Dr.M.G.R.
EDUCATIONAL AND RESEARCH INSTITUTE
UNIVERSITY
(Decl. U/S 3 of UGC Act 1956)
DEPARTMENT OF MECHANICAL ENGINEERING

M.Tech - Industrial Engineering (Part Time)

Curriculum and Syllabus
2013 Regulation

I SEMESTER						
S. No	**Sub. Code**	**Title of the Subject**	**L**	**T**	**P**	**C**
1	MMA130001	Probability And Statistical Methods For Industrial Engineers	3	1	0	4
2	MME13I001	Work System Design	3	0	0	3
3	MMA130013	Operations Research For Industrial Engineers	3	1	0	4
4	MME13IL01	Industrial Engineering Lab.	0	0	4	2
TOTAL			**9**	**2**	**4**	**13**

II SEMESTER						
S. No	**Sub. Code**	**Title of the Subject**	**L**	**T**	**P**	**C**
1	MME13I002	Analysis and Control of Manufacturing Systems	3	0	0	3
2	MME13I005	Manufacturing Systems Modelling	3	0	0	3
3	MME13I006	Simulation Modelling and Analysis	3	0	0	3
4	MME13I007	Quality Engineering	3	0	0	3
TOTAL			**12**	**0**	**0**	**12**

III SEMESTER						
S. No	**Sub. Code**	**Title of the Subject**	**L**	**T**	**P**	**C**
1	MME13I003	Facilities Planning and Design	3	0	0	3
2	MME13I009	Design of Cellular Manufacturing Systems	3	1	0	4
3	MXX13XXX	Elective I	3	0	0	3
4	MME13IL02	Simulation Lab	0	0	4	2
TOTAL			**9**	**1**	**4**	**12**

IV SEMESTER						
S. No	**Sub. Code**	**Title of the Subject**	**L**	**T**	**P**	**C**
1	MME13I008	Supply Chain Management	3	0	0	3
3	MME13I012	Engineering Economics	3	0	0	3
2	MME13I013	Sequencing and Scheduling	3	1	0	4
4	MXX13XXX	Elective II	3	0	0	3
TOTAL			**12**	**1**	**0**	**13**

V SEMESTER						
S. No	**Sub. Code**	**Title of the Subject**	**L**	**T**	**P**	**C**
1	MME13I011	Design and Analysis of Experiments	3	1	0	4
2	MXX13XXX	Elective III	3	0	0	3
3	MXX13XXX	Elective IV	3	0	0	3
4	MME13IL03	Project Phase I	0	0	6	3
TOTAL			**9**	**1**	**6**	**13**

VI SEMESTER						
S. No	**Sub. Code**	**Title of the Subject**	**L**	**T**	**P**	**C**
1	MME13IL04	Project - Phase II	0	0	24	12
TOTAL			**0**	**0**	**24**	**12**

TOTAL NO.OF CREDITS: 75

ELECTIVES						
S. No	**Sub. Code**	**Title of the Subject**	**L**	**T**	**P**	**C**
1.	MME13IE01	Total Quality Management and systems	3	0	0	3
2.	MME13IE02	Reliability Engineering	3	0	0	3
3.	MME13IE03	Productivity Management and Re-Engineering	3	0	0	3
4.	MME13IE05	Maintainability Engineering	3	0	0	3
5.	MME13IE06	Human Factors and Ergonomics	3	0	0	3
6.	MME13IE08	Industrial Automation	3	0	0	3
7.	MME13IE09	System Science and Systems Engineering	3	0	0	3
8.	MME13IE10	Project Management	3	0	0	3
9.	MME13IE11	Industrial Safety and Hygiene	3	0	0	3
10.	MME13IE13	Logistics and Distribution Management	3	0	0	3
11.	MMA13IE01	Advanced Optimization Techniques	3	0	0	3
12.	MBA13AE04	Management Accounting and Financial Management	3	0	0	3
13.	MCS13AE02	Applied Object oriented programming	3	0	0	3
14.	MCS13AE03	Systems Analysis and Design	3	0	0	3

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MMA130001 **PROBABILITY AND STATISTICAL METHODS FOR INDUSTRIAL ENGINEERS** **3 1 0 4**

OBJECTIVES:

- The student will learn basic probability & statistical mathematical tools and techniques which emphasize the development of rigorous logical thinking and analytical skills.
- Also learn the theory and applications of implementation of DOE and testing hypothesis Transformation.

UNIT I: ONE DIMENSIONAL RANDOM VARIABLES **12 Hrs**

Random variables – Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson, Exponential, and normal distributions – Functions of a Random variable.

UNIT II: TWO DIMENSIONAL RANDOM VARIABLES **12 Hrs**

Joint distributions – Marginal and conditional distributions – Functions of two dimensional random variables – Correlation – Regression.

UNIT III: ESTIMATION THEORY **12 Hrs**

Unbiased estimators – Method of moments –Maximum likelihood estimation – Curve fitting by Principle of least squares.

UNIT IV: TESTING OF HYPOTHESIS **12 Hrs**

Tests of Significance – Large Sample Tests – Mean – Proportions – Small Sample Tests – t, F, Chi-square Tests: Independence of Attributes, Goodness of Fit.

UNIT V: DESIGN OF EXPERIMENTS **12 Hrs**

Analysis of Variance – One way classification – Two way classification – Design of Experiments – Completely Randomized Block Design – Randomized Block Design – Latin Square Design.

Total no. of hrs : 60

REFERENCES

1. Richard Johnson A.,(2009) ” *Miller & Freund’s Probability and statistics for Engineers*”, (8th ed), Prentice Hall of India.
2. Richard Johnson A., Wichern .D.W, (2007) “*Applied Multivariate Statistical Analysis*”, (6th ed), Prentice Hall of India
3. Gupta S.C., Kapoor V.K.,(2007), “*Fundamentals of Mathematical Statistics*”, S.Chand & Co.
4. Soong T.T.,(2004) ”*Fundamentals of Probability and Statistics for Engineers*”, John Wiley & Sons

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MME 13I001 **WORK SYSTEM DESIGN** **3 0 0 3**

OBJECTIVES:

- The student will learn basic tools and fundamentals in method study and time which emphasize the improvement of overall productivity and focused theory and applications of ergonomic study.

UNIT I: PRODUCTIVITY **9 Hrs**

Productivity and living standards – work design and Productivity – Productivity measurement-Productivity models, scope of motion and time study - Work methods design.

UNIT II: METHOD STUDY **9 Hrs**

Total work content, developing methods – operation analysis, tools for method analysis , flow process macro analysis, operation – micro analysis, therbligs,multiple activity chart, motion & micro motion study, graphic tools. Method study in office

UNIT III: WORK MEASUREMENT **9 Hrs**

Stop watch time study, Performance rating, allowances, standard data-machining times for basic operations, learning effect

UNIT IV: APPLIED WORK MEASUREMENT **9 Hrs**

Methods time measurement (MTM), Work sampling – Determining time standards from standard data and formulas -Predetermined motion time standards – work factor system – methods time measurement, Analytical Estimation, Measuring work by physiological methods – heart rate measurement – measuring oxygen consumption– establishing time standards by physiology methods.

UNIT V: ERGONOMICS **9 Hrs**

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.

Total no. of hrs : 45

REFERENCES

1. Benjamin W.Niebel,(2009) " *Motion and Time Study*", (9th ed), Richard, D. Irwin Inc
2. Barnes, R.M,(2002) "*Motion and Time Study*", John Wiley
3. (2001) "*Introduction to work study*",(3rd ed), ILO, Oxford & IBH publishing
4. Bridger R.S,(2008) "*Introduction to Ergonomics*", McGraw Hill
5. Prem Vrat,(1998) "*Productivity Management- A systems approach*", Narosa publishing

MMA 130013 OPERATIONS RESEARCH FOR INDUSTRIAL ENGINEERS 3 1 0 4

OBJECTIVES:

- The student will learn basic operation research mathematical tools and techniques which emphasize the development of analytical skills. Also learn theory and applications of implementation of traditional optimization methods.

UNIT I: LINEAR PROGRAMMING 12 Hrs

Formulation of LPP – Standard form of LPP – Graphical method – Simplex method – Big M method – Two phase method.

UNIT II: DUALITY IN LINEAR PROGRAMMING 12 Hrs

Duality – Primal-Dual relation – Dual simplex method – Sensitivity analysis.

UNIT III: TRANSPORTATION AND ASSIGNMENT 12 Hrs

Formulation of Transportation problem – North West corner method – Least cost method – Vogel's approximation method – Optimality test – MODI method – Degeneracy – Assignment problem: Hungarian method – Travelling salesman problem.

UNIT IV: INTEGER AND DYNAMIC PROGRAMMING 12 Hrs

Linear Integer programming – Cutting plane method – Branch and Bound method – Dynamic programming – Formulation.

UNIT V: QUEUING MODELS AND SIMULATION 12 Hrs

Elementary concepts – Pure Birth and Death process – Single server Markovian models with infinite and finite capacity – Multi server Markovian models with infinite and finite capacity – Simulation: Introduction – Monte-Carlo Technique – Generation of Random numbers – Applications to Queuing models.

Total no. of hrs : 60

REFERENCES

1. Sundaresan V. et al.,(2009) "*Resource Management Techniques*", A.R. Publications
2. Panneerselvam R.,(2011) " *Operations Research*", (2nd ed.), Prentice Hall of India
3. Hamdy A. Taha,(2010) " *Operations Research: An Introduction*", (9th ed.), Pearson
4. Hillier, Lieberman,(2005) "*Introduction to Operations Research*", (8th ed.), (IAE), Tata McGraw Hill Publishing Co
5. Hira D.S., Gupta P.K.,(2007) "*Operations Research*", S.Chand & Co

MME 13IL01 **INDUSTRIAL ENGINEERING LAB** **0 0 4 2**

1. Preparation of operation process chart
2. Preparation of two- handed process chart
3. Preparation of multiple activity chart
4. Demonstration of work sampling
5. Experiment to demonstrate methods improvement
6. Experiment to draw learning curve
7. Demonstration of central limit theorem
8. Drawing control chart for variables
9. Drawing control charts for demerits
10. Drawing O-C curve
11. Experiment to demonstrate finished product inspection
12. Experiment to demonstrate control chart – for fraction defectives

MME 13I002 ANALYSIS AND CONTROL OF MANUFACTURING SYSTEMS 3 0 0 3

OBJECTIVES:

- The student will learn the concept of control and analysis of various fields in manufacturing systems. In particular methods involved in forecasting, planning and Inventory control systems.

UNIT I: INTRODUCTION 5 Hrs

Production Management – Input-output model, objectives, Trends and challenges, value chains, operations strategy, Technological Innovations in Manufacturing, Corporate strategic choices, Process planning and selection.

UNIT II: FORECASTING 10 Hrs

The forecasting process, Time series forecasting models – moving averages, exponential smoothing- multi-item forecasting- regression models, qualitative methods, forecasting system controls

UNIT III: PLANNING ACTIVITIES 10 Hrs

Capacity planning, aggregate production planning strategies and methods, Master Production Schedule, MRP, MRP II, CRP, ERP,SAP

UNIT IV: CONTROL ACTIVITIES 10 Hrs

Production Activity Control, Just-in-time systems, Scheduling in Manufacturing, Theory of constraints and synchronous manufacturing.

UNIT V: INVENTORY MANAGEMENT 10 Hrs

Introduction, Types of inventories, reasons for keeping inventories, inventory control, benefits of inventory control, cost associated with inventory, inventory cost relationships, safety stock, inventory models, deterministic and stochastic models, inventory control system, selective control of inventory.

Total no. of hrs : 45

REFERENCES

1. Seetharama L.Narasimhan, Dennis W.McLeavey, Peter J.Billington,(2002) "*Production Planning and Inventory Control*" , PHI
2. Panneerselvam,R,(2005) " *Production and operations management*", PHI
3. Lee J.Krajewski, Larry P.Ritzman,(2000) "*Operations Management*", Pearson Education
4. Mahadevan,B,(2007) " *Operations- Theory & Practice*", Pearson Education

MME 13I005 MANUFACTURING SYSTEMS MODELLING 3 0 0 3

OBJECTIVES:

- The student will learn analytical ability in modelling of manufacturing system. It focused various strategies involved in lean , queuing and markov systems.

UNIT I: INTRODUCTION 5 Hrs

Manufacturing systems – types and concepts, manufacturing automation - Performance measures – types and uses of manufacturing models

UNIT II: FOCUSSED FACTORIES 9 Hrs

GT/CMS, FMS planning, design and control. Process planning – variant and generative approaches of CAPP, general serial systems – analysis of paced and unplaced lines.

UNIT III: LEAN SYSTEMS 9 Hrs

Characteristics of Lean systems for services and Manufacturing, Pull method of work flow, Small lot sizes, Kanban system, Value stream mapping, JIT

UNIT IV: QUEUING MODELS OF MANUFACTURING 10 Hrs

Basic Queuing models, Queuing networks, application of queuing models for AMS.

UNIT V: MARKOV AND PETRINET MODELS OF MANUFACTURING 12 Hrs

Stochastic processes in manufacturing, discrete and continuous time Markov chain models. Concepts of Petri nets, ETPN and GSPN models.

Total no. of hrs : 45

REFERENCES

1. Nicolas, J.M,(2001) "*Competitive manufacturing management - continuous improvement lean production, customer focused quality*", McGraw-Hill, NY
2. Viswanadam, N and Narahari, Y,(1996) "*Performance modeling of automated manufacturing systems*", PHI, New Delhi
3. Lee J. Krajewski,(2008) "*Operations Management – Processes and Value Chains*", Pearson

MME13I006 SIMULATION MODELLING AND ANALYSIS 3 0 0 3

OBJECTIVES:

- The student will learn various steps involved in system simulation and import the implementation knowledge with soft skill.

UNIT I: INTRODUCTION 3 Hrs

Systems, modeling, general systems theory, concept of simulation, simulation as a decision making tool, mathematical and statistical models. Modeling formalism simulators ,DEVS,DTSS,DESS.

UNIT II: RANDOM NUMBERS AND VARIATES 5 Hrs

Pseudo random numbers, techniques and tests for random numbers, inverse-transforms, acceptance-rejection techniques, special properties of variates.

UNIT III: DESIGN OF SIMULATION EXPERIMENTS 8 Hrs

Problem formulation, data collection and reduction, time flow mechanism, key variables, logic flow chart, starting condition, run size, experimental design consideration, output analysis and interpretation validation.

UNIT IV: APPLICATIONS 14 Hrs

Simulation of manufacturing and material-handling system, performance measures, various failures. Comparison and selection of simulation languages, study of any one simulation language.

UNIT V: CASE STUDIES / MINI PROJECT 15 Hrs

Development of simulation models using the simulation language studied for systems like, queuing systems, production systems, inventory systems, maintenance and replacement systems, investment analysis and network.

Total no. of hrs : 45

REFERENCES

1. Jerry Banks and John S.Carson, Barry L Nelson, David M.Nicol, P.Shahabudeen,(2009) "*Discrete event system simulation*", Pearson Education
2. Law A.M,(2008) "*Simulation Modelling and Analysis*", Tata Mc Graw Hill
3. Thomas J.Schriber,(1991) "*Simulation using GPSS*", John Wiley
4. Kelton, W. David,(2006) "*Simulation with Arena"*, McGraw-Hill
5. Bernard P.Zeigler,Herbert Praehofer,(2000) "*Theoryof Modeling &Simulation*", Elsevier Science

MME13I007 **QUALITY ENGINEERING** **3 0 0 3**

OBJECTIVES:

- The student will learn basics and importance of quality control engineering which emphasize the development of logical and analytical skills. Theory and applications of implementation of traditional statistical tools, acceptance sampling

UNIT I: QUALITY CONCEPTS **5 Hrs**

Quality Dimensions – Quality definitions - Quality control – Quality Assurance – Quality planning - Quality costs – Economics of quality – Quality loss function.

UNIT II: STATISTICAL PROCESS CONTROL **10 Hrs**

Process variability – Control charts for variables, Warning control limits – process capability, machine capability and gauge capability studies – Statistical tolerance.

UNIT III: OTHER CONTROL CHARTS **8 Hrs**

Control charts for variables, Control charts for attributes, Demerit control chart, control charts for individual measurement, moving range chart, multi-variate chart, cumulative sum (CUSUM) chart.

UNIT IV: ACCEPTANCE SAMPLING **10 Hrs**

Economics of sampling – Acceptance sampling by variables and attributes – Single, double and sequential plans – OC curves – ATI, ASN, AOQL – Standard sampling tables-IS2500, Dodge- Roaming and MIL- standards.

UNIT V: TOTAL QUALITY MANAGEMENT AND SIX SIGMA **12 Hrs**

TQM concepts, Quality system, Seven tools of quality, 5S, QFD, KAIZEN, POKA YOKE, Six sigma concepts – DMAIC/ DMADV approach.

Total no. of hrs : 45

REFERENCES

1. Douglas, C. Montgomery,(2007) "*Introduction to Statistical Quality Control*", (IVnd ed.), John Wiley & Sons
2. Grant, E.L. and Leavenworth, R.S.,(2000), "*Statistical Quality Control*", TMH
3. Dale H.Besterfiled,(2002) "*Total Quality Management*", Pearson Education Asia

MME 13I003 **FACILITIES PLANNING AND DESIGN** **3 0 0 3**

OBJECTIVES:

- The student will learn the concepts and basic tools in facilities planning. It focused various strategies involved in plan location, layout design and material handling systems.

UNIT I: INTRODUCTION **5 Hrs**

Facilities planning, significance, objectives, requirement, process, product and schedule design, need for layout study – types of layout

UNIT II: PLANT LOCATION **10 Hrs**

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 **10 Hrs**

Design cycle – SLP procedure, nadler's ideal approach, flow and activity analysis, computerized layout planning procedure – ALDEP, CORELAP, CRAFT

UNIT IV: GROUP TECHNOLOGY AND LINE BALANCING **10 Hrs**

Group technology – Production Flow analysis (PFA), ROC (Rank Order Clustering) – Line balancing, single, multi and mixed mode, parallel line and parallel station

UNIT V: MATERIAL HANDLING **10 Hrs**

Principles, unit load concept, material handling system design, handling equipment types, selection and specification, handling cost, containers and packaging

Total no. of hrs : 45

REFERENCES

1. Tompkins, J.A. and J.A.White,(2003) "*Facilities planning*", John Wiley
2. Richard Francis.L. and John A.White,(2002) "*Facilities Layout and location - an analytical approach*", PHI
3. James Apple.M,(1977) "*Plant layout and Material Handling*", John Wiley
4. Pannerselvam,R,(2007) "*Production and Operations Management*", PHI

MME13I009 DESIGN OF CELLULAR MANUFACTURING SYSTEMS 3 1 0 4

OBJECTIVES:

- The student will learn basic methodology of cellular manufacturing system which emphasizes more on implementation and performance measures of group technology. Also focused theory and applications of design, planning and control for cell performance

UNIT I: INTRODUCTION 8 Hrs

Introduction to Group Technology, limitations of traditional manufacturing systems, characteristics and design of groups, benefits of GT and issues in GT.

UNIT II: CMS PLANNING AND DESIGN 15 Hrs

Problems in GT/CMS - Design of CMS – Production Flow Analysis, Optimization Models, traditional approaches and non-traditional approaches- Simulated Annealing, Genetic Algorithms

UNIT III: IMPLEMENTATION OF GT/CMS 13 Hrs

Inter and intra cell layout and capacity planning. Managerial structure and groups, batch sequencing and sizing, life cycle issues in GT/CMS. Linkages to JIT systems

UNIT IV: PERFORMANCE MEASUREMENT AND CONTROL 13 Hrs

Measuring CMS performance - Parametric analysis - PBC in GT/CMS, cell loading, GT and MRP - framework.

UNIT V: ECONOMIC OF GT/CMS 11 Hrs

Conventional Vs group use of computer models in GT/CMS, Human aspects of GT/CMS - cases.

Total no. of hrs : 60

REFERENCES

1. Burbidge, J.L,(1979) "*Group Technology in Engineering Industry*", Mechanical Engineering pub. London
2. Askin, R.G and Vakharia, A.J., "*GT planning and operation, in The automated factory - Hand book: Technology and Management*", Cleland, D.I and Bidananda, B (Eds), TAB Books, NY
3. Irani, S.A, "*Cellular Manufacturing Systems - Hand book*".
4. Kamrani, A.K,, Parsaei, H.R and Liles, D.H. (Eds),(1995) "*Planning, design and analysis of cellular manufacturing systems*", Elsevier
5. Askin, R.G., and Strandridge, C.R.,(1993) "*Modelling and Analysis of Manufacturing Systems*", John Wiley and Sons
6. Askin, R. G. and J. B. Goldberg,(2002) "*Design and Operation of Lean Production Systems*", John Wiley & Sons, New York

MME13IL02 **SIMULATION LAB** **0 0 4 2**

OBJECTIVES:

- The student will learn various GUI based simulation software knowledge in the management system. Also import algorithm knowledge in the management system.

1. Modeling and simulation of facilities layout using WITNESS software
2. Modeling and simulation Transportation models using ARENA software
3. Modeling and simulation job shop scheduling using QUEST software
4. Modeling and simulation in SIMQUICK software
5. Modeling and simulation material handling system using PROMODEL software
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/LABVIEW)

MME13I008 **SUPPLY CHAIN MANAGEMENT** **3 0 0 3**

OBJECTIVES:

- The student will learn basic conceptual idea of supply chain management systems and its internal structural systems. Also focused the theory and applications of SCM networks with simple case study.

UNIT I: INTRODUCTION **6 Hrs**

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

UNIT II: LOGISTICS MANAGEMENT **10 Hrs**

Factors – Modes of Transportation - Design options for Transportation Networks-Routing and Scheduling – Inbound and outbound logistics- Reverse Logistics – 3PL- Integrated Logistics Concepts- Integrated Logistics Model – Activities - Measuring logistics cost and performance – Warehouse Management - Case Analysis

UNIT III: SUPPLY CHAIN NETWORK DESIGN **10 Hrs**

Distribution in Supply Chain – Factors in Distribution network design –Design options-Network Design in Supply Chain – Framework for network Decisions - Managing cycle inventory and safety.

UNIT IV: SOURCING AND PRICING IN SUPPLY CHAIN **9 Hrs**

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

UNIT V: COORDINATION AND TECHNOLOGY IN SUPPLY CHAIN **10 Hrs**

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 no. of hrs : 45

REFERENCES

1. Sunil Chopra and Peter Meindl,(2007) "*Supply Chain Management, Strategy, Planning, and operation*", (2nd ed.), PHI
2. David J.Bloomberg, Stephen Lemay and Joe B.Hanna,(2002), " *Logistics*", PHI
3. Martin Christopher, "*Logistics and Supply Chain Management –Strategies for Reducing Cost and Improving Service*", (2nd ed.), Pearson Education Asia
4. Jeremy F.Shapiro, Thomson Duxbury, (2002) " *Modeling the supply chain*"
5. James B.Ayers,(2000) "*Handbook of Supply chain management*", St.Lucle Press

MME13I012 **ENGINEERING ECONOMICS** **3 0 0 3**

OBJECTIVES:

- The student will learn basic conceptual idea of engineering economics which emphasize the importance of demand and supply. Also learn the theory and applications of forecasting techniques, market competition and national income and its policies.

UNIT I: DEMAND ANALYSIS AND FORECASTING **10 Hrs**

Managerial Economics – Meaning, Nature and Scope – Managerial Economics and Business decision making – Role of Managerial Economist – Demand Analysis – Fundamental Concepts of Managerial Economics – Meaning, Determinants and Types of Demand – Elasticity of demand - Demand forecasting and forecasting methods.

UNIT II: PRODUCTION FUNCTION AND COST ANALYSIS **10 Hrs**

Supply: Meaning and determinants – production function- Isoquants – Expanstion path Cobb Douglas function – Cost concepts – Cost output relationship – Economies and diseconomies of scale – Cost functions- Determination of cost- Estimation of cost.

UNIT III: MARKET COMPETITION AND PRICING **10 Hrs**

Market Structure – Various forms – Equilibrium of a firm – Perfect competition – Monopolistic competition – Oligopolistic competition – Pricing of products under different market structures – Methods of pricing – Factors affecting pricing decision – Differential pricing – Government Intervention and pricing.

UNIT IV: PROFIT ANALYSIS **07 Hrs**

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 Hrs**

National Income – Accounting – Consumption and investment – Business Cycle and unemployment – Inflation and deflation, Balance of Payments – Monetary and Fiscal policies.

Total no. of hrs : 45

REFERENCES

1. A. Ramachandra Aryasry and V.V. Ramana Murthy(2004) " *Engineering Economics and Financial Accounting*", Tata Mc graw Hill Publishing Company Ltd., New Delhgi
2. V.L. Mote, Samuel and G.S.Gupta,(1981) "*Managerial Economics – Concepts and cases*", Tata McGraw Hill Publishing Company Ltd, New Delhi
3. A.Nag,(1999) "*Macro Economics for Management Students*", MacMillan India Ltd., New Delhi.

MME13I013 **SEQUENCING AND SCHEDULING** **3 1 0 4**

OBJECTIVES:

- The student will learn mathematical tools and its algorithms in sequencing and scheduling which emphasize the improvement of productivity and time. Also learn the theory and applications of various patterns like parallel machine, flow shop, job shop problems.

UNIT I: SINGLE MACHINE MODELS **12 Hrs**

Single machine models - Scheduling function and theory – scheduling problem: objectives, constraints – pure sequencing – performance measures, sequencing theorems - SPT, EDD. Sequence – minimization of mean flow time, mean tardiness etc – branch and bound algorithm –assignment model.

UNIT II: PARALLEL MACHINE MODELS **12 Hrs**

Parallel machine models - Independent jobs Minimizing makespan, completion time, due date and on-line problems.

UNIT III: FLOW SHOP MODELS **12 Hrs**

Flow shop models - Johnson's problem – Extension of Johnsons's rule for 3 machine problem – Jackson's method – algorithm – Palmer's method.

UNIT IV: JOB SHOP MODELS **12 Hrs**

Job shop models – disjunctive, shifting bottle neck, weighted tardiness, makespan, dynamic job shop simulation.

UNIT V: SCHEDULING IN PRACTICES **12 Hrs**

Other models - Scheduling of intermittent production: Resource smoothing – Giffler Thomson algorithm – Branch and Bound method – Scheduling of continuous production - Line balancing.

Total no. of hrs : 60

REFERENCES

1. Michael Pinedoo,(2010) "*Scheduling: theory, algorithms and systems*",(4th ed.), Prentice Hall, New Delhi
2. King, J.R,(1975) "*Production planning and control*", Pergamon International Library
3. Kenneth R.Baker,(1974) "*Introduction to sequencing and scheduling*", John Wiley and Sons

MME13I011 DESIGN AND ANALYSIS OF EXPERIMENTS 3 1 0 4

OBJECTIVES:

- The student will learn basic mathematical tools in design of experiments which emphasize the development of rigorous logical thinking and analytical skills. Also learn the theory and applications of implementation of special experiment design and Taguchi method.

UNIT I: EXPERIMENTAL DESIGN FUNDAMENTALS 9 Hrs

Importance of experiments, experimental strategies, basic principles of design, terminology, ANOVA, steps in experimentation, sample size, normal probability plot, linear regression model.

UNIT II: SINGLE FACTOR EXPERIMENTS 12 Hrs

Completely randomized design, Randomized block design, Latin square design. Statistical analysis, estimation of model parameters, model adequacy checking, pair wise comparison tests.

UNIT III: MULTIFACTOR EXPERIMENTS 13 Hrs

Two and three factor full factorial experiments, 2^K factorial Experiments, Confounding and Blocking designs.

UNIT IV: SPECIAL EXPERIMENTAL DESIGNS: 13 Hrs

Fractional factorial design, nested designs, Split plot design, Introduction to Response Surface Methodology, Experiments with random factors, rules for expected mean squares, approximate F- tests.

UNIT V: TAGUCHI METHODS 13 Hrs

Steps in experimentation, design using Orthogonal Arrays, data analysis, Robust design- control and noise factors, S/N ratios, parameter design, case studies.

Total no. of hrs : 60

REFERENCES

1. Montgomery, D.C.,(2011) "*Design and Analysis of experiments*",(7th ed.) John Wiley and Sons
2. Nicolo Belavendram,(1995) "*Quality by Design; Taguchi techniques for industrial experimentation*", Prentice Hall
3. Phillip J.Rose,(1996) "*Taguchi techniques for quality engineering*", McGraw Hill

MME13IL03 **PROJECT PHASE I** **0 0 6 3**

OBJECTIVES:

- The student will learn the partial research methodology of any mechanical real-world problem.
- They will learn how to use methods/tools to resolve those problems.
- They will have extensive literature survey of the problem selected.

Students should select the area of the project work and complete the literature survey.
Student should identify the problem of study and start the work.
Students are expected to do the project work individually.
A guide will be allotted to each student based on the area of the Project work.
Project reviews will be conducted once in a fortnight to asses the development of the project work.
At the end of the semester students should submit a report of the work completed and should appear for a Project Viva- voce examination conducted by the internal examiner.
Continuous assessment mark (50 marks) will be awarded based on the performance in the reviews.
End semester mark (50 marks) will be awarded for project viva voce examination.

MME13IL04 **PROJECT PHASE II** **0 0 24 12**

OBJECTIVES:

- To implement their innovative ideas to solve the real time industrial engineering problems.
- To apply the industrial engineering to solve the problems.

Students are expected to do a Project work either in an Industry or at the University in the area of specialization individually. Each student will be allotted a guide based on the area of Project work

Number of reviews will be conducted during the semester to monitor the development of project. Students have to submit the thesis at the end of the semester and appear for the Project Viva-Voce examination conducted by one internal examiner and one external examiner.

It is mandatory that the student should have presented his project work as a technical paper in National/international conference /Journals. A copy of the certificate in proof of paper presentation should be enclosed in the project report.

50% weightage (100 marks) will be given for the continuous assessment and 50% weightage (100 marks)for the Project viva a voce examination.

MME13IE01 TOTAL QUALITY MANAGEMENT AND SYSTEMS 3 0 0 3

OBJECTIVES:

- A world-wide concept of the best management principles to be studied for effective implementation to achieve best results in terms of customer satisfaction and interests of company.

UNIT I: CONCEPTS AND PHILOSOPHY 9 Hrs

Basic concepts, need for TQM, principles of TQM, Quality philosophies of Deming, Crosby, Juran, Ishikawa and Feigenbaum, TQM models.

UNIT II: TQM PROCESS 9 Hrs

QC tools, problem solving methodologies, new management tools, quality circles, bench marking, strategic quality planning.

UNIT III: TQM SYSTEMS 9 Hrs

Quality policy deployment, quality function deployment, introduction to BPR and FMEA.

UNIT IV: QUALITY SYSTEM 9 Hrs

Need for ISO 9000 system, advantages, clauses of ISO 9000, Implementation of ISO 9000, QS9000 systems, introduction to EMS, quality costs, quality auditing, case studies.

UNIT V: IMPLEMENTATION OF TQM 9 Hrs

KAIZEN, 5S, JIT, POKAYOKE, Taguchi methods, steps in TQM implementation, national and international quality awards, case studies.

Total no. of hrs : 45

REFERENCES

1. Dale H.Besterfiled,(2005) "*Total Quality Management*", Pearson Education Asia,
2. Rose, J.E,(1993) "*Total Quality Management*", Kogan Page Ltd
3. John Bank,(1993) "*The essence of total quality management*", PHI
4. Greg Bounds, Lyle Yorks et al,(1994) "*Beyond Total Quality Management*", McGraw Hill
5. Takashi Osada,(1991) "*The 5S's The Asian Productivity Organisation*".
6. Masaki Imami,(1986) " *KAIZEN*", McGraw Hill

MME13IE02 **RELIABILITY ENGINEERING** **3 0 0 3**

OBJECTIVES:

- Improvement of Reliability of equipment by various scientific methods and implementation of them, for optimal life and efficiency in functioning of equipments to be studied.

UNIT I: RELIABILITY CONCEPT **9 Hrs**

Reliability definition – Reliability applications – Reliability mathematics – f(t), F(t), R(t) functions – Hazard rate function – Reliability parameters – Measures of central tendency – Design life –A priori and posteriori probabilities – Component mortality –Mortality curve – Useful life.

UNIT II; LIFE DATA ANALYSIS **11 Hrs**

Data classification –Nonparametric methods: Ungrouped, Grouped, Complete, Censored data – Time to failure distributions – Probability plotting: Exponential, Weibull –Goodness of fit tests – Survival graphs.

UNIT III: RELIABILITY MODELLING **10 Hrs**

Series parallel configurations – Parallel redundancy – k out of n system – Complex systems: RBD method – Baye's approach – Minimal path and cut sets – Fault Tree Analysis – Standby system – Physical reliability models.

UNIT IV: RELIABILITY MANAGEMENT **8 Hrs**

Reliability testing: Failure terminated test – Time terminated test – Upper and lower MTBFs –Sequential Testing – Reliability growth monitoring – Reliability allocation – Software reliability – Human reliability.

UNIT V: RELIABILITY IMPROVEMENT **7 Hrs**

Analysis of downtime – Repair time distribution – System repair time – Maintainability prediction – Measures of maintainability – Availability definitions –System Availability – Replacement decisions – Economic life.

Total no. of hrs : 45

REFERENCES

1. Charles E. Ebeling,(2000) "*An introduction to Reliability and Maintainability Engineering*", TMH
2. Roy Billington and Ronald N. Allan,(2007) "*Reliability Evaluation of Engineering Systems*", Springer

MME13IE03 PRODUCTIVITY MANAGEMENT AND RE-ENGINEERING 3 0 0 3

OBJECTIVES:

- To improve the existing processes in manufacturing by re-engineering, and management with analytical tools and models and a study of the success factors after implementing them.

UNIT I: PRODUCTIVITY 9 Hrs

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

UNIT II: SYSTEMS APPROACH TO PRODUCTIVITY MEASUREMENT 9 Hrs

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

UNIT III: ORGANISATIONAL TRANSFORMATION 9 Hrs

Elements of Organisational 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 Hrs

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

UNIT V: RE-ENGINEERING TOOLS AND IMPLEMENTATION 9 Hrs

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

Total no. of hrs : 45

REFERENCES

1. Sumanth, D.J.,(1990) "*Productivity Engineering and Management*", TMH, New Delhi
2. Edosomwan, J.A.,(1996) "*Organisational Transformation and Process Re-engineering*", Library Cataloging in Pub. Data
3. Rastogi, P.N.,(1995) "*Re-engineering and Re-inventing the Enterprise*", Wheeler Pub. New Delhi
4. Premvrat, Sardana, G.D. and Sahay, B.S.,(1998) "*Productivity Management – A Systems Approach*", Narosa Publishing House. New Delhi

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DEPARTMENT OF MECHANICAL ENGINEERING

MME13IE05 **MAINTAINABILITY ENGINEERING** **3 0 0 3**

OBJECTIVES:

- Productive maintenance theories and models for loss prevention and quality functioning of machines and other equipments are necessary for control and improvement in maintenance.

UNIT I: MAINTENANCE CONCEPT **6 Hrs**

Need for maintenance – Maintenance definition – Maintenance objectives – Challenges of Maintenance management – Tero technology – Scope of maintenance department – Maintenance costs.

UNIT II: MAINTENANCE MODELS **12 Hrs**

Proactive/Reactive maintenance – Imperfect maintenance – Maintenance policies – PM versus b/d maintenance – Optimal PM schedule and product characteristics – Optimal Inspection frequency: Maximizing profit – Minimizing downtime – Replacement models.

UNIT III: MAINTENANCE LOGISTICS **11 Hrs**

Human factors – Crew size decisions: Learning curves – Simulation – Maintenance resource requirements: Optimal size of service facility – Optimal repair effort – Maintenance planning – Maintenance scheduling – Spare parts control – Capital spare.

UNIT IV: MAINTENANCE QUALITY **8 Hrs**

Maintenance excellence –Five Zero concept –FMECA –Root cause analysis – System effectiveness – Design for maintainability – Maintainability allocation – CMMS – Reliability Centered Maintenance.

UNIT V: TOTAL PRODUCTIVE MAINTENANCE **8 Hrs**

TPM features – Chronic and sporadic losses – Equipment defects – Six major losses – Overall Equipment Effectiveness – TPM pillars –TPM implementation – Autonomous maintenance.

Total no. of hrs : 45

REFERENCES

1. Andrew K.S.Jardine & Albert H.C.Tsang,(2006) "*Maintenance, Replacement and Reliability*", Taylor and Francis
2. Bikas Badhury & S.K.Basu,(2003) "*Tero Technology: Reliability Engineering and Maintenance Management*", Asian Books
3. Seichi Nakajima,(1993) "*Total Productive Maintenance*", Productivity Press

MME13IE06 **HUMAN FACTORS AND ERGONOMICS** **3 0 0 3**

OBJECTIVES:

- Design of various equipments, facilities and environment to achieve health and comfort in their usage and standardizing the size and dimensions of various engineering items are aimed in this study.

UNIT I: PHYSIOLOGICAL PERFORMANCE **10 Hrs**

Factors affecting physiological performance, physical work load and energy expenditure, heat stress, manual lifting, shift work

UNIT II: WORK SPACE DESIGN **10 Hrs**

Anthropometry, Workspace designs for standing and seated workers, arrangement of components within a physical space, interpersonal aspect of workplace design.

UNIT III: DESIGN OF EQUIPMENT **10 Hrs**

Ergonomic factors to be considered in the design of displays and control, design for maintainability, design of human computer interaction.

UNIT IV: COGNITIVE ERGONOMICS **5 Hrs**

Information Theory, Information processing, signal detection theory, Human response, human errors, cognitive task analysis.

UNIT V: DESIGN OF ENVIRONMENT **10 Hrs**

Vision and Illumination design – Noise and Vibration

Total no. of hrs : 45

REFERENCES

1. Martin Helander,(2006) "*A guide to Human Factors and Ergonomics*", (2nd ed.), CRC, Taylor & Francis Group
2. Bridger, R.S.,(1995) "*Introduction to Ergonomics*", McGraw Hill.
3. MeCormik, J.,(1992) "*Human Factors Engineering and Design*", McGraw Hill

MME13IE08 **INDUSTRIAL AUTOMATION** **3 0 0 3**

OBJECTIVES:

- Usage of computer software programs for performance and production in industries and making the best economical decisions taking into factors of speed, accuracy, less manpower cost, quality and customer satisfaction.

UNIT I: AUTOMATION **5 Hrs**

Types of production – Functions – Automation strategies – Production economics – Costs in manufacturing – Break-even analysis.

UNIT II: AUTOMATED FLOW LINES **10 Hrs**

Transfer mechanism - Buffer storage – Analysis of transfer lines - Automated assembly systems.

UNIT III: NUMERICAL CONTROL AND ROBOTICS **10 Hrs**

NC-CNC – Part programming – DNC – Adaptive control – Robot anatomy – Specifications – End effectors – Sensors - Robot cell design – CAD/CAM.

UNIT IV: AUTOMATED HANDLING AND STORAGE **10 Hrs**

Automated material handling systems – AS/RS – carousel storage – Automatic data capture – bar code technology

UNIT V: MANUFACTURING SUPPORT SYSTEMS **10 Hrs**

Product design and CAD, CAD/CAM and CIM, Computer aided process planning- variant and generative approaches, Concurrent engineering and design for manufacture, Lean production, Agile manufacturing.

Total no. of hrs : 45

REFERENCES

1. Mikell P.Groover,(2003) "*Automation, Production Systems and Computer Integrated Manufacturing*", PHI
2. Weatherall,(1995) "*Computer Integrated Manufacturing – A total company strategy*", (2nd ed.)

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DEPARTMENT OF MECHANICAL ENGINEERING

MME13IE09 SYSTEM SCIENCE AND SYSTEMS ENGINEERING 3 0 0 3

OBJECTIVES:

- Study of scientific systems and options to choose the best system basing on analytical models and tools applicable to various industries and for proper management decisions in engineering industries.

UNIT I: SYSTEMS SCIENCE CONCEPTS 10 Hrs

System as a function of system-hood and thing-hood, Systems thinking, Evolution of systems movement, Framework of deductive and inductive approaches, classification systems models, Methodological paradigms, Laws of systems science, Organized complexity, Systems simplification

UNIT II: SYSTEMS ENGINEERING PROCESSES 10 Hrs

Life cycles-Phases-Steps, Formulation of Issues: Problem Identification – Scoping – Bounding, Problem definition – Identification of needs, alterables, constraints; Value System Design: Objectives and objective measures; Generation of Alternatives/ system synthesis – Identification of activities and activity measures; Functional decomposition and analysis
Tools: Objectives hierarchies – trees, cross interaction matrix; Functional analysis approaches – SADT, DFD, CFD, FFBD, ICOM, Node tree, Context diagram, decomposition; BPR, QFD, Brain storming, Brain writing, Groupware, Delphi, Morphological box

UNIT III: ANALYSIS OF ALTERNATIVES 10 Hrs

Uncertain/ Imperfect information; Cross-impact analysis, Hierarchical inference, logical reasoning inference; Structural modeling; System Dynamics;
Tools: Coupled uncoupled events – Baye's model – event trees, Causal loop diagram, probability trees; Structural models – Tree structures, reachability graph and matrix, Causal loop diagrams, influence diagrams, decision trees; System Dynamic Models – population models, urban dynamics, world dynamic models; Economic models

UNIT IV: INTERPRETATION OF ALTERNATIVES AND DECISION MAKING 10 Hrs

Types of decisions – descriptive, prescriptive, normative; Decision assessment efforts types – under certainty, probabilistic uncertainty, probabilistic imprecision, information imperfection, conflict and cooperation; Prescriptive normative decision assessments; Utility theory; Group decision making, Game Theory

UNIT V: SYSTEMS ENGINEERING MANAGEMENT CONCEPTS 5 Hrs

Organizational structures, SE management plan; Network based systems planning and management methods; Cognitive factors in SE.

Total no. of hrs : 45

REFERENCES

1. Andrew P Sage and James E Armstrong,(2000) "*Introduction to Systems Engineering*",Wiley Series
2. George J Klir,(2001) "*Facets of Systems Science*", Kluwer Publishers

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MME13IE10 **PROJECT MANAGEMENT** **3 0 0 3**

OBJECTIVES:

- Handling of Projects with proper planning and control and close monitoring to avoid wastage of inputs, risks, losses are to be studied with mathematical tools and standard software programs.

UNIT I: STRATEGIC MANAGEMENT AND PROJECT SELECTION 9 Hrs

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

UNIT II: PROJECT PLANNING 9 Hrs

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

UNIT III: PROJECT IMPLEMENTATION 12 Hrs

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 Hrs

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 Hrs

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

Total no. of hrs : 45

REFERENCES

1. Jack R. Meredith, and Samuel J. Mantel Jr.,(2006) "*Project Management – A Managerial Approach*", John Wiley and Sons
2. Harold Kerzner,(2006) "*Project Management – A Systems Approach to Planning, Scheduling and Controlling*",John Wiley and Sons

MME13IE11 INDUSTRIAL SAFETY AND HYGIENE 3 0 0 3

OBJECTIVES:

- For bringing high awareness for ensuring safe operations in industries, by appraisal of various factors involved in occupation of the employees and implementing the safety measures adopting cost-effective methods.

UNIT I: OPERATIONAL SAFETY 9 Hrs

Hot metal operation, boiler, pressure vessels – heat treatment shop – gas furnace operation – electroplating – hot bending pipes – safety in welding and cutting, Cold – metal operation – safety in machine shop – cold bending and chamfering of pipes- metal cutting – shot blasting, grinding, painting – power press and other machines. Management of toxic gases and chemicals – industrial fires and prevention – road safety – highway and urban safety – safety of sewage disposal and cleaning – control of environmental pollution – managing emergencies in industries – planning security and risk assessments, on – site and off site. Control of major industrial hazards.

UNIT II: SAFETY APPRAISA L AND ANALYSIS 9 Hrs

Human side of safety – personal protective equipment – causes and cost of accidents. Accidents prevention program – specific hazard control strategies – HAZOP training and development of employees – first aid – fire fight devices – accident reporting, investigation. Measurement of safety performance, accident reporting and investigation – plant safety inspection, job safety analysis – safety permit procedures. Product safety – plant safety rules and procedures – safety sampling – safety inventory systems. Determining the cost effectiveness of safety measurement.

UNIT III: OCCUPATIONAL HEALTH 9 Hrs

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 9 Hrs

Safety and health standards – industrial hygiene – occupational diseases prevention welfare facilities. The object of factories act 1948 with special reference to safety provisions, model rules 123a, history of legislations related to safety – pressure vessel act – Indian boiler act – the environmental protection act – electricity act – explosive act.

UNIT V: SAFETY MANAGEMENT 9 Hrs

Evaluation of modern safety concepts – safety management functions – safety organization, safety department-safety committee, safety audit – performance measurements and motivation – employee participation in safety - safety and productivity.

Total no. of hrs : 45

REFERENCES

1. John.V .Grimaldi and Rollin. H Simonds,(1989) "*Safety Managenent*", All India traveler book seller, New Delhi
2. Krishnan N.V,(1996) "*Safety in Industry*", Jaico Publisher House
3. "*Industrial Safety and the law*", P.M.C Nair Publishers, Trivandrum
4. Singh, U.K and Dewan, J.M.,(1996) "*Sagety, Security And Risk Management*", APH publishinf company, New Delhi
5. John V Grimaldi,(2003) "*Safety Management*", AITB publishers

MME13IE13 LOGISTICS AND DISTRIBUTION MANAGEMENT 3 0 0 3

OBJECTIVES:

- Study of economical safe transportation and efficient distribution methods by selecting proper logistic models as applicable to different industries. Knowledge of global issues in diverse transportation areas and inferences to improve governing of logistics to be studied.

UNIT I: INTRODUCTION TO LOGISTICS MANAGEMENT 5 Hrs

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 Hrs

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 Hrs

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 Hrs

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 Hrs

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

Total no. of hrs : 45

REFERENCES

1. David Bloomberg, Stephen LeMay, Joe Hanna,(2002) "*Logistics*", Prentice Hall
2. Thomas Teufel, Jurgen Rohricht, Peter Willems,(2002) "*SAP Processes: Logistics*", Addison-Wesley
3. Julien Bramel, David Simchi-Levi,(2006) "*The logic of logistics: theory, algorithms, and applications for logistics management*", Springer
4. Murphy, G.J, "*Transport and Distribution*", (2nd ed.), Business Books
5. Ballou, R.H.,(2004) "*Business Logistics Management/Supply Chain*", (5th ed.), Prentice-Hall

MMA13IE01 ADVANCED OPTIMIZATION TECHNIQUES 3 0 0 3

OBJECTIVES:

- Developing skills in analysis and finding optimized methods with diverse input parameters and developing problem solving techniques using updated mathematical models, algorithms, software programs and simulations.

UNIT I: INTRODUCTION 7 Hrs

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

UNIT II: NON- LINEAR PROGRAMMING 11 Hrs

Karmakars method of solving L.P. problems, Integer linear programming methods and applications, Quadratic programming, non-linear programming – unconstrained optimization techniques, Basics of constrained optimization, Introduction to integer non-linear programming, Basics of geometric programming

UNIT III: CONSTRAINED OPTIMIZATION 9 Hrs

Kuhn-Tucker, transformation, sensitivity analysis, direct search, linearised search, reduced gradient, gradient projection, computer program- Penality function method

UNIT IV: MULTI-OBJECTIVE MODELS 10 Hrs

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

UNIT V: META-HEURISTIC MODELS 8 Hrs

Introduction to Genetic algorithms, Tabu and Scatter search algorithms, Ant, Simulated Annealing, neural network , fuzzy system.

Total no. of hrs : 45

REFERENCES

1. Kalyanmoy Deb,(2004) “Optimization for Engineering design – algorithms and examples”, PHI, New Delhi
2. Singiresu S.Rao,(2009) “Engineering optimization – Theory and practices”, John Wiley and Sons
3. Garfinkel, R.S. and Nemhauser, G.L.,(1972) “Integer programming”, John Wiley & Sons

MBA13AE04 MANAGEMENT ACCOUNTING & FINANCIAL MANAGEMENT 3 0 0 3

OBJECTIVES:

- Accounting methods for financial management to ensure a proper budgeting and performance of industries and avoiding financial risks are to be studied. Best financial decisions can be made in terms of capital investment and current assets.

UNIT I: FINANCIAL ACCOUNTING 10 Hrs

Salient features of Balance sheet and Profit & Loss Statement, Cash Flow and Fund Flow Analysis, Working Capital management, Inventory valuation, Financial Ratio analysis – Depreciation.

UNIT II: COST ACCOUNTING 10 Hrs

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 10 Hrs

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 10 Hrs

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 5 Hrs

Cost of Capital – Capital structure – Dividend Policy – Leasing.

Total no. of hrs : 45

REFERENCES

1. Bhattacharya, S.K. and John Deardon,(1996) "*Accounting for Management – Text and Cases*", Vikas Publishing House, New Delhi
2. Charles, T.Horn Green,(1996) "*Introduction to Management Accounting*", Prentice Hall, New Delhi
3. James, C.Van Horne,(2002) "*Fundamental of Financial Management*", (12th ed.), Pearson Education
4. Pandey, I.M.,(2004) "*Financial Management*", (8th ed.), Vikas Publishing House, New Delhi

MCS13AE02 APPLIED OBJECT ORIENTED PROGRAMMING 3 0 0 3

OBJECTIVES:

- Arriving at optimal methods for functioning of industries using the available resources and improvement of resources by observing the simulated results using computer software programs, with various input parameters.

UNIT I: FUNDAMENTALS OF OBJECT ORIENTED PROGRAMMING 5 Hrs

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

UNIT II: C++ Basics 15 Hrs

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

UNIT III: C++ CLASS 5 Hrs

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

UNIT IV: CLASS DERIVATION 10 Hrs

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

UNIT V: APPLICATION 10 Hrs

OOP's applications in Industrial Engineering.

Total no. of hrs : 45

REFERENCES

1. Robert Lafore,(2002) "*Object oriented programming in C++*", Sam Publishing
2. E.Balagurusamy,(2009) "*Object oriented programming with C ++*",Tata Mc Graw Hill
3. Stanley B.Lippman,(2003) "*C++ Printer*", Addison – Wesley Pub.Co
4. Nabajyoti Barkakati,(2001) "*Object Oriented Programming in C++*", Prentice Hall of India

MCS13AE03 **SYSTEMS ANALYSIS AND DESIGN** **3 0 0 3**

OBJECTIVES:

- Design of Object oriented Systems by models, diagrams basing on available database for various activities in industries, which should be feasible and economically viable are to be practiced.

UNIT I: SYSTEMS ANALYSIS FUNDAMENTALS **9 Hrs**

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 **9 Hrs**

Sampling and investigating hard data, Interviewing, Using Questionnaires, Developing prototype, System requirements specification, Feasibility analysis

UNIT III: THE ANALYSIS PROCESS **9 Hrs**

Data flow diagrams, Data dictionary, Process specifications, Presenting the systems proposal

UNIT IV: THE ESSENTIALS OF DESIGN **9 Hrs**

Designing effective output, designing the database, designing the user interface, Designing data entry procedures

UNIT V : SOFTWARE ENGINEERING AND IMPLEMENTATION **9 Hrs**

Quality assurance through software engineering, Implementation approaches, Implementing distributed systems, Object oriented systems analysis and design

Total no. of hrs : 45

REFERENCES

1. Arthur M. Langer,(2001) "*Analysis and Design of Information systems*", Springer
2. Kendall and Kendall,(2004), "*Systems Analysis and Design*", Prentice hall
3. V. Rajaraman,(2006) "*Analysis and Design of Information systems*" , PHI