologies	IMSE7339	Financial technologies
IELM7020	Asset and portfolio management	IMSE7340	Asset and portfolio management
IELM7021	Computational optimization and intelligent analytics	IMSE7111	Intelligent optimization

IELM7022	Advanced cyber-physical systems	IMSE7139	Cyber-physical systems
Capstone Courses			
IELM7023	Systems integration and analytics	IMSE7098	Project*
IELM7045	Dissertation	IMSE7099	Dissertation

* This course is offered to students admitted in 2021-22 and thereafter.