SRI VENKATESWARA UNIVERSITY COLLEGE OF ENGINEERING:
TIRUPATI -517502
(AUTONOMOUS)

DEPARTMENT OF MECHANICAL ENGINEERING
(Choice Based Credit System)

R23

POST GRADUATION PROGRAM

MASTER OF TECHNOLOGY
in
INDUSTRIAL ENGINEERING

Scheme of Instructions and Evaluation
(With effect from the Academic Year 2023-24)

SRI VENKATESWARA UNIVERSITY COLLEGE OF ENGINEERING: TIRUPATI – 517 502
DEPARTMENT OF MECHANICAL ENGINEERING-SCHEME OF INSTRUCTION- (CBCS) EFFECTIVE FROM THE ACADEMIC YEAR:2023-2024

M.TECH (PG) SPECIALIZATION: INDUSTRIAL ENGINEERING

I-SEMESTER

Category	Course Code	Course Title	Scheme of Instruction (Hours/Week)				No. of Credits	Scheme of Evaluation		
			Lecture	Tutorial	Practical	Total		Sessional Marks	Semester End Examination Marks	Total
PCC	IE11C	Operations Planning and Control	3	1	0	4	4	40	60	100
PCC	IE12C	Work System Design	3	1	0	4	4	40	60	100
PCC	IE13C	Facilities Planning	3	1	0	4	4	40	60	100
PEC	IE14C	Programme Elective- I	3	0	0	3	3	40	60	100
PEC	IE15C	Programme Elective- II	3	0	0	3	3	40	60	100
PCC	IE16L	Industrial Engineering Lab-I	0	0	3	3	1.5	40	60	100
PCC	IE17L	Simulation Lab – I	0	0	3	3	1.5	40	60	100
MC	IE18C	Research Methodology and IPR	3	0	0	3	3	40	60	100
	Total		**18**	**3**	**6**	**27**	**24**	**320**	**480**	**800**

List of Programme Elective					
Course Title	**I**	**Applied Probability and Statistics**	**Financial Management & Control**	**Human Resource Management**	**Expert Systems in Manufacturing**
	II	**Design for Manufacturing**	**Marketing Management**	**System Dynamics**	**Enterprise Resource Planning**

II-SEMESTER

Category	Course Code	Course Title	Scheme of Instruction (Hours/Week)				No. of Credits	Scheme of Evaluation		
			Lecture	Tutorial	Practical	Total		Sessional Marks	Semester End Examination Marks	Total
PCC	IE21C	Advanced Operation Research	3	1	0	4	4	40	60	100
PCC	IE22C	Quality Control and Reliability Engineering	3	1	0	4	4	40	60	100
PEC	IE23C	Programme Elective Course – III	3	0	0	3	3	40	60	100
PEC	IE24C	Programme Elective Course – IV	3	0	0	3	3	40	60	100
PCC	IE25L	Industrial Engineering Lab-II	0	0	3	3	1.5	40	60	100
PCC	IE26L	Simulation Lab – II	0	0	3	3	1.5	40	60	100
MC	IE27C	Value Added course	3	0	0	3	3	100	-	100
PCC	IE28P	Mini Project with Seminar	1	0	2	3	2	100	-	100
	Total		**16**	**2**	**8**	**26**	**22**	**440**	**360**	**800**

List of Programme Elective					
Course Title	**III**	**Supply Chain Management**	**System Simulation**	**Project Management**	**Intelligent Manufacturing Systems**
	IV	**Productivity Engineering & Management**	**Logistics Engineering & Management**	**Service Engineering & Management**	**Energy Management**

Value Added course				
Course Title	**I**	Leadership Qualities for Engineers	Stress Management	Universal Human Values

III-SEMESTER

Category	Course Code	Course Title	Scheme of Instruction (Hours/Week)				No. of Credits	Scheme of Evaluation		
			Lecture	Tutorial	Practical	Total		Sessional Marks	Semester End Examination Marks	Total
OEC	CSP32C	Open Elective Course ($MOOC_S$)	0	0	0	0	3	100	-	100
PCC	CSP33I	Industrial/ Research Internship (Min of 4 Weeks)	0	0	0	0	3	100	-	100
PCC	CSP34J	**Dissertation Work Phase-I**	0	0	24	24	12	40	60	100
	Total		**0**	**0**	**20**	**20**	**18**	**240**	**60**	**300**

IV-SEMESTER

Category	Course Code	Course Title	Scheme of Instruction (Hours/Week)				No. of Credits	Scheme of Evaluation		
			Lecture	Tutorial	Practical	Total		Sessional Marks	Semester End Examination Marks	Total
PCC	CSP41J	**Dissertation WorkPhase-II and Viva-Voce**	0	0	20	20	10 + 06 = 16	40	60	100
	Total		**0**	**0**	**20**	**20**	**16**	**40**	**60**	**100**

IE11C OPERATIONS PLANNING AND CONTROL
M. Tech I- SEMESTER
INDUSTRIAL ENGINEERING

Instruction Hours/ Week: (L-T-P-C): 3-1-0-4

COURSE CONTENT:

Unit -I

OPC is a system approach—types of production and OPC functions. Forecasting: Forecasting Methods — Qualitative Methods — Quantitative methods— moving average and exponential smoothing methods for different data patterns. Forecast errors, Tracking signal.

Unit -II

Mass Production Management Principles of flow lines, Assembly line balancing, approach to line balancing — RPW, COMSOAL, Integer, and Dynamic programming formulations. Introduction to transfer lines.Production Planning Linear programming formulations for static demand cases, Product Mix Decisions. Chance- constrained programming models.

Unit -III

Aggregate Production Planning Production planning under dynamic conditions strategies, costs involved Heuristic methods, linear production, and inventory programs. Aggregate production planning — HMMS model, search decision, parametric production planning, management coefficient models. Disaggregation — hierarchical planning, mathematical programming formulations. Master Production Schedule.

Unit -IV

Operations Scheduling Flow shop sequencing and job scheduling. Periodic review models. Continuous review models, lot size models with dynamic demand, and inventory models of spare parts.

Unit -V

Materials Requirement Planning (MRP) Introduction. Inventory in a manufacturing environment. Principles of MRP, MRP processing logic. MRP systems, and MRP-II,Jut-In-Time manufacturing: set-up reduction, stable MPS, and Kanban control.

COURSE OUTCOMES:

From this course, students will be able to

1. Describe Forecasting principles and techniques for short-range and long-range planning
2. Analyse Production requirements for each product and plan the shop floor activities
3. Elaborate Work station loading and scheduling of paths to avoid bottlenecks for smooth production
4. Design Solution for product mix decision using OR techniques.
5. Analyse optimal job sequences to achieve the minimum makespan with maximum production

REFERENCES

1. Montgomery, Operations Research in Production Planning, Scheduling and Inventory Control — Prentice Hall, N.J
2. Buffa, E.S., Operations Management — John Wiley & Sons.
3. Elsyod and Boucher Analysis of Production Systems, Prentice Hall, N.J,ISE Series
4. Burbridge, Production Planning — Heinemann Publishers, 1971.

IE12C WORK SYSTEM DESIGN
M. Tech I- SEMESTER
INDUSTRIAL ENGINEERING

Instruction Hours/ Week: (L-T-P-C): 3-1-0-4

COURSE CONTENT:

UNIT-I

Method study: Purpose of work-study-Objectives, applications, Method study definition & basic procedure selection of job, Various recording techniques like outline process charts, flow charts, Man machine charts, Two handed process charts, sting diagram, flow diagram, Multiple activity chart, Simo, Cycle-graphs and chrono-cycle graphs, Critical examination, development and maintenance of improved methods.

UNIT-II

Micro motion studies: Use of fundamental hand motions- principles of motion economy and work place layout, Process planning and design of jigs and fixtures. Applications of method study in office and other diverse functional areas for development and implementation of work systems.

UNIT-III

Ergonomics-Introduction to ergonomics and human engineering, physical basis of mans Perception of his environment. Anthropometry and work design, studies on human psycho sensorial processes for design of work systems.

UNIT-IV

Work Measurement-Work measurement objectives and techniques, time study and rating systems, allowances, standard and allowed time, production norms, production study, activity sampling development of synthetic and standard data, application of work study in non — traditional areas like hospitals, public utilities, etc.

UNIT-V

Principles of predetermined motion time systems (PMTS). The MTM system, its history and development, basic motions and their control characteristics, simultaneous and combined motions, limiting motions, learning curve concepts, application of PMTS & MTM.

COURSE OUTCOMES:

At the end of the course student will be able to

1. Apply the work study procedures and analyse the methods using various recording techniques.
2. Use principles of motion economy and apply the method study in diverse functional areas for development and implementation of work systems.
3. Understand the concept of anthropometry and work system for ergonomic design of work systems
4. Estimate the standard time for a given task using different work measurement systems.
5. Apply the concepts of learning curves, PMTS & MTM to reveal the existence of ineffective time.

REFERENCES

1. Mundel, Motion and Time Study,PHI,1973
2. Niebel, Motion and Time Study. USA Edition
3. Barnes, Motion and Time Study — Design and Measurement of Work.
4. Hank Book of industrial Engineers by H.BMaynard
5. Work study and Ergonomics - S.K. Sharma and Savita Sharma
6. Workstudy – Suresh Dalela

IE13C FACILITIES PLANNING
M. Tech I- SEMESTER
INDUSTRIAL ENGINEERING

Instruction Hours/ Week: (L-T-P-C): 3-1-0-4

COURSE CONTENT:

UNIT-I

Facilities Planning: Definition, Significance, Objectives and process of facilities planning — strategic facilities planning; Relationship between product, process and schedule design and facilities planning. Activity relationships and space requirements planning personnel requirements.

UNIT-II

Material Handling: Definition, principles, system design and selection of equipment, unit load concepts. Basic layout types — Immer, Nadler, Muther Apple James and Ree's approaches to plant layout. Modular design concept. Production Line balancing.

UNIT-III

Computer Aided Layout: CRAFT, COFAD, PLANET, CORELAP, ALDEP. Planning for receiving and shipping, storage and ware housing, manufacturing, office planning, facility services and non — manufacturing functions.

UNIT-IV

Quantitative Approaches to facilities Planning: Deterministic models - single and multi - facility location models. Location - Allocation problems - quadratic assignment problem. Warehouse layout models. Plant location problems. Conveyor models. Storage models.

UNIT-V

Probabilistic models: Conveyor models, waiting line models simulation models and storage models Evaluation, selection, implementation and maintenance of the Facilities plan.

COURSE OUTCOMES:

1. Able to know the concept of facilities planning that aid in design of Product, Process and schedule design.
2. Able to design Material handling equipment for industrial and non-industrial purpose.
3. Able to analyse handling, receiving and shipping of goods using computer aided layout software.
4. Able to solve Problems of ware house, conveyor and allocation models using Quantitative approach.
5. Able to simulate the waiting line models, storage models and conveyor models using simulation software.

REFERENCES

1. Tompkins. J.A. and White, J.A., Facilities Planning.John Wiley& Sons
2. Francies, R.L., and Mc Ginnis White, J.A., Facility Layout and Location — Ananalytical approach, PHI Publications

IE14C APPLIED PROBABILITY AND STATISTICS
M.Tech I SEMESTER
INDUSTRIAL ENGINEERING
Common to Industrial Engineering & Production Engineering
(Programme Elective- I)

Instruction Hours/ Week: (L-T-P-C): 3-0-0-3

COURSE CONTENT:

UNIT-I

Introduction to probability: Probability, sample space — axioms of probability, Random variables — Discrete and Continuous — Expectations — Moment Generating functions. Conditional probability — Bayer's theorem — Independent Events.

UNIT-II

Discrete distributions: Binomial, Hyper geometric, Gama, Students t, Chi-square, Weibell distributions. Bivariate random variables and their distributions (with specific reference to bivariate normal distributions only). Conditional distributions — Covariance, Correlation coefficient — Regression of the mean.

UNIT-III

Functions of random variables: Probability distribution of functions of random variables their joint probability distribution.

Sampling: Sampling Distribution — Law of Large Numbers — Central Limit theorem.

UNIT-IV

Estimation: Point Estimation, Interval Estimation and Confidence Intervals. (Maximum Likelihood Estimation), Bayesians Estimation.

Testing of Hypothesis: Simple hypothesis and the Neyman — Pearson lemma — Composite hypothesis — goodness of fit tests.

UNIT-V

Analysis of variance: One way classification — Randomized, complete block designs

COURSE OUTCOMES:

At the end of the course, students will be able to

1. Understand the basic concept of probability.
2. Explain random variables for discrete and continuous probability estimation.
3. Define sampling theory, apply it to predict the event, and analyze the statistical distributions.
4. Analyse different Estimations and Testing of hypothesis
5. Apply the concepts of analysis of variance for the Correlation between the observed and experimental values.

REFERENCES

1. Ian F. Blake, An introduction to Applied Probability — John Wiley & Sons
2. Milton, J.S., Arnold, Jee C., Probability and Statistics in the Engineering andComputing Sciences — Mc Grawhill, 2003.

IE14C FINANCIAL MANAGEMENT AND CONTROL
M.Tech I SEMESTER
INDUSTRIAL ENGINEERING
(Programme Elective- I)

Instruction Hours/ Week: (L-T-P-C): 3-0-0-3

COURSE CONTENT:

UNIT-I

Goals and functions of Finance; Concepts in Valuation, Time Value of Money. Principles of Capital budgeting generating of cash flows. Evaluation of investment proposals — Capital rationing and mathematical programming of Capital Budgeting.

UNIT-II

Cost of capital for specific sources of financing and weighted average cost of capital. Evaluation of Risky investments — Generation of information needed to evaluate risky investments when cash flows are independent, sequential decisions and decision trees. Abandonment problems evaluation of projects under firm risk concepts.

UNIT-III

Working capital management — factor, principles short term Vs. long term financing, liquidity of assets and evaluation of alternative ways of financing on the liquidity of firms. Management of Cash and marketable securities management of cash lock box and concentration banking cash management, models of Bumol, Miller and Off, Management of accounts receivable credit collection policies, Evaluating credit applicant, inventory control and financial manager.

UNIT-IV

Cost accounting — Elements of cost, types of methods of costing. Overhead charges and allocation, standard costing and budgetary control/marginal costing. Cost variances — methods of calculating variances. Material, Labour, Expenses and indirect expenses preparation of cost sheets and their usages.

UNIT-V

Tools of financial analysis — financial ratio analysis, Funds flow analysis and financial forecasting, analysis of operating and financial leverage.

COURSE OUTCOMES:

At the end of the course student will be able to

1. Analyse the time value of money, and evaluate the investment proposals and use of different capital budgeting methods.
2. Interpret financial data for the purpose of constructing risk assessment and evaluation of projects under firm risk.
3. Take both long-term and short-term financing decisions and understand the management of Cash and marketable securities management.
4. Understand the several methods of costing, preparation of cost sheets and their usages methods.
5. Apply the tools of financial analysis methods to measure the operating efficiency of business.

REFERENCES

1. Vanhorne, James. C. Financial Management and Policy — Pearson Education.
2. Pandey, I. M., Financial Management
3. Humpton, Financial Decision Making (Concepts, problems and cases) —PHI.
4. Humpton, Hand book of financial decisions —PHI.

IE14C HUMAN RESOURCE MANAGEMENT

M.Tech I SEMESTER

INDUSTRIAL ENGINEERING

(Programme Elective- I)

Instruction Hours/ Week: (L-T-P-C): 3-0-0-3

COURSE CONTENT

UNIT-I

Introduction: Definition of personnel management, concept of labour, organisation and function of the personnel department, personnel policies.

Organisational objectives, functions, relationships, organisational structure of formal and organisations, job design.

UNIT-II

Man power planning: Man power forecasting, mobility and promotion problems, job analysis and job description.

Selection: Developing sources, methods of recruitment, alternative selection policies, application blanks and qualification card, interviews, psychological testing.

UNIT-III

Training: The nature of training, objectives in training, types of training, requirements of effective trainingconventionaltrainingtechniques,grouptraining,organisationdevelopment,evaluatingtraining effectiveness.

Performance appraisal: Traditional performance appraisal systems, appraisal programs.

UNIT-IV

Wage and Salary Administration: Factors affecting compensation policy – equity and compensation -comparable value, job evaluation, job evaluating systems- simple ranking- job grading-point systems factor comparison system, effects of job evaluation on human relations, Expectancy theory and compensation, variable compensation, supplementary compensations.

UNIT-

Human Factor Management: Human factors in management behavioural models, motivation, Maslow's hierarchy of needs theory-hygiene approach to motivation, expectancy theory, reinforcement theory McClelland's needs theory, motivational techniques.

Leadership: Definition, trait approaches to leadership, leadership behaviour and styles, situational approach to leadership.

Communication and Counselling: Nature and importance of communications, channels and structure, communication process, Management by objectives, counselling.

COURSE OUTCOMES:

At the end of the course student will be able to

1. Understand concepts of personnel management and organisational structure of formal and organisations identify the importance of human resources.
2. Understand different tools used in planning of human resource needs and select suitable personnel.
3. Understand the effective training techniques and performance appraisal systems for organisational development
4. Establish and maintain an equitable wage and salary system using Wage and salary administration concepts.
5. Understand the concepts of Human factors in management behavioural models, leadership behaviour and importance of communications

REFERENCES

1. Scott, Clothier, Springel, Personnel Management, McGraw-Hill
2. Strauss and Sayles Personnel, The Human Problems of Management, Prentice Hall.
3. Edwon,B. Fillipo, Personnel Management
4. Koontz, O.Donnel, Weihreich, Essentials of Management, McGraw-Hill.
5. Kapoor, N.D., Introduction to Commercial & Industrial Law, Sultan Chand &Sons.

IE14C EXPERT SYSTEMS IN MANUFACTURING
M. Tech I SEMESTER
Common to Industrial Engineering & Production Engineering

(Programme Elective- I)

Instruction Hours/ Week: (L-T-P-C): 3-0-0-3

COURSE CONTENT:

UNIT-I

Artificial Intelligence & Expert Systems, (Knowledge based systems); Definition —— Justification —— Structure Knowledge acquisition; Knowledge base, Inference engine, User interface, Explanatory module, Forward and backward chaining

UNIT-II

Knowledge representation and inferencing. Building expert systems Suitability of task, architecture, hardware, software, personnel- Expert system building tools language, shells.

UNIT-III

Commercial software for manufacturing applications in CAD, CAPP, MRP, CAM, MRP II, Adaptive control of devices, Robotics, Process control, Fault diagnosis, Failure analysis etc.;

UNIT-IV

Linking expert systems to other software such as DBMS, MIS, MDB, Process control and office- automation.

UNIT-V

Case studies of typical applications in process planning, tool selection, cutting toolselection, part classification, inventory control, facilities planning, etc.

Course Outcomes:

At the end of the course student will be able to

1. Understand the Knowledge based systems in solving real-time problems.
2. Develop the expert systems
3. Apply expert system software for manufacturing applications
4. Link the expert systems to other software.
5. Solve the problems in the field of machining, inventory control, process planning with the help of expert systems.

REFERENCES

1. Adodji.B, BAd1I.N Expert System Applications in Engineering & Manufacturing —— John Wiley & Sons (l995)
2. Peter Jackson Introduction to Expert Systems. MartinMerryExpertSystem—85

IE15C DESIGN FOR MANUFACTURING
M. Tech I SEMESTER
Common to Industrial Engineering & Production Engineering

(Programme Elective- II)

Instruction Hours/ Week: (L-T-P-C): 3-0-0-3

COURSE CONTENT:

UNIT-I

Introduction: Design philosophy-steps in design process-general design rules for manufacturability-basic principles of designing for economical production- creativity in design.

Machining processes: Overview of various machining processes-general design rules for machining- dimensional tolerance and surface roughness-Design for machining- ease – redesigning of components for machining ease with suitable examples. General design recommendations for machined parts.

UNIT-II

Metal casting: Appraisal of various casting processes, selection of casting process- general design considerations for casting-casting tolerance-use of solidification, simulation in casting design-product design rules for sand casting.

UNIT-III

Metal joining: Appraisal of various welding processes, factors in design of welding – general design guidelines- pre and post treatment of welds-effects of thermal stresses in weld joints-design of brazed joints. Forging: Design factors for forging–closed die forging design — parting lines of dies — drop forging die design — general design recommendations.

UNIT-IV

Extrusion & Sheet metal work: Design guide lines extruded sections-design principles for punching, blanking, bending, deep drawing-Keeler Goodman forging line diagram – component design for blanking.

UNIT-V

Plastics: Viscous elastic and creep behaviour in plastics-design guidelines for plastic components-design considerations for injection moulding – design guidelines for machining and joining of plastics.

COURSEOUTCOMES:

1. Design components for machining
2. Simulate the casting design and choose the best casting process for a specific product.
3. Evaluate the effect of thermal stresses in weld joints
4. Design components for sheet metal work by understanding in depth the sheet metal processes and their formation mechanisms
5. Design plastic components form machining and joining and selecting a proper processes for different joining cases

REFERENCES:

1. Design for manufacture,Johncobert,AdissonWesley.1995
2. Design for Manufacture by Boothroyd,
3. Design for manufacture, James Bralla
4. ASMHandbookVol.20

IE15C MARKETING MANAGEMENT
M.Tech I SEMESTER
INDUSTRIAL ENGINEERING
(Programme Elective- II)

Instruction Hours/ Week: (L-T-P-C): 3-0-0-3

COURSE CONTENT:

UNIT-I

Introduction: Marketing System, role of scientific marketing analysis. Marketing models, their uses and limitations.

UNIT-II

Product Decisions: How to introduce new product**-** the generation of product idea, product research, developing utility measures for product research. Product evaluation (Break**-** even analysis). Product development (application of PERT/CPM).

Purchasing Decisions: Purchasing under fluctuating prices purchasing with quantity discounts. Pricing

UNIT-III

Decisions: Objectives in setting market price and the policies adopted in setting market price for a certain product. Strategic pricing analysis (Decision trees in pricing analysis).

UNIT-IV

Advertising Decisions: Sales response to advertising, joint optimization of price advertising and quality, Game theory models in advertising. Media advertising allocation model.

UNIT-V

Promotional Decisions: Spatial allocation of selling expenses, sales men recruitment and selection, application of dynamic programming to promotional effort, Branch-switching analysis.

Distribution Decisions: Distribution Systems, Ware housing problems.

COURSEOUTCOMES:

1. State the role and functions of marketing within a range of organizations.
2. Describe key marketing concepts, theories and techniques for analysing a variety of marketing situations.
3. Use written formats to communicate marketing outcomes.
4. Apply the introduced conceptual frame works, theory and techniques to various marketing contexts.
5. Synthesise ideas into a marketing plan.

REFERENCES:

1. Phillips Kotler, Marketing Management Analysis, Planning & Control.
2. Phillips Kotler, Marketing Management—A Model Building Approach.
3. King, Analytical Methods in Marketing.
4. Station, Fundamentals of Marketing.
5. Montgomery, Management Science applied to Marketing.

IE15C SYSTEM DYNAMICS
M.Tech I SEMESTER
INDUSTRIAL ENGINEERING
(Programme Elective- II)

Instruction Hours/ Week: (L-T-P-C): 3-0-0-3

COURSE CONTENT:

UNIT-I

Mental models for traditional management their strengths and weaknesses; Synthesizing concept of traditional management, feedback control, and computer simulation.

UNIT-II

Physical and information flows Causality and its interpretation- Causal loop diagrams and flow diagrams- Decisions and Policies- Level and rate configurations- Principles of modelling- Behavioural characteristics of low order systems.

UNIT-III

Smoothing of information- Exponential delays- Response characteristics of smoothing and delay functions. Simulation of system dynamics models

UNIT-IV

Some applications of system dynamics methodology to policy design problems in industrial economic social, environmental, and technological systems, etc.

UNIT-V

Comparison of system dynamics with popular social science modelling paradigms such as operations research economics and cross- impact theory.

COURSEOUTCOMES:

1. Understand mental models for traditional management and synthesizing concept of traditional management.
2. Able to develop Causal loop diagrams and flow diagrams
3. Analyse the Response characteristics of smoothing and delay functions
4. Apply the system dynamics methodology to policy design problems
5. Able to compare the system dynamics popular social science modelling paradigms.

REFERENCES:

1. Coyle, RG. Management System Dynamics.
2. Forrester, J.W., Industrial Dynamics.
3. Forrester, J.W., Principles of System.
4. Goodman, M.R, Study Notes on System Dynamics.
5. Richardson, G.P. and Pugh, A. L., Introduction to System Dynamics Modelling with DYNAMO.
6. Roberts, E.B., Managerial Applications of System Dynamics.
7. Roberts, N. etal., Introduction to Computer Simulation—The System Dynamics Approach.
8. Mohapatra, P.K.J.,P. Mandal, and Bora, M.C., Lecture Notes on System Dynamics.
9. System Dynamics An International Journal of Policy Modelling, System Dynamics Society of India.
10. System Dynamics Review, System Dynamics Society, M.I.T.

IE15C ENTERPRISE RESOURCE PLANNING
M.Tech I SEMESTER
Common to Industrial Engineering & Production Engineering
(Programme Elective- II)
Instruction Hours/ Week: (L-T-P-C): 3-0-0-3

COURSE CONTENT:

UNIT-I

Introduction to ERP: Enterprise – An Overview, Integrated Management Information, Business Modelling, Integrated Data Model

UNIT-II

ERP and Related Technologies Business Processing Reengineering (BPR), Data Warehousing, Data Mining, On-line Analytical Processing (OLAP), Supply Chain Management (SCM), Customer Relationship Management (CRM), MIS - Management Information System, DSS - Decision Support System, EIS - Executive Information System.

UNIT-III

ERP Manufacturing Prospective: MRP - Material Requirement Planning, BOM - Bill of Material, MRP - Manufacturing Resource Planning, DRP - Distributed Requirement Planning, PDM - Product Data Management

UNIT-IV

ERP Modules Finance, Plant Maintenance, Quality Management, Materials Management

UNIT-V

Benefits of ERP Reduction of Lead-Time, On-time Shipment, Reduction in Cycle Time, Improved Resource Utilization, Better Customer Satisfaction, Improved Supplier Performance, Increased Flexibility, Reduced Quality Costs, Improved Information Accuracy and Design-making Capability

COURSE OUTCOMES:
At the end of the course student will be able

1. To understand the basic concept of enterprise resource planning (ERP).
2. To analyse the related technologies of business processing reengineering.
3. To apply the concept of MRP 1, MRP 2, BOM, DRP and PDM.
4. To develop the ERP models.
5. To understand the ERP reduction of timings and benefits.

REFERENCE:

1. Enterprise Resource Planning - Alexis Leon, Tata McGraw Hill.
2. Enterprise Resource Planning – Diversified by Alexis Leon, TMH.
3. Enterprise Resource Planning - Ravi Shankar & S. Jaiswal ,Galgoti

IE16L INDUSTRIAL ENGINEERING LAB – I
M.TECH I SEMESTER
INDUSTRIAL ENGINEERING

Instruction Hours/ Week: (L-T-P-C): 0-0-3-1.5

COURSE CONTENT:

LISTOF EXPERIMENTS:

1. Draw two handed process charts for Bolt, Washer & Nut assembly.
2. Performance rating
3. Standard time calculation.
4. Development of OC curves.
5. Pin board study.
6. Inventory control system.
7. Productivity measurement
8. Ergonomic design
9. Random number generation

COURSE OUTCOMES:

1. To develop two handed process charts for Bolt, Washer & Nut assembly.
2. To evaluate performance rating and standard time.
3. To develop OC curves for a sampling study.
4. To understand and analyse the inventory control systems, and random number generation
5. To understand the concept of productivity measurement and ergonomic design.

IE17L SIMULATION LAB – I
M.TECH I SEMESTER
INDUSTRIAL ENGINEERING

Instruction Hours/ Week: (L-T-P-C): 0-0-3-3

COURSE CONTENT:

LISTOF EXPERIMENTS:

1. Simplex Method
2. Two Phase Method
3. Big M-Method.
4. Transportation Model
5. Queuing Model
6. Sequencing model
7. Assignment model
8. P-system, Q-system Inventory Models
9. PERT
10. Make or buy decision

COURSE OUTCOMES:

At the end of the course student will be able to

1. To apply the simplex, big M, two-phase methods.
2. To simulate the transportation model, queuing model, sequencing model.
3. To solve P-system, Q-system optimization problems.
4. To apply the PERT for a project duration estimation
5. To solve make or buy decision problems.

IE18C RESEARCH METHODOLOGY AND IPR
M.Tech I SEMESTER
INDUSTRIAL ENGINEERING

Instruction Hours/ Week: (L-T-P-C): 3-0-0-3

COURSE CONTENT:

UNIT-I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

UNIT-II

Effective literature studies approaches, analysis, Plagiarism, Research ethics.

UNIT-III

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

UNIT-IV

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT. Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT-V

New Developments in IPR: Administration of Patent System. New developments in IPR, IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

COURSE OUTCOMES:

At the end of this course, students will be able to

1. Understand research problem formulation.
2. Analyse research related information
3. Follow research ethics
4. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
5. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

REFERENCES:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & Engineering students"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
3. Ranjit Kumar, 2nd Edition , "Research Methodology: A Step by Step Guide for beginners"
4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
5. Mayall , "Industrial Design", McGraw Hill, 1992.
6. Niebel , "Product Design", McGraw Hill, 1974.
7. Asimov , "Introduction to Design", Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.
9. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008.

IE21C ADVANCED OPERATION RESEARCH
M.Tech I SEMESTER
INDUSTRIAL ENGINEERING

Instruction Hours/ Week: (L-T-P-C): 3-1-0-4

COURSE CONTENT:

UNIT-I

Non - linear Programming: Classical Optimisation techniques and Kuhn Tucker theory — One dimensional minimization — Unconstrained and Constrained minimisation methods – Quadratic programming.

UNIT-II

Stochastic programming — Geometric programming problem and applications.

UNIT-III

Dynamic Programming: Characteristics of dynamic programming problems — single and multi — stage models — Practical applications to inventory and Cargo loading problems.

UNIT-IV

Multi — criteria Optimization: Introduction to multi criteria optimization — Methods of solution. Goal programming and applications.

UNIT-V

Meta Hemistich — genetic Algorithms, Simulated Annealing, Tabu search, Ant Colony Optimization algorithms.

COURSE OUTCOMES:

At the end of the course student will be able

1. To solve classical optimization problems
2. To apply stochastic programming and geometric programming concepts for solving of problems.
3. To solve constrained and Unconstrained and cargo loading problems by dynamic programming.
4. To apply multi criteria and goal programming for different applications.
5. To understand and apply heuristic algorithms for solving of problems.

REFERENCES:

1. Taha, Hamdy. A., Operations Research an Introduction. PHI Edition, 6th Edition.
2. Rao, S.S., Optimisation theory and practice — PHI.
3. Hiller & Liberaman, Operations Research — Tata McGrawhill,7t Edition,2002.

IE22C QUALITY CONTROL AND RELIABILITY ENGINEERING
M.TECH I SEMESTER
INDUSTRIAL ENGINEERING

Instruction Hours/ Week: (L-T-P-C): 3-1-0-4

COURSE CONTENT:

UNIT-1

Basic Concepts: Definitions of quality, Quality of design, Quality of conformance, and Quality of performance, Dimensions of quality, Quality characteristics, Quality control, Statistical quality control and cost of quality.

Fundamentals of Probability and Statistics: Events, Sample space, Probability rules, Dependent and Independent events, Statistical tools in quality control, Concept of variation, Graphical tools for data representation and analysis, Discrete and continuous probability distributions and their applications in quality control, numerical problems

UNIT-2

Control charts for Variables: Variation, Causes of variation, Objectives of control charts, Choice of variable, Subgroup size and sub grouping, frequency of sampling, control limits. Process capability analysis, Relationship of a process in control to specification limits, Variable charts - X bar chart, R chart, σ chart, revision of control limits and RPI, Introduction to custom chart and moving range charts, numerical problems.

UNIT-3

Control charts for Attributes: Control charts for fraction nonconforming (p chart, np chart) and nonconformities (c chart and u chart) with variable and constant sample size, Choice between variables and attributes control charts, revision of control limits, numerical problems.

Failure Data Analysis : Introduction, Failure Data, Quantitative measures, MTTF, MTBF, Bathtub Curve, Mean Life, Life Testing, numerical problems, Introduction to Failure Mode and Effect Analysis.

UNIT-4

Acceptance Sampling: Fundamentals of acceptance sampling, Sampling methods, OC Curves and their characteristics, AQL, IQL, LTPD, AOQ/AOQL. Types of acceptance sampling-Single, Double, Multiple, and Sequential sampling plans, Average Total Inspection, comparison amongst sampling plans, numerical problems

UNIT-5

System Reliability: Definition, Series, parallel and mixed configuration, Block diagram concept, r-out-of-n structure solving problems using mathematical models. Difficulty in achieving reliability, Methods for improving reliability during design, Different techniques available to improve reliability, Reliability-Cost trade off, Prediction and Analysis, numerical problems.

Maintainability and Availability: Introduction, Techniques available to improve maintainability and availability, trade-off among reliability, maintainability and availability, Simple problems

COURSE OUTCOMES:

At the end of the course student will be able to

1. To understand basic concepts of quality control.
2. To apply the control charts of variables (X bar ,P bar charts) for different applications.
3. To apply the control charts of attributes (C bar ,N bar charts) and **conduct Failure Analysis**
4. To apply acceptance sampling plans for quality control.
5. Understand the concepts of reliability management, and **Maintainability and Availability:**

REFERENCES:

1. Fergenbaum, V. Armand, Total Quality Control — Tata MeGrawhill(40th Edition)
2. Besterfield H. Dale., Quality Control — A practical approach — Pearson Education Asia (2nd Edition).
3. Grant, E. L., Statistical Quality Control — Tata Mc Grawhill (6th Edition)
4. Montgomary — Statistical Quality Control — John Wiley & Sons
5. Srinath, L.S., Concepts in Reliability Engineering — Prentice Hall India.

IE23C SUPPLY CHAIN MANAGEMENT
M.TECH II SEMESTER
INDUSTRIAL ENGINEERING
(Programme Elective Course – III)

Instruction Hours/ Week: (L-T-P-C): 3-0-0-3

COURSE CONTENT:

UNIT-I
Development of SCM concepts and Definitions – key decision areas – strategic. Supply Chain Management and Key components, External Drivers of Change. Dimensions of Logistics – The Macro perspective and the macro dimension – Logistic system analysis.

UNIT-II
Sourcing strategy: Manufacturing management – make or buy decision – capacity management – Materials Management – choice of sources – procurement planning.

UNIT-III
Distribution strategy: Choice of Market – network design – warehouse designed operation and distribution planning – transportation – packaging.

UNIT-IV
Inventory Strategy: Demand forecasting – inventory planning – planning of stocking facilities – warehouse location allocation. Warehouse design and operations – inventory norms.

UNIT-V
Channels of Distribution – Customer Service Strategy: Identification of Service needs, cost of services – revenue Management.

COURSE OUTCOMES:
At the end of the course student will be able to learn the

1. To understand the concept of SCM and Logistic system analysis.
2. To apply the concepts of manufacturing management and materials management.
3. To develop distribution strategies for market choices warehouses.
4. To develop inventory strategies
5. To understand the channels of distribution.

REFERENCES:

1. Supply Chain Management Strategy, Planning and operation — Sunil Chopra and Peter Meindl.
2. Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies by David Simchi-Levi, Philip Kaminsky and Edith Simchi-Levi
3. Supply Chain Management: Strategy, Planning, and Operation by Sunil Chopra and Peter Meindl 4. Supply Chain Logistics Management by Donald Bowersox, David Closs and M. Bixby Cooper
4. The Handbook of Logistics and Distribution Management: Understanding the Supply Chain by Alan Rushton, Phil Croucher and Peter Baker

IE23C SYSTEM SIMULATION
M.TECH II SEMESTER
INDUSTRIAL ENGINEERING
(Programme Elective Course – III)

Instruction Hours/ Week: (L-T-P-C): 3-0-0-3

COURSE CONTENT:

UNIT-I
Modelling: Discrete- event and process representations, High- level and low- level languages.

UNIT-II
Input Modelling: fitting distributions to data, selecting distributions without data, non stationary arrival processes, multi variate input models.

UNIT-III
Output Analysis: point and interval estimation for means, probabilities and quintiles.

UNIT-IV
Experiment Design: terminating vs. steady-state simulation, determining number of reps/batches for fixed precision, initial bias mitigation, use of common random numbers and antithetic variates.

UNIT-V
Variety Generation: pseudorandom number generators, inverse cdf transformation, non stationary arrival processes, multivariate input models Using Simulation in Research: experiment within an experiment approach

COURSE OUTCOMES:
At the end of the course student will be able to
1. To understand about the modelling and types of modelling languages.
2. To develop models with multi variety inputs
3. To perform output analysis.
4. To create the experiments designs.
5. To generate random numbers for Simulation

REFERENCES:

1. J. Banks, J. S. Carson, B. L. Nelson and D. M. Nicol (2001), Discrete Event System Simulation, 3rd Ed., Pearson Education International Series.
2. A. M. Law and W. D. Kelton (2000), Simulation Modeling and Analysis, 3rd Ed., McGraw Hill International - Industrial Engg. Series.

IE23C PROJECT MANAGEMENT
M.TECH II SEMESTER
INDUSTRIAL ENGINEERING
(Programme Elective Course – III)

Instruction Hours/ Week: (L-T-P-C): 3-0-0-3

COURSE CONTENT:

UNIT-I

Basics of Project Management: Introduction, Need for Project Management, Project Management Knowledge Areas and Processes, The Project Life Cycle, The Project Manager (PM), Phases of Project Management Life Cycle, Project Management Processes, Impact of Delays in Project Completions, Essentials of Project Management Philosophy, Project Management Principles

UNIT-II

Project Identification and Selection: Introduction, Project Identification Process, Project Initiation, Pre-Feasibility Study, Feasibility Studies, Project Break-even point

Project Planning: Introduction, Project Planning, Need of Project Planning, Project Life Cycle, Roles, Responsibility and Team Work, Project Planning Process, Work Break down Structure (WBS)

UNIT-III

Organisational Structure and Organisational Issues: Introduction, Concept of Organisational Structure, Roles and Responsibilities of Project Leader, Relationship between Project Manager and Line Manager, Leadership Styles for Project Managers, Conflict Resolution, Team Management and Diversity Management, Change management

UNIT-IV

Project Performance Measurement and Evaluation: Introduction, Performance Measurement, Productivity, Project Performance Evaluation, Benefits and Challenges of Performance Measurement and Evaluation, Controlling the Projects

UNIT-V

Project Execution and Control: Introduction, Project Execution, Project Control Process, Purpose of Project Execution and Control

COURSE OUT COMES:

At the end of the course, students will be able to

1. Understand the project principles and project life cycles as to avoid the project delays and the design stage itself to arrive at the Break-even point
2. Analysis the project planning, the role and responsibility of the team work in the assignment of jobs
3. understand the Organization structure, responsibilities and role of leaders and team management
4. Analyse the Process of Implementation of Performance Measurements For Better Productivity And Project Process Control
5. Execute And Control Of Projects

REFERENCES:

1. Effective project management by Robert K.Wysoki

IE15C INTELLIGENT MANUFACTURING SYSTEMS
M TECH I SEMESTER
INDUSTRIAL ENGINEERING
(Programme Elective- II)

Instruction Hours/ Week: (L-T-P-C): 3-0-0-3

COURSE CONTENT:

UNIT I:
Computer integrated manufacturing systems – structure and functional areas of CIM system - AD, CAPP, CAM, CAQC, ASRS and advantages of CIM Manufacturing communication systems – MAP/TOP OSI model, data redundancy, top-down and bottom-up approach, volume of information. Intelligent manufacturing – system components, system architecture and data flow, system operation.

UNIT II:
Components of knowledge-based systems – basic components of knowledge based systems, knowledge representation, comparison of knowledge representation schemes, interference engine, knowledge acquisition Machine learning – concept of artificial intelligence, conceptual learning, and artificial neural networks -biological neuron, artificial neuron, types of neural networks, applications in manufacturing.

UNIT III:
Automated process planning – variant approach, generative approach, expert systems for process planning, feature recognition, phases of process planning knowledge Based System for Equipment Selection (KBSES) – Manufacturing system design, equipment selection problem, modelling the manufacturing equipment selection problem, problem solving approach in KBSES, structure of the KBSES.

UNIT IV:
Group technology: models and algorithms – visual method, coding method, cluster analysis method, matrix formation – similarity coefficient method, sorting-based algorithms, bond energy algorithm, cost-based method, cluster identification method, extended ci method.

UNIT V:
Knowledge-based group technology - group technology in the automated manufacturing system, structure of knowledge-based system for group technology (KBSGT) – data base, knowledge base, clustering algorithm.

COURSE OUTCOMES:

At the end of the course, students will be able to

1. Describe the performance of manufacturing systems.
2. Derive the systemic approach for designing and implementing manufacturing systems.
3. Analyze new procedures to improve productivity and existing manufacturing systems.
4. Explain and Analyze online collaboration tools to work in complex teams
5. Understand the group technology in automated manufacturing systems.

REFERENCES:

1. Andre Kusaic, "Intelligent Manufacturing Systems" , PHI, 1989.
2. Hamid R.Parsaei and Mohammad Jamshidi,"Design and Implementation of Intelligent Manufacturing Systems" , PHI, 2009.
3. Mikell P Groover, "Automation, Production Systems and Computer Integrated Manufacturing", 8th edition, PHI, 2008.
4. YagnaNarayana, "Artificial neural networks" , PHI,2009.

IE24C PRODUCTIVITY ENGINEERING & MANAGEMENT
M.TECH II SEMESTER
(Programme Elective Course – III)
Common to Industrial Engineering & Production Engineering

Instruction Hours/ Week: (L-T-P-C): 3-0-0-3

COURSE CONTENT:

UNIT-I

Basic definitions and Scope-Significance of Productivity in economic development. Productivity measurement at nation level. Benefits of higher productivity at firm level. Diversity of productivity concepts.

UNIT-II

Productivity measurement models—Partial Productivity models, the multi—factor productivity Computers for productivity measurement. Productivity Evaluation Productivity Models, Total Model. Expression for Total Productivity change, the Productivity Evaluation Tree.

UNIT-III

Productivity Planning—Long and Short Term Productivity models Causes of flow productivity in companies — various strategies for productivity improvement. The Analytical Productivity Model.

UNIT-IV

Productivity Management at Enterprise level—Productivity Improvement Techniques—Technology based, Materials based, Product based, employee based and cost based. Productivity in service industries

UNIT-V

Case Studies, R&D Productivity, Evaluation of R&D, productivity, Technology Transfer.

COURSE OUTCOMES:

At the end of the course student will be able to learn the

1 Analyse the significance of productivity measurement at national level and firm level
2 Implement the Productivity measurement models.
3 develop Productivity Planning
4 apply Productivity Improvement Techniques
5 Carryout case studies of productivity improvement for entrepreneurship development and technology transfer

REFERENCES

1. Sumanth David, J., Productivity Engineering and Management ——McGraw-Hill Book(1984)
2. Scott, Sink, D., Productivity Management Planning, Measurement and evaluation, control and Improvement.

IE24C LOGISTICS ENGINEERING & MANAGEMENT

M.TECH II SEMESTER

INDUSTRIAL ENGINEERING

(Programme Elective Course – III)

Instruction Hours/ Week: (L-T-P-C): 3-0-0-3

COURSE CONTENT:

UNIT-I

Logistics: Nature & Concepts – Evolution – Importance – Advantage – Objectives – Components – Functions – Supply Chain Management: Nature & Concepts – Value chain – Functions & Contribution – Effectiveness – Framework – Outsourcing – 3 PLs – 4 PLs – Bull whip effect – SC Relationships – Conflict resolution – Harmonious relationship – Customer Service: Nature & Concepts – Importance – Components – Cost – Gap analysis – Strategic management – Case Study.

UNIT-II

Information: Position of Information in L&SCM – Logistical Informational Systems – Operational Logistical Informational Systems – Integrated Information Technology Solution for L&SCM – Emerging L&SCM – Demand Forecasting: Nature & Components – Impact of forecast on L&SCM – Effective forecasting – Techniques – Selection – Principles – Inventory: Concepts – Types – Functions – Elements – Inventory management – ABC analysis – ABC-VED matrix – Materials Requirement Planning – Distribution Requirement Planning – Just in Time System – Prerequisites – Case study

UNIT III

Transportation: Introduction – Position of transportation in L&SCM – Elements of transportation cost – Modes – Multimodal transport – Containerization – Selection of transportation modes – Transportation decision – Transportation network: routing & scheduling – Warehousing & Distribution Centers

UNIT IV

Protective Packaging: Introduction – Concepts – Functions – Forms – Problems – Policy – Order Processing: Introduction – Concepts – Functions – Elements – Significance – Materials Handling: Introduction – Concept – Objective- Principles – Equipments – Considerations – Purchasing & Sourcing Management: Introduction – Nature – Scope – Importance – Trends – Contemporary sourcing & supplier management – Case study.

UNIT-V

Organization: Introduction – Evolutionary trends of L&SCM – Principles – Factors.
Performance Measurement: Introduction – Dimensions – Basic tools – Impediments to improve performance – Case Study.

COURSE OUTCOMES:

At the end of the course student will be able to learn the

1. To understand the basic fundamentals of logistics nature and concepts.
2. Develop Logistical Informational Systems
3. Develop Transportation network
4. Apply the basic concept of protective packaging and material handling
5. Apply the L&SCM tools to improve performance of organisation.

REFERENCES:

1. Agrawal, D.K., "A Text book of Logistics & Supply Chain Management", MacMillan Publishers India Ltd., 2009.
2. Sunil Chopra & Peter Meindl, "Supply Chain Management, Strategy, Planning and Operation", 2 nd Edition, PHI, 2004.
3. David J. Bloomberg, Stephan Lemay & Joe B. Hanna, "Logistics", PHI, 2002.
4. Jeremy F.Shapiro, "Modeling the Supply Chain", Thomson Duxbury, 2002.
5. James B. Ayers, "Handbook of Supply Chain Management", St. Lucle Press, 2000.

IE24C SERVICE ENGINEERING & MANAGEMENT

M.TECH II SEMESTER

INDUSTRIAL ENGINEERING

(Programme Elective Course – III)

Instruction Hours/ Week: (L-T-P-C): 3-0-0-3

COURSE CONTENT:

UNIT-I

Introduction Strategic service vision, service concepts and strategy, Understanding services, focus on customers, customer service management; Design and delivery of the services, Managing capacity and demand, Service quality and productivity, Globalization of services, Service Network; IT Enabled services, Design and operation of systems for e-Business

UNIT-II

Business Process Management - process analysis, reengineering, process measurement and effectiveness

UNIT-III

Management science application in services- Applications of inventory models, location analysis, queuing theory, operations scheduling, economic analysis, decision models, utility theory, simulation modelling, performance evaluation with data envelopment analysis, AHP and productivity models, evaluation of the dynamics of enablers, inhibitors and results

UNIT-IV

Management Control systems -control processes, performance measurement, variations in management control and modern control systems, management control of projects, management control of reliability; BPO and Services marketing

UNIT-V

Applications of Technology management, Benchmarking, Customer relationship management, Data mining and Knowledge management

COURSE OUTCOMES:

At the end of the course student will be able to learn the

1. To analysis the concept of strategic service vision.
2. To create the business process management and effectiveness of measurements.
3. To apply the management science application in services.
4. To remember the management control systems with their applications.
5. To understand the concept of application of technology management.

REFERENCES:

1. James A. Fitzsimmons and Mona J. Fitzsimmons (2000(T)), Service Management: Operation, Strategy and JIT, Third Edition, McGraw-Hill, Inc, NY.
2. Joseph M. Juran (1992), Quality by Design, The Free press.
3. R. Kalakota and A. B. Whiston (1999), Frontier of Electronic Commerce,AddisonWesley.
4. R. N. Anthony and V. Govindarajan (1998), Management Control Systems, Tata McGraw Hill Publishing Co. Ltd.
5. K. D. Hoffmann and J. E. G. Bateson (2002), Essentials of Services Marketing, Thomson South Western College Publishing.
6. M. J. A. Berry and G. S. Linoff (2001), Mastering Data Mining-The Art and Science of CRM, John Wiley & Sons Inc

IE24C ENERGY MANAGEMENT
M.TECH II SEMESTER
Common to Industrial Engineering & Production Engineering
(Programme Elective Course – III)

Instruction Hours/ Week: (L-T-P-C): 3-0-0-3

COURSE CONTENT:

UNIT-I

Introduction: Principles of energy management. Managerial organization, Functional areas for i) manufacturing industry, ii) Process industry, iii) Commerce, iv) Government, Role of Energy manager in each of these organizations. Initiating, Organizing, and managing energy management programs.

UNIT-II

Energy Audit: Definition and concepts. Types of energy audits, Basic energy concepts, Resources for plant energy studies. Data gathering, Analytical techniques. Energy Conservation: Technologies for energy conservation, Design for conservation of energy materials, Energy flow networks.

UNIT-III

Alternative Energy Sources: **Solar Energy** – Types of devices for Solar Energy Collection.
Solar Energy Collection: Flat plate and concentrating collectors – Classification of concentrating collectors – Orientation and Thermal analysis – Advanced collectors.
Solar Applications: Solar heating/cooling techniques – Solar distillation and drying - Photovoltaic energy conversion.

UNIT-IV

Wind Energy: Sources and potentials – Horizontal and Vertical axis windmills – Performance characteristics.
Solar Energy Storage: Different methods – Sensible, Latent heat and Stratified storage – Solar Ponds.

UNIT-V

Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of biogas, utilization for cooking.
Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.
Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles.

COURSE OUTCOMES:

At the end of the course student will be able to learn the

1. To remember the principles of energy management.
2. To analysis the energy audit.
3. To understand the basic concepts of Alternate energy sources.
4. To understand the basic concepts of alternate energy sources (wind , solar).
5. To understand the basic concepts of biomass , geothermal and ocean energies.

REFERENCES:

1. Energy Management Hand Book / W.C. Turner (Ed)
2. Rai G.D. : Non-conventionalEnergy Sources, Standard PublishersDistributors.
3. Solar Energy /Sukhatme
4. Energy Management Principles / CB Smith/ Pergamon Press
5. Energy Management / W.R.Murthy and G.Mc.Kay / BS Publication
6. Management / H.Koontz and CyrillDonnel / McGraw Hill.

IE25L INDUSTRIAL ENGINEERING LAB-II
M.TECH II SEMESTER
INDUSTRIAL ENGINEERING

Instruction Hours/ Week: (L-T-P-C): 0-0-3-1.5

COURSE CONTENT:

LIST OF EXPERIMENTS:

1. Sales forecasting.
2. Control charts for Variables.
3. Control charts for Attributes.
4. Development of Bill of Materials for MRP.
5. Draw SIMO charts for Ball Point Pen assembly.
6. Determine cycle time using MTM
7. Draw flow process charts for Activities by taking a case study.
8. Determine percentage utilization using work sampling.

COURSE OUTCOMES:

At the end of the course student will be able to

1. Predict future demand using forecasting techniques.
2. Apply the control charts for checking allowable limits.
3. Prepare the BOM for MRP.
4. Apply the concepts of MTM, SIMO charts and work sampling.
5. Draw flow process chart and conduct work sampling study.

IE26L SIMULATION LAB – II
M.TECH II SEMESTER
INDUSTRIAL ENGINEERING

Instruction Hours/ Week: (L-T-P-C): 0-0-3-1.5

COURSE CONTENT:

LIST OF EXPERIMENTS:

1. PERT Model
2. Transportation Model
3. Queuing Model
4. Sequencing Problem
5. Assignment Problem.
6. DOE by Taguchi design.
7. DOE by Response surface methodology.
8. Single response Optimization.
9. Multi response Optimization.
10. Layout optimization

COURSE OUTCOMES:

At the end of the course student will be able

1.To apply the PERT for a project duration estimation.
2.To simulate the transportation model, queuing model, sequencing model.
3. To develop DOE by Taguchi and Response surface methodology.
4.To solve the single and multi-response optimization problems.
5. To solve layout optimization problems.

IE27C LEADERSHIP QUALTIES FOR ENGINEERS
M.TECH II SEMESTER
INDUSTRIAL ENGINEERING

Instruction Hours/ Week: (L-T-P-C): 3-0-0-3

COURSE CONTENT:

UNIT-I

Introduction to Leadership Roles, functions and characteristics of a leader, evolution and growth of leadership, Leadership traits and ethics, Attitude, Behavior, Personality traits and leadership, Types and Styles of leadership, Leader vs Manager, Essential qualities of an effective leader.

UNIT-II

Leadership and Management (Nature, Scope and Significance of Management, Levels of Management, Functions: Planning, Organizing, Staffing, Directing and Controlling, Skills: Conceptual, Human and Technical, Roles: Interpersonal, Informational and Decisional, difference between a leader and a manager)

UNIT-III

Types of Leaders, Leadership styles: Traditional, Transactional, Transformational, Inspirational and servant leadership and Emerging issues in leadership: Emotional Intelligence and leadership, Trust as a factor, Gender and Leadership.

UNIT-IV

Personality: Concept and Definition, Determinants of personality, Personality traits, Personality characteristics in organizations: Self-evaluation, Locus of control, Self-efficacy, Self-esteem, Self-monitoring: Positive and negative Impact.

UNIT-V

Self-Discovery (Awareness of personal values, beliefs and vision that motivates behavior, Personal SWOT, Trust: Openness, confidentiality, blind spot and unknown part of personality, Self-disclosure, seeking feedback, self-reflection, introspection and self-management.

COURSE OUTCOMES:

At the end of the course, students will be able to

1. To understand the leadership roles.
2. To apply the concepts of Leadership and Management.
3. To understand and apply the concepts of Leadership styles.
4. Inculcate and apply personality development aspects.
5. To inculcate and create awareness.

REFERENCES:

1. Organisational Behaviour , M.Parikh and R.Gupta , Tata McGraw Hill Education Private Limited
2. Organisational Behavior, D. Nelson, J.C Quick and P. Khandelwal, Cengage Publication.

IE27C STRESS MANAGEMENT
M.TECH II SEMESTER
INDUSTRIAL ENGINEERING
(Value Added Course)

Instruction Hours/ Week: (L-T-P-C): 3-0-0-3

COURSE CONTENT:

UNIT-I

Meaning and nature of stress: Difference between eustress and distress; Frustration, conflict and pressure; Meaning of stressors; common stressors at work place: Stressors unique to age and gender. Stress and Memory; Stress and Other Cognitive Variables; Stressful environmental conditions on performance.

UNIT-II

Behavioural aspects of Stress: Adaptive and Maladaptive Behaviour; Individual and Cultural Differences: Sources of Stress- Across the Lifespan; College and Occupational Stress.

UNIT-III

Stress and Work performance: Role of communication in managing stress and work performance: Emotional regulation and coping; Emotional intelligence and conflict management: Emotional Basis and Stress; Stress and Conflict in Relationships. Stress intervention – interpersonal, Management Standards and Management Competencies.

UNIT-IV

Strategies of Stress Management: Prevention of stress Challenging Stressful Thinking; Problem Solving; Emotional and cognitive coping styles: Strategies of Synthesis and Prevention: Resilience and Stress; Optimal functioning; Making changes last; Small changes and large rewards.

UNIT-V

Preparing for the Future: Care of the Self: Nutrition and Other Lifestyle Issues: Stress reduction practices: Time management; Exercise; Relaxation techniques; yoga; meditation.

COURSE OUTCOMES:

1. To understand the cognitive variables of stress and Learn Managing Work-Life Balance
2. Preparing for better future by reducing the stress.
3. To understand the nature and consequences of stress
4. To understand the impact of stress on work.
5. To recognize the stressors, Adaptive and Maladaptive behavior

REFERENCES:

1. Baron .L &Feist.J (2000) Health Psychology 4th edition, USA Brooks/Cole
2. Barlow, Rapee, and Perini(2014), 10 Steps to Mastering Stress: A Lifestyle Approach, USA
3. Clayton,M, (2011).Brilliant stressmanagement How to manage stress in any situation's 1st edition, Greart Britain Pearson Education
4. Cooper,C,&Palmer,S, (2000)Conquer Your Stress, London: Institute of personal development Universities Press
5. Dutta, P,K, (2010) Stress management Himalaya, Himalaya Publishing House
6. Lee, K. (2014). Reset: Make the Most of Your Stress: Your 24-7 Plan for Well-being. Universe Publishing.

IE27C UNIVERSAL HUMAN VALUES
M.TECH II SEMESTER
INDUSTRIAL ENGINEERING
(Value Added Course)

Instruction Hours/ Week: (L-T-P-C): 3-0-0-3

COURSE CONTENT:

UNIT-I

Introduction to Value Education : Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations.

UNIT-II

Harmony in the Human Being : Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.

UNIT-III

Harmony in the Family and Society: Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.

UNIT-IV

Harmony in the Nature/Existence : Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence.

UNIT-V

Implications of the Holistic Understanding – a Look at Professional Ethics : Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession.

COURSE OUTCOMES:

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.

2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.

3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

REFERENCES:

1. JeevanVidya: EkParichaya, ANagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj – PanditSunderlal.

IE28P: MINI PROJECT WITH SEMINAR

Instruction Hours/ Week: (L-T-P-C): 1-0-2-2

COURSE OUTCOMES:

At the end of this course, students will be able to

1. Apply emerging technology in processes and systems
2. Analyse the results
3. Deduct conclusions from results
4. Prepare report/document
5. Present effectively

CONTENT:

The students are required conduct experimental work/mathematical modelling/simulation on software packages etc. And collect relevant for analysis, and deduct the conclusions from results. Finally, the student should prepare the report and give seminar on project.

Semester III & IV
PE33ED and PE41D Dissertation Work

Phase–I, Phase–II and Viva-Voce

GUIDELINES FOR DISSERATION PHASE-I AND DISSERATION PHASE-II:

1. The dissertation is a yearlong activity; to be carried out and evaluated in two phases i.e. Phase–I in sem-3andPhase–II in sem-4.

2. The dissertation may be carried out in department laboratories/ industry.

3. After multiple interactions with guide and based on comprehensive literature survey, the student shall identify the domain and define dissertation objectives.

4. Phase–I evaluation: A committee comprising of guides of respective specialization shall assess the progress/ performance of the student based on report, presentation and Q&A. In case of unsatisfactory performance, committee may recommend repeating the Phase-I work.

5. During phase – II: Student is required to continue Phase-1 as per the schedule and thesis (combined phase-1&2) should be submitted at end of sem-4. Accomplished results/contributions/innovations should be published in reputed journals/ conferences/Patents.

6. Phase – II evaluation: Guide, committee with external examiner shall assess the progress/performance of the student based on report, presentation and Q&A. In case of unsatisfactory performance, committee may recommend for extension or repeating the work.

COURSE OUTCOMES:

At the end of this course, students will be able to

1. Synthesize knowledge and skills previously gained and applied to anin-depth study and execution of new technical problem.
2. Select different methodologies to carry out the selected project work.
3. Deduct conclusions from results
4. Prepare report/document
5. Present effectively