M.TECH. INDUSTRIAL ENGINEERING

TEACHING SCHEME & SYLLABUS
2014-15
Shri Ramdeobaba College of Engineering & Management has the distinction of offering first inter disciplinarily post graduate programme in Industrial Engineering in the year 2004.

This Post Graduate programme has the available expertise of its core faculty supported by faculty of other departments and expert faculty from other engineering colleges. Faculty specialises in Operations Research, Quality Management, Human factors Engineering, Simulation and Modelling. Most of the faculty members are doctorates and deeply involved in the research work. The programme is functioning with the state of the art laboratories and close association with industries around.

All the Post Graduate Projects are based on live problems offered by the industry.

Program Educational Objectives are as follows:

1. Programme will prepare students to work in any engineering organization and undertake research work.

2. Programme will ensure development of problem solving ability through the use of industrial engineering tools and software.

3. Programme will encourage development of independent thinking and also the ability to work in teams through live projects undertaken in industry.
### Scheme of Examination of Master of Technology (Industrial Engineering) Semester Pattern

#### I Semester M. Tech. (Industrial Engineering)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Code</th>
<th>Course</th>
<th>L</th>
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<th>P</th>
<th>Credits</th>
<th>Maximum Marks</th>
<th>Exam Duration</th>
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<tr>
<td></td>
<td>INT501</td>
<td>Operations Research</td>
<td>4</td>
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<td>Personnel Management and Industrial Relations</td>
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#### II Semester M. Tech. (Industrial Engineering)

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<td>Methods Engineering and Ergonomics</td>
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<td>Manufacturing Economics and Analysis</td>
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<td>Project Evaluation and Management</td>
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### III Semester M. Tech. (Industrial Engineering)

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<td>INT602-1</td>
<td>Marketing Management</td>
<td>INT603-1</td>
<td>Materials Management</td>
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<td>INT602-2</td>
<td>Flexible Manufacturing System &amp; Robotics</td>
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<td>Mechatronics</td>
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<td>INT602-3</td>
<td>Total Quality Management</td>
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<td>Value Engineering</td>
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<td>INT602-4</td>
<td>Energy Management</td>
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<td>Industrial Design</td>
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<td>INT602-5</td>
<td>System Design &amp; Engineering</td>
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<td>Information Systems in Engineering</td>
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<td>INT602-6</td>
<td>Communication</td>
<td>INT603-6</td>
<td>Reliability Engineering</td>
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### IV Semester M. Tech (Industrial Engineering)

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<th>Sr. No.</th>
<th>Code</th>
<th>Course</th>
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Syllabus of Semester I, M. Tech (Industrial Engineering)

Course Code: INT501    Course: Operations Research
L: 4Hrs. T: 0Hrs. P: 0 Hrs. Per week    Total Credits: 8

Course Outcomes:
1. Formulate Situation concerned as on LPP and solve it by simplex method. They will also be able to
carry out sensitivity analysis on various constituents of LPP.
2. Apply LPP concepts to some applications like transportation problem, assignment problem, game. They
will also get the concept of optimal sequencing of operations.
3. Determine specifications for effective design of queuing system.
4. Simulate, queuing, inventory management systems.
5. Determine optimal solution using dynamic programming approach.
6. Analyse flow networks, activity networks through the perspectives.

Syllabus:

Introduction
Introduction to O.R, Optimization Techniques, Model Formulation, Assignment, Transportation models,
General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models, Deterministic
and Probabilistic Models. Competitive Models, Waiting Line Models, Single and Multi-channel Problems,
Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Shortest Route
Problems. Investment Models, Game Theory Simulation, Project Networks.

Reference Books:
2. Operations Research: Pannerselvam, Prentice Hall of India
Syllabus of Semester I, M. Tech (Industrial Engineering)

Course Code: INP501
Course: Operation Research Laboratory
L:0 Hr., T:0 Mrs., P:2 Mrs., Per week
Total Credits : 2

Practicals based on theory syllabus.
Syllabus of Semester I, M. Tech (Industrial Engineering)

Course Code: INT502    Course: Computers & Database Management
L: 4 Hrs. T: 0 Hrs. P: 0 Hrs. Per week   Total Credits: 8

Course Outcomes:
1. To get Familiarized with the various hardware and its architecture.
2. To realize the importance of information for decision making in the organizing.
3. Use of the database in strategic planning process.
4. To do the cost benefit analysis of Information System.

Syllabus:
Various types of Hardware and Software in common use as applicable to Information Technology. The different Hardware Application Architectures available e.g. Centralized, Distributed, Client-Server. Concept of General System Theory and their applications to Information Systems. Designing Data and Information Architecture to assist and improve planning, decision making and control. Use of information / data for decision making at the various levels of the organization and components of the information system which can support those decisions i.e. transaction processing systems, management information system etc. Cost benefit analysis of I.T, Different methods of data collection. Electronic Commerce and its impact on Business Strategy. Use of databases and planning modules in strategic planning process e.g. external database economic models, forecasting and modeling packages strategy of information development and management on organization structure. Safety of data, evaluation of database system to avoid fraud, ERP and Relational Database Management System.

Reference Books:
Syllabus of Semester I, M. Tech (Industrial Engineering)

Course Code: INP502  
Course: Computers & Database Management Lab  
L:0 Hr., T:0 Mrs., P:2 Mrs., Per week  
Total Credits: 2

Practicals based on theory syllabus.

Practicals:
1. Development of software for file handling system.
2. Development of programs using simple SQL commands.
3. Use of DDL commands on Computer (MS-SQL)
4. Use of DML Commands
5. Development of database management system for any Industrial application
6. Specific application system progress for detail study.
7. Development of any practical oriented system as applicable in industry
Course Code: INT503    Course: Statistics and Quality Control
L: 4 Hrs. T: 0 Hrs. P: 0 Hrs. Per week    Total Credits: 8

Course Outcomes:
1. Understand the applications of Probability distribution in predicting behavior of the process.
3. Develop Control charts for process control.
4. Develop understanding of Sampling plans for acceptance of materials.
5. Understanding of concepts such as Six sigma, Lean Production and JIT

Syllabus:

I. Statistical Methods Useful in Quality Improvement
Introduction to Quality, Meaning of Quality, Brief History of Quality Control and Improvement, Statistical Methods of Quality Control and Improvement, Other Aspects of Quality Control and Improvement.
Modeling Process Quality, Describing Variation, Important Discrete Distributions, Important Continuous Distributions, Inferences about Process Quality
Statistics and Sampling Distributions, Point Estimation of Process Parameters, Statistical Inference for Two Samples, Statistical Inference for more than Two Populations, Basic Methods of Statistical Process Control and Capability Analysis

II. Methods and Philosophy of Statistical Process Control
Control Charts for Attributes, Control Charts for Fraction Nonconforming, Control Charts for Nonconformities (Defects), Choice between Attributes and Variables Control Charts, Guidelines for Implementing Control Charts.

III. Acceptance Sampling

IV. Six Sigma/Lean
Six Sigma, DMAIC, Application of Six Sigma tools to minimize production variability, Taguchi Loss Function, Lean Production and Quality, The Birth of Lean Production, The Lean Production System, Stability, Just-In-Time

Reference Books:
3. The Assurance Sciences: S. Halpern, Prentice Hall India Ltd. New Delhi,
Teaching Scheme & Syllabus For M.Tech. Industrial Engineering

Syllabus of Semester I, M. Tech (Industrial Engineering)

Course Code: INP503  Course: Statistics and Quality Control Lab
L:0 Hr., T:0 Mrs., P:2 Mrs., Per week  Total Credits: 2

Practicals based on theory syllabus
Course Code: INT504    Course: Personnel Management And Industrial Relations
L: 4 Hrs. T: 0 Hrs. P: 0 Hrs. Per week   Total Credits: 8

Course Outcomes:
1. To understand the scope & objective of personnel management.
2. To get knowledge about personnel functions like personnel planning, recruitment, training etc.
3. To become aware about employee health security welfare related issue
4. To know about the labour legislations, role, functions of Trade unions.
5. To understand nature, Causes and settlement of Industrial disputes.

Syllabus:
Introduction to personnel management, scope and objectives of personnel management, evolution of personnel management, environment of personnel management.
Personnel planning, job analysis and design, recruitment, selection, training and placement, performance appraisal and job evaluation, motivation and morale
Employee remuneration, health, security and welfare, labour legislations, industrial relations, trade unions, industrial disputes and their resolution

Reference Books:
3. Dynamics of Industrial Relations: C. B. Mamoria, Himalaya Publication.
Course Code: INT505     Course: Planning and Control of Manufacturing Systems
L: 4 Hrs. T: 0 Hrs. P: 0 Hrs. Per week          Total Credits: 8

Course Outcomes:
1. Students should be able to distinguish different manufacturing systems from its applications and limitations point of view.
2. Students should be able use various demand forecasting tools for production planning, aggregate planning and process planning and associated material handling equipments.
3. Students should be able use sequencing, scheduling and line balancing of techniques for production.
4. Students should be able to evaluate the problems of planning and control of group technology and cellular manufacturing.

Syllabus:
Types of manufacturing systems and their associated planning and control problems, Material handling and Material flow characteristics in manufacturing systems. Tools and techniques of facility planning and layout.

Demand forecasting:
Tools and techniques. Production planning and control, Capacity planning: tools and techniques, Aggregate production planning, MRP, ERR Process planning and LOB techniques.

Scheduling of Production:

Problems of planning and control of group technology, cellular manufacturing, CIMS and FMS.

Reference Books:
3. Industrial Engineering and Production Management: Martand / Telsang, S. ChandA Co.,
4. Production and Operation Management: Pannerselvam, Prentice Hall of India
Course Code: INT506  
Course: Automation in Production  
L: 4 Hrs.  T: 0 Hrs.  P: 0 Hrs. Per week  
Total Credits: 8

Course Outcomes:
1. Students should be able to evaluate & Compare investment proposals for Automation Projects.
2. Students should be able to analyze & evaluate the performance of automated production lines based on production time, production rate and efficiency of line.
3. Students should be able to design part delivery system and evaluate the performance of automated assembly lines.
4. Students should be able to evaluate and select a suitable CNC/ Machining Centers for manufacturing a particular component.
5. Students should be able to use different codes & commands for preparing a CNC part programme and its execution.

Syllabus:

Automation:
Principles, basic concepts, economy, efficiency, productivity and performance of machine tools, main trends in automation, automatic devices, automatic and semi-automatic machines, programme controlled machines, special purpose machines, unit type and transfer machines, automation in assembly, gauging and size control.

Numerical Control (N.C.):
Management implication, advantages and applications, N.C Systems and controls, information processing and storage. Part programming languages, manual programming, machine axis system, machining centres, CNC, DNC and adaptive control. Selection of components for CNC manufacturing, tools for CNC.

Reference Books:
3. NC and CAM: Kundra and Rao, Tata McGraw Hill-.
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<tr>
<th>Course Code</th>
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<td>L:4 Hr, T:0 Mrs., P:0 Mrs., Per Week</td>
<td>Automation in Production Laboratory</td>
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<td>Total Credits : 8</td>
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Practicals based on theory syllabus.
Course Code: INT507
Course: Methods Engineering & Ergonomics
L: 4 Hrs. T: 0 Hrs. P: 0 Hrs. Per week
Total Credits: 8

Course Outcomes:
1. Students will be able to understand the concept of total time of manufacturing.
2. Students will understand the better methods and concept of productivity measurement.
3. Students can evaluate performance of service industry and give proper measures for improvement.
4. They can determine standard time for a job or a process and delays in work.
5. Students will be able to put ergonomic assessments and solutions to practical use in the workplace.
6. Students will be able to find and assure that the workplace fits the worker.

Syllabus:

Methods Engineering:
Analysis of operations, job work, systems involving man and machines, Schematic models, charts and other aids for analysis. Work Measurement, stop watch time study; PMTS; work sampling, Setting of Time standards. Principles of motion economy and work place design. Total time to manufacture the job Work content and ineffective time. Productivity Introduction and models for Productivity Improvement e.g. OMAX etc. Productivity Improvement techniques e.g. SMED, KAIZEN etc.

Ergonomics:
Basic anatomy of human body and its functional systems; principles of ergonomics, design of displays and controls in relation to information processing by human being; Anthropometry, effects of personal factors and environment on human performance, Determination of physiological work load.

Reference Books:
2. Motion and Time Study: R. M. Barnes,
4. Motion and Time Study: M. E. Mundel.
Syllabus of Semester II, M. Tech (Industrial Engineering)

Course Code: INP507
L:4 Hr, T:0 Mrs., P:0 Mrs., Per Week

Course: Methods Engineering & Ergonomics Lab
Total Credits: 8

Practicals based on theory syllabus.
Syllabus of Semester II, M. Tech (Industrial Engineering)

Course Code: INT508  Course: Manufacturing Economics & Analysis
L: 4 Hrs. T: 0 Hrs. P: 0 Hrs. Per week  Total Credits: 8

Course Outcomes:
1. To make students understand the concept of Time Value of Money.
2. To make students understand the various costs and their application in manufacturing scenarios.
3. To make students understand Capital budgeting, and evaluation of various financial ratios.
4. To make students understand Financial Accounting, its principle, interpretations various types of financial statements and their use.

Syllabus:
The principal and use of economic analysis in the engineering practices,

Time Value of Money:
Nominal and effective interest rates and continuous compounding

Role of engineering economy in the decision making process, Discounted cash flow analysis, evaluation of investment alternatives, evaluation of alternatives with equal and unequal lives, the effects of income tax on economic studies, Replacement analysis.

Capital budgeting:
Rate of return computation & Cost of Capital; Payback period; Present worth, Annual Worth and capitalized cost evaluation; Benefit/Cost ratio evaluation.

Financial accounting & Costing:

Reference Books:
1. Engineering Economy: Theusen H. G. and others Prentice Hall of India
4. Engineering Economy: De; Garmo PE., MacMillan Publication
5. Cost Accounting: Jawaharlal, Tata McGraw Hill
6. Advanced Accounts Volume II: M. C. Shukla, TS. Grewal, S. C. Gupta, S. Chand and company
7. Cost Accounting, Principles & Practice: Jain Narang, PHI
Course Code: INT509     Course: Project Evaluation & Management
L: 4 Hrs. T: 0 Hrs. P: 0 Hrs. Per week    Total Credits: 8

Course Outcomes:
1. Students will be able to prepare project charter.
2. Students will be able to plan & schedule the project activities
3. Students will demonstrate the ability to understand the use of human resources.
4. Students will be able evaluate project performance.
5. Students will be able to prepare project audit report.

Syllabus:

Reference Books:
1. Project Management: David Cleland, Lewis Ireland, Tata McGraw Hill
2. Project Management: S. Chaudhary, Tata McGraw Hill
4. Project Management: Jack Gido, James Clements, Cengage Learning
Course Code: INT510  
Course: Maintenance Engineering

L: 4 Hrs.  T: 0 Hrs.  P: 0 Hrs. Per week  
Total Credits: 8

Course Outcomes:
1. To understand the statistical & Reliability concepts applied in maintenance and related models.
   Criticality of failure analysis, review of reliability. Logical diagrams of real life situations to find the reliability of the system.
2. To understand basic models of maintenance systems, including various aspects of breakdown & prevention of breakdown in respect of the maintenance and their controls.
3. To understand spares management, costing and budgeting of equipment maintenance resources planning for maintaining maintenance facilities and their implications in real scenario.
4. Cost and resources management for maintenance.
5. Condition monitoring programs to ensure performance of equipments. Various practical techniques involved with different levels of use of these techniques

Syllabus:
Introduction:

Standby Machines:

Reference Books:
5. Maintainability and Maintenance, Management Instrument Society of America: J. D. Patton (Jr.).
Syllabus of Semester III, M. Tech (Industrial Engineering)

Course Code: INT601 Course: Research Methodology
L: 4 Hrs. T: 0 Hrs. P: 0 Hrs. Per week Total Credits: 6

Course Outcomes:
1. Students will be able to gain insights into different aspects of research
2. Students will be able to understand different data collection methods in research.
3. Students will be able to learn and understand the basics of data analysis tools and techniques.
4. Students will be able to understand the role of computers in research.
5. Students will be able to understand the documentation of research and report writing.

Syllabus:
Meaning of Research, Research Methods versus Methodology Objectives of research, Motivation in Research, Types of Research, Research approaches, Significance of Research,

Identification of a research problem, Criteria for selection of the problem, Defining the Research problem, Selecting the Problem, Technique involved in defining a problem, Research Design: Need, features of a good design, research design concepts, Different research designs,

Literature survey and review: Need of review of literature.
Data Collection: Meaning and importance of data, Sources of data, Methods of data collection, Collection of Primary Data; Observation Method, Interview Method, Data through Surveys and Questionnaires, Some Other Methods of Data Collection, Experimentation, Simulation.

Data Analysis: Statistical analysis, Measures of central tendency, Measures of dispersion, Probability distributions: Binomial, Poisson, Uniform, Normal and Exponential, Hypothesis Testing, Procedure for Hypothesis Testing Confidence Interval, Test of Significance, Comparison of Two Proportions, Comparison of Means, Analysis of Variance (ANOVA), Basic principle of ANOVA, One way and Two way ANOVA, Design of Experiments, Importance of experimental designs.

Optimization of Model parameters, Application of optimization theory to modeling, Heuristic and metaheuristic approaches like Fuzzy logic, Genetic Algorithm (GA), Simulated Annealing (SA), etc.

Role of computers in Research: Introduction to spreadsheet application, features and functions, Using formulas and functions, Data storing, Features for Statistical data analysis, Generating charts/ graph and other features, Use of MS Excel, Power Point, Use of statistical Analysis software SPSS, MINITAB, MATLAB, etc.

Report Writing and publication: Planning of Report Writing, Thesis writing, Formats of report writing, Types of Reports, Different steps in writing report, Formats of publications in Research journals
Reference Books:
2. Design and Analysis of Experiments: Angela Dean and Daniel Voss, Published by Springer- Verlag NewYork, In
Teaching Scheme & Syllabus For M.Tech. Industrial Engineering

Syllabus of Semester III, M. Tech (Industrial Engineering)

Course Code : INT602-1 (Elective I)                      Course : Marketing Management
L: 3 Hrs. T: 0 Hrs. P: 0 Hrs. Per week                 Total Credits : 6

Course Outcomes:
1. Students will be able to understand concept of Marketing and model the marketing system.
2. Will be able to formulate form “P” of marketing and understand buyer behavior.
3. Methods of market forecast and demand potential estimate.
4. Will be able to understand market activities such as MIS, Market Research.

Syllabus:

Modern Marketing Concept:
Changing business orientation, integrated marketing, customer satisfaction, definition of marketing management, basic marketing system model, e-commerce and Internet marketing. Marketing Environment: Marketing opportunity concept, economic, social, political and cultural environment, Duryer behavior and the four P’s of marketing mix, brand preference. Measurement and Forecasting of Demand: Concept of Market Forecast and Market potential methods of estimating current demand, Chain ratio, Index of buying pinrer method, estimation of future demand, Survey of buyer intentions, Statistical analysis. Organizing for Marketing: Break up of marketing activities, organization for integrated marketing, Market information systems (MIS), internal accounting and intelligence systems, marketing research and decision making. Marketing Strategies: Product market matching, Product management, Product life cycles, innovations, Promotion strategies in advertising, personal selling, sales promotion and publicity. Price decisions: Reasons, Objectives and Methods; Price setting, Buyers reaction, demand elasticity of price, distribution trade off analysis, physical distribution methods, concept of level of service and Cost of services, overall marketing mix. Market Segmentation and marketing Control: Concept of segmentation, methods of segmentation, control of management over marketing subsystems, efficiency control, short and long controls.

Text Books:
3. Marketing Management: Philips Kotler
Shri Ramdeobaba College of Engineering & Management, Nagpur

Syllabus of Semester III, M. Tech (Industrial Engineering)

Course Code: INT602-3 (Elective I)  Course: Total Quality Management
L: 3 Hrs.  T: 0 Hrs.  P: 0 Hrs. Per week  Total Credits: 6

Course Outcomes:
1. Make control charts for predicting loss of process control.
2. Make use of statistical tools for minimizing inspection in acceptance control.
3. Design quality management and assurance systems.
5. Develop skills to increase quality and reliability of manufactured product

Syllabus:

Text Books:
1. TQM. And ISO14000: Dr. K. Arora
2. Essentials of TQM / More house: Debra L
Course Code : INT602-4 (Elective I)  
Course : Energy Management  
L: 3 Hrs.  T: 0 Hrs.  P: 0 Hrs. Per week  
Total Credits : 6

Course Outcomes:
1. Ability to understand and identify areas of energy conservation in industries.
2. Know the duties and responsibilities of an energy manager and energy auditor.
3. Ability to analyze and modify existing working of the energy utilizing and generating machines.
4. Know how to use instruments in energy audit process.
5. Ability to understand and implement proper energy saving techniques in boiler, furnaces, compressor, and heavy machineries.

Syllabus:

Text Books:
Course Outcomes:
1. Students will develop understanding of system concepts, components, and properties.
2. Will be familiarized with the process of designing a system.
3. Will be able to understand the concept of system reliability, maintainability,

Syllabus:

Types of information:
Operational, tactical, strategic, and statutory. Need of information systems, management structure, requirements of information at different levels of management, functional allocation of management, requirements of information for various functions, qualities of information.

Requirements determination:
Requirements specifications, feasibility analysis, final specifications, hardware and software study, system design, system implementation, system evaluation, system modification.

Role of systems analyst:
Attributes of a systems analyst, tools used in system analysis. Strategies: methods, documenting study, system requirements.

Specification:
From narratives of requirements to classification of requirements as strategic, tactical, operational, and statutory. Deciding project goals: examining alternative solutions, cost-benefit analysis, quantifications of costs and benefits, payback period, system proposal preparation for management, parts and documentation of a proposal, tools for prototype creation.

Data flow diagrams:
Case study for use of DFD, good conventions, leveling of DFDs, leveling rules, logical and physical DFDs, software tools to create DFDs.

Procedure specifications in structured English:
Examples and cases, decision tables for complex logical specifications, specification-oriented design vs procedure-oriented design.
Entity relationship model:

E-R diagrams, relationships cardinality and participation, normalizing relations, various normal forms and their need, some examples of relational data base design.

Text Books:

2. Systems Engineering Principles and Practice: (Wiley Series in Systems Engineering and Management) by Alexander Kossiakoff, William N. Sweet, Sam Seymour and Steven M. Biemer (2011)
Course Code: INT602-6 (Elective I)   Course: Communication
L: 3 Hrs. T: 0 Hrs. P: 0 Hrs. Per week   Total Credits: 6

Course Outcomes:
1. To make students realize the importance of communication.
2. To prepare for making effective communication.
3. To prepare for group discussion & Personnel Interview.
4. To be able to write Business letters, Report etc.

Syllabus:
Introduction, importance of communication, process of communication, types of communication, interpersonal and intrapersonal communication, basic communication skills, barriers to communication, overcoming the barriers in communication.

Effective verbal communication, public speaking, oral presentation, non-verbal communication, telephonic conversation.

Group behavior and group dynamics, group discussion, types of interviews, facing the personal interview, meetings, video conferencing

Effective written communication, reports, memos, business letters. Communication through emails.

Text Books:
1. Communication for Professional Engineers: Bill Scott, Thomas Telford Ltd., 1984
Course Code: INT603-1 (Elective II)    Course: Materials Management
L: 3 Hrs. T: 0 Hrs. P: 0 Hrs. Per week    Total Credits: 6

Course Outcomes:
1. Students will understand the objective and scope of material management.
2. Students will be able to understand the concept of various cost involved in inventory control.
3. Students will be able to understand various purchase and production based inventory control models.
4. Students will be able to understand the vendor rating system, MRP, JIT, KANBAN etc.
5. Students will be able to understand various algorithms in inventory control.

Syllabus:
Role of materials management techniques in material productivity improvement, Cost reduction and value improvement, Purchase management, Incoming material control, Acceptance sampling and Inspection, Vendor rating system, Inventory management, Various inventory control models, Material requirement planning systems, Discrete lot size techniques, Wangar and Whitin algorithm, Silver and metal algorithm, Algorithms for multi product lot sizing with constraint inventory management of perishable commodities, Design of inventory distribution systems, Inventory management in KANBAN and JIT.

Text Books:
2. Material management & Inventory Control: Tersine
3. Applied Materials Management: S. Chatterjee
Syllabus of Semester III, M. Tech (Industrial Engineering)

Course Code: INT603-2 (Elective II) Course: Mechatronics
L: 3 Hrs. T: 0 Hrs. P: 0 Hrs. Per week Total Credits: 6

Course Outcomes:
1. Describe the basic building blocks of mechatronic systems (e.g. hardware, software, communication, interfacing, sensing, control and actuation)
2. Sketch such a technical solution and select component types.
3. Identify critical problems/design issues and suggest feasible methods and tools to solve those.
4. Be able to summarize and on smaller problems apply a development model for mechatronic product development.
5. Model, simulate and synthesize (but not realize) smaller mechatronic systems and products.

Syllabus:
Introduction of Mechatronics Technology and approach towards Mechatronics designing, Study of sensors and transducers, measurement of various parameters like displacement, position, proximity, velocity, force temperature, light, etc., Selection criteria for sensors, signal conditioning elements and their needs, data indicators and recorders for a Mechatronics systems, Actuation system including pneumatic/hydraulic, electrical and mechanical actuation. System modeling for mechanical, electrical, fluid, thermal and the combination to find transfer function. Checking system stability by using tools like MATLAB and SIMULINK, close loop controllers, Digital logic including combination of logic and sequential logic, Study of microprocessor and programmable logic controllers (PLC), Fault detection technique in Mechatronics systems.

Text Books:
Course Code: INT603-3 (Elective II)    Course: Value Engineering    Total Credits: 6

L: 3 Hrs.  T: 0 Hrs.  P: 0 Hrs. Per week

Course Outcomes:
1. Students will be able to apply cost reduction techniques.
2. Will be able to evaluate various alternatives.
3. Will be able to prioritize functions of products.
4. Will be able to identify under value products.
5. Will be able to improve value of product.

Syllabus:
Value engineering and its application in product design, Identification of major function and removal of poor value functions in a product, Types of value Effects of functions and cost on value, Life cycle of product and value engineering, Steps in value engineering, Methodology in value engineering, Fast diagram, Matrix method and other approaches in value engineering, Evaluation of value alternatives, Case studies in value engineering.

Text Books:
3. An Introduction to Value Engineering: L. D. Miles
Syllabus of Semester III, M. Tech (Industrial Engineering)

Course Code: INT603-4 (Elective II)  
Course: Industrial Design  
L: 3 Hrs. T: 0 Hrs. P: 0 Hrs. Per week  
Total Credits: 6

Course Outcomes:
1. Students will able to apply the knowledge of methods engg. in Industrial design situations.
2. Apply the knowledge of facilities planning.
3. Apply the optimization techniques in design situations.
4. Apply the concept of Scheduling in design.

Syllabus:
Industrial system and organization: engineering economy; work measurement technique; motivation and time study; factory planning and material handling. Industrial standardization, critical path method, quality assurance and statistical quality control, Reliability, maintenance and management planning, scheduling, job analysis, evaluation, value engineering.

Text Books:
Teaching Scheme & Syllabus For M.Tech. Industrial Engineering

Syllabus of Semester III, M. Tech (Industrial Engineering)

Course Code: INT603-5 (Elective II)  
Course: Information Systems In Engineering  
L: 3 Hrs.  T: 0 Hrs.  P: 0 Hrs. Per week  
Total Credits: 6

Course Outcomes:
1. To leverage the IT infrastructure as a growth career for a given business model.
2. To make necessary changes in the organization to make the best use of IT growth. To empower the employee in the lower stata of the organization as they capture and process the valuable data.
3. To evolve an effective decision support system (DSS) to guide the decision making and forecast the effect of those decision.
4. To devise and use the artificial intelligence to accomplish the complex task of their business process.
5. To integrate and streamline the process of a business enterprise and add value to it.

Syllabus:
MIS introduction:

Text Books:
2. Information Systems for Modern Management: New Delhi, Prentice-Hall India, 1983
Course Code: INT603-6 (Elective II)  Course: Reliability Engineering
L: 3 Hrs. T: 0 Hrs. P: 0 Hrs. Per week  Total Credits: 6

Course Outcomes:
1. Students will be able to understand the important of Reliability in product Design.
3. Develop understanding of concepts to Arability and availability.

Syllabus:

Introduction:

State Dependent System:

Design for Reliability:

Reliability Growth Testing:

Text Books:
2. Reliability Based Design : S. S. Rao, McGraw Hill
Syllabus of Semester III, M. Tech (Industrial Engineering)

Course Code: INP604
Course: Project Phase I
L: 0 Hr., T: 0 Mrs., P: 6 Mrs., Per week
Total Credits: 24

Project Phase

Seminar/research work based on some topic related to Industrial Engineering
Seminar/research work based on some topic related to Industrial Engineering