M. Tech. DEGREE

INDUSTRIAL ENGINEERING

SYLLABUS
FOR
CREDIT BASED CURRICULUM
(2009-2010)

DEPARTMENT OF PRODUCTION ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY
TIRUCHIRAPPALLI – 620 015, INDIA.
M.Tech. INDUSTRIAL ENGINEERING

The total minimum credits required for completing the programme is 60

Semester I

<table>
<thead>
<tr>
<th>CODE</th>
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List of Electives

Elective I & II

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Or any other elective subject from any other department

List of reserve Electives:

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MA 611 PROBABILITY AND STATISTICS

Random variable - Two dimensional random variables - Standard probability distributions - Binomial, Poisson and Normal distributions - Moment generating function.

Special distributions - Uniform, Geometric, Exponential, Gamma, Weibull and Beta distributions - Mean, Variance, Raw moments from moment generating functions of respective distributions.

Sampling distributions - Confidence interval estimation of population parameters - Testing of hypotheses - Large sample tests for mean and proportion - T-test, F-test and Chi-square test.

Curve fitting - Method of least squares - Regression and correlation – Rank correlation – Multiple and partial correlation - Analysis of variance - One way and two way classifications - Time series analysis.

Basics concepts of reliability - Failure rate analysis - Reliability of systems - Series, Parallel - Maintenance - Preventive and corrective - Maintainability equation - Availability - Quality and Reliability.

REFERENCES
1. BOWKER and LIBERMAN, Engineering Statistics, Prentice-Hall.
4. SPIEGEL, MURRAY R,Statistics, Schaum’s Series.
5. TRIVEDI K.S., Probability and Statistics with Reliability and Queuing and Computer Science Applications, Prentice Hall Of India

PR 651 ADVANCED OPERATIONS RESEARCH

Linear programming- methods- Simplex method – Big M method – Two phase method – Special cases - Goal programming.

Duality analysis-sensitivity analysis-changes in right-hand side constants of constraints-changes in objective function co-efficient-adding a new constraints-adding a new variable.


Unconstrained nonlinear algorithms-Constrained algorithms- Separable programming - Quadratic programming-Geometric programming-Stochastic programming.

REFERENCES

PR 653 ANALYSIS AND CONTROL OF MANUFACTURING SYSTEM

Production system – Forecasting and its types – Forecasting errors and tracking signals - Inventory costs

Terminology of Inventory systems – Inventory policies – Analysis of Static Deterministic Inventory Models

Aggregate Production Planning - Value stream management for lean office

Introduction to material requirements planning - Lot sizing – MRP Versus MRP II – Software structure of MRP – Re planning frequency in MRP


REFERENCES

PR 659 OPERATIONS MANAGEMENT LABORATORY

OBJECTIVE: Practical Exposure on Operation Management Packages

1. Smart cam
2. Harvard project manager
3. Linear programming
4. Transportation
5. Project management
6. Facilities layout
7. Material requirement planning
8. Inventory management
9. Quality management
10. Job shop scheduling
11. Forecasting

PR 652 QUALITY ENGINEERING

Control charts for variables and attributes – Process capability studies

Design of experiments – ANOVA - Taguchi methods – Reliability – MTBF – MTTR

Acceptance sampling by variables and attributes – ASN – ATI – AOQL - IS2500 plans – MIL STD 105E


REFERENCES

PR 654 MODELING AND SIMULATION

Introduction to systems and modeling - discrete and continuous system - Limitations of simulation, areas of application - Monte Carlo Simulation. Discrete event simulation and their applications in queueing and inventory problems.

Random number generation and their techniques - tests for random numbers

Random variable generation –

Analysis of simulation data - Input modeling – verification and validation of simulation models – output analysis for a single model.

Simulation languages and packages - FORTRAN, C, C++, GPSS, SIMAN V, MODSIM III, ARENA, QUEST, VMAP - Introduction to GPSS – Case studies - Simulation of manufacturing and material handling system.

REFERENCES

PR 656 WORK DESIGN AND ERGONOMICS

Introduction to work study - Productivity – scope of motion and time study - Work methods design.


Work measurement and its methods.

Motion economy- Ergonomics practices – human body measurement – layout of equipment – seat design - design of controls and compatibility – environmental control – vision and design of displays. Design of work space, chair table.

REFERENCES

PR 658 SIMULATION LAB.

1. Modeling and simulation using witness
2. Modeling and simulation in arena
3. Modeling and simulation in Quest
4. Modeling and simulation in SIMQUICK
5. Modeling and simulation in gpss
6. Queing & Inventory modeling in c language
7. Computer aided factory integrated management system
8. Random variate generate using c
9. Robot work cell simulation
10. Simulation using simulink (Matlab)

PR 663 FACILITIES PLANNING

Facilities requirement - need for layout and its types.

Plant location analysis –simple problems in single facility location models, network location problems.

Layout design - Design cycle – computer algorithms – ALDEP, CORELAP, and CRAFT.

Group technology – Production Flow analysis (PFA), ROC (Rank Order Clustering) – Line balancing

Material handling design - handling equipment types, selection and specification, containers and packaging.

REFERENCES
PR 665 VALUE ENGINEERING

An overview of value engineering (VE) - Definition, Concepts and approaches of value analysis and engineering – evaluation of VE.

Evaluation of function, Problem setting system, problem solving system, setting and solving management-decision – type and services problem, evaluation of value.

Results accelerators, Basic steps in using the systems

Value analysis - Understanding the decision environment, Effect of value analysis on other work in the business.

VE Team, Co-ordinate, designer, different services, definitions, construction management contracts, value engineering case studies, Effective organization for value work, function analysis system techniques-FAST diagram.

REFERENCES

PR 669 PROJECT MANAGEMENT


Project cash flows –Investment criteria- Net Present Value-Cost Benefit Ratio-Internal Rate of Return -Pay back period –Accounting Rate of Return.

Costing - Financial and economic appraisal of single project – multiple projects and constraints – method of ranking – mathematical programming approach – LP, ILP and goal programming model.

Portfolio theory and capital asset pricing model approaches to risk analysis - Network techniques for project management – PERT, CPM.

Introduction to Software Project Management (SPM) - Software Metrics – Software quality – Risk management in SPM- Emerging issues.

REFERENCES
MB 681 FINANCIAL MANAGEMENT

Role of financial management

Capital and inventory management

Capital budgeting

Financing decision

Risk analysis

REFERENCES

PR 666 SUPPLY CHAIN MANAGEMENT

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

Introduction to Inventory Management: Selective Control Techniques, MUSIC-3D systems, Various costs. Deterministic Models, Quantity Discounts - all units, incremental price; Sensitivity, Make-or-buy decisions.

Independent Demand Systems (Probabilistic Models): Q- system, P- system, Mathematical modelling under known stock out costs and service levels, Bullwhip effect, Information and supply chain trade-offs.


REFERENCES
PR 668 TOTAL QUALITY MANAGEMENT

Concepts of quality systems - The total quality management system – Characteristics of the total quality management system.

The task of quality organization - organizing principles – Structural total quality organization


Vendor relations – objectives and activities - vendor qualification process – vendor quality surveys – Vendor quality improvement – vendor quality rating and evaluation.

REFERENCES
3. Feignbaum, “Total Quality Control”.

PR 672 TERO TECHNOLOGY

Probability concepts – Probability distributions – density and distribution functions for uniform, exponential, razeligh, weibull, normal distribution - Non-maintained systems – Reliability definition and its important – method of improving reliability redundancy techniques – failure data analysis

Reliability models- Hazard models – constant, linearly increasing and Weibull models- estimating of reliability, failure density and MTTF for hazard models.

Maintenances systems and economics of reliability - Maintainability and availability concepts, MTBF, MTTR, MTBM & MDT repair hozard rate, maintainability and availability functions and their mathematical expressions

Maintenance and spares management - preventive replacement- individual breakdown replacement policy - individual preventive replacement policy - preventive group replacement.

Condition based maintenance - advantages and disadvantages - vibration monitoring - vibration parameters - vibration instruments

REFERENCES
PR 661 SEQUENCING AND SCHEDULING


Parallel machine models - Independent jobs Minimizing makespan.


Job shop models – dynamic job shop simulation.


REFERENCES

PR 662 ADVANCED OPTIMISATION TECHNIQUES

Introduction, Classification of optimization problems, Applications of optimization, concepts of design vector, Design constraints, constrain surface, objective function surfaces and multi-level optimization.

Karmakars method of solving L.P. problems, Quadratic programming, non-linear programming – unconstrained optimization techniques, Basics of constrained optimization.

Integer linear programming methods and applications, Introduction to integer non-linear programming, Basics of geometric programming.

Multi-objective optimization methods and applications, Formulation of problems – Separable programming and stochastic programming.

Introduction to Genetic algorithms, Simulated Annealing, neural network based optimization and optimization of fuzzy systems.

REFERENCES
PR 664 PRODUCTION MANAGEMENT SYSTEMS

Manufacturing systems - CIM and production management – Job shop production, batch production, mass production.


Just In Time (JIT) - KANBAN System – Types of KANBAN cards.

Introduction to optimized production technology (OPT) - OPT philosophy improvement tools – Requirement and assumptions of OPT.


REFERENCES

PR 667 ENTERPRISE RESOURCE PLANNING


Data Warehousing - Data Mining - On-line Analytical Processing (OLAP) - Supply Chain Management.

ERP Implementation - ERP Implementation Lifecycle - Implementation Methodology - Vendors, Consultants and Users - Contracts with Vendors, Consultants and Employees - Project Management and Monitoring.

Business Modules in an ERP Package - ERP Market - ERP-Present and Future - Turbo Charge the ERP System.

Enterprise Integration Applications (EIA) - ERP and E-Commerce - ERP and Internet - Future Directions in ERP.

REFERENCES
PR 670 DESIGN AND ANALYSIS OF FLEXIBLE MANUFACTURING SYSTEMS


Models for the performance evaluation of an FMS configuration - Decision models for the design of a FMS - Routing optimization - Capacity optimization - Equipment optimization

Decision models for the design of a FMS-Classification of decision problems and models in the selection of the optimal FMS configuration-quantifiable goals of the configuration planning. Routing optimization: Routing optimization with an unlimited number of pallets.


REFERENCES


PR 671 COMPUTER AIDED PROCESS PLANNING AND CONTROL

Process Planning - part design representation – Engineering design – design drafting – Computer aided design – CAD input/output devices

Geometric modeling for Process planning- Group technology- coding and its types


REFERENCES

PR 674 E-COMMERCE


REFERENCES