MASTER OF SCIENCE IN ENGINEERING IN INDUSTRIAL ENGINEERING AND LOGISTICS MANAGEMENT

(Applicable to students admitted to the curriculum in the academic year 2025-26 and thereafter)

Definition and Terminology

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

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

Elective course – any taught-postgraduate-level course offered by the Departments of the Faculty of Engineering, and selected courses in the subject areas of COMP, ECOM, FITE, ICOM offered by the School of Computing and Data Science, for the fulfilment of the curriculum requirements of the degree of MSc(Eng)(IELM) 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 Experience	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, and selected courses in the subject areas of COMP, ECOM, FITE, ICOM offered by the School of Computing and Data Science. 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 systems 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 following is a list of discipline courses offered by the Department of Data and Systems Engineering. It should be noted that not all of the courses listed below are offered every year

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List of Discipline Courses for MSc(Eng)(IELM)

Fundamental Courses (Students are required to choose at least 2 out of 3):
DASE7015 Engineering economics and finance
DASE7020 Supply chain management
DASE7034 Operational research

Capstone Experiences (Students are required to choose either one):
DASE7098 Project (12 credits)
DASE7099 Dissertation (24 credits)

Other Discipline Courses:
DASE7111 Data-driven optimization
DASE7119 Digital enterprises and e-commerce
DASE7128 Human factors engineering
DASE7137 Virtual reality and applications
DASE7138 Healthcare systems engineering
DASE7139 Cyber-physical systems
DASE7140 Machine learning and applications
DASE7141 Advanced digital twin and applications
DASE7142 Advanced computational methods
DASE7143 The internet of things
DASE7150 Frontiers in data and systems engineering A
DASE7151 Frontiers in data and systems engineering B
DASE7152 Frontiers in data and systems engineering C
DASE7153 Frontiers in data and systems engineering D
DASE7154 Intelligent technologies for systems engineering A
DASE7155 Intelligent technologies for systems engineering B
DASE7156 Intelligent technologies for systems engineering C
DASE7157 Intelligent technologies for systems engineering D
DASE7158 Human-computer interaction
DASE7212 Physical internet
DASE7221 Warehousing and city logistics
DASE7222 Decision analytics in global logistics
DASE7251 Fundamentals of law for logistics
DASE7310 Financial engineering
DASE7315 Supply chain and logistics finance
DASE7337 Operational risk management
DASE7339 Financial technologies
DASE7340 Asset and portfolio management
DASE7341 Technology innovation and entrepreneurship
DASE7342 Managing the strategic growth of technology start-ups
DASE7505 Intelligent unmanned systems
DASE7506 Advanced machine learning methods

DASE7902 Project management
DASE7909 Quality management
DASE7936 Operations planning and control

Elective Courses

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

Course Description

DASE7015. 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.

DASE7020. 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.

DASE7034. 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.

DASE7098. 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.

DASE7099. Dissertation (24 credits)

Student individuals 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 Data and Systems Engineering. The Dissertation can be related to research projects within the department or industry-related projects.

DASE7111. Data-driven optimization (6 credits)

Overview of data-driven 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.

DASE7119. 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.

DASE7128. 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.

This course is mutually exclusive with IDAT7223.

DASE7137. Virtual reality and applications (6 credits)

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

DASE7138. 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.

DASE7139. 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 individual projects will be integrated at the end to address CPS from system point of view as well in applications related settings.

DASE7140. Machine learning and applications (6 credits)

Overall view of machine learning methods. Supervised learning, unsupervised learning, reinforcement learning. Support-vector machines, linear regression, decision trees, k-nearest neighbor algorithm, neural networks. Active learning, classification and regression. Model training, testing, selection, and validation. Performance evaluation. Industrial applications in forecasting, ranking, recommendation systems, information extraction, object recognition in computer vision, and pattern recognition.

DASE7141. Advanced digital twin and applications (6 credits)

This course teaches fundamental technologies of digital twin. Overall view of basic concepts related to digital twin. How to build blocks of digital twin. The setup of sensor systems and digital twin infrastructures. The integration, testing, monitoring and maintenance of digital twin. Data collection, processing, storage, transmission, and synchronization. Simulation and decision-making support in industrial engineering and logistics management.

DASE7142. Advanced computational methods (6 credits)

This course teaches fundamental computational methods and the applications to engineering problems in the context of industrial engineering. Analytical models, algorithms, and simulation methods will be discussed. Variability and uncertainty in engineering problems. Foundations of probability, sampling distributions, confidence intervals. Interpolation and regression. Numerical solution of linear and non-linear equations, numerical differentiation and integration, boundary value problems, initial value problems and partial differential equations. Monte Carlo method.

DASE7143. The internet of things (6 credits)

Theory and fundamentals of internet of things (IoT). Methods to create abstractions, formalisms and semantics at IoT layer. Artificial intelligence of things, machine learning for IoT, edge computing. IoT challenges in security, reliability and privacy. Device software development, IoT in cloud-to-thing-continuum. IoT software development, test beds and quality assurance. Sensors and actuators, remote operations and control. IoT applications in manufacturing, construction, healthcare, logistics and supply chain management.

DASE7150. Frontiers in data and systems engineering A (6 credits)

This course is part of the series “Frontiers in data and systems engineering”. The aim of this series is to provide students with a deeper understanding of the advanced topics under the five areas of focus of this programme, namely, fundamentals of industrial engineering, advanced engineering technology, logistics and supply chain management, financial engineering, and leadership development. This course focuses on the fundamental theories and advanced engineering technologies in industrial engineering. Through this course, students are expected to have a holistic view of the fundamental theories and technologies in industrial engineering. This course mainly consists of lectures and projects.

DASE7151. Frontiers in data and systems engineering B (6 credits)

This course is part of the series "Frontiers in data and systems engineering". The aim of this series is to provide students with a deeper understanding of the advanced topics under the five areas of focus of this programme, namely, fundamentals of industrial engineering, advanced engineering technology, logistics and supply chain management, financial engineering, and leadership development. This course focuses on the advanced theories and data analytics methods in logistics and supply chain management. Case studies and industrial applications in the logistics and supply chain management field will be discussed. This course mainly consists of lectures and projects.

DASE7152. Frontiers in data and systems engineering C (6 credits)

This course is part of the series "Frontiers in data and systems engineering". The aim of this series is to provide students with a deeper understanding of the advanced topics under the five areas of focus of this programme, namely, fundamentals of industrial engineering, advanced engineering technology, logistics and supply chain management, financial engineering, and leadership development. This course focuses on the emerging engineering technologies and applications in the industry. Through this course, students are expected to have a holistic view of the technology development in industrial engineering. This course mainly consists of lectures and projects.

DASE7153. Frontiers in data and systems engineering D (6 credits)

This course is part of the series "Frontiers in data and systems engineering". The aim of this series is to provide students with a deeper understanding of the advanced topics under the five areas of focus of this programme, namely, fundamentals of industrial engineering, advanced engineering technology, logistics and supply chain management, financial engineering, and leadership development. This course focuses on the engineering practices and leadership training in industrial engineering. Case studies of various industrial applications will be discussed. This course mainly consists of lectures and projects.

DASE7154. Intelligent technologies for systems engineering A (6 credits)

This course is part of the series "Intelligent technologies for systems engineering". This series of courses are designed to introduce students to critical technologies with applications in intelligent engineering systems. The course will cover essential topics about the intelligent technologies with an emphasis on their augmentation in data engineering and analytics. Students will learn the fundamental theories and knowledge related to the technologies, and how to leverage such technologies to enhance various aspects of industrial engineering. This course mainly consists of lectures and projects.

DASE7155. Intelligent technologies for systems engineering B (6 credits)

This course is part of the series "Intelligent technologies for systems engineering". This series of courses are designed to introduce students to critical technologies with applications in intelligent engineering systems. The course will cover essential topics about the intelligent technologies with an emphasis on their integration into complex industrial systems. Students will learn the fundamental theories and knowledge related to the technologies; and gain hands-on experience in implementing these technologies to improve efficiency, productivity and performance of the industrial systems. This course mainly consists of lectures and projects.

DASE7156. Intelligent technologies for systems engineering C (6 credits)

This course is part of the series "Intelligent technologies for systems engineering". This series of courses are designed to introduce students to critical technologies with applications in intelligent engineering systems. The course will cover essential topics about the intelligent technologies with an emphasis on their capabilities to enhance decision-making in industrial operations. Students will learn the fundamental theories and knowledge related to the technologies, and also the skills to design and implement intelligent technologies tailored to address complex engineering challenges. This course mainly consists of lectures and projects.

DASE7157. Intelligent technologies for systems engineering D (6 credits)

This course is part of the series "Intelligent technologies for systems engineering". This series of courses are designed to introduce students to critical technologies with applications in intelligent engineering systems. The course will cover essential topics about the intelligent technologies with an emphasis on suitable, sustainable and socially responsible applications in engineering systems. Students will learn the fundamental theories and knowledge related to the technologies. Students will be engaged in thoughtful discussions on the intelligent technologies and the applications in various engineering settings. This course mainly consists of lectures and projects.

DASE7158. Human-computer interaction (6 credits)

Human–computer interaction (HCI) is a discipline concerned with the design, evaluation, and implementation of interactive computing systems for human use, as well as the study of the broader phenomena that shape their use and impact. This course introduces the fundamental concepts of HCI, including user experience, human-centered design, and an understanding of human capabilities and behavior. Topics include the history of interaction techniques, input devices, user interface design, virtual, augmented, and mixed reality, and emerging paradigms such as human–AI interaction. The course also covers design engineering practices and methods for evaluating interactive systems.

DASE7212. 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.

DASE7221. 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.

DASE7222. Decision analytics in global logistics (6 credits)

Global logistics and trade; key stakeholders in logistics; global logistics network modeling; characteristics of freight transportation modes; transportation mode selection; transportation demand and supply analysis; logistics service pricing; truck fleet problem; vehicle routing problem; scheduling problem; container loading problem; shipping route planning; ship emission controls; speed optimization; intermodal terminal operations.

DASE7251. 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.

DASE7310. 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.

DASE7315. 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.

DASE7337. 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.

DASE7339. 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.

DASE7340. 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.

DASE7341. Technology innovation and entrepreneurship (6 credits)

This course provides foundational knowledge on technology-based start-ups, covering essential topics such as creating start-ups by exploring resources, developing business models, making strategic product development decisions, and formulating effective go-to-market strategies. We will introduce key entrepreneurship principles from a practitioner's perspective. By the end of the course, participants will have gained the essential skills needed to navigate and succeed in the start-up ecosystem.

DASE7342. Managing the strategic growth of technology start-ups (6 credits)

This enhanced course aims to equip start-up entrepreneurs from engineering backgrounds with the essential business knowledge needed to transform a technology concept into a successful enterprise. This course addresses the organizational challenges as start-ups grow from founders to an established team. By demystifying financial and legal jargons, it teaches how to value a start-up and leverage financial markets to maximize business value. This course also discusses how to drive business growth by making strategic deals with investors and other partners in the start-up ecosystem.

DASE7505. Intelligent unmanned systems (6 credits)

This course will introduce students to the field of autonomous mobile robotics. Topics will focus on definition and applications of mobile robots; mobile robot components and architecture; kinematics and dynamics of mobile robots; sensors for mobile robots; planning and navigation for mobile robot; simultaneous localization and mapping; mobile manipulators; applications. The assignments of this course will involve building and testing autonomous mobile robots using simulation software and physical robots.

DASE7506. Advanced machine learning methods (6 credits)

This course provides a detailed examination of various advanced topics in machine learning for industrial engineering, including four main directions: generative models; sequential decision making; physical AI; and large language model agents. It will cover a series of frontier topics, such as: diffusion models; flow-based models; reinforcement learning; robotic foundation models; large language models; agentic systems, etc. As the sequel to the course DASE7140 Machine learning and applications, this course requires skills in Python programming, an understanding of core machine learning concepts, and knowledge of calculus, linear algebra, probability, and statistics—at an elementary level. DASE7140 covers the first two prerequisites, so completing DASE7140 is recommended but not required for enrolling in this course.

DASE7902. 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.

DASE7909. 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.

DASE7936. 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.
