**UNIVERSITY DEPARTMENTS**

**ANNA UNIVERSITY CHENNAI : : CHENNAI 600 025**

**REGULATIONS - 2009**

**CURRICULUM I TO IV SEMESTERS (FULL TIME)**

**M.E. QUALITY ENGINEERING AND MANAGEMENT**

### SEMESTER I

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**UNIVERSITY DEPARTMENTS**

**ANNA UNIVERSITY CHENNAI : : CHENNAI 600 025**

**REGULATIONS - 2009**

**CURRICULUM I TO VI SEMESTERS (PART TIME)**

**M.E. QUALITY ENGINEERING & MANAGEMENT**

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Total number of credits to be earned for the award of the degree: 67
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UNIT I ONE DIMENSIONAL RANDOM VARIABLES
Random variables-Probability function- moments- moment generating functions and their properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and normal distributions – Functions of a Random variable.

UNIT II TWO DIMENSIONAL RANDOM VARIABLES
Joint distributions – Marginal and conditional distributions – Functions of two dimensional random variables – Regression Curve – Correlation.

UNIT III ESTIMATION THEORY

UNIT IV TESTING OF HYPOTHESIS
Sampling distributions- Type I and Type II errors – Tests based on normal, t, $\chi^2$ and F distributions for testing of mean, variance and proportions – Tests for Independence of attributes and Goodness of fit.

UNIT V MULTIVARIATE ANALYSIS
Covariance matrix – Correlation Matrix – Multivariate Normal density function – Principal components – Sample variation by principal components – Principal components by graphing.

L+T: 45+15
TOTAL: 60 PERIODS

REFERENCES:
UNIT I   MACHINE TOOLS  
Lathe – types of lathes – shaper –shapers operations – planer – planer operations –
Types of grinding machines

UNIT II  MANUFACTURING PROCESS  
Patterns – casting process – forging – rolling - extrusion process- welding
technology.

UNIT III  NON TRADITIONAL MACHINING TECHNIQUES  
Electric discharge machining – wire EDM – chemical machining – elector chemical
machining – ultra sonic machining – abrasive jet machining – water jet machining

UNIT IV  MANUFACTURING SYSTEMS  
Manufacturing systems – Functions – Types of production – Costs in manufacturing-
Modern manufacturing systems & controls

UNIT V   WORK SYSTEMS  
Introduction to time study and method study.

TOTAL: 45 PERIODS

REFERENCES:
1. S.K.Hajara Choudhury,Elements of Workshop technology Volume I and
UNIT I INTRODUCTION
Need for TQM, evolution of quality, Definition of quality, TQM philosophy – CONTRIBUTIONS OF Deming Juran, Crosby and Ishikawa, TQM models.

UNIT II PLANNING
Vision, Mission, Quality policy and objective Planning and Organization for quality, Quality policy Deployment, Quality function deployment, introduction to BPR and analysis of Quality Costs.

UNIT III TQM PRINCIPLES

UNIT IV TQM TOOLS AND TECHNIQUES
PDSA, The Seven Tools of Quality, New Seven management tools, Concept of six sigma, FMEA, Bench Marking, JIT, POKA YOKE, 5S, KAIZEN, Quality circles.

UNIT V QUALITY SYSTEMS

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:
QE 9113  OPTIMIZATION TECHNIQUES  L T P C 3 0 0 3

UNIT I  LINEAR PROGRAMMING  15
The L.P.model, Assumptions, solving by Graphical and simplex method, Post optimality analysis, the transportation problem, the assignment problem.

UNIT II  NET WORKS  8
PERT-CPM, the shortest path - Minimal spanning tree – Maximum flow problems.

UNIT III  DECISION ANALYSIS  7
Decision making without and with experimentation Decision trees, Game theory.

UNIT IV  MARKOV PROCESSES  8
Basic structure of queuing models, application of queuing theory, Markov chain.

UNIT V  DYNAMIC PROGRAMMING  7
Characteristics of D.P.problems, Deterministic dynamic programming.

TOTAL: 45 PERIODS

REFERENCES:
UNIT I LINEAR MEASUREMENT AND ANGULAR MEASUREMENT


UNIT II STANDARDS FOR LINEAR AND ANGULAR MEASUREMENTS

Shop floor standards and their calibration, light interference, Method of coincidence, Slip gauge calibration, Measurement errors, Limits, fits, Tolerance, Gauges, Gauge design.

UNIT III MEASUREMENT APPLICATION


UNIT IV MODERN CONCEPTS

Image processing and its application in Metrology, Co-ordinate measuring machine, Types of CMM, Probes used, Application, Non-contact CMM using Electro-optical sensors for dimensional metrology.

UNIT V INTRODUCTION TO MEASUREMENT SYSTEMS

System configuration, basic characteristics of measuring devices, Displacement, force and torque measurement, standards, Calibration, Sensors, Basic principles and concepts of temperature, Pressure and flow measurement, Destructive testing – Nondestructive testing.

TOTAL: 45 PERIODS

REFERENCES:
<p>| | |</p>
<table>
<thead>
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<tbody>
<tr>
<td><strong>QE 9121 TOTAL QUALITY CONTROL</strong></td>
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<tr>
<td><strong>UNIT I INTRODUCTION</strong></td>
<td>3 0 0 3</td>
</tr>
<tr>
<td><strong>UNIT II CONTROL CHARTS</strong></td>
<td>12</td>
</tr>
<tr>
<td>Chance and assignable causes of process variation, statistical basis of the control chart, control charts for variables and attributes- Construction and application.</td>
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<tr>
<td><strong>UNIT III SPECIAL CONTROL PROCEDURES</strong></td>
<td>8</td>
</tr>
<tr>
<td>Warning and modified control limits, control chart for individual measurements, multi-vari chart, X-chart with a linear trend, chart for moving averages and ranges, cumulative-sum and exponentially weighted moving average control charts.</td>
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</tr>
<tr>
<td><strong>UNIT IV STATISTICAL PROCESS CONTROL</strong></td>
<td>8</td>
</tr>
<tr>
<td>Process stability, process capability analysis using a Histogram or probability plots and control chart. Gauge capability studies, setting specification limits.</td>
<td></td>
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<tr>
<td><strong>UNIT V ACCEPTANCE SAMPLING</strong></td>
<td>10</td>
</tr>
<tr>
<td>The acceptance sampling fundamental, OC curve, sampling plans for attributes, simple, double, multiple and sequential, sampling plans for variables, MIL-STD-105D and MIL-STD-414E &amp; IS2500 standards.</td>
<td></td>
</tr>
</tbody>
</table>

**REFERENCES:**

2. IS 2500 Standard.
UNIT I  INTRODUCTION
Perception of quality, Taguchi’s definition of quality – quality loss function, tolerance using loss function, quality and process capability, Planning of experiments, design principles, terminology.

UNIT II  FACTORIAL EXPERIMENTS
Design and analysis of single factor and multi-factor experiments, tests on means, EMS rules.

UNIT III  SPECIAL DESIGNS
$2^K$ Factorial designs, Fractional factorial designs, Nested designs, Blocking and Confounding.

UNIT IV  ORTHOGONAL EXPERIMENTS
Selection of orthogonal arrays (OA’s) OA designs, conduct of OA experiments, data collection and analysis of simple experiments, Modification of orthogonal arrays.

UNIT V  ROBUST DESIGN
Variability due to noise factors, Product and process design, Principles of robust design, objective functions in robust design - S/N ratios , Inner and outer OA experiments, optimization using S/N ratios, fraction defective analysis, case studies.

TOTAL: 45 PERIODS

REFERENCES:

UNIT I SOFTWARE QUALITY


UNIT II SOFTWARE ENGINEERING ACTIVITIES

Estimation, Requirements, Analysis, Architecture, Design, development Testing and Maintenance

UNIT III SUPPORT ACTIVITIES


UNIT IV SOFTWARE QUALITY MANAGEMENT TOOLS


UNIT V QUALITY ASSURANCE MODELS


TEXT BOOK


REFERENCES:

UNIT I  INTRODUCTION
Maintenance definition – Maintenance objectives – Maintenance management –
Functions of maintenance department – Tero technology – Maintenance costs.

UNIT II  MAINTENANCE MODELS
Maintenance policies – Imperfect maintenance – PM versus b/d maintenance –
Optimal PM schedule and product characteristics – Inspection decisions: Maximizing
profit – Minimizing downtime – Replacement models.

UNIT III  MAINTENANCE LOGISTICS
Maintenance staffing – Human factors –Resource requirements: Optimal size of
service facility – Optimal repair effort – Maintenance planning and scheduling –
Spares planning – Capital spare.

UNIT IV  MAINTENANCE QUALITY
Five Zero concept –FMECA – Maintainability prediction– Design for maintainability –
Maintainability allocation – Reliability Centered Maintenance.

UNIT IV  TOTAL PRODUCTIVE MAINTENANCE
TPM fundamentals – Chronic and sporadic losses – Six big losses – OEE as a
measure – TPM pillars– Autonomous maintenance –TPM implementation.

TOTAL: 45 PERIODS

REFERENCES:
1. Andrew K.S.Jardine & Albert H.C.Tsang, “Maintenance, Replacement and
2. Bikas Badhury & S.K.Basu, “Tero Technology: Reliability Engineering and
UNIT I INTRODUCTION

Systems, modeling, types of models- simulation definition, types of simulation.

UNIT II GENERATION OF RANDOM NUMBERS AND VARIATES 5

Pseudo random number, methods of generating random variates, testing of random numbers and variates.

UNIT III DESIGN OF SIMULATION EXPERIMENTS 8

Problem formulation, data collection and reduction, time flow mechanism, key variables, logic flow chart, starting condition, run size,

UNIT IV SIMULATION LANGUAGES 14

Comparison and selection of simulation languages, study of any one simulation language.

UNIT V CASE STUDIES/MINI PROJECT 15

Development of simulation models related to quality engineering & Management

TOTAL: 45 PERIODS

REFERENCES:

UNIT I DECISION MAKING
Managerial decision making, system modeling and support-preview of the modeling process-phases of decision making process.

UNIT II MODELING AND ANALYSIS
DSS components- Data warehousing, access, analysis, mining and visualization-modeling and analysis-DSS development.

UNIT III KNOWLEDGE MANAGEMENT
Group support systems- enterprise DSS- supply chain and DSS-knowledge management methods, technologies and tools.

UNIT IV INTELLIGENT SYSTEMS
Artificial intelligence and expert systems-concepts, structure, types-knowledge acquisition and validation, knowledge representation

UNIT V IMPLEMENTATION
Implementation, integration and impact of management support systems.

REFERENCES:
IE9161 APPLIED OBJECT ORIENTED PROGRAMMING L T P C 3 0 0 3

UNIT I UNDAMENTALS OF OBJECT ORIENTED PROGRAMMING 5

Elements of OOP, classes, subjects, messaging, inheritance, polymorphism, OOP paradigm versus procedural paradigm, object-oriented design.

UNIT II ++ Basics 15

Expression and statements, operators, precedence, type conversion, control statements, loops, Arrays structures, functions, argument passing, reference argument, overloaded function.

UNIT III C++ CLASS 5

Definition, class objects, member functions, class argument, operator overloading, user defined conversions.

UNIT IV CLASS DERIVATION 10

Derivation specification, public and private base classes, standard conversions under derivation, class scope, initialization and assignment under derivation.

UNIT V APPLICATION 10

OOP’s applications in Industrial Engineering.

TOTAL: 45 PERIODS

REFERENCES

UNIT I SCHEDULING BASICS  

UNIT II SINGLE MACHINE MODEL  
Pure sequencing –Minimizing $\bar{T}$, $\bar{F}$ – Hodgson’s algorithm – Smith’s rule – WI algorithm – Dynamic programming – Branch and Bound – Non simultaneous arrivals –Dependent jobs – Sequence dependent set up times.

UNIT III PARALLEL MACHINE MODEL  
Minimizing makespan: McNaughton’s algorithm – Heuristic procedures – Minimizing $\bar{w}F$: $H_1$ & $H_m$ heuristics – Hu’s algorithm – Muntz Coffman algorithm.

UNIT IV FLOW SHOP MODEL  

UNIT V JOB SHOP MODEL  

TOTAL: 45 PERIODS

REFERENCES:
UNIT I INTRODUCTION

Definition of Logistics and SCM: Evolution, Scope, Importance & Decision Phases – Drivers of SC Performance and Obstacles.

UNIT II LOGISTICS MANAGEMENT


UNIT III SUPPLY CHAIN NETWORK DESIGN


UNIT IV SOURCING, AND PRICING IN SUPPLY CHAIN

Supplier selection and Contracts – Design collaboration – Procurement process – Revenue management in supply chain

UNIT V COORDINATION AND TECHNOLOGY IN SUPPLY CHAIN

Supply chain coordination – Bullwhip effect – Effect of lack of co-ordination and obstacles – IT and SCM – supply chain IT frame work. E Business & SCM. Metrics for SC performance – Case Analysis

TOTAL: 45 PERIODS

REFERENCES:

2. Logistics, David J.Bloomberg, Stephen Lemay and Joe B.Hanna, PHI 2002
4. Modeling the supply chain, Jeremy F.Shapiro, Thomson Duxbury, 2002
UNIT I  PROCESS MANAGEMENT

Operations strategy, types of processes, process management – outsourcing, make-buy decision, process re-engineering

UNIT II  FORECASTING

Purpose and application of forecasts, types of forecasts, Delphi & Market surveys, Moving average and exponential smoothing methods, Linear Regression, monitoring of forecasts.

UNIT III  PRODUCTION PLANNING

Aggregate planning problem, costs, strategies, graphical and tabular methods, transportation and linear programming methods, MRP, MRPII, CRP, ERP.

UNIT IV  PRODUCTION CONTROL

Capacity planning and control, production activity control, JIT, flow shop & Job shop scheduling basic models.

UNIT V  INVENTORY MANAGEMENT

Inventory classification and analysis, Basic inventory systems, deterministic and probability models.

TOTAL: 45 PERIODS

REFERENCES:

UNIT I MATERIALS PLANNING 10

Objectives of materials management, Materials control – Variety reduction, Codification, Storage and handling, Materials forecasting, Inventory control, MRP & MRP-II

UNIT II PURCHASING 10

Policies and procedures, Selection of sources of supply, Make or Buy, Vendor evaluation and rating, Vendor development, Buying of different materials – JIT in purchasing, Kanban.

UNIT III SPARE PARTS MANAGEMENT 10

Importance of spares management – Categorization, Reliability and Quality of spares, Procurement, Warehousing and Logistics, Obsolescence of spares – Spares information system

UNIT IV VALUE ENGINEERING CONCEPTS 10

Origin of Value Engineering, Meaning of value, Definition of Value Engineering and Value analysis, Type of Value, function – Basic and Secondary functions, concept of cost and wroth, creativity in Value Engineering.

UNIT V VALUE ENGINEERING PROCESS 10

Seven phases of job plan, FAST Diagram as Value Engineering Tool, Behavioural and organizational aspects of Value Engineering, Ten principles of Value analysis, Benefits of Value Engineering, Case study.

TOTAL: 45 PERIODS

REFERENCES:

UNIT I PRODUCT DEVELOPMENT AND CONCEPT SELECTION


UNIT II PRODUCT ARCHITECTURE

Product architecture – Implication of the architecture – Establishing the architecture – Related system level design issues.

UNIT III INDUSTRIAL AND MANUFACTURING DESIGN

Need for industrial design – Impact of industrial design – Industrial design process. Assessing the quality of industrial design- Human Engineering consideration - Estimate the manufacturing cost – Reduce the component cost – Reduce the assembly cost – Reduce the support cost – Impact of DFM decisions on other factors.

UNIT IV PROTOTYPING AND ECONOMIC ANALYSIS


UNIT V MANAGING PRODUCT DEVELOPMENT PROJECTS

Sequential, parallel and coupled tasks - Baseline project planning – Project Budget-Project execution – Project evaluation- patents- patent search-patent laws-International code for patents.

TOTAL: 45 PERIODS

TEXT BOOK:


REFERENCES:


UNIT I  EVOLUTION OF LEAN SIX SIGMA  
Introduction to Lean Principles and Six Sigma Concepts-Similarities and differences – Synergy-Evolution of Lean Six Sigma

UNIT II  LEAN SIX SIGMA APPROACH  
Lean Six Sigma Methodology- Phases of Lean Six Sigma Method, Managing Lean Six sigma Project, Six sigma Methodologies (DMAIC, DMADV, DFSS)

UNIT III  SIX SIGMA TOOLS AND TECHNIQUES  

UNIT IV  LEAN TOOLS  

UNIT V  LEAN SIX SIGMA IMPLEMENTATION  
Identifying Lean Six Sigma Projects, Define Scope, Planning for Implementation, Selection of tools and techniques for each phase, measuring the Benefits

TOTAL: 45 PERIODS

REFERENCES:
5. Liker, Jeffrey; Meier, David, Toyota Talent, Tata Mcgraw Hills
UNIT I  RELIABILITY CONCEPT

UNIT II  FAILURE DATA ANALYSIS

UNIT III  RELIABILITY ASSESSMENT
Different configurations – Redundancy – m/n system – Complex systems: RBD – Baye’s method – Cut and tie sets – Fault Tree Analysis – Standby system.

UNIT IV  RELIABILITY MONITORING

UNIT V  RELIABILITY IMPROVEMENT

TOTAL: 45 PERIODS

REFERENCES:
UNIT I   BUSINESS EXCELLENCE MODELS                             8

Business Excellence Concepts – Need for BE models – Pioneers in the model MBNQA, EFQM and DEMING award

UNIT II    MBNQA                                                                       12

Criteria : : LEADERSHIP , Strategic planning , Customer and Market focus , Measurement analysis and Knowledge Management , Human resource focus, process management , business results

UNIT III  BUSINESS EXCELLENCE AWARDS IN INDIA                             7

Models in Business excellence: RBNQA CII EXIM Award, Tata BE Model etc

UNIT IV  IMPLEMENTING BUSINESS EXCELLENCE MODEL                 10

Basic concepts – Training -Report writing – Internal audit-Report submission – Initial assessment -Site visit – Scoring – Criteria for Award, Award finalization

UNIT V    CASE STUDY                                  8

TEXT BOOK:


REFERENCES:

http://www.baldrige.nist.gov
http://www.baldrige21.com/
www.imc.org
www.qimpro.com
www.imcrbnqa.com
www.efqm.org
www.juse.or.jp/e/deming/index.html
UNIT I  FINANCIAL ACCOUNTING  

UNIT II  COST ACCOUNTING  
Cost accounting systems: Job costing, Process costing, Allocation of overheads, Activity based costing, differential cost and incremental cost, Variance analysis, Software costing.

UNIT III  BUDGETING  
Requirements for a sound budget, fixed budget-preparation of sales and production budget, flexible budgets, zero base budgeting and budgetary Control.

UNIT IV  FINANCIAL MANAGEMENT  
Investment decisions – Capital Investment process, types of investment proposals, investment appraisal techniques – pay back period method, Accounting rate of return, net present value method, internal rate of return and profitability index method.

UNIT V  FINANCIAL DECISIONS  

TOTAL: 45 PERIODS

REFERENCES:

UNIT I  STRATEGIC MANAGEMENT AND PROJECT SELECTION  9

Project selection models, Project portfolio process, Analysis under uncertainty, Project organization, Matrix organization

UNIT II  PROJECT PLANNING  9

Work breakdown structure, Systems integration, Interface coordination, Project life cycle, Conflict and negotiation,

UNIT III  PROJECT IMPLEMENTATION  12

Estimating Project Budgets, Process of cost estimation, Scheduling: Network Techniques PERT and CPM, Risk analysis using simulation, CPM- crashing a project, Resource loading, leveling, and allocation

UNIT IV  MONITORING AND INFORMATION SYSTEMS  9

Information needs and the reporting process, computerized PMIS, Earned value analysis, Planning-Monitoring-Controlling cycle, Project control: types of control processes, design of control systems, control of change and scope

UNIT V  PROJECT AUDITING  6

Construction and use of audit report, Project audit life cycle, Essentials of audit and evaluation, Varieties of project termination, the termination process, The Final Report – A project history

REFERENCES:

IE 9170    SERVICES OPERATIONS MANAGEMENT                  L T P C
                       3 0 0 3

UNIT I    INTRODUCTION TO SERVICES                               6

Manufacturing and Services, Definition of Service, Characteristic of Service, Nature of Services, Importance of Activity, Impact of technology

UNIT II   GLOBALIZATION AND STRATEGY                               7

Types of Globalized Services, Outsourcing, issues in Globalization, Service strategies

UNIT III  OPERATIONS ISSUES                                         12

Forecasting, Inventory, capacity Planning, Scheduling

UNIT IV    SERVICE QUALITY AND PRODUCTIVITY                          10

Importance of Quality, Models for Service Quality, GAPS model, issues in productivity measurement, Work measurement

UNIT V     TOOLS FOR SERVICES                                          10

Data Envelopment Analysis, Queuing models, Vehicle Routing models

TOTAL: 45 PERIODS

REFERENCES:

UNIT I  REGRESSION  
Simple Regression, and Correlation – estimation using the regression line, correlation analysis, Multiple Regression and Correlation analysis – finding the multiple regression equation, modeling techniques, Making inferences about population parameters

UNIT II  MULTIVARIATE METHODS  
An overview of multivariate methods, Multivariate normal distribution, Eigen values and Eigen vectors

UNIT III  FACTOR ANALYSIS  
Principal components analysis – objectives, estimation of principal components, testing for independence of variables, Factor analysis model – factor analysis equations and solution

UNIT IV  DISCRIMINANT ANALYSIS  
Discriminant analysis – discrimination for two multi variate normal populations

UNIT V  CLUSTER ANALYSIS  
Cluster analysis – clustering methods, Multivariate analysis of variance

REFERENCES

UNIT I  SYSTEMS ANALYSIS FUNDAMENTALS  
Information systems analysis overview, Classification of information systems, Systems development life cycle, Role of systems analyst, and Role of case tools

UNIT II  INFORMATION REQUIREMENT ANALYSIS  
Sampling and investigating hard data, Interviewing, Using Questionnaires, Developing prototype, System requirements specification, Feasibility analysis

UNIT III  THE ANALYSIS PROCESS  
Data flow diagrams, Data dictionary, Process specifications, presenting the systems proposal

UNIT IV  THE ESSENTIALS OF DESIGN  
Designing effective output, Designing the database, Designing the user interface, Designing data entry procedures

UNIT V  SOFTWARE ENGINEERING AND IMPLEMENTATION  
Quality assurance through software engineering, Implementation approaches, Implementing distributed systems, Object oriented systems analysis and design

REFERENCES:

UNIT I SOFTWARE MEASURES AND METRICS

Measurement theory - Categories of data (Nominal data, Ordinal data, Absolute data (Attribute), Interval data, Ratio data (Continuous Data) - Aspects of Data Quality (correctness, Accuracy, precision, Consistency, Completeness, repeatability) - Base Measures (Size, Cost, Effort, Schedule, Defects, Resources, Changes), Product & Process Metrics.

UNIT II METRICS FRAMEWORK

Goal Question Indicator Metric GQ (I) M Framework - Data Collection & Analysis Plan - Data Collection Systems, Data Validation, Management by Metrics - Key Metrics for each project type.

UNIT III ANALYSIS AND IMPROVEMENTS

Arriving Organizational capability baselines, Arriving Organization Norms – COQ, Productivity, Effort distribution, Phase wise Defect distribution - Using the baselines for Estimation and planning - continual improvement, Corrective and Preventive actions.

UNIT IV ESTIMATION MODELS

Types of Estimation – Effort estimation models – COCOMO.

UNIT V PREDICTION MODELS

Product Quality Prediction Models - Raleigh model, Exponential model.

TOTAL: 45 PERIODS

REFERENCES:

5. http://www.sei.cmu.edu/
UNIT I  INTRODUCTION  
Modern data analytic tools, Stastical concepts: Sampling distributions, resampling, statistical inference, prediction error

UNIT II  LINEAR SYSTEMS ANALYSIS  
Regression modeling, Multivariate analysis, Bayesian modeling, inference and Bayesian networks, Support vector and kernel methods, Analysis of time series: linear systems analysis, nonlinear dynamics

UNIT III  RULE INDUCTION  
Rule induction: rule learning as search, learning first order rules, evaluating quality of rules, ILP systems at work

UNIT IV  TOOLS FOR DATA MODELLING  
Neural networks: learning and generalization, competitive learning, principal component analysis and neural networks; Fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, Stochastic search methods

UNIT V  VISUALIZATION-INTERACTION  
Visualization: Visual data analysis techniques, interaction techniques; Systems and applications: Diversity of IDA applications

TOTAL: 45 PERIODS

REFERENCES:

UNIT I  INTRODUCTION  
Facilities requirement, need for layout study – types of layout.

UNIT II  PLANT LOCATION  
Plant location analysis – factors, costs, location decisions – single facility location models, multi facility location models- set covering problem – warehouse location problems.

UNIT III  LAYOUT DESIGN  
Design cycle – SLP procedure, computerized layout planning procedure – ALDEP, CORELAP, CRAFT

UNIT IV  GROUP TECHNOLOGY AND LINE BALANCING  
Group technology – Production Flow analysis (PFA), ROC (Rank Order Clustering) – Line balancing.

UNIT V  MATERIAL HANDLING  
Principles, unit load concept, material handling system design, handling equipment types, selection and specification, containers and packaging.

TOTAL: 45 PERIODS

REFERENCES:
IE 9154  PRODUCTIVITY MANAGEMENT AND RE-ENGINEERING       L T P C
                                                3 0 0 3

UNIT I  PRODUCTIVITY
9

Productivity Concepts – Macro and Micro factors of productivity – Dynamics of Productivity - Productivity Cycle Productivity Measurement at International, National and Organization level - Productivity measurement models

UNIT II  SYSTEMS APPROACH TO PRODUCTIVITY MEASUREMENT      9

Conceptual frame work, Management by Objectives (MBO), Performance Objectivated Productivity (POP) – Methodology and application to manufacturing and service sector.

UNIT III  ORGANISATIONAL TRANSFORMATION                    9

Elements of Organizational Transformation and Reengineering-Principles of organizational transformation and re-engineering, fundamentals of process re-engineering, preparing the workforce for transformation and re-engineering, methodology, guidelines, LMI CIP Model – DSMC Q & PMP model.

UNIT IV  RE-ENGINEERING PROCESS IMPROVEMENT MODELS          9

PMI models, PASIM Model, Moen and Nolan Strategy for process improvement, LMICIP Model, NPRDC Model.

UNIT V  RE-ENGINEERING TOOLS AND IMPLEMENTATION             9

Analytical and process tools and techniques – Information and Communication Technology – Implementation of Reengineering Projects – Success Factors and common implementation Problem – Cases.

TOTAL: 45 PERIODS

REFERENCES:

UNIT I DEMAND ANALYSIS AND FORECASTING 10

UNIT II PRODUCTION FUNCTION AND COST ANALYSIS 10

UNIT III MARKET COMPETITION AND PRICING 10

UNIT IV PROFIT ANALYSIS 07
The concept of profit: Profit planning, control and measurement of profits. Profit maximisation – Cost volume profit analysis – Investment Analysis.

UNIT V NATIONAL INCOME AND POLICY 08

REFERENCES:
UNIT I OPERATIONAL SAFETY


UNIT II SAFETY APPRAISAL AND ANALYSIS


UNIT III OCCUPATIONAL HEALTH

Concept and spectrum of health functional units and activities of operational health service – occupational and related disease – levels of prevention of diseases – notifiable occupational diseases Toxicology Lead – Nickel, chromium and manganese toxicity – gas poisoning (such as CO, Ammonia Chlorise, So2, H2s.) their effects and prevention – effects of ultra violet radiation and infrared radiation on human system.

UNIT IV SAFETY AND HEALTH REGULATIONS


UNIT V SAFETY MANAGEMENT


TOTAL: 45 PERIODS
TEXT BOOKS:


REFERENCES:

1. Occupational Safety Manual BHEL.
2. Industrial Safety and the law by P.M.C Nair Publishers, Trivandrum.
IE 9168  LOGISTICS AND DISTRIBUTION MANAGEMENT  L T P C
3 0 0 3

UNIT I  INTRODUCTION TO LOGISTICS MANAGEMENT  5

Logistics Management: Definition of logistics and the concepts of logistics. Logistics Activities: Functions of the logistics system – transportation, warehousing, order processing, information handling and procurement

UNIT II  DISTRIBUTION MANAGEMENT  10

Distribution Management, Outbound logistics, Facility location, Classical location problems, Strategic planning models for location analysis, location models, multi objective analysis of location models.

UNIT III  TRANSPORTATION MANAGEMENT  10

Transportation alternatives and technologies; transportation performance analysis; total transportation cost analysis; fleet development and management; fleet performance indicators; routing and scheduling; shipment planning; vehicle loading; transportation management and information systems requirements.

UNIT IV  LOGISTICS MODELLING  10

Logistics Customer Service, Modeling logistics systems, Simulation of logistic systems, cost effective distribution strategies, Value of information in logistics, E-logistics, risk pooling effect, International and global issues in logistics, Integrated functional activities in logistics, Role of government in international logistics and Principal characteristics of logistics in various countries and regions

UNIT V  LOGISTICS IN DIFFERENT INDUSTRIES  10

Logistics in different industries: Third party, and fourth party logistics, Reverse logistics, Airline Schedule Planning, Railway Networks, Postal services, the maritime industries, health care industry and other service industries

REFERENCES:
UNIT I  INTRODUCTION
Definition-development-scope-objectives-importance of individual behavior-cause
Role of learning in shaping behavior- the influence of thinking and perception.

UNIT II  GROUP BEHAVIOR
Group Behavior-Groups- Contributing factors- Group Norms, Communication-
Process-Barriers to communication-Effective communication, leadership-formal and
informal characteristics-Managerial grid-Leadership styles-group Decision making-
Leadership Role in Group Decision, Group Conflicts-Types-Causes-Conflict
Resolution-Intergroup relations and conflicts –Organization centralization and
decentralization-formal and informal- organizational structures- organizational
change and development- change process-resistance to change-culture and ethics

UNIT III  MOTIVATION
Motivation and motivators-The hierarchy of needs theory-the motivation-hygiene
approach to motivation-Expectancy-equity-reinforcement-McClelland’s needs theory
of motivation-special motivational techniques-job enrichment- a systems and
contingency approach to motivation.

UNIT IV  TRAINING AND DEVELOPMENT
Training & Development: Training – Need and Importance – Steps in Training
Programme – Evaluation of Training Programmes – Concept of Management
Development Programme – Techniques of Training and Development – Group
Discussion- Conferences and Seminar – Case Studies – Role Playing – Business
Games – Sensitivity Training – Stages of Career Development.

UNIT V  INDUSTRIAL FATIGUE
Definition-concept-Nature-Effects-causes-Elimination- Safety management practices-
Effect of environment-Hazard control Technology-Working conditions-environmental
conditions

TOTAL: 45 PERIODS

REFERENCES:
2. Ties, AF stoner, and R.Edward Freeman, ‘Management’, PHI Pvt ltd, New
Delhi, 1992.
4. Nicky Hayes, Foundations of Psychology and Introductory Text, Routledge,
## UNIT I  INTRODUCTION

Technology management - Scope, components, and overview. Technology and environment, Technology and society, Technology Impact analysis, environmental, social, legal, political aspects, techniques for analysis - steps involved. Technology policy strategy: Science and technology Policy of India, implications to industry, The dynamics of technology change

## UNIT II  TECHNOLOGY FORECASTING


## UNIT III  TECHNOLOGY CHOICE AND EVALUATION

Issues in the development new high tech products, Methods of analyzing alternate technologies, Techno-economic feasibility studies, Need for multi-criteria considerations such as, social, environmental, and political, Analytic hierarchy method, Fuzzy multi-criteria decision making, and other methods.

## UNIT IV  TECHNOLOGY TRANSFER AND ACQUISITION

Import regulations, Implications of agreements like Uruguay Round and WTO, Bargaining process, Transfer option, MOU- Technology Adoption and Productivity - Adopting technology-human interactions, Organisational redesign and re-engineering, Technology productivity.

## UNIT V  TECHNOLOGY ABSORPTION AND INNOVATION

Present status in India, Need for new outlook, Absorption strategies for acquired technology, creating new/improved technologies, Innovations, Technology Measurement- Technology Audit, Risk and exposure, R&D portfolio management

### TOTAL: 45 PERIODS

### REFERENCES:
5. Irvin M. Rubin, Organisational behavior an experimental approach, Prentice Hall, 1995