# Department of Mechanical Engineering

## Curriculum for M. Tech. Programme in Industrial Engineering and Management

### Semester 1

<table>
<thead>
<tr>
<th>Code</th>
<th>Title of Course</th>
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<tbody>
<tr>
<td>ME6101</td>
<td>Decision Modeling - I</td>
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<td>ME6102</td>
<td>Inventory and Supply Chain Management</td>
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<td>ME6103</td>
<td>Accounting and Finance for Management</td>
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<td>ME6104</td>
<td>Marketing Management</td>
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<tr>
<td>ME6191</td>
<td>Industrial Engineering Laboratory</td>
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<td>ME6192</td>
<td>Seminar</td>
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<td>ME6111</td>
<td>Decision Modeling – II</td>
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<td>ME6112</td>
<td>Facilities Layout Planning</td>
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<td>ME6113</td>
<td>Manufacturing Planning and Control</td>
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<td>ME6114</td>
<td>Human Resource Management</td>
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<td>ME6193</td>
<td>Computational Laboratory-II</td>
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<td>ME6194</td>
<td>Term Paper/ Mini Project/Industrial Training</td>
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**Total Credits: 60**

### Stipulations:

1. A minimum of 60 credits have to be earned for the award of M. Tech. degree in this programme.
2. Students have to credit a minimum of eight core courses and four electives during the programme; however they have option to credit two electives in the Third Semester, drawing one each from First and Second Semesters.
3. Students may undergo Industrial Training during May-June.
## List of Electives

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<tr>
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<tr>
<td>1</td>
<td>ME6121</td>
<td>Statistics for Management</td>
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<td>2</td>
<td>ME6122</td>
<td>Work System Design</td>
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<td>ME6123</td>
<td>Management of Technology and Innovation</td>
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<td>4</td>
<td>ME6124</td>
<td>Strategic Management</td>
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<td>5</td>
<td>ME6125</td>
<td>Management Information Systems</td>
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<td>6</td>
<td>ME6126</td>
<td>Group Technology and FMS</td>
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<td>7</td>
<td>ME6127</td>
<td>Reliability Engineering and Management</td>
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<td>8</td>
<td>ME6128</td>
<td>Product Management</td>
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<td>ME6129</td>
<td>Project Management</td>
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<td>10</td>
<td>ME6130</td>
<td>Technical Entrepreneurship</td>
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<tr>
<td>11</td>
<td>ME6131</td>
<td>Business Ethics</td>
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<td>12</td>
<td>ME6132</td>
<td>Computer Methods in Management</td>
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<td>13</td>
<td>ME6133</td>
<td>Organizational Behaviour</td>
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<td>14</td>
<td>ME6134</td>
<td>Consumer Behaviour</td>
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<td>15</td>
<td>ME6135</td>
<td>Soft Computing Techniques</td>
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<td>16</td>
<td>ME6136</td>
<td>Risk Management and Insurance</td>
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<td>ME6137</td>
<td>Financial Management</td>
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<td>18</td>
<td>ME6138</td>
<td>Decision Support and Expert System</td>
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<td>19</td>
<td>ME6139</td>
<td>System Modelling and Simulation</td>
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<td>ME6140</td>
<td>Data Base Management</td>
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<td>21</td>
<td>ME6141</td>
<td>Enterprise Resource Planning</td>
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<td>22</td>
<td>ME6142</td>
<td>Industrial Scheduling</td>
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<td>23</td>
<td>ME6143</td>
<td>Lean Production Management</td>
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<td>ME6144</td>
<td>Investment Management</td>
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<td>25</td>
<td>ME6145</td>
<td>Takeovers and Corporate Restructuring</td>
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<td>26</td>
<td>ME6146</td>
<td>Forecasting Techniques</td>
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<td>27</td>
<td>ME6147</td>
<td>Managerial Economics</td>
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<td>28</td>
<td>ME6148</td>
<td>Computer Integrated Manufacturing</td>
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<td>ME6312</td>
<td>Quality Engineering &amp; Management</td>
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<td>30</td>
<td>ME6329</td>
<td>Design of Experiments</td>
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*Note: Students may choose any course offered in the Institute with the approval from the Programme Coordinator.*
DEPARTMENT OF MECHANICAL ENGINEERING

BRIEF SYLLABI

M. Tech. Programme in Industrial Engineering & Management

Pre-requisite for courses: Nil
Total Hours for all courses except for Project: 42
Lecture hours for theory courses: 3
Hours for Practical/Seminar: 3
Credit for theory courses: 3
Credit for Practical/Seminar: 1

ME6101 DECISION MODELLING I

ME6102 INVENTORY AND SUPPLY CHAIN MANAGEMENT
Introduction to Supply Chain Management (SCM), Sourcing and Procurement, Purchasing, Stores Management, Inventory Management- Independent Demand Systems (Deterministic Models), Multi-item Joint Replenishment, Inventory System Constraints, Independent Demand Systems (Probabilistic Models)- Single order Quantities, Dynamic Order Quantities, Managing inventory in supply chain.

ME6103 ACCOUNTING AND FINANCE FOR MANAGEMENT

ME6104 MARKETING MANAGEMENT

ME6191 INDUSTRIAL ENGINEERING LABORATORY

ME6111 DECISION MODELLING II
Decision analysis, multi-objective decision models, Sequential Decision Making (Deterministic and Stochastic Cases), Dynamic programming, Markov processes, Markov chains, Application of queuing models.

ME6112 FACILITIES LAYOUT PLANNING

ME6113 MANUFACTURING PLANNING AND CONTROL
Manufacturing Planning and Control (MPC), Enterprise Resource Planning (ERP), Demand Management and MPC environment, Forecasting framework, Sales and Operation Planning, Master Production Schedule (MPS), Material Requirement Planning (MRP), Shop floor control concepts, General job shop scheduling - Static, deterministic, Dynamic, probabilistic job shop.

ME6114 HUMAN RESOURCE MANAGEMENT
Definition of personnel management, Organizational objectives, Manpower planning, Selection, Training, Performance Appraisal, Wage and Salary Administration, Expectancy theory and compensation, Human Factor Management- behavioural models, motivation, Leadership, Communication and counseling.

ME6193 COMPUTATIONAL LABORATORY
Development of algorithms and computer programs using C, C++, MATLAB, LINDO, LINGO, EXCEL and ARENA for the modeling and analysis of decision problems in the areas of Production Planning and Control, Inventory and Supply Chain Management, Manufacturing System Design, Performance of Manufacturing

**ME6121 STATISTICS FOR MANAGEMENT**

**ME6122 WORK SYSTEM DESIGN**

**ME6123 MANAGEMENT OF TECHNOLOGY AND INNOVATION**
Understanding Management of Technology, Technology and competition, technology acquisition, Technology Strategy, Appropriation of technology, Technology evaluation and financing.

**ME6124 STRATEGIC MANAGEMENT**
Concept of strategic management, Strategy formulation, SWOT Analysis, Portfolio analysis, Strategy Implementation and Control, Strategic issues of technology.

**ME6125 MANAGEMENT INFORMATION SYSTEMS**
Information systems for Decision Making, General Steps in Information System Design, System requirements specification, Modern software design techniques, Verification and validation methods, Capability Maturity Model(CMM), System Testing, System implementation issues and solution procedures, Distributed data management, Data mining and warehousing, Security features in global information systems.

**ME6126 GROUP TECHNOLOGY AND FMS**

**ME6127 RELIABILITY ENGINEERING AND MANAGEMENT**

**ME6128 PRODUCT MANAGEMENT**
Introduction to Product Management, Target marketing, New product innovation and development, Brand Management.

**ME6129 PROJECT MANAGEMENT**

**ME6130 TECHNICAL ENTREPRENEURSHIP**
Basis and challenges of entrepreneurship, Entrepreneurship Index and its need, Concept of new ventures, Appropriate technology, Starting a New Technological Venture and Developing the Business, Financing a new venture, Venture capital, Managing the New Technological Venture- Franchising or Acquisition.

**ME6131 BUSINESS ETHICS**
Some basic principles in Business Ethics, Historical perspective, culture and ethics in India, Economics and the environment, The sphere of personal ethics, Role of objectivity, practicability, Ethical Responsibilities of Economic Agents, Environmental protection, Corporate accountability, Ethical conflicts, Ethical responsibilities of Organizational Leader, Ethics in use of Information Technology, Ethics in Marketing, Ethics of advertising and sponsorship.

**ME6132 COMPUTER METHODS IN MANAGEMENT**
Programming and Problem Solving, Efficiency of algorithms, Program design methods, Fundamentals of Programming, Data structures, Unix system Interface, Dynamic storage management, Framework of E-commerce, site security.
ME6133 ORGANISATIONAL BEHAVIOR
Introduction to Organizational Behaviour (OB), Foundations of group behavior, Work design and technology, Organizational change, stress management.

ME6134 CONSUMER BEHAVIOR
Consumer behaviour as discipline and Science, Consumer motivation, consumer perception, consumer learning, Consumer influence and diffusion of innovations, Consumers in their social and cultural settings.

ME6135 SOFT COMPUTING TECHNIQUES

ME6136 RISK MANAGEMENT AND INSURANCE
Basic concept of risk and insurance, Personal property and liability risks, Commercial property and liability risks, Life and Health insurance.

ME6137 FINANCIAL MANAGEMENT

ME6138 DECISION SUPPORT AND EXPERT SYSTEMS

ME6139 SYSTEMS MODELLING AND SIMULATION

ME6140 DATA BASE MANAGEMENT
Database systems, Data Definition Language- Data Manipulation Language, ER Diagrams, Structure of Relational Databases- SQL, Design- Normalisation functional, Multi-valued and joint dependencies, File organization, Indexing and Hashing, Query Processing, Security and Integrity.

ME6141 ENTERPRISE RESOURCE PLANNING
Introduction to Enterprise Resource Planning (ERP), Systems and technology background, Reengineering, ERP Life Cycle, Designing ERP systems, Implementing ERP systems, Successes and failures.

ME6142 INDUSTRIAL SCHEDULING
Importance of scheduling in implementation of production planning, Single machine sequencing with independent jobs- without and with due dates, Flow shop scheduling, Job shop scheduling, Scheduling of Flexible assembly systems.

ME6143 LEAN PRODUCTION MANAGEMENT

ME6144 INVESTMENT MANAGEMENT
Investment environment: - securities and market, Characteristics and financial analysis of common stocks, Bond valuations and analysis, Mutual funds, international investing.

ME6145 TAKEOVERS AND CORPORATE RESTRUCTURING
Takeover process, merger process, theories of mergers, Restructuring and divestitures, Joint ventures and alliances, Takeover defenses, International takeovers and restructuring.
ME6146 FORECASTING TECHNIQUES
An overview of forecasting techniques, Time series data and models, Regression-moving average models Seasonal data and forecasting errors, Moving average models MA(q), Autoregressive models AR(p), Panel data, Qualitative forecasting, Relevance Trees, Delphi Method, Cross-Impact Analysis.

ME6147 MANAGERIAL ECONOMICS

ME6148 COMPUTER INTEGRATED MANUFACTURING
Manufacturing models and metrics, Concurrent engineering, Classification scheme for manufacturing system, GT & Process planning, Introduction to CAPP, Material handling, FMS and Shop floor control, NC, CNC, DNC & CIM and Data base, Virtual Manufacturing.
DEPARTMENT OF MECHANICAL ENGINEERING

Detailed Syllabi for the M.Tech. Programme in
INDUSTRIAL ENGINEERING AND MANAGEMENT

ME6101 DECISION MODELLING-I

Pre-requisite: Nil
Total Hours: 42

Module I (11 hours)


Module II (10 hours)


Module III (11 hours)


Module IV (10 hours)


Algorithms for Constrained Optimization: Penalty function methods, Quadratic programming, Separable convex programming.

References

ME6102 INVENTORY AND SUPPLY CHAIN MANAGEMENT

Pre-requisite: Nil
Total Hours: 42

Module I (10 hours)

Introduction to Supply Chain Management (SCM): Concept of Logistics Management, Concept of supply management and SCM, Core competency, Value chain, Elements of supply chain efficiency, Flow in supply chains, Key issues in supply chain management, Decision phases in supply chain, Supply chain integration, Process view of a supply chain, Competitive Strategy and supply chain strategies, Uncertainties in supply chain, Supply chain drivers.

Module II (10 hours)

Sourcing and Procurement: Outsourcing benefit, Importance of suppliers, Evaluating a potential supplier, Supply contracts, Competitive bidding and Negotiation, E-procurement

Purchasing: Objectives, Relations with other departments, Centralised and Decentralised purchasing, Purchasing procedure, Types of orders, Tender buying, Purchasing department records, Computer based systems/EDI.

Stores Management: Functions, Storage methods, Receiving, Inspection, Issues, Inventory Valuation.

Module III (12 hours)

Introduction to Inventory Management: Selective Control Techniques, MUSIC-3D systems, Various costs.

Independent Demand Systems: Deterministic Models, Quantity Discounts - all units, incremental price; Sensitivity, Make-or-buy decisions.

Multi-item Joint Replenishment: Economic Production Quantity for multiple items.

Inventory System Constraints: Exchange Curve (Optimal Policy Curve), Working Capital restrictions, Storage Space restrictions.

Module IV (10 hours)

Independent Demand Systems (Probabilistic Models):


Dynamic Order Quantities: Q- system, P- system, Mathematical modelling under known stock out costs and service levels.

Managing inventory in supply chain: Bullwhip effect, Information and supply chain trade-offs

References

ME 6103 ACCOUNTING AND FINANCE FOR MANAGEMENT

Pre-requisite: Nil
Total Hours: 42

Module I (10 hours)

Module II (10 hours)

Module III (10 hours)

Module IV (12 hours)

References
ME6104 MARKETING MANAGEMENT

Pre-requisite: Nil
Total Hours: 42

Module I (9 hours)

Marketing Planning: Planning Process, Strategic Business Units, Evaluation of SBUs.

Module II (11 hours)

Marketing Mix: Marketing mix variables and their importance.
Pricing Strategies: Meaning of pricing, Importance, Objectives, Factors influencing price determination, Demand market based pricing, Tender pricing, Product line pricing, Selecting the final price.

Module III (11 hours)

Marketing Research: Marketing Research Process, Research objectives, Research Plan development, Collecting information, Analysis.

Module IV (11 hours)

Marketing Communication: Marketing mix variables communicate, Steps in developing effective communication.
Advertising Management: Purpose, Factors in advertising, Advertising Portfolio Selection, Deciding message or copy.
Sales Promotion: Sales Promotion Tools, Consumer promotion tools, Business promotion tools.

References

ME6191 INDUSTRIAL ENGINEERING LABORATORY

- Experiments on Method Study
- Experiments on Time Study
- Vocational Guidance Tests
- Muscle Dynamometer Tests
- Eye-Hand Coordination Experiments
- Depth Perception Tests
- Visual Acuity Tests
- Construction of Control Charts for Quality Planning and Analysis

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ME6192 SEMINAR

Each student shall prepare a seminar paper on any topic of interest related to the core/elective courses (not course content) being undergone in the first semester of the M. Tech. programme. He/she shall get the paper approved by the Programme Coordinator/Faculty Members in the concerned area of specialization and shall present it in the class in the presence of Faculty in-charge of seminar class. Every student shall participate in the seminar. Grade will be awarded on the basis of the student’s paper, presentation and his/her participation in the seminar.

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ME6111 DECISION MODELLING-II

Pre-requisite: Nil
Total Hours: 42

Module I (12 Hours)


Module II (10 Hours)

Sequential Decision Making (Deterministic Case): Sequential decision models, Dynamic programming, Bellman's principle of optimality, Forward recursion and backward recursion, Discrete state discrete time case, Continuous state continuous time case.

Module III (10 Hours)


Module IV (10 Hours)

Queuing Models for Decision Making: Application of queuing models, Features of queuing process, Characterisation of queuing models and solutions - (M/M/1):(GD/|/|), (M/M/1): (GD/N/|), (M/M/c): (GD/|/|) models – Queuing decision models.

References

**ME6112 FACILITIES LAYOUT PLANNING**

**Pre-requisite:** Nil  
**Total Hours:** 42

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**Module I (11 hours)**


**Module II (11 hours)**

**Single Facility Location Problems:** Rectilinear Distance Problems, Squared Euclidean Distance Problems and Euclidean Distance Problems, Contour Lines (Iso-Cost Lines).  
**Introduction to Multifacility Location Problems:** Formulation of Problems, LP formulation with rectilinear distance.

**Module III (11 hours)**

**Computerised Layout Planning:** Basic Philosophy in Computerised Layout Planning, Construction and Improvement Algorithms, Major features of Improvement Algorithms.  
**Major Features of Computerised Algorithms, such as ALDEP, CORELAP, CRAFT, FRAT, and MAT.**  
**Formulation of Layout Problems:** Quantitative, Qualitative, and multi-objective, Limitation of Computerised Layout Planning, Flow Dominance, Complexity Rating, Solution Efficiency.

**Module IV (9 hours)**

**Mass Production Management (Line Balancing):** Basic idea of assembly line balancing, Optimization of number of stations with given production rate, Minimization of cycle time with fixed number of stations.  
**Line Balancing Algorithms:** Kilbridge and Wester, Rank Positional Weight method, COMSOAL, Moodie and Young method.

**References**

ME6113 MANUFACTURING PLANNING AND CONTROL

Pre-requisite: Nil
Total Hours: 42

Module I (9 Hours)

Manufacturing Planning and Control (MPC): MPC systems, MPC system payoff, Hierarchy of managerial decisions, MPC system framework, Type of configurations manufacturing system, Options in dealing with the hierarchy of decisions.


Module II (11 Hours)

Demand Management: Demand management and MPC environment, Communicating with other MPC modules and customers, Forecasting framework; Time series analysis - Individual-item, short-term forecasting models, Forecast errors, Forecast error over lead time, Interval estimate, Special classes of individual items; Coefficient of correlation.

Module III (11 Hours)

Sales and Operation Planning: Nature of sales and operation planning, Relevant costs, Sales and operation planning methods.

Master Production Schedule (MPS): Nature of MPS, MPS Techniques, Time fencing and MPS stability, Structuring BOM, Final assembly schedule, Managing the MPS, Disaggregation techniques.

Module IV (11 Hours)


Production Activity Control: Framework, Shop floor control concepts, Techniques, Performance measures, Gantt chart, Finite loading systems, Priority sequencing rules, General job shop scheduling - Static, deterministic job shop - Dynamic, probabilistic job shop.

References

ME6114 HUMAN RESOURCE MANAGEMENT

Pre-requisite: Nil
Total Hours: 42

Module I (11 Hours)
Introduction: Definition of personnel management, concept of labour, organisation and function of the personnel department, personnel policies.
Organisational objectives, functions, relationships, organisational structure of formal and organisations, job design.

Module II (11 Hours)
Manpower planning: Man power forecasting, mobility and promotion problems, job analysis and job description.
Selection: Developing sources, methods of recruitment, alternative selection policies, application blanks and qualification card, interviews, psychological testing.
Training: The nature of training, objectives in training, types of training, requirements of effective training, conventional training techniques, group training, organisation development, evaluating training effectiveness.
Performance appraisal: Traditional performance appraisal systems, appraisal programs.

Module III (11 Hours)

Module IV (9 Hours)
Human Factor Management: Human factors in management behavioural models, motivation, Maslow's hierarchy of needs theory - hygiene approach to motivation, expectancy theory, reinforcement theory McClelland's needs theory, motivational techniques.
Leadership: Definition, trait approaches to leadership, leadership behaviour and styles, situational approach to leadership.
Communication and Counselling: Nature and importance of communications, channels and structure, communication process, Management by objectives, counselling.

References
3. Edwon, B. Fillipo, Personnel Management
ME6193 COMPUTATIONAL LABORATORY

Development of algorithms and computer programs using C, C++, MATLAB, LINDO, LINGO, EXCEL and ARENA for the modeling and analysis of decision problems in the following areas:
- Production Planning and Control
- Inventory and Supply Chain Management
- Manufacturing System Design
- Performance of Manufacturing Systems
- Facilities Planning
- Financial Management
- Human Resource Management
- Marketing Management

ME6194 TERM PAPER/MINI PROJECT/INDUSTRIAL TRAINING

Students are free to select any one assignment from the following term paper/mini project/industrial training.

Term Paper: Prepare a review paper on any industrial engineering and management topic with the individual analysis and comments.

Mini project: Students can select any project work and work under the guidance of any teaching staff in the department. End of the semester, each student has to submit a thesis report.
Project work is evaluated by the department as per M. Tech. regulations.

Industrial Training: Who are opting for industrial training, as to undergo a minimum of four weeks training in well established industries during in the summer vacation after the first two semesters. He has to submit a report on his training to the department and the same is evaluated as per M. Tech. regulations.
ME7195 PROJECT WORK

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The student will be encouraged to fix the area of the project work and conduct the literature review during the second semester itself. The project work starts in the third semester. The topic shall be research and development oriented. The project can be carried out at the institute or in an industry/research organization. They are supposed to complete a good quantum of the work in the third semester. There shall be evaluation of the work carried out in the third semester.

ME7196 PROJECT WORK

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The project work started in the third semester will be extended to the end of the fourth semester. The project can be carried out at the institute or in an industry/research organization. Students desirous of carrying out project in industry or other organization have to fulfill the requirements as specified in the “Ordinances and Regulations for M. Tech.”. There shall be evaluations of the project work by a committee constituted by the department and by an external examiner.

Regulations for M. Tech. under the section - Project Work in Industry or Other Organization

At the end of the third semester, the students’ thesis work shall be assessed by a committee and graded as specified in the “Ordinances and Regulations for M. Tech.”. If the work has been graded as unsatisfactory, the committee may recommend a suitable period by which the project will have to be extended beyond the fourth semester. At the end of the fourth semester, the student shall present his/her thesis work before an evaluation committee, which will evaluate the work and decide whether the student may be allowed to submit the thesis or whether he/she needs to carry out additional work. The final viva-voce examination will be conducted as per the “Ordinances and Regulations for M. Tech.”
ME6121 STATISTICS FOR MANAGEMENT

Pre-requisite: Nil
Total Hours: 42

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Module I (11 hours)

Data Description: Graphical presentation of data - Numerical description of data - Exploratory data analysis.

Module II (11 hours)


Module III (11 hours)

Design and Analysis of Experiments: Fundamental assumptions of analysis of variance, Single factor experiments – Fixed/random effects model – Model adequacy checking - Multiple comparisons - Design of experiments with several factors - Two factor factorial experiments - General factorial experiments - The $2^k$ Factorial design -Introduction to response surface method in optimal design of parameters.

Module IV (9 hours)


References

ME6122 WORK SYSTEM DESIGN

Pre-requisite: Nil
Total Hours: 42

Module I (13 Hours)

Definition and scope of work design and measurement.

Module II (11 Hours)


Module III (9 Hours)

Speech communication – Speech intelligibility – Components of speech communication.

Module IV (9 Hours)

Human control of systems – Input-output channels – Compatibility – Nature of continuous control systems – Influence of display factors and control factors on system control.

References
ME6123 MANAGEMENT OF TECHNOLOGY AND INNOVATION

Pre-requisite: Nil
Total Hours: 42

Module I (11 Hours)

Module II (11 Hours)
Technology and competition, technology acquisition. Integration of strategic planning and technology planning. Key performance factors for technology management.

Module III (11 Hours)

Module IV (9 Hours)

References

ME6124 STRATEGIC MANAGEMENT

Pre-requisite: Nil
Total Hours: 42

Module I (11 Hours)


Module II (11 Hours)


Module III (11 Hours)

Strategy Implementation and Control: Implementation issues – analysis change, analysing culture, implementation approach, evaluation and control.

Module IV (9 Hours)

Strategic issues of technology, entrepreneurial ventures, non-profit organisations.

References

ME6125 MANAGEMENT INFORMATION SYSTEMS

Pre-requisite: Nil
Total Hours: 42

Module I (11 Hours)

Information systems for Decision Making: Building blocks in information systems-input, output, model, technology, database, and control blocks, System view of business and information system design forces, Information systems development life cycle, Information systems for strategic planning.

Module II (11 Hours)

General Steps in Information System Design: System Investigation and requirements engineering, System requirements specification documents, Feasibility studies, System analysis and general system design, Charting tools in data base design, Data flow diagrams and E-R diagrams, Decision tools and models, Prototyping, Detailed system design, Form design, Code design, Database normalisation, Introduction to data structures and relational database.

Module III (11 Hours)

System Implementation: Modern software design techniques, Verification and validation methods, Performance of software systems, Software metric and models, Software standards, Introduction to Capability Maturity Model(CMM) and Quality Management in software organizations.


Module IV (9 Hours)

System Evaluation: System implementation issues and solution procedures, training and post implementation audit, System fine-tuning, Monitoring and updating.

Modern Information Systems: Multimedia technology, Distributed data management, Data mining and warehousing, Security features in global information systems.

References

ME6126 GROUP TECHNOLOGY AND FMS

Pre-requisite: Nil
Total Hours: 42

Module I (11 Hours)

Introduction: World class manufacturing, Ways of configuring manufacturing system

Group Technology (GT): Role of GT in Computer Aided Manufacturing (CAM), Features of GT, Cellular manufacturing, Role of similarity in GT, Composite part, Coding and classification, Similarity coefficient based clustering, Key machine approach, Binary ordering algorithm, Production flow analysis.

Module II (11 Hours)


Module III (11 Hours)

Cellular Manufacturing: Focused factory and Pull production, Building blocks of workcell, Linked cell, Different type of cells, Cycle time, Workcell Design; Worker assignment; Incentive plans; Issues in implementing Cellular Manufacturing.

Process Planning: Process planning for parts and assemblies – Manual process planning; Computer aided process planning (CAPP); Approaches to process planning; Process Planning systems; Variant process planning- Development stages – Family formation – search algorithm.

Module IV (9 Hours)

Flexible Manufacturing System (FMS): Types of automation, Flexibility, Types of FMS, FMS Layout configuration, Automated workpiece flow, Material handling, and machining, Performance measures – Bottleneck model – Extended bottleneck model – Sizing of FMS; FMS Scheduling and Control.

References

ME6127 RELIABILITY ENGINEERING AND MANAGEMENT

Pre-requisite: Nil
Total Hours: 42

Module I (11 Hours)

**Basic Concepts of Reliability:** Definitions-Reliability, Hazard rate, Active Redundancy, Maintainability, Downtime; Reliability and Quality, Failure and failure modes, Causes of failures, Maintainability and Availability.

**Reliability Mathematics:** Introduction to probability distributions, Concept of Bathtub Hazard Rate curve, Reliability Evaluation of two-state device networks-series, parallel, k-out-of-m systems; Standby redundant systems, Reliability evaluation of three-state device networks-series and parallel.

Module II (11 Hours)

**Reliability Determination Methods:** Network reduction technique, Path tracing technique, Decomposition technique, Delta-Star method.

**Advanced Reliability Evaluation Concepts:** Supplementary variables technique, Interference theory, Human reliability, Common cause failures, Fault trees, Failure mode and effect analysis.

**Reliability Optimization:** Redundancy optimization-parallel, series-parallel, and series networks.

Module III (11 Hours)

**Failure Data Analysis:** Failure data banks, Nonrepairable items failure data analysis-complete data, incomplete data; Incomplete failure data hazard plotting technique, Maximum likelihood estimation technique.

**Total Productivity Maintenance (TPM):** Distinctive features of TPM, Basic philosophy of zero defects (ZD), ZD and TPM, Maximizing equipment effectiveness, Six major losses, TPM development activities, Steps of TPM development, Autonomous maintenance, Planned maintenance, Measuring TPM effectiveness.

Module IV (9 Hours)

**Maintainability and Availability Concepts:** Maintainability function, Availability function, Frequency of failures, Two-unit parallel system with repair, k-out-of-m systems, Preventive maintenance.

**Reliability Management:** Reliability Programme, Management policies and decisions, Reliability management by objectives, Reliability groups, Reliability data acquisition and analysis, Managing people for reliability.

**References**

ME6128 PRODUCT MANAGEMENT

Pre-requisite: Nil
Total Hours: 42

Module I (10 Hours)


Module II (10 Hours)


Module III (10 Hours)


Module IV (9 Hours)


References

ME6129 PROJECT MANAGEMENT

Pre-requisite: Nil
Total Hours: 42

Module I (11 Hours)

Project Planning: Analysis and Appraisal Generation of project ideas, Scouting for project ideas, Preliminary screening, Project rating index, Cost of project.


Module II (11 Hours)

Project Implementation: Development of project network, Dummy activities, Activity on node networks, Cyclic network, Forward pass and Backward pass computations, Algorithm for critical path, Total slacks, free slacks and their interpretations.

Time-cost Trade off Procedure: Schedule related project costs, Time cost trade off, Lowest cost schedule.

PERT Network: Three time estimates for activities, Estimation of mean and variance of activity times, Event oriented algorithm for critical path, Probability of meeting a schedule date.

Module III (11 Hours)

Network Analysis: Algorithms for shortest route problems-Dijkstra's, Flyod's, Pollacks, and Dantzig's algorithms; Algorithms for minimal spanning tree- Kruskal's algorithm and Prim's algorithm; Algorithms for maximal flow problems-Ford and Fulkerson's algorithm(Labelsing method), Maximum flow minimum cut explanation.

Linear Programming Formulation of Network Problems: A flow network interpretation for determination of critical paths, Time cost trade off and maximal flow, Chance constrained linear programming for probabilistic durations of activities in PERT network.

Module IV (9 Hours)

Project Scheduling with Limited Resources: Complexity of project scheduling with limited resources, Levelling the demands on key resources, A simple heuristic program for resource allocation.

Project Review and Administrative Aspects: Initial review, Performance evaluation, Abandonment analysis, Project organization, Matrix organization, Project control, Variance analysis approach, Performance analysis.

References

ME6130 TECHNICAL ENTREPRENEURSHIP

Pre-requisite: Nil
Total Hours: 42

Module I (11 Hours)

Introduction: Basis and challenges of entrepreneurship, Technological entrepreneurship, Innovation and entrepreneurship in technology based organizations, High Tech. Entrepreneurship, Role of technical entrepreneurs in Industrial Development, Entrepreneurial characteristics, Entrepreneurship Index and its need.

Module II (11 Hours)

New Ventures: Concept of new ventures, Technology absorption, Appropriate technology, Networking with industries and institutions, Medium and small ventures, Product design for Rural entrepreneurs, Management concern in small and medium Enterprises.

Module III (11 Hours)

Starting a New Technological Venture and Developing the Business: Business idea, Business plan, Marketing plan, Financial plan, Organizational plan, Financing a new venture-Sources of capital, Venture capital, Going Public.

Module IV (9 Hours)

Managing the New Technological Venture: Developing systems in new venture, managing during early operations, growth and expansion, ending the venture, Legal issues, Franchising or acquisition, Intrapreneurship, International Entrepreneurship.

References

ME6131 BUSINESS ETHICS

Pre-requisite: Nil
Total Hours: 42

Module I (11 Hours)

Basic Theory: Some basic principles—Meaning, Types of evil and consequences, Proportionality, Minor evils or Physical evils, Problems, Positive obligations, Rights, Cooperation in Evil, Location of responsibility, The gray areas, Economical and Political Considerations, Relationship between firm and employee, customers, competitors, intermediaries, and unions.

Module II (11 Hours)

Historical perspective, culture and ethics in India, codes and culture, Economics and the environment- green business, ethics and competition, The ethical code, social audit, A framework for analysis and action, The sphere of personal ethics- consequences, rights and duties, virtue and character, Role of objectivity, practicability, Judgement and balancing acts, The individual and corporation.

Module III (11 Hours)

Ethical Responsibilities of Economic Agents: role obligations, obligation to shareholder, rights and obligations to customer, obligation to pay taxes, Environmental protection, Corporate accountability, Ethical conflicts, Ethics, Government policies and laws.

Module IV (9 Hours)

Ethical responsibilities of Organizational Leader: power, leadership, obstacles to ethical conduct, pressures for conformity, Evaluation and rewards, Job pressures and issues, organizational change, Ethics in use of Information Technology, Intellectual Property Rights, Ethics in Marketing, Ethics of advertising and sponsorship, Acquisition and merger, Multinational decision making—Reconciling International norms.

References

ME6132 COMPUTER METHODS IN MANAGEMENT

Pre-requisite: Nil
Total Hours: 42

Module I (11 hours)
Programming and Problem Solving: Computer organisation, Steps involved in computer programming, Developing algorithms and flow charts, Efficiency of algorithms, Program design methods, Top-down modular programming, Measures of program performance. Introduction to object oriented programming: Basic concepts of OOP, Object-oriented languages, Applications of OOP, Moving from C to C++.

Module II (11 hours)
Fundamentals of Programming: Variables and Arithmetic statements, Arrays, Functions, Data types, Flow of control, Functions, Recursion, Pointers and strings, Bitwise operators and enumeration types, Structures and unions, Linear linked lists and list operations, Basic I/O functions.

Module III (11 hours)
Unix system Interface: File descriptors, Pointers and strings, Bit-wise operators and enumeration types, Structures and unions, Linear linked lists and list operations, Basic I/O functions. Introduction to Data structures: Operations on binary trees, storage representation and manipulation of binary trees, conversion of General trees in to binary trees, Dynamic storage management, sorting – bubble sort, tree sort, Searching – sequential and binary searching, hashing functions.

Module IV (9 hours)
Computer applications in business: Framework of E-commerce, LAN, WAN, Internet – HTTP, HTML, VRML, site security – firewalls, Transaction security, cryptography and cryptographic algorithms, Digital signatures

References
ME6133 ORGANISATIONAL BEHAVIOR

Pre-requisite: Nil
Total Hours: 42

Module I (11 Hours)

Module II (11 Hours)
Group Process: Foundations of group behavior, understanding team, communication, leadership, power, conflict and negotiation.

Module III (11 Hours)
Organisational Process: Work design and technology, organisation structure and design – organisational culture.

Module IV (9 Hours)
Special topics: Organisational change, stress management, decision making in organisations.

References
ME6134 CONSUMER BEHAVIOR

Pre-requisite: Nil
Total Hours: 42

Module I (11 Hours)
Introduction: - Diversity in the market place, market segmentation, Consumer behaviour as discipline and Science, Ethics in marketing.

Module II (11 Hours)
Consumers as individuals: - Consumer motivation, consumer perception, consumer learning, personality and life styles, attitudes, attitude change, communications and CB.

Module III (11 Hours)
Consumers as decision makers: - Consumer influence and diffusion of innovations, individual decision making, group influence and opinion leadership.

Module IV (9 Hours)
Consumers in their social and cultural settings: - Social class and CB, influence of culture, subculture and CB, income, Age, Ethnic, racial and religion subcultures.

References

ME6135 SOFT COMPUTING TECHNIQUES

Pre-requisite: Nil
Total Hours: 42

Module I (11 Hours)


Module II (8 Hours)


Module III (11 Hours)


Module IV (12 Hours)


References

ME6136 RISK MANAGEMENT AND INSURANCE

Pre-requisite: Nil
Total Hours: 42

Module I (11 Hours)
Basic concept of risk and insurance: - risk, meaning, type, insurance, characteristics, types, risk management, objectives, steps in RM, losses evaluation, legal principle, in risk and insurance.

Module II (11 Hours)
Personal property and liability risks: - Liability risks, House owners insurance, automobile insurance, other property and liability insurance coverage.

Module III (11 Hours)
Commercial property and liability risks: - commercial property insurance, commercial liability insurance, crime insurance.

Module IV (9 Hours)
Life and Health insurance: - Fundamentals, types, individual health and disability – income insurance, group life and health insurance, retirement plans.
Special topics – insurance company operation, insurance pricing.

References
ME6137 FINANCIAL MANAGEMENT

Pre-requisite: Nil
Total Hours: 42

Module I (11 Hours)

Introduction to financial management and valuation of financial assets: - corporate finance, goal of financial management, FM decisions, financial statements – working with financial statements, ratio analysis, fund flow analysis, time value of money, stock valuation, bond valuation.

Module II (11 Hours)

Investment in long term assets:- capital budgeting decision criteria, traditional techniques, discounted casts flow techniques, NPV – IRR comparisons, capital rationing, risk analysis.

Module III (11 Hours)

Cost of capital and long term financial policy:- Raising capital, cost of capital, financial and operating leverage, capital structure theories, dividends and dividend policy, introduction to CAPM.

Module IV (9 Hours)


References

ME6138 DECISION SUPPORT AND EXPERT SYSTEMS

Pre-requisite: Nil
Total Hours: 42

Module I (11 Hours)

Introduction: Information systems, Human Information Processing, Newell and Simon model for human information processing-intelligence stage, decision stage, choice stage, Rasmussen model of judgment and choice, The Klein model Information and information value, Classification of decisions, Types of information systems, Decision support system.


Module II (11 Hours)

Knowledge-Based Expert System (KBES): Introduction, What is KBES, Architecture of KBES-knowledge base, predicate logic, Production rules, Procedural programs, Inference mechanisms-backward chaining, forward chaining, inexact reasoning, non-monotonic reasoning, reasoning based on certainty factors, expert system development shell.

Search Techniques: Introduction, Problem definition and solution process, Production systems, Search techniques-breadth first search, heuristic search, agenda-driven search, Problem decomposition and AND-OR graphs.

Module III (11 Hours)


Module IV (9 Hours)

Applications of Decision Support Systems: Decision support in office information systems, Auditing, artificial intelligence and expert systems, Decision support systems for resource allocation.

Process Models and Knowledge-Based Systems: Expert systems for diagnosis- understanding of domain knowledge, evolution of knowledge nets, transformation of knowledge from nets to rule base, Blackboard model of problem solving-blackboard architecture, blackboard framework, integrated engineering system, an illustrative example, Conceptual Design of a Car Body Shape.

References

ME6139 SYSTEMS MODELLING AND SIMULATION

Pre-requisite: Nil
Total Hours: 42

Module I (11 Hours)

System Concept: Systems and system environment, Components of a system, Discrete and continuous systems, Systems approach to problem solving, Types of system study, System analysis, system design and system postulation, System modelling, Types of models.
System Simulation: Technique of simulation, Comparison of simulation and analytical methods, Types of system simulation, Steps in simulation study, Monte Carlo simulation.

Module II (11 Hours)

Random Number Generation: Techniques for generating random numbers, Linear congruential method, Test for random numbers, Frequency tests, run tests, tests for autocorrelation, gap test, and Poker test.
Input Modelling for Simulation: Data collection, Identifying the distribution with data, Parameter estimation, Goodness of fit test, Chi square, Kromogrov and Smirnov tests, Selecting input model when data are not available.

Module III (11 Hours)

Verification and Validation of Simulation Models: Verification of simulation models, Calibration and validation of models, Face validity, Validation of model assumption, validating input-output transformation, Input-output validation using historical input data.
Metamodelling: Simple linear regression, Testing for significance of regression, Multiple linear regression.

Module IV (9 Hours)


References

ME6140 DATA BASE MANAGEMENT

Pre-requisite: Nil
Total Hours: 42

Module I (11 Hours)

Database systems - purpose - Abstraction - models, Instances and Schemes - Data independence - Data Definition Language - Data Manipulation Language.

Module II (11 Hours)

Structure of Relational Databases - Relational algebra - Tuple relational calculus - Domain relational calculus - modifying the data base - views - SQL - Quel.
Integrity Constraints - Domain Constraints, Referential integrity - functional dependencies - assertions - triggers.

Module III (11 Hours)

Relational Data base design - pitfalls - Normalisation's using functional, Multi-valued and join dependencies, domain key normal form - alternative approaches.
File organisation - sequential files - Mapping relational data to files - Data dictionary Storage - Buffer Management - Indexing - Basic concepts - B and B-tree index files - Static hash function - dynamic hash function - comparison of Indexing and Hashing.

Module IV (9 Hours)

Query Processing - Interpretations - equivalence of expressions - Estimating cost of Query processing and access using Index.
Security and Integrity - Violations - Authorisation and views - encryption - Data validation - Multiple user access.

References

ME6141 ENTERPRISE RESOURCE PLANNING

Pre-requisite: Nil
Total Hours: 42

Module I (11 Hours)

Module II (11 Hours)

Module III (11 Hours)
ERP Life Cycle - Deciding to go ERP - Choosing an ERP system - Designing ERP systems - Should prune processes or ERP software be changed - Choosing standard model - Artifacts and processes.

Module IV (9 Hours)

References
ME6142 INDUSTRIAL SCHEDULING

Pre-requisite: Nil
Total Hours: 42

Module I (11 hours)

Introduction: Importance of scheduling in implementation of production planning - overview of models – machine configurations – processing characteristics and constraints – objectives and performance measures – computational complexity; NP complete and NP hard – optimality of schedules
Single machine sequencing with independent jobs; without due dates, with due dates – adjacent pairwise interchange methods – branch and bound approach – neighborhood search techniques – random sampling – parallel machine models.

Module II (10 hours)


Module III (10 hours)


Module IV (11 hours)

Applications and directions: Scheduling of Flexible assembly systems – lot sizing and scheduling -Scheduling balancing and other aspects of design in mixed model assembly lines and flow lines- A survey of other scheduling problems. Applications in manufacturing systems.

References

5. S. French (1982), Sequencing and Scheduling, Elis Horwood Ltd., Chichester, U.K.
ME6143 LEAN PRODUCTION MANAGEMENT

Pre-requisite: Nil
Total Hours: 42

Module I (11 Hours)

Small-Lot Production: Lot-size Basics; Lot sizing; Lot-size Reduction; Facilitating Small Lot Size.
Setup-Time reduction: Setup Reduction Methodology; Techniques for Setup-Reduction; Setup Reduction Projects.

Module II (11 Hours)

Pull Production Systems: Pull Systems and Push Systems; Conditions for Pull Production Systems; How to achieve Pull Production; Mechanisms for Signal and Control.
Workcells and Cellular Manufacturing: Cell layout and Capacity Measures; Design of Workcells; Worker Assignment; Implementation Issues.

Module III (11 Hours)

Scheduling for Smooth Flow: Production Leveling; Level Scheduling in Pull Production; Master Production Scheduling.
Synchronising and Balancing Process: Synchronisation; Bottleneck Scheduling; Balancing; Adapting to Schedule changes.

Module IV (9 Hours)

Planning and Control in Pull Production: Centralised Planning and Control System; Decentralised planning and Control system; Adapting MRP-Based Production Planning and Control System to Pull production
Maintaining and Improving Equipment: Equipment Maintenance; Equipment Effectiveness; Total Productive Maintenance.

References

ME6144 INVESTMENT MANAGEMENT

Pre-requisite: Nil
Total Hours: 42

Module I (11 Hours)
Investment environment: - securities and market, investment process, capital market, primary and secondary, efficient markets.

Module II (11 Hours)
Investment theory: - Portfolio selection problem, Portfolio analysis, CAPM, Factor models, Arbitrage pricing theory.

Module III (11 Hours)
Common stocks – characteristics, financial analysis of common stocks, dividend, earnings, investment management and performance evaluation.

Module IV (9 Hours)
Fixed income securities: - Types, Bond valuations, Bond analysis and portfolio management.
Mutual funds, options, futures and international investing.

References
ME6145 TAKEOVERS AND CORPORATE RESTRUCTURING

Pre-requisite: Nil
Total Hours: 42

Module I (11 Hours)
Takeovers and Mergers in Practice: Takeover process, merger process, legal aspects, Accounting for M & A.

Module II (11 Hours)
M & A theory: Strategic processes, theories of mergers, timing of merger activity, empirical tests, valuation approaches.

Module III (11 Hours)
Restructuring : Restructuring and divestitures, Restructuring organisations and ownership, financial restructuring.

Module IV (9 Hours)
Special topics: Joint ventures and alliances, share repurchase, Takeover defenses, International takeovers and restructuring, corporate governance.

References
ME6146 FORECASTING TECHNIQUES

Pre-requisite: Nil
Total Hours: 42

Module I (10 hours)


Module II (10 hours)

Regression-moving average models: Regression methods in time series analysis – simple linear regression, multiple linear regression. Simple moving averages for a constant process, moving averages for a linear trend process – Exponential smoothing for a constant process, estimation of demand variance – Exponential method for smoothing a linear trend, choice of a smoothing constant

Module 3 (15 hours)

Seasonal data and forecasting errors: Smoothing models for seasonal data – a multiplicative seasonal model, an additive seasonal model. Period and cumulative forecasts – variance of forecast errors, definition, variance of period forecast errors, variance of cumulative forecast errors, prediction intervals. Analysis of forecast errors – Estimation of variances


Module 4 (10 hours)


References

4. Alan L. Porter, A. Thomas Roper, Thomas Wimason, Jery Banks, Fredrick A. Rossini Forecasting and Management of Technology
Module I (10 hours)

Introduction to managerial economics – the nature of the firm – the concept of economic profit – economics and decision making – economic models.
Demand theory and analysis – market demand – price elasticity – income elasticity – cross elasticity
Regression techniques and demand estimation – business and economic forecasting.

Module II (9 hours)

Market structure – perfect competition and monopoly – monopolistic competition – oligopoly and barriers to entry – market structure and barriers to entry – game theory and strategic behaviour

Module III (10 hours)


Module IV (10 hours)

Technological change, location theory and taxation – the impact of technological change - technological change and market structure – locating the firm in a global economy – market area determination – threshold analysis.
Taxes and decision making – taxes on profit – taxes on inputs – property taxes – tax preferences.

References

ME6148 COMPUTER INTEGRATED MANUFACTURING

Pre-requisite: Nil
Total Hours: 42

Module I (9 hours)

**Introduction** Manufacturing operations – product/production relationships-Manufacturing models and metrics-Elements of automation system – concurrent engineering. Components of a Manufacturing system – Classification scheme for manufacturing system – Analysis of single station systems.

Module II (11 hours)


Module III (11 hours)

**Material handling, FMS and Shop floor control** Analysis of material transport system – Analysis of vehicle-based system, conveyor analysis. Storage systems – storage system performance, storage location strategies, automated storage systems – ASRS, Carousel storage systems, Engineering Analysis. Automatic Identification and Data capture, Bar codes and RFID. FMS components-Material handling and storage system – computer control system. Quantitative analysis of FMS. Shop floor control and data capture – simulation.

Module IV (11 hours)


References