Contents of Courses for the Masters of Engineering Management Programme

EM 501 Organizational Systems

Definitions of management; Evolution of management thought, classical, quantitative and behavioral schools; interactions between organizations and their environments. The planning process; strategic and tactical planning, developing planning premises, nature of managerial decision making, quantitative aids, management by objectives. Organizational structures; behavior of the individual, work group, and organization; coordination and spans of control, the informal organization; authority delegation and decentralization, groups and committees, managing organizational change and conflict. Motivation, performance and satisfaction; building a high-performance team; leadership, interpersonal and organizational communication, staffing and personal function. The control process; budgetary and non-budgetary methods of control; team performance measurement and improvement strategies. Use of management information systems.

EM 502 Accounting and Financial Management

Foundations of finance with applications in corporate finance and investment management. Major financial decisions made by corporate managers and investors with focus on process valuation. Criteria for investment decisions, valuation of financial assets and liabilities, relationships between risks and return, market efficiency, and the valuation of derivative securities. Major corporate financial instruments including debt, equity and convertible securities. Analysis and projection of financial statements, cost elements in pricing, cost control and design of accounting systems.

EM 503 Strategic Planning and Decision Making

Critical issues in shaping the competitive strategy for engineering-driven companies in a turbulent business environment; corporate mission; key result areas and situational analysis including strengths, weaknesses, opportunities and threats; identifying planning assumptions, critical issues, setting objectives, formulating strategy. Managing technology as a strategic resource of the firm; understanding of the process, roles and rewards of technological innovation; integrating the strategic relationship of technology with strategic planning, marketing, finance, engineering and manufacturing; government, societal and international issues; issues pertaining to cultural diversity and ethical concerns. Subjective, judgmental and expert decisions; conflict resolution in strategic decisions involving technological alternatives; hierarchical decision modeling; individual and aggregate decisions; decision discrepancies and evaluation of group disagreements.

EM 504 Project Management Framework and Tools

Role of projects in organization's competitive strategy; Standard methodologies for managing projects; Project life cycle; Design-implementation interface; Estimating: preliminary and detailed; Contractual risk allocation; Scheduling: PBS; WBS; Integration of scope, time, resource and cost dimensions of a project; Evaluation of labor, material, equipment, and subcontract resources; Scheduling techniques including CPM/ PERT, GERT, critical chain; Solving real-world project schedules; Monte Carlo simulation; Cost budgeting; Cost baseline; Cash flow analysis; Earned value analysis; Cost control; Proposal presentation; Application of software for project management (MS Project, Primavera Project Planner-P3).

EM 505 Operations Research

Deterministic modeling: Linear programming; The Simplex method; Multiple objective linear optimization; Duality and sensitivity analysis; Post optimality analysis from the viewpoint of technology management; Transportation, transshipment, and assignment problems; Problem formulation; Goal programming; Network analysis; Dynamic programming; Integer programming and nonlinear programming. Probabilistic modeling: Markov chains; Queuing theory and applications; Inventory theory; Forecasting; Design analysis and simulation; Pareto optimality and tradeoff curves.

EM 511 Total Quality Management

Critical principles and procedures of quality management in a competitive global environment; contemporary definitions of quality; construction quality; Product quality; Process quality; Quality economics; Quality philosophies; Planning, organizing and controlling for quality; Human resource strategies; QA and QC tools.

EM 512 Project Evaluation and Feasibility Analysis

Evaluation of engineering projects from the engineering management perspective; Techniques for capital investment for decision-making; Time value of money and the concept of equivalence; Present worth, annual and rate of return analysis; Multiple alternatives; Replacement criteria; Tax considerations; Breakeven sensitivity analysis; Project evaluations under uncertainty; Risk sharing; Capital budgeting; Cost of capital depreciation; Multicriteria decisions. Project feasibility analysis; Organizational impacts; societal impacts; Environmental impacts.

EM 513 Research Methods in Engineering Management

Research methods in engineering and technology management; Statistical techniques including proper selection; Use and interpretation of parametric and non-parametric tests along with factor and discriminate analysis; Design of experiments and model misspecification; Simulation in engineering and management research and practice.

IM 501 Supply Chain Management

Management systems for distribution, materials handling, inventory control, transportation planning and facilities location and analysis; Logistics information systems and development of logistics strategy. Use of planning models and software packages to demonstrate concepts of strategic partnering, adequate safety stock levels, and risk pooling. Integrated decision support systems in the management of the supply chain and logistics network design issues.

IM 502 Computer Simulation Methods

The objective and purpose of simulation, its advantages and limitations. Process view of discrete manufacturing and business systems involving inputs, activities, and outputs; structure; and metrics. Identification of decision variables; uncontrollable variables, and dependent variables for strategic and operational level decisions. Modeling of industrial systems using dynamic simulation environments, and analysis of alternatives using statistical techniques and animation. Applications to include production systems, inventory management, transportation and supply chain, business process re-engineering, and public systems.

IM 503 Maintenance Management

Typical maintenance responsibilities; Types of maintenance: Breakdown Maintenance, Preventive Maintenance, Individual Versus Group Replacement, Internal Versus External Maintenance; Determination of Crew size. Queuing Theory Application in Maintenance: Input, Queue, Service Characteristics. Mathematical Approach; Monte Carlo Simulation, Computerized Maintenance Management.

IM 505 Automated Manufacturing Systems

Automated flow lines; Methods of work part transport; Transfer mechanism; Buffer storage; Control functions; Automation for machining operations; Design and fabrication considerations; General terminology and analysis; Analysis of transfer lines without storage; Partial automation; Automated flow lines with storage buffers; Computer simulation of automated flow lines. The assembly process; Assembly systems; Manual assembly lines; The line balancing problem; Methods of line balancing; Computerized line balancing methods; Flexible manual assembly lines; Types of automated assembly systems; Parts feeding devices; Analysis of multi-station assembly machines; Analysis of a single station assembly machine. Schemes for Concurrent Engineering: Axiomatic Design, DFM Guidelines, Design for Assembly, The Taguchi Method for Robust Design, Manufacturing Process Design Rules, Computer-Aided DFM, Group Technology; Failure-Mode and Effects Analysis. Robot motions, Robot drive power, Types of robots; Robot motions: Link geometries, Frame of reference, Orientation, Changing frames of reference, Workspace Descriptions; Robot accuracy and repeatability; Economic justification of Robots; Characteristics of robot applications; Robot Cell design; Types of robot applications, Material handling applications; Processing applications; Assembly & inspection.

IM 506 Business Process Reengineering

Fundamentals of process management; importance of process decisions and process choices; strategic process decisions for manufacturing and service environments.
Costs, quality, and timeliness as the primary attributes of value; creation of value through strategies and processes. Process improvement tools and frameworks; process maps, value stream mapping, service blueprinting, reengineering, Poka-Yoke, lean systems and six-sigma.
Simulation and modeling of discrete event systems and processes; random numbers generation, Monte-Carlo simulation, and probability distributions for discrete event processes. Implementing BPR methodology; initiating organizational change; building the reengineering organization; identifying BPR opportunities, understanding existing processes, reengineering processes, blueprinting new business systems, performing transformation.

IM 511 Statistical Quality Control

Review of Probability & Statistics, Probability Distributions, Hypothesis Testing (One-Tail and Two-Tail Tests), Sampling Distributions, Quality Control & Assurance, Causes of Variation, Control Charts (for attributes and variables), EWMA Chart and CUSUM Chart, Metrology & Gauging, Gauge Capability Analysis, Gauge Repeatability and Reproducibility, Process Capability Indices, Acceptance Sampling (for attributes and variables).

IM 512 Reliability Engineering

Fundamentals of Reliability Engineering, failure modes & effects analysis, failure distributions, complete & censored data, reliability estimation using normal, exponential, Weibull and other distributions, reliability metrics, Monte Carlo simulation, goodness of fit tests, bogey life test, sample size determination, accelerated life testing, stress-strength relationship, maximum likelihood estimation.

IM 513 Six Sigma Methodologies

Introduction to Six Sigma, Internal & External Customers, DMAIC (Define, Measure, Analyze, Improve, Control) cycle, six sigma goals and metrics, six sigma training, six sigma teams, green;

black and master black belt, design for six sigma, DMADV (Define, Measure, Analyze, Design, Verify), case studies.

IM 514 Quality Planning & Management

Introduction to Quality Management Systems, design of QMS, quality tools and their application in management, total quality management, product and service quality, process quality, quality philosophies, quality planning; improvement and control, quality function deployment, determination of vendor quality level.

IM 515 Agile and Lean Manufacturing

Introduction to Lean Manufacturing, value concept, lean objectives & tools, origins of lean systems, group technology, 5S, single minute exchange of dies, total productive maintenance, Kaizen, Just-In-Time Manufacturing Systems, Push & Pull Manufacturing Systems, Poka-Yoke, Toyota production system, introduction to agile manufacturing, research projects in agile manufacturing, design of market responsive supply and distributions manufacturing systems.

IM 516 Design and Analysis of Experiments

Introduction, controllable and uncontrollable factors, single factor experiment, ANOVA, regression model, comparison tests, contrasts, randomized block design, latin square design, two-level and three-level full factorial experiments, blocking, confounding, two-level and three-level fractional factorial designs, experiments with random factors, response surface methodologies.

IM 517 Advanced Quality Engineering

Product and Process Design Optimization using Taguchi Methods; fractional factorial designs using orthogonal arrays and linear graphs; statistical tolerances, robust design and signal to noise ratio; process optimization using response surface methodology, TRIZ (Theory of inventive problem solving).

IM 525 Design for Manufacturing

Concepts of design for manufacturing (DFM), role of DFM in product specification and standardization, design, development, and functional requirements, material and process selection. Introduction to components of DFM – design for assembly, performance, quality, bio-compatibility, ergonomics, recycling, etc. Design to Cost. Quantitative methods of material selection in DFM based on engineering properties, material performance indices, comparative property charts, costs, etc., Evaluation of single and multi-attribute utilities. Design rules for selection of materials and processes, Part geometry and tolerances, shape factor, prototyping, computer-aided material and functional modeling, mathematical optimization, formation of objective and constraint functions, factorial analysis. Case studies on product design for manufacturing and assembly.

IM 526 Facilities Planning and Layout

Introduction to Product and Process Design, process planning and sequencing; manufacturing processes: automation with respect to sensing equipment and control systems; manufacturing systems: fixed and flexible manufacturing systems, single-stage multi-machines systems, Just in time and group technology approach; requirements and selection of machines and labour, building, organization, communications and support requirements; material handling principles: equipment and its selection criteria, flow lines, grouping, packaging, storage and warehousing, plant and office layout: conventional approaches, flow space and activity relationships, computerized layout planning models and algorithms, computer aided process planning, operation sequence and path planning with constraints, case studies in CAPP, simultaneous

development of plant layout and material handling systems, basic facility location problems, single- and multiple facility placement problems, heuristics and computerized approaches.

IM-550 Advanced Principles of Supply Chain Management

Introduction and Concepts: Introduction to logistics and supply chain and supply chain management. The internal and external supply chain, strategic and operational issues System Models and Optimisation Supply chain modelling, Logistic Network Configuration, optimisation Inventory Management and Risk Pooling: The Value of Information, Distribution Strategies Strategic Alliances International Supply Chain Management: Co-ordinated Product and Supply Chain Management Customer Value and Supply Chain Management Information Technology for Supply Chain Management: Decision Support Systems for Supply Chain Management

IM-551 Information Technology for Supply Chain Management

Basic information technology skills; Role of information in Supply Chain; Information as a driver of SC; Data and information; Social Implications of IT; Database concepts; Database queries; E-commerce and interactive networking; Privacy and digital security; Limits to computation; Fluency in information technology; Management information system.

IM-552 Logistics Management

Overview of logistics; Logistics and information technology; Elements of logistics system – Demand management, Order management and customer service; Material handling; protective packaging; Transportation and its management; Location – Distribution centre, warehouse and plant; Inventory management; Warehouse management; International logistics; Logistics system – Organising, Analysing and Controlling.

IM-553 Green Supply Chain Management

Green Purchasing Fundamentals; Design for Environment (DfE) Principles; International Green Labelling; Green Product Standards; Environmentally Preferred Purchasing (EPP); Green Purchasing Program Development; Corporate Social Responsibility Sustainable Development; Sustainability in Major Business Sectors; Introduction to Environmental Science; Carbon Strategies; Developing a Climate Strategy; Supporting Green House Gas Reductions; Tracking Emissions and Reporting; Green Supply Chain's Carbon Footprint; Developing a Carbon Policy; Green Transportation and Logistics; Building Energy Efficiency in 3PL Operations; Greater Sustainability in Distribution Operations; Green Fleet Management; Integrating Sustainability Across the Extended Supply Chain; Lean and Green Supply Chain.

IM-554 Procurement Management

Management functions; Fundamentals of public procurement; Tendering and contracting procedures; Procurement planning; monitoring and evaluation; Bidding documents and procedure; Bid opening, evaluation and award of contract; Contract management; Fundamentals of contract law; Legal aspect of procurement; Negotiation; Fraud detection and control.

IM-555 Business Process Simulation

Modelling for business process improvement; Basics of business process model; Modelling rules; Modelling verification; Evaluating Simulations; Concept of domains; Business motivation; Business rules; Measuring "as-is" process; Designing "to-be" process.

IM-556 Retail Management

Introduction to Retailing; Building and Sustaining Relationships in Retailing; Strategic Planning in Retailing; Retail Institutions by Ownerships, by Store-Based Strategy; Web, Non-Store Based and other Forms of Traditional Retailing; Identifying and Understanding Consumers; Information Gathering and Processing in Retailing; Trading Area Analysis; Site Selection; Financial Dimensions; Developing Merchandise Plans; Financial Merchandise Management; Pricing in Retailing.

IM-557 Managing Supply Chain Inventory

The Fundamentals of Supply chain inventory; Methodologies; Demand Planning; Inventory; Service and Cost Optimisation; Supply Planning; Performance Management and S&OP; Supply Chain Collaboration; Planning Processes; Simulation and Modelling; Financial Link; Implementation and Change.

IM-558 Change Management

Managing change; Experiencing change; Recognising the impact change can have on standards; Experience of change/change management principles; Nine key principles of managing change; Emotional responses to change; Business and personal impacts of failing to deal with people's needs & concerns; Identifying our own response to change; DREC change curve; Compelling reasons for change; Responding to resistance; Clear vision and objectives for change; Steps to creating a clear vision; Imaging your vision; Building momentum and managing resistance to change; Driving momentum; Recognising the reasons for resistance.

IM-559 International Trade

Introduction to Ricardian Model; Specific-Factors Model; Heckscher-Ohlin Model; Factor Movements; Increasing Returns to Scale and Imperfect Competition; Offshoring; Tariffs and Quotas under Perfect Competition; Effective Protection; Role of the WTO; Export Subsidies; Trade Remedies; Trade Agreements; Trade and the Environment

IM-560 Process Management

Operations Strategy; Business Process Analysis & Improvement; Managing Customer Experiences; Diagnosing Business Processes; Business Valuation: Operational Improvements; Mass Customization- Consequences for Process Design; Planning for Uncertainty: The Newsvendor Model; Supply Chain Innovation; Outsourcing, Off-shoring and Mass Customization; Managing Supply Chain Relationships.

IM-561 Principles of Marketing

Introduction of Marketing; Marketing Process & Company Analysis; Competitor Analysis; Customer Analysis: Individual & Aggregate; Segmentation, Targeting and Positioning; Product, Services and Branding Strategies; Pricing; Integrated Marketing Communication; Channels of Distribution.

IM-562 New Product and Service Development Management

Introduction and Overview -New product and service development from a strategic marketing and management perspective; Sources of Innovation; Product and service standards and competition; Entry timing and first-mover advantage; Product market structure and definition; Product complements and substitutes; Transition strategies between product and service markets; Developing new services and developing and pricing service bundles; Users and lead users in new product development; custom products and custom design; Marketing Research Techniques for Product and Service Development; Organisational factors and new product development in large firms; Managing the new product development process.

IM-563 Warehouse Management and Physical Distribution Network

Warehousing and Physical Distribution as part of SCM Function; Location of Function on the Organisation Chart; Need for Warehousing and Physical Distribution; Inventory as Working Capital; Stockholding costs and its Influences; Functions of Warehousing; Storage of Materials, Records-Planning-Equipment-FIFO / LIFO-Layout-Identification-Bar-coding; Maintaining Inventory Accuracy, Stocktaking-Cycle Counting-Technology; Warehouse Safety; Measuring Effectiveness and Efficiency.

IM-564 Supplier Relationship Management

Introduction to supplier management; Levels of supplier relationship (strategic, business and operational); Lifecycle of a supplier relationship; Managing risk in supplier management; Stakeholder identification; Sourcing and selecting suppliers; The sourcing process; Researching possible suppliers; Detailed response assessment; Non-disclosure agreements; Engaging with the supplier; Service Level Agreement - purpose and structure; Refining and agreeing key performance indicators and deliverables; Contract types and duration; Contract terms and conditions; Contract placement and termination; Negotiation, arbitration and litigation; Escrow agreements; Limitations of liability; Implications of culture on performance / relationships; Influencing and leading suppliers; Relationship and segmentation analysis; Optimising the relationship; Negotiating with suppliers. Changing and evolving supplier relationships; Handling disputes and conflict; An approach to managing conflict; Potential closure situations - project closure, end of long term contract, premature termination; Risk assessment for the exit stage.

ME-586 Health, Safety and Environment

Safety management, OSHA protection program, management systems, equipment safety, fire protection and life safety, combustion and flammability, process and system safety, system reliability, material handling, operations safety, construction safety, chemical hazard assessment, material safety datasheets, exposure limits, hazard communication, personal protective equipment, industrial ventilation, radiation safety, sound and hearing conservation.

Types of pollution and prevention, Air emissions modeling, air sampling methods, waste treatment (physical, chemical, biological thermal types) and disposal technologies, waste water and water treatment, water quality standards, water discharge limitations and standards, pretreatment regulations, storage and containment.