(CBCS - with effect from the Academic Year 2016-17)

SRI VENKATESWARA UNIVERSITY: TIRUPATI

SRI VENKATESWARA UNIVERSITY COLLEGE OF ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING

Course

M.Tech MECHANICAL ENGINEERING

(Industrial Engineering)

Choice Based Credit System (CBCS)

Academic Year 2017-2018

VISION AND MISSION OF MECHANICAL ENGINEERING DEPARTMENT

VISION:

To be a globally renowned center for quality education and innovative research in Mechanical Engineering

MISSION:

M1	Prepare effective and responsible graduate engineers for global requirements.
M2	Continuously strive to improve pedagogical methods employed in delivering the academic programs.
M3	Respond dynamically to the changing requirements of the industry.
M4	Conduct basic and applied research to contribute to intellectual human capital.
M5	Inculcate the spirit of entrepreneurship and social responsibility.

PROGRAM OUTCOMES

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and

safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assesssocietal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

SEMESTER – I

Course Code	Course Title	Instructions			Marks		Credits
		Hours / Week			Sess-ionals	End Exam	
		L	T	D/P			
MAME T01	Applied Probability and Statistics *	4	--	--	40	60	4
MEIE T01	Operations Research	4	--	--	40	60	4
MEIE T02	Work System Design	4	--	--	40	60	4
MEIE T03	Operations Planning and Control *	4	--	--	40	60	4
	Elective – I	4	--	--	40	60	4
	Elective – II	4	--	--	40	60	4
MEIE P01	Industrial Engineering Lab	--	--	3	40	60	2
MEIE S01	Seminar	--	--	3	--	100	2
	Total	24		6	280	520	28

SEMESTER – II

Course Code	Course Title	Instructions			Marks		Credits
		Hours / Week			Sess-ionals	End Exam	
		L	T	D/P			
MEIE T04	Supply Chain Management	4	--	--	40	60	4
MEIE T05	Quality Control and Reliability Engineering	4	--	--	40	60	4
MEIE T06	Human Resources Management	4	--	--	40	60	4
MEIE T07	Advanced Operations Research	4	--	--	40	60	4
	Elective – III	4	--	--	40	60	4
	Open Elective	4	--	--	40	60	4
MEIE P02	Simulation Lab	--	--	3	40	60	2
MEIE V01	Comprehensive Viva	--	--	3	--	100	2
	Total	24		6	280	520	28

SEMESTER – III & IV

Course Code	Course Title	Instructions	Marks		Credits
		Hours / Week	Sess-	End	

		L	T	D/P	ionals	Exam	
MEIE J01	Dissertation	--	--	--	40	60	24

Elective – I, II & III should be chosen from the following list of Electives

Course Code	Course Title
MEIE E01	System Dynamics
MEIE E02	Logistics Engineering and Management
MEIE E03	Quantitative Models for Supply Chain Management
MEIE E04	Facilities Planning
MEIE E05	Service Engineering and Management
MEIE E06	Discrete Event System Simulation
MEIE E07	Financial Management and Control
MEIE E08	Marketing Management
MEPE E09	Energy Management *
MEPE E10	Design for Manufacturing *
MEIE E09	Design and Analysis of Experiments *
MEIE E10	Productivity Engineering and Management *

List of Open Electives to be offered for other Departments:

Course Code	Course Title
MEOE T01	Project Management *
MEOE T02	Non Conventional Energy Sources *

***** Common to Industrial Engineering and Production Engineering

MAME T01 APPLIED PROBABILITY AND STATISTICS

M.Tech I Semester
Common to Industrial Engineering & Production Engineering

Lectures / Week: 4 periods

Course Objectives:

1. To identify suitable random variables for discrete and continuous probability estimation.
2. To understand the suitability of the mathematical distributions for the industrial applications
3. To study the sampling theory and apply in prediction of the event and analyze the statistical distributions by process of matrices.

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, Chisquare, 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 student will be able to learn the-

1. Basic concepts of sampling applied in population enumeration.
2. Regression techniques for application and forecast the demand and related variables
3. Testing of hypothesis using statistical distributions.
4. Correlation between the observed values and experimental values for analysis of variance.

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.
2. Assignments.
3. Daily class room interactions.
4. Presentations by students.

REFERENCES

1. Ian F. Blake, An introduction to Applied Probability — John Wiley & Sons (1979)
2. Milton, J.S., Arnold, Jee C., Probability and Statistics in the Engineering and Computing Sciences — Mc Grawhill, 2003.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2				3						
CO2	2	3	1									
CO3		3	1									
CO4	2	3										
CO5		3		2								

MEIE T01 OPERATION RESEARCH

M.Tech I Semester
Industrial Engineering

Lectures / Week: 4 periods

Course Objectives:

1. To identify the importance of minimization and maximization issues in production / manufacturing decision making.
2. To formulate the industrial production concepts so as to achieve the optimal method and development of network in order to identify the scheduling routes and arrive at shortest route for minimal production times
3. To construct a project network for 3 time estimates and identify critical path for proper resource allocation.

Course Content:

UNIT-I

Review of Basic Methods: Review of simplex method, Duality and Post Optimality analysis. Revised Simplex method.

UNIT-II

Integer programming: Integer and Mixed Integer and Zero — One Programming

UNIT-III

Network Flows:

Flows through net works — Shortest route and maximal flow problems — Minimum cost flow problems — Relation between linear programming and Network Flows — introduction to multi commodity flows.

UNIT-IV

Project Management with PERT/CPM:

Project planning and scheduling with limited resources — Time cost tradeoffs — Resource leveling and Resource Allocations.

UNIT-V

Queuing Theory:

Waiting line models — Birth — Death process — Finite and Infinite queuing models — simple priority discipline models — Application of waiting line theory to industrial and service sectors.

Course Outcomes:

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

1. Procedures to model and solve the LPP problems.
2. The design and implementation of the Project Planning.
3. Concepts of queuing systems in real life situations and model for analysis.

4. Importance of the collaboration with industrial projects with involvement of both written and PPT presentations.
5. Estimate the time for shortest path in project scheduling so as to allocate the resources and minimize the make span

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.
2. Assignments.
3. Daily class room interactions.
4. Presentations by students.

REFERENCES:

1. Taha, Hamdy. A., Operations Research an Introduction. — Prentice Hall, India (2003).
2. Hiller & Liberaman, Operations Research — Tata McGrawhill,7th Edition,2002.
3. Bazara S. Mokhtar, Jarvis John and Sherali D. Hanif, Linear Programming and
4. Network Flows — John Wiley & Sons (1990).

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3		1								
CO2	1	3										
CO3	1	3		1								
CO4	1	3		1								
CO5	1	3										

MEIE T02 WORK SYSTEM DESIGN

M.Tech I Semester
Industrial Engineering

Lectures / Week: 4 periods

Course Objectives:

1. To study the existing work place layout and time for each operation.
2. To study the existing working methods and hand and body motion leading to work measurement
3. To learn and design PMTS, MTS systems and man / machine method for implementation of ergonomics.

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 learn the-

1. Work study principle and design effective work layout for minimal hand and body motions.
2. Design process for improvement and design the method study.
3. Estimation of time for each operation through micro motion study so as to eliminate unnecessary movements.

4. Design the ergonomics for effective usage of hand and body motions.

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.
2. Assignments.
3. Daily class room interactions.
4. Presentations by students.

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. Mc Cormic, Human Factors in Engineering Design
5. Work Study by ILO
6. Hank Book of industrial Engineers by H.B Maynard
7. Work study and Ergonomics - S.K. Sharma and Savita Sharma
8. Workstudy - Suresh Dalela

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2			3				1			2
CO2		3		2			1					1
CO3		3		2	1							
CO4	1	3	2	2								1
CO5	1		3	2								

MEIE T03 OPERATIONS PLANNING AND CONTROL

M.Tech I Semester
Common to Industrial Engineering & Production Engineering

Lectures / Week: 4 periods

Course Objectives:

1. To understanding the production processes involved in the manufacturing of a product
2. To forecast the production demand and estimate and plan the schedule activities.
3. To plan the loading of work stations and scheduling for line balancing and LOB.

Course Content:

UNIT-I

OPC 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 case, 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 programmes. 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, 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:

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

1. Forecasting principles and techniques for short range and long range planning

2. Production requirements for each product and plan the shop floor activities
3. Work station loading and scheduling of paths to avoid bottle necks for smooth production
4. Solution for product mix decision using OR techniques.
5. Optimal job sequences to achieve the minimum make span with maximum production output

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.
2. Assignments.
3. Daily class room interactions.
4. Presentations by students.

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.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3			2							
CO2		3		1	2							
CO3			3	2								
CO4	1	3	2									
CO5	1		3	2								

MEIE P01 COMPUTATIONAL LABORATORY

M.Tech I Semester
Industrial Engineering

Lectures / Week: 3 periods

List of Experiments

1. Bolt and Washer assembly
2. Performance Rating
3. OC Curves
4. Simulation
5. Pin Board Study
6. PMTS

Course Outcomes:

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

1. To pursue the method adopted in performing the operation.
2. Understanding of reliable and flexible method to accomplish hectic task in minimum possible time.
3. To record the human activities during working conditions using scientific methods.
4. To study the performance rating of individual worker and to cost accordingly
5. Development of new techniques to minimize the bottlenecks

Contribution to outcomes

1. Class room teaching (through chalk and board and presentations)
2. Through PPT's
3. Expert lecture from industries.
4. Video lectures through NPTEL

Assessment of outcomes

1. Sessional test
2. End term exam
3. Surprise quiz
4. Presentation by students
5. Daily class room interaction

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1		3									
CO2	1		3									
CO3		2		3								
CO4		2		3								
CO5		2	2	3								

MEIE T04 SUPPLY CHAIN MANAGEMENT

M.Tech II Semester
Industrial Engineering

Lectures / Week: 4 periods

Course Objectives:

1. To understand the managerial decision strategies relating to suppliers and related logistics
2. To compute the tradeoffs between the supplier and the purchaser for continuous process operation
3. To understand and optimal utilization of financial resources

Course Content:

UNIT-I

Strategic Frame work to analyze supply chains — understanding supply chain — supply performance — planning demand and supply in a supply chain.

UNIT-II

Demand forecasting in a supply chain — Aggregate planning in a supply chain — planning managing Inventories in a supply chain.

UNIT-III

Determining optimal level of product availability. Transportation, Network design and information Technology in a supply chains.

UNIT-IV

Coordinating a Supply chain — E — business and the supply chain.

UNIT-V

Financial factors influencing supply chain decisions.

Course Outcomes:

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

1. Managerial decision plans for effective implementation with competitive supplies
2. Demand of the materials and maintain zero inventories with proper supply chain.
3. Manufacturing operations and allocation of resources for optimal production.
4. Proper sales market so as to plan the MRP and lean manufacturing concepts
5. Logistics for purchasing raw materials and maintain continuous chain with suppliers and customers

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.
2. Assignments.
3. Daily class room interactions.
4. Presentations by students.

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
5. The Handbook of Logistics and Distribution Management: Understanding the Supply Chain by Alan Rushton, Phil Croucher and Peter Baker

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1		3		2							1
CO2	2		2	3								
CO3	1	3										
CO4	1		3									
CO5		3										

MEIE T05 QUALITY CONTROL AND RELIABILITY ENGINEERING

M.Tech II Semester
Industrial Engineering

Lectures / Week: 4 periods

Course Objectives:

1. Able to know the concepts and methods of modern statistical quality control.
2. Students learn to apply standard quality control tools, theoretical statistical concepts that justify the use of particular quality control tools in particular situations.
3. They learn theory and methods for analyzing the performance of different quality control tools.

Course Content:

UNIT-I

Product Quality, Quality Control, Factors affecting quality, Systems approach to quality, Quality Costs, Quality Circles, Total Quality Management, ISO 9000.

UNIT-II

Control charts for variables and attributes, Process capability studies, Quality Rating System

UNIT-III

Lot — by — Lot acceptance sampling plans by attributes — Acceptance sampling plans for continuous production — Acceptance Sampling plans for variables.

UNIT-IV

Concepts of Reliability, Quality and Reliability, Failure data analysis, Life testing characteristics Failure Rate, Hazard Rate, Reliability. Hazard models (Exponential and Weibull), System reliability with components in series and in parallel, mixed configurations.

UNIT-V

Reliability improvement, Active and standby redundancy, introduction to reliability optimization, Availability and maintainability, Application of reliability in maintenance strategies.

Course Outcomes:

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

1. Able to maintain quality in products using quality circle principles.
2. Able to apply statistical methods to accept the lot of samples.
3. Able to increase the reliability of product through statistical approach.
4. Able to judge whether the lots of samples are to be accept or reject.
5. Learn fundamentals of reliability management and risk assessment.

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.
2. Assignments.
3. Daily class room interactions.
4. Presentations by students.

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.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2			3								
CO2			2	3								
CO3	1		3									
CO4	1				3	2					1	1
CO5			2		3						1	

MEIE T06 HUMAN RESOURCE MANAGEMENT

M.Tech II Semester
Industrial Engineering

Lectures / Week: 4 periods

Course Objectives:

1. Effectively manage and plan key human resource functions within organizations
2. Contribute to employee performance management and organizational effectiveness
3. Develop effective written and oral communication skills

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

Manpower 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 training conventional training techniques, group training, organisation development, evaluating training 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-V

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

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

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

Course Outcomes:

1. Critically evaluate and apply theories and models of HRM that explain the nature and significance of key HRM practices and HRM outcomes as they relate to diverse organisational contexts.
2. Critically analyse and apply the emerging strategic role that HRM plays in a changing business environment and workplace to maintain current policies and procedures

3. Analyse and align HR systems and processes to leadership strategies and objectives in contemporary organisations to promote best practice in HR performance.
4. Identify and evaluate key organisational approaches to improving HR outcomes for both the organisation and its employees
5. Critically analyse employee-employer issues using relevant ethical and legal processes and approaches to solve problems.

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.
2. Assignments.
3. Daily class room interactions.
4. Presentations by students.

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 Managemnt, McGraw Hill.
5. Kapoor, N.D., Introduction to Commercial & Industrial Law, Sultan Chand & Sons.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2		3								
CO2		2	1	3								
CO3	1	2	1	3								
CO4		2	1	3	1							
CO5		2		3	2							

MEIE T07 ADVANCED OPERATION RESEARCH

M.Tech II Semester
Industrial Engineering

Lectures / Week: 4 periods

Course Objectives:

1. Able to learn non-linear, stochastic and dynamic programming
2. Able to understand the concept of multi criteria optimization
3. Able to know the different alogarithms

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 multicriteria optimization — Methods of solution. Goal programming and applications.

UNIT-V

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

Course Outcomes:

1. Able to solve nonlinear problems using Kuhn Tucker conditions.
2. Able to solve Un-constrained and constrained minimization problems using programming methods.
3. Ability to solve multi objective problems using Goal programming.
4. Able to develop meta heuristic algorithms to solve optimization problems.

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.
2. Assignments.
3. Daily class room interactions.
4. Presentations by students.

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.
4. Kalyanmoy Deb, Optimization for Engineering Design Algorithms and Examples (1996).

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2	2	3								
CO2		3	2									
CO3		3	1	2								
CO4		2		1	3							
CO5		3	2		1							

MEIE P02 SIMULATION LABORATORY

M.Tech II Semester
Industrial Engineering

Lectures / Week: 3 periods

List of Exercises

1. Using C & C++ Language
2. N Job 2 Machine Problem
3. Inventory Price Break
4. Solving Simultaneous Equation by Gauss Elimination Method
5. Solving ABC Analysis
6. Solving Simulation of Inventory Systems
7. Solving Simulation of Queuing Systems
8. Solving Application of Newton Raphson Method etc.

Course Outcomes:

1. Able to understand the basic programming knowledge with respect to domain.
2. Able to develop a program to solve N job 2 machine problem using C, C++ software, and to develop a program in C, C++ to solve inventory price breaks problem
3. Able to solve inventory control problem of ABC analysis in MS-EXCEL
4. Able to solve queuing theory problems in TORA package.
5. Able to solve linear programming and non-linear programming problems using TORA

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		3										
CO2		3										
CO3		3										
CO4		3										
CO5		3										

MEIE E01 SYSTEM DYNAMICS

Industrial Engineering
Elective

Lectures / Week: 4 periods

Course Objective:

1. Able to learn models for traditional management and their strengths & weaknesses, principles of modeling.
2. Able to learn software packages like DYNAMO and DYSMAP compilers, and DYMOSIM
3. Able to know the concept of Comparison of system dynamics with popular social science modeling paradigms and some applications of system methodologies.

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 ioop diagrams and flow diagrams — Decisions and Policies — Level and rate configurations — Principles of modelling — Behavioural characteristics of low order systems; Smoothing of information — Exponential delays — Response characteristics of smoothing and delay functions.

UNIT-III

Simulation of system dynamics models; DYNAMO and DYSMAP compilers, and DYMOSIM software package.

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.

Course Outcomes:

1. Ability to develop students' skills in analyzing, simulating, and identifying dynamic systems based upon their input-output responses.
2. Develop and analyze a simulation model that provides a useful explanation of a given problematic behaviour in a narrowly-defined task
3. Able to compare popular social science modeling paradigms such as research economics and cross impact theory

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.

2. Assignments.
3. Daily class room interactions.
4. Presentations by students.

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. et al., 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.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	3								
CO2		3	2	2								
CO3		3	1	2								
CO4	2	1		1								
CO5	1	3	2	1								

MEIE E02 LOGISTIC ENGINEERING AND MANAGEMENT

Industrial Engineering
Elective

Lectures / Week: 4 periods

Course Objective:

1. Acquire a working knowledge regarding the art of Logistics Systems Modeling
2. Able to conceptualize real world situations related to logistics systems development decisions, originating from source requirements and goals.
3. Able to know the concept of TPM, Data collection, Analysis and system evaluation.

Course Content:

UNIT-I

Introduction to logistics: Scope and elements — Need for logistics Engineering — Related Terms and definitions.

UNIT-II

Logistics in the design and Development phase: The design process related discipline — Design for maintainability — Design for Maintainability — Design for Human factors and safety — Design Integration — Configuration change control.

UNIT-III

Logistics in the Production /Construction Phase: Industrial Engineering and operation analysis — quality control — production operations — Transition from Production to user operation.

UNIT-IV

Logistics in the utilization and Support Phase: Totsal Productive maintenance (TPM) — Data collection, Analysis and system evaluation — evaluation of Logistics support Elements.

UNIT-V

Logistics Management: Logistics Planning — Work breakdown structure — cost estimating & controlling — Major Interfaces with other program activities — Management & Control.

Course Outcomes:

1. An ability to apply the knowledge, techniques, skills, and modern tools of the discipline to Engineering Logistics technology;
2. An ability to apply knowledge of engineering, management and technology to Engineering Logistics related issues;
3. An ability to identify analyse and solve Engineering Logistics related issues;
4. An ability to identify, analyse, and solve narrowly defined Engineering Logistics technology problems;
5. An ability to apply written, oral, and graphical communications in both technical and non-technical environments and an ability to identify and use appropriate technical and management literature;

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.
2. Assignments.
3. Daily class room interactions.
4. Presentations by students.

REFERENCES

1. Logistics Engineering and Management — Benjamin S. Blanchard.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1			2	3							
CO2	1	2	3									
CO3	1	2		3								
CO4	1	2		3	1							
CO5		2	2	3								

MEIE E03 QUANTITATIVE MODELS FOR SUPPLY CHAIN MANAGEMENT

Industrial Engineering
Elective

Lectures / Week: 4 periods

Course Objective:

1. Able to know the concept of quantitative techniques of analysis and design

2. Able to understand IT-enabled implementation of solutions in some areas of Supply Chain Management.
3. Able to understand the analysis of total supply chain costs, robust design of supply chains, co-ordination of supply chain decisions and handling of uncertainties in supply chain management.

Course Content:

Unit-I

Introduction to Supply chain management- Definition, complexity and key issues- centralized and Decentralized systems-SCM involving in a number of decisions that benefit by quantitative techniques of analysis and design.

Unit-II

Modeling, Computation and IT-enabled implementation of solutions in some areas of Supply chain management-Value of information and supply chain integration- Bull-whip effect, Push-based, Pull based systems.

Unit-III

The application areas- material flow management across the supply chain, value management and analysis of total supply chain costs, robust design of supply chains, co-ordination of supply chain decisions and handling of uncertainties in supply chain management.

Unit-IV

Transportation Decision- Drivers of the decision, Network Design Decisions, Cross-Docking, transshipment. Distribution and logistics in Supply chain- Direct shipment/ intermediate storage policies, Vehicle routing models, third- part logistics

Unit-V

Information technology in supply chain- Enabling supply chain through IT, ERP vendor platforms, Service oriented architecture (SOA), RFID

Course Outcomes:

1. Understand and Implement information system in supply chain.
2. Analyze Mathematical modeling of Supply Chain
3. Understand basics of
4. Reverse & Agile supply chain.
5. Analyze various case studies on supply chain.

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.
2. Assignments.
3. Daily class room interactions.

4. Presentations by students.

REFERENCES

1. Simchi-Levi, D. P. Kaminski and E. Simchi-Levi (2003), Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies, (2nd Edition) Irwin, McGraw-Hill.
2. Chopra S., and P. Meindl (2002), Supply Chain Management: Strategy, Planning, and Operations, Prentice-Hall, India.
3. Shapiro J. (2001), Modelling the Supply Chain, Duxbury Thomson Learning
4. N. Viswanadham. (1999), Analysis of Manufacturing Enterprises: An approach to Leveraging Value Delivery Process for competitive Advantage, Kluwer Academic Publishers, Boston.
5. Tayur, S. Ram Ganeshan and Michael Magazine (1998), Quantitative Models for Supply chain Management, Kluwer Academic Publishers, Boston.
6. G. Raghuram and N. Rangaraj [Editors] (2000) Logistics and Supply Chain Management: Cases and Concepts, Macmillan, New Delhi.
7. Journal articles as appropriate

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2		3								
CO2		2	2	3								
CO3		2	3	1								
CO4	1	2	3									
CO5	1				3							

MEIE E04 FACILITIES PLANNING

Industrial Engineering
Elective

Lectures / Week: 4 periods

Course Objectives:

1. Able to understand the methodology of facilities planning for manufacturing and service.

2. Able to learn the requirements analysis, design procedures, evaluation and computer aided plant layout.
3. Able to understand the Quantitative Approaches to facilities Planning and probabilistic models

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 design 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.

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.
2. Assignments.
3. Daily class room interactions.
4. Presentations by students.

REFERENCES

1. Tompkins. J.A. and White, J.A., Facilities Planning.John Wiley& Sons,1984.
2. Francies, R.L., and Mc Ginnis White, J.A., Facility Layout and Location — An analytical approach, PHI Publications.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3										
CO2		3	2	1								
CO3			2		3							
CO4		3	2	1								
CO5		1	3	2								

MEIE E05 SERVICE ENGINEERING MANAGEMENT

Industrial Engineering
Elective

Lectures / Week: 4 periods

Course Objectives:

1. Able to understand the Strategic service vision, service concepts and business process management
2. Able to know the applications of inventory models, queuing theory, simulation modeling
3. Able to understand various management control systems, BPO and Services marketing and applications

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 eBusiness ;

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 modeling, 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 Outcome:

1. Able to acquire knowledge on focusing on customer and service management
2. Able to manage modern control system, BPO and Services marketing
3. Able to maintain good customer relationship, data mining knowledge management
4. Able to apply utility theory, simulation modeling in management science applications.

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.
2. Assignments.

3. Daily class room interactions.
4. Presentations by students.

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, Addison-Wesley.
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

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	3								
CO2	1	2	3	1								
CO3	1	2		3								
CO4		3			2	2						
CO5			3	2					1			

MEIE E06 DISCRETE EVENT SYSTEM SIMULATION

Industrial Engineering
Elective

Lectures / Week: 4 periods

Course Objectives:

1. Able to understand the need for system modeling and generation of random numbers
2. Able to know the concept of stochastic variates and Various methods of generating stochastic variates
3. Able to learn the design of simulation experiments, simulation languages and applications

Course Content:

UNIT-I

Introduction: Systems — Need for system modeling — General Systems theory — Systems approach to modeling. Open and closed loop models. Concept of Simulation as decision making tool types of simulations — Continuous and discrete probability distributions.

UNIT-II

Generation of Random Numbers: Pseudo random numbers — methods of generation — characteristics of Random numbers and various statistical tests to assess the randomness.

UNIT-III

Generation of Stochastic Variates: Concept of stochastic variates — Various methods of generating stochastic variates — generation of stochastic variates from various statistical distributions(uniform, exponential, normal and empirical distributions etc.,)

UNIT-IV

Design of Simulation Experiments: Problem Formulation — Data collection and reduction — Time flow mechanisms — Flow charts. Starting conditions — Run size experimental design considerations output analysis and interpretation — validation. Variance reduction techniques.

UNIT-V

Simulation Languages — comparison and selection of simulation languages GPSS, SIMSCRIPT, SIMULA, DYNAMO etc.

Application of Simulation: Study of queuing Systems, Production systems, Inventory systems, Maintenance and Replacement systems, Investment analysis etc.

Course Outcomes:

1. Classify various simulation models and give practical examples for each category
2. Construct a model for a given set of data and motivate its validity
3. Generate and test random number variates and apply them to develop simulation models
4. Analyze output data produced by a model and test validity of the model
5. Explain parallel and distributed simulation methods

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.
2. Assignments.

3. Daily class room interactions.
4. Presentations by students.

REFERENCES

1. Banks, J. and Carson II, Discrete Event System Simulation — Prentice Hall International Series(1984).
2. Naylor et al., Computer Simulation techniques — John Wiley & Sons.
3. Geoffrey Gordon — System Simulation — Prentice Hall, India(2" Edition).

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3										
CO2		3	2	1								
CO3			2		3							
CO4		3	2	1								
CO5		1	3	2								

MEIE E07 FINANCIAL MANAGEMENT AND CONTROL

Industrial Engineering
Elective

Lectures / Week: 4 periods

Course Objectives:

1. Able to understand Goals and functions of Finance, risk concepts
2. Able to know the concept of working capital management and evaluation of alternative ways of financing on the liquidity of firms
3. Able to understand the methods of cost accounting and tools of financial analysis

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:

1. Clearly understand the cost management discipline and process
2. Recognise potential pitfalls and understand avoidance strategies
3. Use a cost management estimation and control plan
4. Understand the process and importance of Cost Estimation, Cost Budgeting and Cost Control
5. Understand the financial analysis and flow of funds

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.
2. Assignments.
3. Daily class room interactions.
4. Presentations by students.

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 offinancial decisions — PHI.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2		3								
CO2		2	2	3								
CO3		2	3	1								
CO4	1	2	3									
CO5	1				3							

MEIE E08 MARKETING MANAGEMENT

Industrial Engineering
Elective

Lectures / Week: 4 periods

Course Objectives:

1. Able to know the concept of role of scientific marketing analysis, generation of product ideas and product development
2. Able to understand the purchasing decisions, strategic pricing analysis
3. Able to learn the concept of advertising, promotional and distribution decisions

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, salesmen recruitment and selection, application of dynamic programming to promotional effort, Branch — Switching analysis.

Distribution Decisions: Distribution Systems, Warehousing problems.

Course Outcomes:

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 frameworks, theory and techniques to various marketing contexts.

5. Synthesise ideas into a marketing plan.

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.
2. Assignments.
3. Daily class room interactions.
4. Presentations by students.

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.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1									
CO2	2	1			2							
CO3		2	2									2
CO4		1	2	1		1						2
CO5		2	2	1		1						2

MEPE E09 ENERGY MANAGEMENT

Common to Industrial Engineering & Production Engineering
Elective

Lectures / Week: 4 periods

Course Objectives:

1. Familiarizing with management, especially with management in energy sector engineering.
2. Studying methods of energy accounting and energy auditing in energy sector, industry and final consumption.
3. Able to understand the fundamentals of product strategy management and Finding opportunities to increase the rational use of alternative energies.

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. Critical assessment of energy usage. Formulation of objectives and constrains, Synthesis of alternative options and technical analysis of options. Process integration.

UNIT-III

Economic Analysis: Scope, Characterization of an investment project. Types of depreciation, Time value of money. Budget considerations, Risk analysis.

UNIT-IV

Alternative Energy Sources:

Solar Energy – Types of devices for Solar Energy Collection – Thermal Storage System – Control Systems-

Wind Energy – Availability – Wind Devices – Wind Characteristics – Performance of Turbines and systems.

UNIT-V

Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield,combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

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:

1. Understanding basics of demand side management and mechanisms (technical, legal or financial) that influence energy consumption.
2. Recognizing opportunities for increasing rational use of alternative energies.
3. Learning the basics of energy auditing with application on different sectors.
4. Able to take the decisions in budget estimations and evaluate risk analysis

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.
2. Assignments.
3. Daily class room interactions.
4. Presentations by students.

REFERENCES:

1. Energy Management Hand Book / W.C. Turner (Ed)
2. Renewable Energy Sources fTwideil & Weir
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 Cyrill Donnel / McGraw Hill
7. Rai G.D. : Non-conventional Energy Sources, Standard Publishers Distributors

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2											
CO2	3		2		1							
CO3	2		3									
CO4	1											

MEPE E10 DESIGN FOR MANUFACTURING

Common to Industrial Engineering & Production Engineering
Elective

Lectures / Week: 4 periods

Course Objectives:

1. Understand the design rules and considerations with reference to various manufacturing processes
2. To discusses capabilities and limitations of each manufacturing process in relation to part design and cost
3. To examine DFM principles including how the design affects manufacturing cost, lean manufacturing, six sigma, etc.

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 weldments – 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: Visco elastic and creep behavior in plastics-design guidelines for plastic components-design considerations for injection moulding – design guidelines for machining and joining of plastics.

Course Outcomes:

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 for machining and joining and selecting a proper processes for different joining cases

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.
2. Assignments.
3. Daily class room interactions.
4. Presentations by students.

REFERENCES:

1. Design for manufacture, John cobert, Adisson Wesley. 1995
2. Design for Manufacture by Boothroyd,
3. Design for manufacture, James Bralla
4. ASM Hand book Vol.20

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		3									
CO2	2	2	2	2								
CO3	2		2									
CO4	2		3									
CO5	2		3									

MEIE E09 DESIGN AND ANALYSIS OF EXPERIMENTS

Common to Industrial Engineering & Production Engineering
Elective

Lectures / Week: 4 periods

Course Objectives:

1. Able to know the basic principles of design of experiments, ANOVA
2. able to understand the concept of 2k design and 2k-p fractional factorial design
3. Able to learn basics of robust, Taguchi designs and responses in surface methodology

Course Content:

UNIT-I

Introduction to design of experiments: Background and overview, A brief history of Design of Experiments (DOE), Overview of basic statistical concepts, Basic principles of DOE and Types and purpose of DOE methods.

UNIT-II

Full factorial Design: The basic "full factorials", ANOVA, Factorial effects and plots, and Model evaluation.

UNIT-III

Fractional Factorial Design: The one-half fraction and one-quarter of the 2k design, The general 2k-p fractional factorial design and Resolution III, IV and V designs.

UNIT-IV

The Robust Design: The basics of robust designs, Taguchi designs and Robust design example.

UNIT-V

Response Surface Methodology – Central composite designs, Box-Behnken design, Analysis of second order response surfaces and process optimization.

Course Outcomes:

1. Formulate objective(s) and identify key factors in designing experiments for a given problem.
2. Develop appropriate experimental design to conduct experiments for a given problem.
3. Analyze experimental data to derive valid conclusions.
4. Optimize process conditions by developing empirical models using experimental data.
5. Design robust products and processes using parameter design approach.

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.
2. Assignments.
3. Daily class room interactions.
4. Presentations by students.

REFERENCES:

1. Design and Analysis of Experiments, 5th edition, by D.C. Montgomery, John Wiley & Sons, New York, 2001.
2. Design of experiments using Taguchi approach, Ranjith K Roy, John Wiley & Sons.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		2									
CO2	2	3	2									
CO3	3		3									
CO4	2		3									
CO5	3		2									

MEIE E10 PRODUCTIVITY ENGINEERING MANAGEMENT

Common to Industrial Engineering & Production Engineering
Elective

Lectures / Week: 4 periods

Course Objectives:

1. To know the basic definition and concepts of diversity and the difference between productivity and efficiency for economic growth.
2. To understand the various parameters and variables those influence the productivity and model the system performance on computers and measurements the output.
3. To know the long & short term productivity models based on technology and improvement for achievement of management goals

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, Objectives Matrix. Expression for Total Productivity change, the Productivity Evaluation Tree.

UNIT-III

Productivity Planning — Long and Short Term Productivity models — Causes of low 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. Identification and formulation productivity measurement at national level with diversity concepts
2. Development of suitable software for productive evaluation based on objective matrix and decision tree

3. Identification of long term and short term productive models in industry for improvement of the productivity
4. University-industry interaction for entrepreneurship development and technology transfer

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.
2. Assignments.
3. Daily class room interactions.
4. Presentations by students.

References

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

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2											
CO2	3		2		1							
CO3	2		3									
CO4	1											

MEOE T01 PROJECT MANAGEMENT

Common to Industrial Engineering & Production Engineering
Open Elective

Lectures / Week: 4 periods

Course Objectives:

1. To understand the basic concepts of projects, need of projects, project life cycle and knowledge for management
2. To understand the project planning concepts, feasibility studies so as to design a project to achieve break-even point
3. To understand the roles of individual and team work leadership styles, challenges in project improvementation identify the conflict issues and solution process for better execution and control

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 Breakdown 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 Outcomes:

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

1. Better understanding of the project principles and project life cycle so as to avoid the project delays and the design stage itself to arrive at the Break-even point
2. Better analysis of the project planning, the role and responsibility of the team work in the assignment of jobs

3. Organization structure the responsibilities and role of leaders and team management
4. Process of implementation of performance measurements for better productivity and project process control

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.
2. Assignments.
3. Daily class room interactions.
4. Presentations by students.

REFERENCES:

1. Effective project management by Robert K. Wysoki

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2							2		3	
CO2		2							1		3	
CO3	1	2		2							3	
CO4	1	2	3								2	
CO5		2		3					1		1	

MEOE T02 NON CONVENTIONAL ENERGY SOURCES

Common to Industrial Engineering & Production Engineering
Open Elective

Lectures / Week: 4 periods

Course Objectives:

1. To understand and analyze the present and future energy demand of nation so as to develop suitable techniques to tap the non conventional energy sources.
2. To understand the required equipments and instruments for installation of energy plants.
3. To know the concepts and selection of fuel cells for harnessing the energy in local conditions.

Course Content:

UNIT-I

Introduction: Role and potential of new and renewable sources – The solar energy option – Environmental impact of solar power.

Principles of Solar Radiation: Physics of the sun – The solar constant – Extraterrestrial and Terrestrial solar radiation – Solar radiation on tilted surface – Instruments for measuring solar radiation and sun shine – Solar radiation data.

UNIT-II

Solar Energy Collection: Flat plate and concentrating collectors – Classification of concentrating collectors – Orientation and Thermal analysis – Advanced collectors.

Solar Energy Storage: Different methods – Sensible, Latent heat and Stratified storage – Solar Ponds

Solar Applications: Solar heating/cooling techniques – Solar distillation and drying - Photovoltaic energy conversion.

UNIT-III

Wind Energy: Sources and potentials – Horizontal and Vertical axis windmills – Performance characteristics.

Bio-Mass: Principles of Bio-conversion – Anaerobic/Aerobic digestion – Types of Bio-gas digesters – Gas yield – Combustion characteristics of bio-gas – Utilization for cooking, I.C. engine operation – Economic aspects.

UNIT-IV

Geothermal Energy: Resources – Types of wells – Methods of harnessing the energy – Potential in India.

OTEC: Principles – Utilization – Setting of OTEC plants - Thermodynamic cycles.

Tidal and Wave Energy: Potential and Conversion techniques – Mini-hydel power plants – Their economics.

UNIT-V

Direct Energy Conversion: Need for DEC – Carnot cycle – Limitations – Principles of DEC – Thermo-electric generators – Seebeck, Peltier and Joule Thompson effects – Figure of merit – Materials – Applications – MHD generators – Principles – Dissociation and Ionization – Hall effect – Magnetic flux – MHD accelerator – MHD engine – Power generation systems – Electron gas dynamic conversion – Economic aspects

Fuel Cells: Principle – Faraday's laws – Thermodynamic aspects – Selection of fuels and Operating conditions.

Course Outcomes:

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

1. Need and analysis of non-conventional energy sources and the processes of energy conservation.
2. Harnessing the solar energy, storage devices so as to produce electricity; ways for energy distribution.
3. Understand the issue of fuel availability and analyse the supply and demand of fuel at the national level
4. Comparison of the coal-fired power plant with the non-conventional energy utilization to reduce environmental pollution.
5. Working principle of carnot cycle for maximum efficiency, need for power generation systems with thermodynamic concepts.

Contribution to outcomes will be achieved through

1. Class room teaching (chalk board, and presentations)
2. Discussions on case studies.
3. Tutorial Classes/Practice Sessions

Assessment of outcomes

1. Two Internal tests each of 20 marks.
2. Assignments.
3. Daily class room interactions.
4. Presentations by students.

REFERENCES:

1. Non-conventional Energy Sources : Rai G.D.
2. Non-conventional Energy : Ashok V Desai
3. Non-conventional Energy Systems : Mittal K M
4. Renewable Energy Technologies : Ramesh and Kumar
5. Renewable Energy Sources : Twidell and Weir
6. Solar Energy : Sukhame
7. Solar Power Engineering : Magal Frank Kreith B.S. & Kreith J.F.
8. Principles of Solar Energy : Frank Krieth and John F Kreider

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2		3	2							
CO2	2	2		3	3							
CO3	1	2		3	2							

CO4	1	2		3	3							
CO5	1	2		3	3							