

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

[This syllabus is applicable to students admitted to the curriculum in the academic year 2014-2015 and thereafter.]

The curriculum is offered in both part-time and full-time mode. For the part-time mode of study, the curriculum shall extend over not less than two and not more than three calendar 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 modules in accordance with Regulations E5 and E6. Candidates must either select (a) 12 modules; or (b) 8 modules and a dissertation. In either case, he/she can select no more than three Taught Postgraduate level modules 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 modules offered by the Department of Industrial and Manufacturing Systems Engineering. The list below is not final and some modules may not be offered every year.

All modules are assessed through examination (0%-100%) and/or coursework assessment (0%-100%).

### **IELM6001. Concurrent engineering**

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**

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.

### **IELM6004. Industrial project management \***

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.

**IELM6028. Enterprise logistics and facilities design \***

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.

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**IELM6030. Ergonomics**

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.

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**IELM6034. Operational research techniques**

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 transshipments 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.

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**IELM6037. Costing and finance**

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.

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**IELM6042. Quality management \***

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.

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**IELM6044. Supply chain management \***

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.

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**IELM6045. Global operations and logistics \***

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.

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**IELM6046. Supply management \***

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.

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**IELM6048. Terminal and warehousing operations \***

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.

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**IELM6050. Industrial applications of radio frequency identification technologies \***

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.

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**IELM6051. Fundamentals of law for logistics**

The module 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.

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**IELM6052. Operational risk management practices**

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.

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**IELM7011. Supply chain and logistics finance**

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.

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**IELM7012. Physical internet**

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.

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**IELM7013. Digital enterprises and e-commerce**

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” are not allowed to take this module.)

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**IELM7014. Organisation management and strategy**

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 module.)

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**IELM7035. Dissertation (4 modules)**

Student individuals or groups will undertake a supervised dissertation 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.

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\* Approved for reimbursement from the Continuing Education Fund (CEF).

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