

SCHEME OF INSTRUCTION, EXAMINATION AND SYLLABI & MODEL QUESTION PAPERS
FOR FOUR SEMESTER COURSE

for

M.E. INDUSTRIAL ENGINEERING – EVENING COURSE



DEPARTMENT OF MECHANICAL ENGINEERING
COLLEGE OF ENGINEERING
ANDHRA UNIVERSITY
VISAKHAPATNAM

MECHANICAL ENGINEERING
M.E. (INDUSTRIAL ENGINEERING) - EVENING COURSE
(Four-Semester Course w.e.f. 2007-2008)

FIRST SEMESTER - Scheme of Instruction and Examination

Course No.	Name of the course	Periods per week			Exam m (hrs)	Max. marks		credits
		Lec.	Lab	Total		Exam	Sess.	
IE 101E	Methods Engineering and Work Design	4	—	4	3	70	30	4
IE 102E	Probability and Statistics	4	—	4	3	70	30	4
IE 103E	Management Principles & Perspectives	4	—	4	3	70	30	4
IE 104E	Engineering & Managerial Economics	4	—	4	3	70	30	4
IE 105E	Work Study Lab.	—	3	3	-	-	50	2
IE 106E	Seminar	—	3	3	—	—	50	2
Total		16	6	22	—	280	220	20

SECOND SEMESTER-Scheme of Instruction and Examination

Course No.	Name of the course	Periods per week			Exam (hrs)	Max. marks		credits
		Lec	Lab	Total		Exam	Ses.	
IE 201E	Industrial Quality Management	4	—	4	3	70	30	4
IE 202E	Operations Planning & Control Systems	4	—	4	3	70	30	4
IE 203E	Human Resource Development & Industrial Relations	4	—	4	3	70	30	4
IE 204E	Facility Planning and Design	4	—	4	3	70	30	4
IE 205E	Computer Applications Lab	—	3	3	—	—	50	2
IE 206E	Seminar	—	3	3	—	—	50	2
Total		16	6	22	—	280	220	20

THIRD SEMESTER-Scheme of Instruction and Examination

Course No.	Name of the course	Periods per week			Exam (hrs)	Max. marks		credits
		Lec	Lab	Total		Exam	Sess.	
IE 301E	Total Quality Management	4		4	3	70	30	4
IE 302E	Advanced Optimization Techniques	4		4	3	70	30	4
IE 303E	Elective – I	4		4	3	70	30	4
IE 304E	Elective – II	4		4	3	70	30	4
Total		16		16	—	280	120	16

Elective – I : A. Computer Integrated Manufacturing B. Maintenance Management
 ((IE 303E) C. System Dynamics D. Project Management
 E. Corporate Planning F. Supply Chain Management

Elective – II : A. Manufacturing Resource Planning B. Technology Management
 (IE 304E) C. Management Information Systems D. Product Design Management
 E. Production Management - Strategic Perspectives
 F. Human Factor Engineering

FOURTH SEMESTER-Scheme of Instruction and Examination

Course No.	Name of the course	Periods per week	Exam	Credits
IE 401E	Project	12	Recommended/ Not recommended	14

The prerequisite for submission of the ME thesis is that one should communicate his/her work to any referred journal or Publication in a conference.

FIRST SEMESTER

IE 101E METHODS ENGINEERING AND WORK DESIGN (Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 4 Th.

Ses.: 30 Exam: 70

Examination (Theory): 3hrs.

Credits: 4

Work study: Concept of work and productivity - Possibility guides - Methods study - Charting techniques - Concept of standard time and bench mark jobs - Timing techniques and work sampling - Elemental motions, THERBLIGS and principles of motion - Economy - Introduction to predetermined motion time standards.

Human factors engineering: Introduction to ergonomics and human factors - Engineering physiological basis of human performance - Biomechanics - Psychology of work and work load perception - Physical work environment - Basis of ergonomic problem identification - Safety.

Integration of methods and time - Learning theory implications on standard time - Work study applications in production, maintenance, quality and other service functions - Synthetic time standards - MTM system and its application to production and maintenance.

Organization and methods: Procedure analysis and developing office standards - MTM application to office work - Forms design and control - Records management.

Value engineering: VE concepts, Principles, Methodologies and standards - Methods of functional analysis - Creativity - VE case studies/project work.

Job evaluation and incentive scheme: Job description and job analysis - Job evaluation-different methods - Individual and group incentive concepts and implications - Different types of incentive schemes - Suggestion schemes.

References:

1. Introduction to Work Study, I.L.O., 3rd Revised Edn., 1986.
2. Methods, Standards and Work Design, Benjamin W. Niebel and Andris Freivalds, WCB Mc Graw Hill(1999)
3. Improving Productivity and Effectiveness by Mundel, Marvin, E., Prentice Hall, 1983.
4. Human Factors Engineering & Design by Sounders, M.S. and McCornic, E.J., McGraw Hill, 1983.
5. Fitting the Task to the Man by Grandjean, E., Taylor and Francis, London, 1989.
6. Measuring and Enhancing Productivity of Service and Government Organizations by Mundel Marvin, E., Asian Productivity Organization, Tokyo.

7. Compendium on Value Engineering by Tufty, H.G., The Indo-American Society, Bombay, 1983.
8. Compensation Administration by Belchar, David, W., Prentice Hall, N.J.

IE 102E PROBABILITY AND STATISTICS
(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 4 Th.

Ses.: 30 Exam: 70

Examination (Theory): 3hrs.

Credits: 4

Fundamental distributions (with stress on the normal distribution and its applications in industry), Statement and uses of Chi-square and distributions.

Least square principles, Elements of curve fitting, Correlation and regression analysis, Motion of linear regression, Concepts of bi-variable and multivariate distributions, The partial and multiple correlations.

Populations, Sample, Parameter, Statistics, Sampling distribution, Standard error, Sampling methods including simulated sample by Monte Carlo methods. Random numbers and their uses. Basic notions on consistence unbiasedness and efficiency. Maximum likelihood estimation.

Motion of statistical hypothesis and statistical test large and small sample tests of significance, Motion of non-parametric test.

Stochastic processes, Markov chains and process, Time series components and analysis.

Analysis of variance - Design of experiments.

Industrial applications.

References:

1. Introduction to Mathematical Statistics by Hogg, R.V. and Craig, A.T.
2. Elements of Probability Theory by Cramer, K.
3. Statistics for Management by Levin and Rubin, PHI, 2001.
4. Mathematical Statistics by John E. Freund, 5th Ed. PHI.
5. Probability & Statistics for Engineers and Scientists by Ronald E. Walpole, Pearson Education Asia Edition.

IE 103E MANAGEMENT PRINCIPLES AND PERSPECTIVES

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 4 Th.

Ses.: 30 Exam: 70

Examination (Theory): 3hrs.

Credits: 4

Management principles: Management functions, Roles & Skills - History of management thought - Various theories and approaches to management - Planning process, tools and techniques - Management by objectives - Decision making process, approaches and aids - Formal and informal organizations - Organisation structure and design - Organization principles of line and staff authority and span of control - Delegation, decentralization and autonomy - Managerial control-need and principles - Role of information in control - Control methods and techniques - Managerial ethics and social responsibility.

Systems approach in problem solving: Systems concepts: System, Environment, Input, Output, Process, Feedback and Control - Classification of systems - System analysis: System design and systems engineering - General systems theory and its application to business problems - Systems design: System purchaser(s), Objectives, Constraints, Design of input, Output process and Feedback control - Examples of application and case studies in different areas of business management.

References:

1. Management by Koonetz, H, O'Donnel, C. and Weihrich, H., McGraw Hill International Student Edn., 9th Edn., 1984.
2. Introduction to Management by Plankett, W.R. and Attner, R.F., Kent Publishing Company.
3. Systems Analysis for Business and Industrial Problem Solving by Optner, S.L., McGraw Hill, NY, 1975.

IE 104E ENGINEERING AND MANAGERIAL ECONOMICS

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 4 Th.

Ses.: 30 Exam: 70

Examination (Theory): 3hrs.

Credits: 4

The principle and use of economic analysis in engineering practice - Discounted cash-flow analysis - Corporate tax and investment - Depreciation and economic studies - Replacement analysis - Valuation of assets - Economic analysis for projects - Analysis of risk and uncertainty - Elements of demand analysis and forecasting - Theory of firm as an owner and as a producer - Economic of scale - Market models - Production function - Output and pricing decision - Long run and short run cost curves.

References:

1. Engineering Economy, William G. Slivan, James A. Bontadelli and Elin M. Wicks, Pearson Education Asia(2001)
2. Engineering Economy by Theusen, H.G. and Others, 5th Edn. Prentice Hall of India, 1981.
3. Managerial Economics by Dean Joel, Prentice Hall of India, New Delhi, 1978.
4. Managerial Economics - Concepts and Cases by Mote, V.L., Samuel Paul, Gupta, G.S., Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1977.

IE 105E WORK STUDY LAB

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 3Pr.

Ses. : 50

Credits : 2

IE 106E SEMINAR

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 3Pr.

Ses. : 50

Credits : 2

The student has to give at least three seminars on topics related to Industrial Engineering.

MODEL QUESTION PAPER-Mechanical Engineering

M.E. (INDUSTRIAL ENGINEERING) - EVENING COURSE - I SEMESTER

IE 101E - METHODS ENGINEERING AND WORK DESIGN

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Time : 3 Hrs.

Max. Marks : 70

Answer any FIVE questions.

All questions carry equal marks.

1. a) How do work study techniques help in improving productivity? Explain.
b) Explain (i) Flow process chart, (ii) Man-machine chart.
2. Explain the principles of motion economy in detail.
3. a) Define the term ergonomics and discuss the objectives and goals of ergonomic studies.
b) Explain Bio-mechanical design considerations. What are the functions performed by man and the involved mechanism in order to make a system success?

4. Discuss various techniques of work-measurement.
5. What is O and M analysis? How do you design and apply the same in the control office of a large business organization?
6. What is job evaluation? Explain the different methods of job evaluation techniques.
7. Explain the various wage incentive schemes.
8. Write notes on:
 - i) Therbligs.
 - ii) Value engineering.
 - iii) Learning theory.
 - iv) MTM.

MODEL QUESTION PAPER-Mechanical Engineering
M.E. (INDUSTRIAL ENGINEERING) - EVENING COURSE - I SEMESTER
IE 102E PROBABILITY AND STATISTICS
(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Time : 3 Hrs.

Max. Marks : 70

Answer any FOUR questions.

All questions carry equal marks.

1. Given below is the distribution of 140 candidates obtaining marks x or more in certain examination.

$x :$	10	20	30	40	50	60	70	80	
	90	100							
$c.f. :$	140	133	118	100	75	45	25	9	2
	0								

Calculate the mean, median, mode and standard deviation.

2. a) Fit a Posson distribution to the following data with respect to the number of red blood corpuscles (x) per cell:

$x :$	0	1	2	3	4	5
No. of cells $f :$	142	156	69	27	5	1

Do you support with reasons, the decision to fit a Posson distribution?

- b) Define normal distribution and find its variance.
- c) In a normal population with mean 15 and standard deviation 3.5, it is known that 647 observations exceed 1625. What is the total number of observations in the population?

3. a) The results of measurement of electric resistance R of a Copper bar at various temperatures t °C are listed below:

t :	19	25	30	36	40	45	50
R :	79	77	79	80	82	83	85

Find a relation $R = a + b A$ by the method of least square.

- b) Find the correlation coefficient between x and y from the given data:

x :	78	89	97	69	59	79	68	57
y :	125	137	156	112	107	138	123	108

4. a) Find the standard error of a linear function of a number of variables.
 b) Test the significance of the difference between the means of the sample from the following data:

	Size of sample	Mean	Standard deviation
Sample A :	100	61	4
Sample B :	200	63	6

5. a) Explain random variable, its distribution expectation and variance.
 b) A random variable x has the following probability function:

Values of x :	-2	-1	0	1	2	3
$P(x)$:	0.1	k	0.2	$2k$	0.3	k

Find the value of k and calculate mean and variance.

6. a) Explain the procedure generally followed in testing of hypothesis. Distinguish between large and small sample tests.

- b) A group of 10 boys fed on a diet A and another group of 8 boys fed on a different diet B recorded the following increase in weights:

Diet A :	56	8	1	12	4	3	9	6	10 kgs
Diet B :	23	6	8	10	1	2	8 kgs		

Does it show the superiority of diet A over that of B?

7. a) Describe the technique of analysis of variance with an illustration for a one way classification.
 b) The following table gives the retail prices of commodity in same shops selected at random in four cities:

City	Price (Rs. per lb)			
A	22	24	27	23
B	20	19	23	–
C	19	17	21	18
D	24	26	29	26

Carry out analysis of variance to test the significance of the difference between the prices of commodity in four cities.

MODEL QUESTION PAPER-Mechanical Engineering
M.E. (INDUSTRIAL ENGINEERING) - EVENING COURSE - I SEMESTER

IE 103E MANAGEMENT PRINCIPLES & PERSPECTIVES
(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Time : 3 Hrs.

Max. Marks : 70

Answer any FIVE questions.

All questions carry equal marks.

1. “Management is regarded as an art of some, science by others and inexact science by many more. The truth seems to be somewhere in between”. In the light of this statement, explain the exact nature of management.
2.
 - a) What steps are involved in planning process?
 - b) What are the major limitations of planning? What action can be taken to make planning effective?
3.
 - a) Distinguish between delegation of authority and decentralization.
 - b) What should be done to ensure effective delegation of authority in a business enterprise?
4.
 - a) What are the essential features of good organization structure?
 - b) How do clearly defined objectives help in managing the organization?
5.
 - a) Write about decision making process.
 - b) What is the need of management control? Explain the principles of managerial control.
6. What is the systems approach of organization theory? Describe the implication of systems approach in organization design.
7. What do you understand by a system? Discuss management as a system bringing out the basic features.
8. Write short notes on any FOUR of the following:
 - a) Managerial ethics.
 - b) Benefits of MBO.
 - c) Concept of feedback.
 - d) Open and closed loop system.
 - e) Role of information in control.

MODEL QUESTION PAPER-Mechanical Engineering
M.E. (INDUSTRIAL ENGINEERING) - EVENING COURSE - I SEMESTER

IE 104E ENGINEERING AND MANAGERIAL ECONOMICS
(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Time : 3 Hrs.

Max. Marks : 70

Answer any FIVE questions.

All questions carry equal marks.

Industrial Engineering Tables are permitted

1. Explain the law of demand and supply in detail.
2. Define a production function. Explain and illustrate isoquant and isocost curves.
3. What are the characteristics of monopolistic competition? Explain how output and price is determined under monopolistic competition.
4. a) Explain the concept of break-even analysis and point out its assumptions.
b) Given the following total cost and total revenue functions, find (i) break-even point, (ii) profit at output 30.
$$\text{Total cost} = 100 + kx, \quad \text{Total revenue} = 10x$$
where x is the quantity sold or purchased.
5. a) Discuss the various methods of depreciation.
b) Find out the depreciation annuity by the annuity charging method after 3 years, when the cost of machine is Rs.8000/- and the scrap value is Rs4000/- only. Rate of interest is 5 percent. Also calculate the value of the machine after two years.
6. a) Discuss the various methods of appraising project profitability.
b) ABC Co. has got up to Rs.20,000 to invest. The following proposals are under consideration.

Project	Initial outlay Rs.	Annual cash flow Rs.	Life Yrs.
A	10,000	2,500	5
B	8,000	2,600	7
C	4,000	1,000	15
D	10,000	2,400	20
E	5,000	1,125	15
F	6,000	2,400	6
G	2,000	1,000	2

- i) Rank these projects in order of their desirability under the pay-back method.
 - ii) Rank these projects under the net present value index method, assuming the cost of capital to be 10 percent.
 - iii) Explain any glaring inconsistencies between (i) and (ii).
7. A manufacturer is offered two machines A and B. A has cost price of Rs.2,500, its running cost is Rs.400 for each of the first 5 years and increases by Rs.100 every subsequent year. Machine B having the same capacity as A, costs Rs.1,250, has running cost of Rs.600 for 6 years, increasing by Rs.100 per year thereafter. If money is worth 10% per year, which machine should be purchased? Scrap value of both machines is negligibly small.
8. Write short notes on any FOUR of the following:
- i) Opportunity cost.
 - ii) Economies of scale.
 - iii) Exponential smoothing technique.
 - iv) Long run and short run cost curves.
 - v) Risk and uncertainty.

SECOND SEMESTER

IE 201E INDUSTRIAL QUALITY MANAGEMENT

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 4 Th.

Ses.: 30 Exam: 70

Examination (Theory): 3hrs.

Credits: 4

Basic concepts of quality assurance system - Statistical quality control - Processes capability analysis - Inspection standards - Control charts for process control - Acceptance sampling including sampling tables - Quality costs estimation and reduction - Quality circles including fault-tree analysis - Total quality control including automation - Product and system reliability: Basic concepts, Quantitative measurement, Prediction, Evaluation and Optimization, Maintainability, Case studies in quality and reliability management in manufacturing and service organizations.

References:

1. Statistical Quality Control by Grant E.L. and Leavenworth, R.S., 5th Edn., McGraw Hill, NY, 1980.
2. Quality Planning and Analysis from Product Development Through Usage by Juran, J.M. and Gryna, F.M., 2nd Edn., McGraw Hill, NY, 1980.
3. Guide to Quality Control by Kaoru Ishikawa, Asian Productivity Organization, 1982.
4. Applications of Quality Control in Service Industries by Rosander, A.C., Marel Dekker, Inc., (ASOC Quality Press), NY, 1985.
5. Engineering Maintainability, B. S. Dhillon, PHI (2000)

6. Principles of Quality Costs- Principles, Implementation and Use, Jack Comaperella, PHI (2000)
7. Introduction to Statistical Quality Control by Montgomery, John Wiely.
8. An Introduction to Reliability and maintainability Engineering by Charles E. Ebeling, Tata McGraw Hill.

IE 202E OPERATIONS PLANNING AND CONTROL SYSTEMS

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 4 Th.

Ses.: 30 Exam: 70

Examination (Theory): 3hrs.

Credits: 4

Operations strategy - Concept of operation planning and control for various operational systems in manufacturing and non-manufacturing sector - Operations planning and control as an integrated system - Aggregate planning and master planning scheduling - Hierarchical productions planning - Material requirement planning, Lot sizing, MRP-II - Scheduling - Group technology - Engineering trends in planning and scheduling, Concepts of just-in-time, Pull and push system of work flow, Opt, etc. - project planning, Monitoring and control - Logistics, Distribution planning and control - Maintenance planning and control.

Implementation and evaluation of operations planning and control system.

Forecasting techniques including box jenkins - Material requirements, Explosion and levels - Classification and inventory analysis - Codification, Standardization and variety reduction - Make or buy decision - Inventory control techniques - Inventory systems - Material requirement planning, Phasing, Materials functions including budgeting, Purchasing and vendor development - Spare parts management - Stores and material accounting - Import export policies, Legal aspects of purchasing, Evaluation of materials management performance.

References:

1. Production Planning and Inventory Control, Narasimhan, Mc Leavy, Billington, PHI(1999)
2. Operation Management- Strategy and Analysis, Lee Krajewski and Larry P. Ritzman, Addison- Wesley (2000).
3. Operations Management : Theory and Problems by Monk, J.G., McGraw Hill, NY, 1985.
4. Computer Aided Production Management, P. B. Mohapatra, PHI (2001)
5. Manufacturing Planning and Control Systems by Vollmann, Thomas, E. and Others, Richard D. Irwin, Illinois, 1984.
6. Service Operations Management by Fitzsimmons,J.A.andSullivan,R.S.,McGraw Hill,NY, 1982.
7. Materials Management by Ammer, Dean, S., Richard D. Irwin, Illinois, 1962.
8. Managing Materials in Industry by Baily, Peter and Farmer, David, Grower Press, London, 1972.

IE 203E HUMAN RESOURCE DEVELOPMENT & INDUSTRIAL RELATIONS

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 4 Th.

Ses.: 30 Exam: 70

Examination (Theory): 3hrs.

Credits: 4

Personnel function: Its evolution, Objective principles, Philosophies, Duties and responsibilities of the personnel management in India. Manpower planning: Its uses and benefits - Problems and limitations - Manpower inventory: Manpower forecasting - Manpower skills analysis and practices in Indian industry recruitment: Selection process, Psychological testing - Interviewing techniques, Transfer, Promotion and its policies - Induction placement and exit interview wage and salary administration.

Training and development: Its objective and policy planning and organizing the training department - Training manager and his job - On and off the job training - Techniques, Career planning, Objective of performance appraisal and its methods.

Industrial relations: Problems of labour management relations - Causes for poor industrial relations - Conditions of good industrial relations - Trade union act - Objectives and advantages of trade unions - Collective bargaining - Industrial disputes act - Disciplinary action and domestic enquires - Machinery for settlement of dispute - Grievance procedure and its handling - Counselling - Lay-off, Lockouts, Strikes, Retrenchment - Labour participation in management, Joint management councils, Factories act and other social security acts relevant to the course.

References:

1. Personnel Management by Monappa Arun and Saiyadain, M.S., 5th Reprint, Tata McGraw Hill, New Delhi.
2. Industrial Relations by Saiyadian, M.S., 1st Edn., Tata McGraw Hill, New Delhi, 1987.
3. The Industrial Law by Malik, P.L., 5th Edn., Eastern Book Co., 1982.

IE 204E FACILITY PLANNING AND DESIGN

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 4 Th.

Ses.: 30 Exam: 70

Examination (Theory): 3hrs.

Credits: 4

Introduction to layout design process - Systematic layout planning - Computerized layout planning - ALDEP, CORELAP, CRAFT, Single and multi-facility location problems - Desuete and continuous location and layout problems - Quadratic assignment location problems - Minmax layout and location problems - Discrete plant location and covering problems.

Weberian location theory: Contribution of Hoover, Greenhut and Losch, Isard and others to locational dynamics of manufacturing facilities - Plant and warehouse location and multiproduct distribution system design problems.

Approaches for solving location decision problems with private or public sector goals - Economics of scale - Capacity and configuration constraints and multiperiods

References:

1. Manufacturing Facilities- Location, Planning and Design, D.R. Sule, PWS- Kent Publishing Co.
2. Facilities Planning, James A. Tompkins and John A. White, John Wiley
3. Facility Layout and Location- An Analytical Approach, Richard L. Francis, Leon F Mc Ginnes and John A. White, PHI(1999)
4. Location on Network Theory and Algorithms by Handler, G.Y., Mirchandani, P.B., MIT Press, 1979.

IE 205E COMPUTER APPLICATIONS LAB

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 3 Pr.

Ses. : 50

credits: 2

Data analysis:

Statistical analysis of data with graphs - Linear regression - Multiple linear regression.

Operations research:

Linear programming - Networks - Queuing.

Production management:

Inventory - Layout/Line balancing - Forecasting - Scheduling.
Simulation models.

IE 206E SEMINAR

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 3 Pr.

Ses. : 50

credits: 2

The student has to give at least three seminars on topics related to Industrial Engineering.

MODEL QUESTION PAPER-Mechanical Engineering
M.E. (INDUSTRIAL ENGINEERING) - EVENING COURSE - II SEMESTER

IE 201E INDUSTRIAL QUALITY MANAGEMENT
(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Time : 3 Hrs.

Max. Marks : 70

Answer any FIVE questions.
All questions carry equal marks.
Statistical tables may be supplied.

1. a) Define (i) quality control, (ii) statistical quality control.
b) Discuss the benefits of SQC.
c) What is quality assurance?
2. a) Discuss control charts for variables and attributes.
b) What is process capability? Explain.
3. A subgroup of 5 items each are taken from a manufacturing process at a regular interval. A certain quality characteristics is measured and \bar{X} and R values are computed. After 25 subgroups it is found that $\Sigma \bar{X} = 357.50$ and $\Sigma R = 8.80$. If the specification limits are 14.40 ± 0.40 ; and if the process is in statistical control, what conclusions can you draw about the ability of the process to produce items within specification?
4. 10 samples of each 50 size, of a pipe were inspected in pressure testing. The results of the inspection are given below:

Sample No.:	1	2	3	4	5	6	7	8	9	10
No. of defectives:	2	3	2	0	2	3	2	1	2	3

Draw suitable chart and state your conclusions.
5. a) What do you understand by acceptance sampling?
b) A double sampling plan is as follows:
 - i) Select a sample of 2 from a lot of 30. If both articles inspected are good accept the lot. If both are defective reject the lot. If one is good and one is defective, take a second sample of one article.
 - ii) If the article in the second sample is good, accept the lot. If it is defective reject the lot. If a lot of 35% defective is submitted, what is the probability of acceptance? Compute this by the method, that is theoretically correct rather than by an approximate method.
6. a) Discuss the importance of reliability.
b) What is maintainability and availability? Explain.
7. a) Consider that there are four systems connected in series with reliabilities.
 $R_1 = 0.75, R_2 = 0.9, R_3 = 0.88$ and $R_4 = 0.72$.
Calculate the reliability of the complete system.

b) An equipment consists of three subassemblies. A, B and C with reliabilities $R_a = 0.95$, $R_b = 0.85$, $R_c = 0.75$. Calculate the equipment reliability.

8. Write notes on:

- a) Quality costs.
- b) Quality circles.
- c) MTBF and MTTR.
- d) Modelling parallel systems.

MODEL QUESTION PAPER-Mechanical Engineering
M.E. (INDUSTRIAL ENGINEERING) - EVENING COURSE - II SEMESTER

IE 202E OPERATIONS PLANNING AND CONTROL SYSTEMS
(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Time : 3 Hrs.

Max. Marks : 70

Answer any FIVE questions.

All questions carry equal marks.

- 1. a) What do you mean by operations strategy? Explain the concept of operation planning and control for various operational systems in manufacturing and non-manufacturing sector.
b) Explain the concept of World Class Manufacturing.
- 2. a) How are MAD, bias and MAPE are useful in evaluating the efficiency of forecasting?
b) The demand for refrigerators during the last three years is shown below in a table.

<u>Year</u>	<u>Quarter</u>	<u>Demand</u>
1.	1	500
	2	800
	3	550
	4	400
2.	1	550
	2	912
	3	625
	4	475
3.	1	612
	2	650
	3	600
	4	525

Use exponential smoothing with trend correction to forecast the sales for all four quarters of the fourth year.

Use smoothing constants $\alpha = 0.2$, $\beta = 0.2$, $\gamma = 0.3$.

3. a) Two inventory items have the following data:

Item	Annual usage	Order quantity	Value per unit	Standard deviation of lead time demand
A	10,000	10,000	\$5	40
B	100	100	\$5	5

The inventory investment budget is \$200. Find the optimal amounts of safety stock for each item beginning with a Lagrange Multiplier of 1/100.

- b) A service center seeks to maintain inventories at three times current sales. Lead time at the service center is one week. Sales are 100 units for the first four weeks and 200 units per week thereafter. With a beginning inventory of 300 units and an open order for 100 units to arrive at the beginning of week 2, create a table showing beginning inventory, sales, desired ending inventory actual ending inventory and orders for twelve months.

4. a) Develop the objective function and the constraint equations for the following aggregate output problem. Assume an eight-hour, twenty day month. Person-hour demands for the next six months are 35000, 25000, 40000, 45000 and 30000. The costs are as follows:

Inventory holding cost : \$0.30/person-hours/month.

Regular time payroll cost : \$6/person-hour.

Overtime payroll cost : \$9/person-hour.

Hiring cost : \$300/worker.

Layoff cost : \$500/worker.

The initial status consists of a workforce of 220 workers and a current inventory of 10000 person-hours.

- b) A company forecasts total sales of 5000 hoists for the next month. Based on past sales information, the following breakdowns were obtained for the options:

Motor 1 : 50%

Motor 2 : 50%

Drum A : 35%

Drum B : 65%

Using S-bills, indicate how many of each item would be manufactured?

6. a) Three products X, Y, Z have daily demands of 120, 200 and 360, develop a cycle of production.

- b) The following jobs are waiting to be processed at the same machine center.

Job	Date Order received	Production Day needed	Date Order due	Costs of delay (\$)
A	110	20	180	500
B	120	30	200	1000
C	122	10	175	300

D	125	16	230	500
E	130	18	210	800

In what sequence would the jobs be ranked according to the following rules: (i) FCFC, (ii)EDD, (iii) SPT, (iv) LPT, (v) TSPT, (vi) LS and (vii) COVERT? All dates are according to shop calendar days. No job is allowed to wait more than seventy days. Today on the planning calendar is day 130.

7. a) Develop a dispatch list for each machine center using the critical ratio technique. Assume one week for transport between operations and two days for find inspection and transport to the delivery department. Since the use of alternative machine centers, overlap of operations and job splits is costlier, can we meet the schedule without utilizing them? Assume a five-day work week.
- b) What is the purpose of technology audits in a firm? Explain some major steps involved in the process.
8. Write short notes on the following:
 - a) Hierarchical production planning.
 - b) Make or buy decision.
 - c) Vendor development.
 - d) MPR-II

MODEL QUESTION PAPER-Mechanical Engineering
M.E. (INDUSTRIAL ENGINEERING) - EVENING COURSE - II SEMESTER

IE 203E HUMAN RESOURCE DEVELOPMENT & INDUSTRIAL RELATIONS
(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Time : 3 Hrs.

Max. Marks : 70

Answer any FIVE questions.

All questions carry equal marks.

1. a) What are the functions of personnel management?
- b) What is the role of personnel management in an organization?
2. What is manpower planning? Explain. What are the objectives of manpower planning?
3. a) What are the advantages and disadvantages of psychological test?
- b) In what ways are promotional policies in an organization implemented? How do promotional policies act as motivators?
4. a) Explain the different training methods for operators.
- b) What is performance appraisal? Justify the need of performance appraisal in an organization.

5. a) What are the causes for poor industrial relations?
b) Explain the advantages and disadvantages of having employee associations in an organization.
6. a) What is a grievance? Why should a manager be concerned about the employees' grievances?
b) What are the causes of grievances? In which areas can a manager expect grievances from an employee?
7. a) What is corrective bargaining?
b) What is a Trade Union? What is the role of trade unions in an industry?
8. Write short notes on the following:
 - a) Induction placement.
 - b) Human behaviour.
 - c) Settlement of industrial disputes.
 - d) Factories Act.

MODEL QUESTION PAPER-Mechanical Engineering
M.E. (INDUSTRIAL ENGINEERING) - EVENING COURSE - II SEMESTER

IE 204E FACILITIES PLANNING AND DESIGN
(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Time : 3 Hrs.

Max. Marks : 70

Answer any FIVE questions.

All questions carry equal marks.

1. Describe plant layout process by explaining different the factors which are effecting the layout. (20)
2. Explain systematic layout planning. (20)
3. Explain briefly CRAFT, CORELAP, ALDEP heuristics (20)
4. Existing facilities are located as follows P1 = (4, 6), P2 = (8, 10), P3 = (10, 12), P4 = (10, 15), P5 = (9, 18), P6 = (15, 10). It is desired to locate one new Machine with respect to existing facilities. The amount of item movement between new facility and each existing facility is given as W1 = 5, W2 = 8, W3 = 10, W4 = 12, W5 = 15, W6 = 10. Calculate using Rectilinear approach and gravity location method. (20)

5. Explain the procedure for locating optimum location for new facility with respect to m existing facilities using Euclidean distance approach. (20)
6. The following data are gives for a multi-facility rectilinear distance location problem.
- $$V_{12} = 4$$
- $$W = \begin{pmatrix} 4 & 0 & 5 \\ 2 & 1 & 0 \end{pmatrix}$$
- $$P_1 = (10, 15); P_2 = (20, 25); P_3 = (40, 5)$$
- Find optimum X and Y Co-ordinates new facilities 1 and 2 using co-ordinate decent approach. (20)
7. Define quadratic Assignment Problem. Suggest any heuristic to solve QAP. (20)
8. a) Describe different types of covering problems (10)
- b) Explain with any heuristic the ware house location problem. (10)

IE 301E TOTAL QUALITY MANAGEMENT
(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 4 Th.

Ses.: 30 Exam: 70

Examination (Theory): 3hrs.

Credits: 4

Concepts of TQM: Philosophy of TQM, Customer focus, Organization, Top management commitment, Team work, Quality philosophies of Deming, Crossby and Muller.

TQM process: QC tools, Problem solving methodologies, New management tools, Work habits, Quality circles, Bench marking, Strategic quality planning.

TQM systems: Quality policy deployment, Quality function deployment, Standardization, Designing for quality, Manufacturing for quality.

Quality system: Need for ISO 9000 system, Advantages, Clauses of ISO 9000, Implementation of ISO 9000, Quality costs, Quality auditing, Case studies.

Implementation of TQM: Steps, KAIZEN, 5S, JIT, POKAYOKE, Taguchi methods, Case studies.

References:

1. Total Quality Management by Rose, J.E., Kogan Page Ltd., 1993.
2. The Essence of Total Quality Management by John Bank, PHI, 1993.
3. Beyond Total Quality Management by Greg Bounds, Lyle Yorks et al, McGraw Hill, 1994.
4. The Asian Productivity Organization by Takashi Osada, 1991.
5. KAIZEN by Masaki Imami, McGraw Hill, 1986.

IE 302E ADVANCED OPTIMIZATION TECHNIQUES
(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 4 Th.

Ses.: 30 Exam: 70

Examination (Theory): 3hrs.

Credits: 4

Geometric programming (G.P): Solution of an unconstrained geometric programming, differential calculus method and arithmetic method. Primal dual relationship and sufficiency conditions. Solution of a constrained geometric programming problem (G.P.P), Complementary Geometric Programming (C.G.P)

Dynamic programming(D.P): Multistage decision processes. Concepts of sub optimization and Principal of optimality, computational procedure in dynamic programming calculus method and tabular methods. Linear programming as a case of D.P. and continuous D.P.

Integer programming(I.P): Graphical representation. Gomory's cutting plane method. Bala's algorithm for zero-one programming problem. Branch-and-bound method, Sequential linear discrete Programming, Generalized penalty function method.

Stochastic Programming (S.P.): Basic Concepts of Probability Theory, Stochastic Linear programming.

Non-traditional optimization techniques: Multi-objective optimization - Lexicographic method, Goal programming method, Genetic algorithms, Simulated annealing, Neural Networks based Optimization.

References:

1. Operations Research- Principles and Practice by Ravindran, Phillips and Solberg, John Wiely
2. Introduction to Operations Research by Hiller and Lieberman, Mc Graw Hill
3. Engineering Optimization - Theory and Practice by Rao, S.S., New Age International (P) Ltd. Publishers.
4. Engineering Optimization By Kalyanmanai Deb, Prentice Hall of India, New Delhi.
5. Genetic Algorithms - In Search, Optimization and Machine Learning by David E. Goldberg, Addison-Wesley Longman (Singapore) Pvt. Ltd.

Elective - I

IE 303E (A) COMPUTER INTEGRATED MANUFACTURING

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 4 Th.

Ses.: 30 Exam: 70

Examination (Theory): 3hrs.

Credits: 4

Introduction: Scope of computer integrated manufacturing, Product cycle, Production automation.

Group technology: Role of group technology in CAD/CAM integration, Methods for developing part families, Classification and coding, Examples of coding systems, Facility design using group technology, Economics of group technology.

Computer aided process planning: Approaches to process planning - Manual, Variant, Generative approach, Process planning systems - CAPP, DCLASS, CMPP, Criteria for selecting a CAPP system, Part feature recognition, Artificial intelligence in process planning.

Integrative manufacturing planning and control: Role of integrative manufacturing in CAD/CAM integration, Over view of production control - Forecasting, Master production schedule, Capacity planning, M.R.P., Order release, Shop-floor control, Quality assurance, Planning and control systems, Cellular manufacturing, JIT manufacturing philosophy.

Computer aided quality control: Terminology in quality control, Contact inspection methods,

Non-contact inspection methods, Computer aided testing, Integration of CAQC with CAD/CAM.

Computer integrated manufacturing systems: Types of manufacturing systems, Machine tools and related equipment, Material handling systems, Computer control systems, FMS.

References:

1. CAD/CAM Computer Aided Design and Manufacturing by Mikell P. Groover and Emory W. Zimmer, Jr.
2. Computer Integrated Design and Manufacturing by David D. Bedworth, Mark R. Henderson, Philip M. Wolfe.

Elective - I

IE 303E (B) MAINTENANCE MANAGEMENT

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 4 Th.

Ses.: 30 Exam: 70

Examination (Theory): 3hrs.

Credits: 4

Characteristics, Benefits, Objectives and Policies of maintenance, Organization and structure of maintenance system: Mechanics of maintenance system - Planning and scheduling maintenance activities - Types of maintenance - Preventive maintenance -

Development of preventive maintenance schedule: Planned prevention of breakdowns - Predictive maintenance - Condition monitoring - Equipment codification and classification - Maintenance budgeting and cost control - Production maintenance integration - Replacement - Policies and models - Reliability models - State transition diagrams for maintained and non-maintained systems.

Reliability measurement and life testing application of reliability: Maintenance strategies - Maintainability and availability and criteria - Maintenance manpower planning spare parts management - Maintenance downtime analysis - Computerized maintenance system - Application of simulation technique - Design - Implementation and Operation of an integrated maintenance system.

References:

1. Maintainability Principles and Practices by Blanchard, B.S., McGraw Hill, NY, 1969.
2. Maintenance Management by Carder, A.S., McGraw Hill, NY, 1976.
3. Maintenance Engineering and Management by Mishra, R.C. and Pathak, K., PHI, 2002.

Elective - I **IE 303E (C) SYSTEM DYNAMICS**

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 4 Th.

Ses.: 30 Exam: 70

Examination (Theory): 3hrs.

Credits: 4

Introduction to system dynamics: Basic problem - Fundamental system concepts - Occurrence of dynamic phenomena in managerial and economic systems - Objectives of a system dynamic analysis.

System structure and behaviour: Principles for formulating dynamic system models - Structure of dynamic system model - System of equations - Symbols for flow diagrams - Representation of delays - Policies and decisions - Aggregation of variation - Exogenous variable judging model validity.

Examples of dynamic system model: Model of production distribution system (Forrester models).

Further examples: System dynamics in manufacturing - Marketing and distribution - Research and development - Managerial control and financial applications.

Application of system dynamics to societal: Problems - Regional economic simulation model - Urban transportation planning model - Natural resources management and sociological systems - Case studies.

References:

1. A Study Notes on System Dynamics, Goodman, MIT Press
2. Industrial Dynamics, Forester, MIT Press

3. System Dynamics Modelling and Policy Design, Mohapatra, Bora and Mandal, University Press
4. Management System Dynamics by Coyle, John Wiley, 1977.
5. System Dynamics by Ogata, K., Prentice Hall, NJ, 1978.
6. Managerial Application of System Dynamics by Roberts, E.B., MIT Press.

Elective - I

IE 303E (D) PROJECT MANAGEMENT

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 4 Th.

Ses.: 30 Exam: 70

Examination (Theory): 3hrs.

Credits: 4

Industrial development - Corporate growth and business development. Product innovation research and development - Formulation and implementation of R&D projects. Project identification and formulation - Needs analysis - Resource surveys - Market research - Feasibility analysis. Technical feasibility - Technology forecasting - Choice of technology - Choice of process technology assessment technology - Transfer - Techno economic analysis - Appropriate technology.

Analysis of infrastructures: Inputs transports - Elements of economic geography - Location - Site selection. Investment analysis principles. Industrial policy - Incentives and regulations. Cost estimating - Cost-benefit analysis - Financial analysis - Economic analysis - Social-cost benefit analysis - UNIDO - World Bank and OECD methodologies. Project financing - Source of finance - Cost of capital - Capital structure - Internal finance and foreign exchange regulation - Projects and contracts planning and co-ordination - Project scheduling and monitoring tools and techniques - Project management information systems and documentation - Computer applications in project management.

References:

1. Project Management, David I. Cleland, Mc Graw Hill(1999)
2. Managing Construction Contract by Colier Kinth, Reston Publishing Co.
3. Engineering and Construction Project Management by Kerridge, A.E. and Verveelin, C.H., Gulf Pub. Co., Houston, 1986.
4. Project Formulation and Evaluation Series, No.1, No.2 and No.3, U.N.I.D.O., Oxford and IBH Publishing Co.

Elective - I

IE 303E (E) CORPORATE PLANNING

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 4 Th.

Ses.: 30 Exam: 70

Examination (Theory): 3hrs.

Credits: 4

Corporate objectives, Goals and Policies; Process of corporate planning; SWOT analysis, Gap analysis, Strategy formulation.

Environmental scanning and analysis; Technological forecasting, Economic and social environmental, Business forecasting, Market dynamics, Government policies, Elements of futurology, Strategies for growth and survival; Long range planning of R&D, Strategies for technology base industries, Multinational operations.

Investment evaluation, Capital budgeting, Risk analysis. Industrial dynamics, Computer modelling and simulation. Organizing for corporate planning, Implementing corporate strategies, Business plans, Resources planning, Management control and information systems.

References:

1. Introducing Corporate Planning by Hussey, D.E., Pergaman Press, NY, 1985.
2. Strategic Planning System by Lorange, P. and Vancil, R.F., Prentice Hall, NJ, 1980.
3. Corporate Planning & Policy Designs by Lyneis, J.M., MIT Press.

Elective - I

IE 303E (F) SUPPLY CHAIN MANAGEMENT

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 4 Th.

Ses.: 30 Exam: 70

Examination (Theory): 3hrs.

Credits: 4

Elective – II

IE 304E (A) MANUFACTURING RESOURCE PLANNING

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 4 Th.

Ses.: 30 Exam: 70

Examination (Theory): 3hrs.

Credits: 4

An overview of MRP-II, Master production scheduling and final assembly scheduling, Strategic and business planning, Sales and operations planning, Demand management, Master production scheduling, Bill of materials, Capacity management, Shop floor control, Introduction to ERP, SCM and CRM.

Reference:

Manufacturing Resource Planning (MRP-II) by Khalid Sheikh, Tata McGraw Hill, 2002.

Elective - II

IE 304E (B) TECHNOLOGY MANAGEMENT

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 4 Th.

Ses.: 30 Exam: 70

Examination (Theory): 3hrs.

Credits: 4

Technology development and society: Technology and Corporate growth, Technology forecasting, Technology transfer, Adoption and diffusion, Technology innovation and applied research, Technology assessment, Evaluation of R & D projects, Budgeting and cost control, Managing technology development, Product development, Market development.

References:

1. Managing Technology - The Strategic Vies by Lowell W. Steele, McGraw Hill.
2. Technology Strategy and the Firm by Mark Dodgson, Longman.

Elective - II

IE 304E(C) MANAGEMENT INFORMATION SYSTEMS

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 4 Th.

Ses.: 30 Exam: 70

Examination (Theory): 3hrs.

Credits: 4

and process in organizations. Tools for modelling and analysis of data: Data flow diagram, Data dictionary.

Tools for modelling and analysis of processes: Flow charts, Structured english and pseudocode, Decision tables, Decision trees. Structured design of data processes:

Structured design of data (File design), Structure chart, Transform analysis, Transaction analysis.

Semi structured problems and DSS. Management perspectives: Evolution of MIS in an organization (Nolan's state model), System development life cycle model and Project planning for MIS.

Contingency approaches to information, Requirements analysis. Contingency approaches to applications. Development. Pitfalls in MIS development. Information system audit. Long term MIS planning. Applications: MIS in various functional areas. Case studies and project assignments.

References:

1. Management Information Systems, Laudon and Laudon, PHI(1999)
2. An Introduction to Data Base Management System by Data, C.J., Narosa Publication House, New Delhi, 1985.
3. Design of Computer Data Files by Owen Hansan, Pitman.
4. Management Information Systems by Davis Gordon.
5. Information Systems for Modern Management by Murdic, Ross and Clagget, PHI, 1985.
6. Management Information Systems-Conceptual Foundations by Davis Gordon, McGraw Hill.

Elective – II

IE 304E (D) PRODUCT DESIGN MANAGEMENT

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 4 Th.

Ses.: 30 Exam: 70

Examination (Theory): 3hrs.

Credits: 4

Introduction to design, Product design, Design management, Product management. Traditional & modern design, Design process, Organizational objectives.

Need related intelligence, Identification of latent needs, Technology related intelligence, Development of technological competence.

Organizational strength & weakness, Criteria for a new product, New product management, Forward planning, Coordination and communication.

Innovation, creativity and diffusion, Techniques for creative idea generation. Evaluation of new products ideas, Functions- technological, Ecological, Legal.

Investigating user behaviour - User habits, Expectations, Perception, Techniques for investigating user behaviour.

Stating objectives, Product formulation, Development of business analysis, Analysis for development, Boundary search and functional innovation.

Product design and design methods, Selection of methods appropriate to design stage. Design evaluation - Analysis for fault, Value and Reliability. Ergonomic analysis, Analysis for maintenance and useful life.

Market preparation vendor search, Sales promotion, Test marketing product and introduction strategy.

Organizational structure for effective product innovation and role of product manager.

References:

1. Corporate Strategy and product Innovation by Rothberg, Robert, R., The Free Press, 1976.
2. Design Methods, Seeds of Human Future by Jones, J.C., John Wiley, 1970.
3. New Product Development by Grunwald, G., Business Books, Illinois, 1985.
4. Product Design and Manufacturing, A. K. Chitale and R. C. Gupta, PHI (2002)

Elective – II**IE 304E (E) PRODUCTION MANAGEMENT - STRATEGIC PERSPECTIVES**

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 4 Th.

Ses.: 30 Exam: 70

Examination (Theory): 3hrs.

Credits: 4

Strategic role of production management - Meshing of short and medium term operations planning and control with long term strategic goals of the organisation.

Concepts of strategy. Hierarchy of strategic decisions.

Strategic choices in manufacturing: - Amount, Timing, Type. Facilities - Size, Location, Specialization (focus). Process - Span, Scale, Flexibility. Vertical - Direction, Extent, Balances. Integration - Alternatives. Vendors - Number, Structure, Relationship. Quality - Strategic role, Various dimensions, Balance. Systems - Organisation, Planning, Scheduling and Control. Human resources - People based strategy, Various practices.

Emerging production management concepts and practices, Such as just-in-time with examples and cases.

Manufacturing strategy interconnectedness with financial, Costing and reward systems and need for change in reporting and evaluation systems.

Service operations strategy - Comparison with manufacturing strategy.

References:

1. Restoring Our Competitive Edge, Competing Through Manufacturing by Hayes, R.H. and Wheelwright, S.C., John Wiley, NY, 1984.
2. Manufacturing Strategy by Hill Terry, McMillan Educational Foundation, London, 1985.
3. Manufacturing the Formidable Competitive Weapon by Skinner, W., John Wiley, NY, 1985.
4. Strategic Manufacturing: Dynamic (New) Directions for the 1990s by Moody, Patricia (Ed.), Don Jone Irwin, 1990.

Elective - II

IE 304E (F) HUMAN FACTORS ENGINEERING

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods/week: 4 Th.

Ses.: 30 Exam: 70

Examination (Theory): 3hrs.

Credits: 4

Introduction to Human factors and systems.

Information Input: Information input and processing, Text, Graphics, Symbols, and Codes, Visual displays of dynamic information, Auditory, Tactual, and Olfactory displays, communications

Human Output and Control: Physical Work and Manual Materials Handling, Motor Skills, Human Control of Systems, Controls and Data Entry Devices, Hand Tools and Devices

Workplace Design: Applied Anthropometry, Work-Space Design and Seating, Arrangement of Components within Physical Space, Interpersonal Aspects of Workplace Design

Environmental Conditions: Illumination, Climate, Noise, Motion

Human Factors Applications: Human Error. Accidents, and Safety, Human Factors In Systems Design

References:

1. Human Factors in Engineering and Design, by Mark S. Sanders and Ernest J. McCormic, Tata McGraw-Hill & McGraw-Hill International Editions.
2. Human Factors Methods: A Practical Guide for Engineering and Design by Paul M. Salmon, Neville A. Ashgate Publishing, Ltd.
3. Ergonomics at Work by David J. Osborne, John Wiely & Sons Ltd.
4. Fitting the Task to the Man – A Text Book of Occupational Ergonomics by Taylor & Francis.
5. A Guide to the Ergonomics of Manufacturing by Martin Helender, Taylor & Francis.
6. Human Factors in Product Design by William H. Cushman and Daniel J. Rosenberg, Elsevier.

MODEL QUESTION PAPER-Mechanical Engineering
M.E. (INDUSTRIAL ENGINEERING) - EVENING COURSE - III SEMESTER
IE 301E TOTAL QUALITY MANAGEMENT
(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Time : 3 Hrs.

Max. Marks : 70

Answer any FIVE questions.

All questions carry equal marks.

1. Describe the total quality management philosophy.
2. What is the role of top management in setting a road map for quality improvement in an organization?
3. What are the advantages of using quality function deployment? What are the key ingredients that are necessary for its success?
4. What are the different types of quality audits? Discuss each and identify the context in which they are used.
5. Discuss the emerging role of ISO 9000 standards in the global economy.
6. Describe the steps of benchmarking relative to a company of your choice.
7.
 - a) State the merits and demerits of JIT production system.
 - b) Explain quality circles.
8. Answer any THREE of the following:
 - a) Kaizen.
 - b) Taguchi method.
 - c) QC tools.
 - d) Quality policy.
 - e) Designing for quality.

MODEL QUESTION PAPER-Mechanical Engineering
M.E. (INDUSTRIAL ENGINEERING) - EVENING COURSE - III SEMESTER
IE 302E ADVANCED OPTIMIZATION TECHNIQUES
(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Time : 3 Hrs.

Max. Marks : 70

Answer any FIVE questions.

All questions carry equal marks.

1. a) What is arithmetic – geometric inequality?

- b) Minimize the following function:

$$f(X) = \frac{1}{2}x_1^2 + x_2 + \frac{2}{3}x_1^{-1}x_2^{-1}$$

2. a) Explain the problem of Dimensionality in Dynamic programming.

- b) Maximize $f(x_1, x_2) = 50x_1 + 100x_2$

Subjected to

$$10x_1 + 5x_2 \leq 2500$$

$$4x_1 + 10x_2 \leq 2000$$

$$x_1 + 1.5x_2 \leq 450$$

$$x_1 \geq 0, \quad x_2 \geq 0$$

3. Solve the following problem using Bala's method.

Minimize $f = 3x_1 + 2x_2 + x_3 + x_4$

Subjected to

$$x_2x_3 + x_4 \leq 1$$

$$2x_1 + x_2x_3 + x_4 \geq 3$$

$$x_i = 0 \text{ or } 1, \quad i = 1, 2, 3, 4.$$

4. A contractor plans to use four tractors to work on a project in a remote area. The probability of a tractor functioning for a year without a breakdown is known to be 82%. If X denotes the number of tractors operating at the end of a year, determine the probability mass and distribution function of X and also find the expected value and the standard deviation of the number of tractors operating at the end of one year.

5. Find the minimum of

$$f_1 = x_1^2 + x_2^2$$

$$f_2 = (x_1 - 2)^2 + x_2^2$$

Subject to

$$x_1 - x_2 - 1 \leq 0$$

6. a) Construct the objective function to be used in GAs for a minimization problem with mixed equality and inequality constraints.
- b) Consider the following two strings denoting the vector X1 and X2
X1: {1 0 0 0 1 0 1 1 0 1}
X2: {0 1 1 1 1 1 0 1 1 0}
- Find the result of crossover at location 2. Also, determine the decimal value of the variable before and after crossover if each string denotes a vector of two variables.
7. a) What is a sigmoid function? How it is affected by weighted sum of inputs, explain.
- b) How is a neuron modeled in neural network-based model, explain with one example.
8. Explain any four of the following.
- Goal programming method
 - Simulated Annealing Algorithm
 - Continuous Dynamic programming
 - Branch & Bound method
 - Complementary Geometric programming

MODEL QUESTION PAPER-Mechanical Engineering
M.E. (INDUSTRIAL ENGINEERING) - EVENING COURSE - III SEMESTER
(Elective – I)
IE 303E (C) SYSTEM DYNAMICS
(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Time : 3 Hrs.

Max. Marks : 70

Answer any FIVE questions.
 All questions carry equal marks.

- What are the three foundations of System Dynamics? Discuss their contributions to the development of System Dynamics.
 - What are the broad objectives of the general systems theory as proposed by Bertalanffy?
- Show that a first order delay and a first order smoothing function are structurally equivalent.
 - Develop suitable models for the following situations. (Hint: use multipliers.)
 - Customer order rate received by a company is a function of constant potential demand in the market, delivery delay and quality of the produce.
 - Yield of agricultural land is a function of fertilizer, water and other technological inputs used.

3. a) Discuss how do you determine the polarity of a loop. Do you think the polarity of a loop influences the loop behaviour? Why?
- b) Draw causal loop diagram for the following situation:
 “A factory working in full capacity is currently experiencing fluctuations in customer order and factory production rates.
 The factory managers feel that while the quality and price of its products are comparable with the competitors’ products, the delay in d
4. a) What are the components of a feedback system? Compare them for the cases of positive and negative feedback systems.
- b) Inventory is depleted by sales rate which is constant. The stores manager wishes to maintain a constant inventory level. He follows a proportional control policy for replenishment. Assume that replenishment is instantaneous. Show that the desired inventory level will never be achieved.
5. a) In various steps in modeling should not be followed rigourously and sequentially. Give reasons.
- b) Identify the system variables and their linkages in the following problem situations:
 - i) Technological growth
 - ii) Environmental pollution
6. a) Briefly explain principles of modeling.
- b) Explain the types of equations used in System Dynamics modeling.
7. a) Discuss the conditions under which behaviour sensitivity tests should be carried out.
- b) Compare and contrast the validation schemes used for optimization, models, simulation models and system dynamics models.

MODEL QUESTION PAPER-Mechanical Engineering
M.E. (INDUSTRIAL ENGINEERING) - EVENING COURSE - III SEMESTER
(Elective –II)
IE 304E (C) MANAGEMENT INFORMATION SYSTEMS

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Time : 3 Hrs.

Max. Marks : 70

Answer any FIVE questions.

All questions carry equal marks.

- 1 a) What is the value of information? How would you try to assess the value of information to a decision maker?
- b) What do you think the crucial factors are in the success of an information system from the stand point of a manager ?

- 2 a) What are the factors that led the development of information systems growth ?
b) What are the different types of information systems and explain briefly each of them?
- 3) What are the various stages of system application development cycle?
- 4) What kind of decisions are made in the organizations? How many of them are amenable to computer?
- 5) What is Data Flow diagram Explain its necessity in understanding the needs of organization
- 6) What is system analysis? What are the various techniques of system analysis? Explain one in detail?
- 7) How do various industrial engineering techniques help in MIS project?
- 8) Design an information system for an 100 bed hospital?
- 9) Write short notes on any FOUR of the following;
a) Internet, b) Intranet , c) data base d) cybernetics, e)various generations in MIS design

FOURTH SEMESTER

(Four-Semester Evening Course -Credit System- w.e.f. 2007-2008)

Periods per week: 12

Presentation followed by Viva-Voce Examination with the following members.

1. Chairman, Board of Studies.
2. Head of the Department.
3. External Examiner.
4. Internal Guide and External Guide (if any).

No marks are allotted for the Project work.

Viva-voce - Examination: Recommended/Not recommended.

For final result the dissertation credits are not added for CGPA..