

Course Synopsis
Master of Science (Industrial Engineering)
School of Mechanical Engineering
Faculty of Engineering, Universiti Teknologi Malaysia

Programme Core Course	
Research Methodology MEMI 1903	This course is designed to provide the students with sound understanding to statistical methods in quality improvement. It encompasses various statistical process control problem-solving tools. For control charts, emphasis was given on additional control charts not covered previously at the undergraduate level. Advanced tools and techniques such as Gauge Repeatability and Reproducibility (GR & R), Quality Function Deployment (QFD), Failure Mode Effect Analysis (FMEA) and experimental design methodology were also covered.
Operations Planning and Control MEMI 1843	This course gives advanced knowledge on production planning and control concepts, issues, and techniques. It covers topics such as demand forecasting, aggregate planning, master production schedule, job scheduling, line balancing, capacity planning, inventory management and material requirement planning (MRP) and Enterprises Resources Planning. The focus is on analysis and integration of various techniques for solving production planning problems.
Operations Research and Application MEMI 1853	This course provides students with the concepts and tools to model manufacturing or service systems efficiently using mainly Operations Research techniques. It focuses on formulating models based on deterministic and stochastic Operations Research techniques, applying these techniques for decision making, developing solutions from the models, and conducting simulation studies. Topics covered include linear programming, integer programming, transportation models, network models, goal programming, decision analysis, queuing theory, monte carlo simulation, etc.
Industrial Data Analytics MEMI 1863	This course provides students with the concepts and techniques of data analytics in industrial engineering. The topics covered are based on data science lifecycle; data acquisition, feature engineering, modelling and visualisation. Data analytics types to be included are descriptive, diagnostics, predictive and prescriptive. Descriptive analytics reveals what has happened and predictive analytics is for understanding trends and predict the future. The course focuses on statistical and machine learning techniques for data modelling, and data visualisation to gain insights for decision making.
Elective Track - Engineering Management	
Project Management MEMI 2813	This subject introduces students to the myriad and exacting skills and knowledge expected to manage high risk projects and produce high quality deliverables within the time and cost constraints of their organizations. The phases of the project lifecycle, management deliverables, project charters, scope, work breakdown structures, activity lists, duration estimates, CPM/PERT network diagrams and risk analysis. This subject also covers scheduling resources and costs, reducing project duration as well progress performance measurement and evaluation. This section employs Cooperative Learning (CL).

Engineering Economy and Finance MEMI 2823	This course prepares students to appreciate the financial impact of their decisions. The course takes a broad managerial perspective emphasizing the strategic impact of financial and accounting activities in relation to other activities of the firm. Evaluation of company's performance from financial statements, designing cost structures and determine costs of products or services for managerial use, Activity-based costing and Target costing, time value of money, inflation, taxes, measures of worth of individual projects and alternatives, and methods for capital budgeting methods for long term projects.
Safety Management MEMI 2833	This course provides students with the knowledge on safety management and its implementation in industrial sector, act and regulations and familiar with the standards related to safety management, the principles in hazard identification, risk assessment & control, planning & implementing an effective safety program, behaviour based safety and safety culture.
Quality Management MEMI 2843	This course covers the principles, philosophy and concepts of quality management and related issues. Application of the principles and concepts of Total Quality Management in their organization, developing a strategy for the development of TQM in an organization, applying the problem-solving process and relevant tools for organizational improvement, and using the continuous improvement process for establishing a quality organization. Others quality management initiatives such as Six Sigma, Lean and Lean Six Sigma, and current issues are also discussed.
Engineering and Technology Management MEMI 2853	This course introduces students to the basic functions of engineering management which include planning, organizing, motivating, leading and controlling. Topics on strategic management, organizational structure, motivation, leadership, R&D management, technology management, innovation management, intellectual property management, and professional ethics are covered.
Lean Manufacturing MEMI 2863	This course provides concepts relating to lean manufacturing including kaizen system, value stream mapping, just in time (JIT), Kanban, single minute exchange of die (SMED) technique and line balancing. Selection of lean techniques for problem solving and waste minimization program.
Elective Track - System Engineering	
Statistical Quality Engineering MEMI1813	This course is designed to provide the students with sound understanding to statistical methods in quality improvement. It encompasses various statistical process control problem-solving tools. For control charts, emphasis was given on additional control charts not covered previously at the undergraduate level. Advanced tools and techniques such as Gauge Repeatability and Reproducibility (GR & R), Quality Function Deployment (QFD), Failure Mode Effect Analysis (FMEA) and experimental design methodology were also covered.
Supply Chain and Logistics MEMI1823	This course is identifying strategic importance of good supply chain and logistics design and management on the competitive position for each supply chain members. The main goal of this course is to understand the fundamental of supply chain and logistics including logistics vs supply chain, supply chain drivers, metrics and performance, distribution and network designs, 3PL, 4PL, transportation, procurement and sourcing and the logistics and supply

	chain in the future in order to satisfy end customers. This course also concerns about techniques for designing transportation networks, distribution issues, logistics management, integration issues and performance measurement.
Work Systems and Ergonomics MEMI1833	This course aims to provide students with fundamental knowledge of ergonomics (also known as human factors engineering) relevant for industry. This includes fundamental concepts and analysis of industrial problems in ergonomics such as practice of ergonomics principles and methodology, solving industrial problems related to ergonomics, information input and design, human physical work capacity, job design and task analysis including Ergonomics Risk Assessment (ERA).
Engineering Economy and Finance MEMI 2823	This course prepares students to appreciate the financial impact of their decisions. The course takes a broad managerial perspective emphasizing the strategic impact of financial and accounting activities in relation to other activities of the firm. Evaluation of company's performance from financial statements, designing cost structures and determine costs of products or services for managerial use, Activity-based costing and Target costing, time value of money, inflation, taxes, measures of worth of individual projects and alternatives, and methods for capital budgeting methods for long term projects.
Modelling and Simulation MEMI 2873	This course provides students with the concepts and tools to model manufacturing or service systems efficiently using a practical Simulation software. Topics under Discrete-Event Simulation that span from basic modelling concepts, types of discrete-event approaches, analysis of input data, goodness-of-fit tests, model verification and validation, to full model experimentation and analysis of outputs are covered.
Facilities Planning and Design MEMI 2883	This subject provides students with the concepts and issues related to selection of facilities locations, facilities layout planning and design at the macro and micro levels. It also introduces students to the planning and design of warehousing, material handling systems and it related equipment. It uses both, quantitative and qualitative approaches in the analyses, together with the application of several layout procedures, algorithms and computerized layout planning concepts within a typical manufacturing plant.
Elective Track – Manufacturing Engineering	
Statistical Quality Engineering MEMI1813	This course is designed to provide the students with sound understanding to statistical methods in quality improvement. It encompasses various statistical process control problem-solving tools. For control charts, emphasis was given on additional control charts not covered previously at the undergraduate level. Advanced tools and techniques such as Gauge Repeatability and Reproducibility (GR & R), Quality Function Deployment (QFD), Failure Mode Effect Analysis (FMEA) and experimental design methodology were also covered.
Green Manufacturing Technology MEMI1723	This course introduces students to green manufacturing technology and sustainability considerations in product design and manufacture. It presents the principles, methodology and case studies to develop an understanding of sustainable development that can reduce environmental impact and promote green technology for sustainable practice. Besides that, it is also introducing the Life Cycle Assessment consists of four main phases, goal and scope definition, inventory, impact assessment, and interpretation. Analysis of use valid life cycle

	assessment method to collect and process data of the product's life cycle or the manufacturing processes consumption or declaring the total emissions from the manufacturing.
CAD/CAM/AM MEMP1743	This course discusses: the role of CAD in the design process, the Design/Manufacturing interface CAD/CAM, the basic techniques involved in CAD/CAM, its importance in the selection, implementation and management of CAD/CAM system, the link to machine control, fundamentals of Numerical Control (NC) and Additive Manufacturing (AM). The course also involves hands-on experience in CAD/CAM/AM.
Smart Manufacturing MEMP2723	This course introduces the overview of Smart Manufacturing architectural framework, its application, related technologies and its future directions related to various case studies around the globe. The aim is to introduce students to the new era of Industrial Revolution (IR4.0) related to the power of digital manufacturing and product model data for manufacturing integration. Students will also gain deep insights into how various support systems are used in harnessing from product design, knowledge management, data analysis and other technologies being seamlessly transfer through the entire lifecycle of a manufactured product.
IT for Manufacturing MEMP2733	Knowledge Management and Knowledge Management Infrastructure are the main contents. The lecture is supplemented with the real data mapping and development of information systems. This course is an Instructional lecture and Cooperative learning (CL) enriched with student assignments and group projects. Students are required to perform problem solving using real case study and projects in their individual assignments/projects to measure their skill in communication and analysis of data. Students are guided through the real-life case study that requires them to construct into real data for database design. They are also to prove their ability by constructing a database information system using selected tools. The contents include Business System of project and Product Based, Information Security, Cyber physical system, networking, vertical & horizontal integration, Data exchange, Cloud manufacturing and computer integrated manufacturing (CIM).
Product Innovation & Development MEMM1023	This course introduces the students to the various stages of product design and development methods that can be put into immediate practice in developing products or projects. The development procedures blend the various perspectives of marketing, design, and manufacturing into a single approach to product development. Aspects of sustainable design and manufacturing will also be covered. The course also provides practice in carrying out small projects to expose the various stages of product development. It also includes the various prototyping and manufacturing systems strategies in developing product prototypes.
Elective Track - Quality Engineering	
Statistical Quality Engineering MEMI1813	This course is designed to provide the students with sound understanding to statistical methods in quality improvement. It encompasses various statistical process control problem-solving tools. For control charts, emphasis was given on additional control charts not covered previously at the undergraduate level. Advanced tools and techniques such as Gauge Repeatability and Reproducibility (GR & R), Quality Function Deployment (QFD), Failure Mode Effect Analysis

	(FMEA) and experimental design methodology were also covered.
Engineering and Environmental Safety MEMI2803	<p>This course provides the fundamental concepts of engineering and environmental safety that covers both management and technical aspects. In engineering safety, the focus is on the safety of equipment commonly used in engineering installation and maintenance, safety of chemicals used in engineering processes, and implementation of safety engineering programs in engineering installations and plants. The environmental safety provides the principles and concepts of environmental safety elements, hazardous waste control, environmental assessment under OSHA 1994, impact and cause of global warming, green design and manufacturing, sustainable energy and design for environment.</p> <p>The management element provides the elements of safety (engineering and environmental) management and relevant issues in industry. Certification to ISO 14000, ISO 14001 EMS and compliance to local regulations (EQA 1974) as well as environmental audit are included. The principles in hazard identification, risk assessment & control, planning & implementing an effective safety program, and assessment of the effectiveness of safety program.</p>
Quality Management MEMI2843	<p>This course covers the principles, philosophy and concepts of quality management and related issues. Application of the principles and concepts of Total Quality Management in their organization, developing a strategy for the development of TQM in an organization, applying the problem-solving process and relevant tools for organizational improvement, and using the continuous improvement process for establishing a quality organization. Others quality management initiatives such as Six Sigma, Lean and Lean Six Sigma, and current issues are also discussed.</p>
Lean Manufacturing MEMI2863	<p>This course provides concepts relating to lean manufacturing including kaizen system, value stream mapping, just in time (JIT), Kanban, single minute exchange of die (SMED) technique and line balancing. Selection of lean techniques for problem solving and waste minimization program.</p>
Risk Management MEMI2893	<p>Enterprise risk management enables management to effectively deal with uncertainty and associated risk and opportunity, enhancing the capacity to build value. Value is maximized when management sets strategy and objectives to strike an optimal balance between growth, return goals and related risks, as well as efficiently and effectively deploys resources in pursuit of the entity's objectives.</p> <p>This course aims to prepare students with Enterprise risk management knowledge which encompasses i) aligning risk appetite and strategy, ii) enhancing risk response decisions, iii) reducing operational surprises and losses, iv) identifying and managing multiple and cross- enterprise risks, v) seizing opportunities and vi) improving deployment of capital. Enterprise risk management helps ensure effective reporting and compliance with laws and regulations, and helps avoid damage to the entity's reputation and associated consequences. In sum, enterprise risk management helps an entity get to where it wants to go and avoid pitfalls and surprises along the way.</p>
Smart Manufacturing MEMI2723	<p>This course introduces the overview of Smart Manufacturing architectural framework, its application, related technologies and its future directions related to various case studies around the globe. The</p>

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