UNIVERSITY OF KERALA

B.Tech Degree Course – 2008 Scheme

REGULATIONS

1. Conditions for Admission

Candidates for admission to the B.Tech degree course shall be required to have passed the Higher Secondary Examination, Kerala or 12th Standard V.H.S.E., C.B.S.E., I.C.S.E. or any examination accepted by the university as equivalent thereto obtaining not less than 50% in Mathematics and 50% in Mathematics, Physics and Chemistry/ Bio- technology/ Computer Science/ Biology put together, or a diploma in Engineering awarded by the Board of Technical Education, Kerala or an examination recognized as equivalent thereto after undergoing an institutional course of at least three years securing a minimum of 50 % marks in the final diploma examination subject to the usual concessions allowed for backward classes and other communities as specified from time to time.

2. Duration of the course

i) The course for the B.Tech Degree shall extend over a period of four academic years comprising of eight semesters. The first and second semester shall be combined and each semester from third semester onwards shall cover the groups of subjects as given in the curriculum and scheme of examination

ii) Each semester shall ordinarily comprise of not less than 400 working periods each of 60 minutes duration

iii) A candidate who could not complete the programme and pass all examinations within Ten (10) years since his first admission to the B.Tech programme will not be allowed to continue and he has to quit the Programme. However he can be readmitted to the first year of the programme if he/she satisfies the eligibility norms applicable to the regular candidates prevailing at the time of readmission.

3. Eligibility for the Degree

Candidates for admission to the degree of bachelor of technology shall be required to have undergone the prescribed course of study in an institution maintained by or affiliated to the University of Kerala for a period of not less than four academic years and to have passed all the examinations specified in the scheme of study

4. Subjects of Study

The subjects of study shall be in accordance with the scheme and syllabi prescribed

5. Evaluation

Candidates in each semester will be evaluated both by continuous assessment and end semester University examination. The individual maximum marks allotted for continuous assessment and University examination for each subject is as prescribed by the scheme of study.

5.1 Continuous Assessment (C.A)

The marks awarded for the continuous assessment will be on the basis of the day-to-day work, periodic tests (minimum two in a semester) and assignments (minimum of three – one each from each module). The faculty member concerned will do the continuous assessment for each semester. The C.A. marks for the individual subjects shall be computed by giving weight age to the following parameters.

Subject	Attendance	Tests	Assignments/ Class Work
Theory Subjects	20%	50%	30%
Drawing	20%	40%	40%
Practical	20%	40%	40%
Project Work	Work Assessed by Guide – 50% Assessed by a three member committee out of which one member is the guide – 50%		

The C.A. marks for the attendance (20%) for each theory, practical and drawing shall be awarded in full only if the candidate has secured 90% attendance or above in the subject. Proportionate reduction shall be made in the case of subjects in which he/she gets below 90% of the attendance for a subject. The CA marks obtained by the student for all subjects in a semester is to be published at least 5 days before the commencement of the University examinations. Anomalies if any may be scrutinized by the department committee and the final CA marks are forwarded to the university within the stipulated time.

5.2. End Semester University Examinations

i) There will be University examinations at the end of the first academic year and at the end of every semester from third semester onwards in subjects as prescribed under the respective scheme of examinations. Semester classes shall be completed at least 10 working days before the commencement of the University examination.

ii) The examination will be held twice in an year – April/May session (for even semester) and October/November session (for odd semester). The combined 1st and 2nd semester is reckoned as equivalent to an even semester for the purpose of conduct of examination and the University examination will be held during April/May. However VII and VIII Semester examination will be conducted in both the sessions. This schedule will not be changed

iii) A student will be permitted to appear for the university examination only if he/she satisfies the following requirements

a. He/she must secure not less than 75% attendance in the total number of working periods during the first year and in each semester thereafter and shall be physically present for a minimum of 60% of the total working periods. In addition, he/she also shall be physically present in at least 50% of total working periods for each subject

b. He must earn a progress certificate from the head of the institution of having satisfactorily completed the course of study in the semester as prescribed by these regulations

c. It shall be open to the Vice-Chancellor to grant condonation of shortage of attendance on the recommendation of the head of the institution in accordance with the following norms
d. The attendance shall not be less than 60% of the total working periods
e. He/she shall be physically present for a minimum of 50% of the total working periods
f. The shortage shall not be condoned more than twice during the entire course
g. The condonation shall be granted subject to the rules and procedures prescribed by the university from time to time.
h. The condonation for combined 1st and 2nd semesters will be reckoned as a single condonation for attendance purposes.

iv) A student who is not permitted to appear for the University examinations for a particular semester due to the shortage of attendance and not permitted by the authorities for condonation of shortage of attendance shall repeat the semester when it is offered again. This provision is allowed only once for a semester.

v) The university will conduct examinations for all subjects (Theory, Drawing & Practical)

vi) The scheme of valuation will be decided by the chief examiner for theory / drawing subjects

vii) For practical examinations, the examiners together will decide the marks to be awarded. The student shall produce the certified record of the work done in the laboratory during the examination. The evaluation of the candidate should be as per the guidelines given in the syllabus for the practical subject.

6. Letter Grades

For each subject in a semester, based on the total marks obtained by the student in the University examination and Continuous assessment put together a letter grade (S,A+, A, B+, B, C+, C, D, E and F) will be awarded. ***All letter grades except 'F' will be awarded if the marks for the University examination is 40 % or above and the total mark (C.A marks + University Exam mark) is 50 % or above.*** No absolute mark will be indicated in the grade card. Letter grade corresponding to total marks (C.A marks+ University Exam mark) and the corresponding grade point in a ten-point scale is described below.

% of Total marks *(C.A marks + University Exam mark)*	**Letter Grade**	**Grade Point (G.P)**	**Remarks**
90 % and above	S	10	Excellent
85 % and above but less than 90%	A+	9	
80 % and above but less than 85%	A	8.5	
75 % and above but less than 80%	B+	8	
70 % and above but less than 75%	B	7.5	
65 % and above but less than 70%	C+	7	
60 % and above but less than 65%	C	6.5	
55 % and above but less than 60%	D	6	
50 % and above but less than 55%	E	5.5	
Below 50% (C.A + U.E) or below 40 % for U.E only	F	0	Failed

7. Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA)

Grade point average is the semester wise average points obtained by each student in a 10-point scale. GPA for a particular semester is calculated as per the calculation shown below.

$$GPA = \frac{\sum Credit \times \text{GP obtained for the subject}}{\sum \text{credit for subject}}$$

Cumulative Grade point Average (CGPA) is the average grade points obtained by the students till the end of any particular semester. CGPA is calculated in a 10-point scale as shown below.

$$\text{CGPA} = \frac{\sum \text{Credits for semester} \times \text{GPA obtained for the semester}}{\sum \text{credits for the semester}}$$

GPA and CGPA shall be rounded to two decimal points. The Grade card issued to the students shall contain subject number and subject name, credits for the subject, letter grades obtained, GPA for the semester and CGPA up to that particular semester. However on specific request from a candidate and after remitting the prescribed fees the University shall issue detailed mark to the individual candidate.

8. Minimum for a pass

a) A candidate shall be declared to have passed a semester examination in full in the first appearance if he/she secures not less than 5.5 GPA with a minimum of 'E' grade for the all individual subject in that semester.

b) A candidate shall be declared to have passed in an individual subject of a semester examination if he/she secures grade 'E' or above.

c) A candidate who does not secure a full pass in a semester examination as per clause (a) above will have to pass in all the subjects of the semester examination as per clause (b) above before he is declared to have passed in that semester examination in full.

9. Improvement of Grades

i) A candidate shall be allowed to re-appear for a maximum of two subjects of a semester examination in order to improve the marks and hence the grades already obtained subject to the following conditions

   a) The candidate shall be permitted to improve the examination only along with next available chance.
   b) The candidate shall not be allowed to appear for an improvement examination for the subjects of the VII & VIII semesters
   c) The grades obtained by the candidate for each subject in the improvement chance he has appeared for or the already existing grades – whichever is better will be reckoned as the grades secured.
   d) First & Second semester will be counted as a single chance and they can improve a maximum of three subjects

ii) A candidate shall be allowed to repeat the course work in one or more semesters in order to better the C.A. marks already obtained, subject to the following conditions
   a) He/she shall repeat the course work in a particular semester only once and that too at the earliest opportunity offered to him/her.
   b) He/she shall not combine this course work with his/her regular course work
   c) He/she shall not be allowed to repeat the course work of any semester if he has already passed that semester examination in full
   d) The C.A marks obtained by the repetition of the course work will be considered for all purposes

iii) A candidate shall be allowed to withdraw from the whole examination of a semester in accordance with the rules for cancellation of examination of the University of Kerala.

10. Classification of Successful candidates

i) A candidate who qualifies for the degree passing all the subjects of the eight semesters within five academic years (ten consecutive semesters after the commencement of his/her course of study) and secures not less than 8 CGPA up to and including eighth semester (overall CGPA) shall be declared to have passed the B.Tech degree examination in FIRST CLASS WITH DISTINCTION
ii) A candidate who qualifies for the degree passing all the subjects of the eight semesters within five academic years (ten consecutive semesters after the commencement of his/her course of study) and secures less than 8 CGPA but not less than 6.5 CGPA up to and including eighth semester shall be declared to have passed the B.Tech degree examination in FIRST CLASS.
iii) All other successful candidates shall be declared to have passed the B.Tech Degree examination in SECOND CLASS
iv)Successful candidates who complete the examination in four academic years (Eight consecutive semesters after the commencement of the course of study shall be ranked branch-wise on the basis of the CGPA in all eight semesters put together. In the case of a tie in the CGPA the total marks of the students who have got same CGPA shall be considered for finalizing the rank. Students who pass the examination in supplementary examination are also covered under this clause

11. Educational Tour

a) The students may undertake one educational tour during the course and submit a tour report
b) The tour may be conducted during the vacation / holidays taking not more than 5 working days, combined with the vacation / holidays if required. Total number of Tour days shall not exceed 15 days.
c) The tour period shall be considered as part of the working periods of a semester

12. Revision of Regulations

The university may from time to time revise, amend or change the regulations, curriculum, scheme of examinations and syllabi. These changes unless specified otherwise, will have effect from the beginning of the academic year / semester following the notification of the University

UNIVERSITY OF KERALA

B. TECH DEGREE COURSE – 2008 SCHEME

INDUSTRIAL ENGINEERING

I - VIII SEMESTER SYLLABUS (2008 SCHEME)

RECOMMENDED TO BE PLACED BEFORE

BOARD OF STUDIES IN ENGINEERING

& FACULTY OF ENGINEERING FOR APPROVAL

UNIVERSITY OF KERALA

INDUSTRIAL ENGINEERING

SCHEME OF STUDIES FOR B. TECH. DEGREE

I - VIII SEMESTER (2008 SCHEME)

University of Kerala

Scheme of study for the B.Tech, Combined I and II Semesters, 2008 scheme

(Common for all branches)

Course No	Name of subject	Weekly load, hours			Max sessional marks	Exam Dur Hrs	Exam max marks	Credits
		L	T	D/P				
08.101	Engineering Mathematics	2	1	0	50	3	100	6
08.102	Engineering Physics	2	1	0	50	3	100	6
08.103	Engineering Chemistry	2	1	0	50	3	100	6
08.104	Engineering Graphics	1	0	2	50	3	100	6
08.105	Engineering Mechanics	2	1	0	50	3	100	6
08.106	Basic Civil Engineering	2	1	0	50	3	100	6
08.107	Basic Mechanical Engineering	2	1	0	50	3	100	6
08.108	Basic Electrical and Electronics Engineering	2	1	0	50	3	100	6
08.109	Basic Communication and Information Engineering	2	1	0	50	3	100	6
08.110	Engineering Workshops	0	0	2	50	3	100	4
	Total	17	8	4	500		1000	58

The subject 08.108 will be handled by the Department of Electrical and Electronics Engineering and the subject 08.109 will be handled by the Department of Electronics and Communication Engineering,

Semester III

Course No	Name of subject	Weekly load, hours			Max. Sessional marks	Exam Dur Hrs	Exam max marks	Credits
		L	T	D/P				
08.301	Engineering Mathematics- II (CMPUNERFHBTA)	3	1	-	50	3	100	4
08.302	Mechanics of Machines	3	1	-	50	3	100	4
08.303	Metallurgy and Material Science	3	0	-	50	3	100	3
08.304	Mechanics of Structures	3	0	-	50	3	100	3
08.305	Electrical Machines	3	0	2	50	3	100	5
08.306	Thermal Engineering	3	1	-	50	3	100	4
08.307	Computer Aided Drafting Lab a. Machine Drawing b. Building Drawing	0	0	3	50	4	100	3
08.308	Machine Dynamics and Material Testing Lab	0	0	3	50	3	100	3
	Total	18	3	8	400		800	29

Semester IV

Course No	Name of subject	Weekly load, hours			Max sessional marks	Exam Dur Hrs	Exam max marks	Credits
		L	T	D/P				
08.401	Engineering Mathematics – III (CMPUNERFHB)	3	1	-	50	3	100	4
08.402	Computer programming and Numerical Methods(MNPU)	3	1	-	50	3	100	4
08.403	Fluid Mechanics and Hydraulic Machines	3	1	-	50	3	100	4
08.404	Manufacturing Processes(MN)	3	1	-	50	3	100	4
08.405	Operations Management	3	1	-	50	3	100	4
08.406	Introduction to Industrial Engineering	3	0	0	50	3	100	3
08.407	Fluid Mechanics & Machines Lab(MN)	0	0	3	50	3	100	3
08.408	Thermal Engg. Lab.	0	0	3	50	3	100	3
	Total	18	5	6	400		800	29

Semester V

Course No	Name of subject	Weekly load, hours			Max sessional marks	Exam Dur Hrs	Exam max marks	Credits
		L	T	D/P				
08.501	Introduction to Stochastic Models(N)	3	1	-	50	3	100	4
08.502	Operations Research(N)	3	1	-	50	3	100	4
08.503	Methods and Systems Design(N)	3	1	-	50	3	100	4
08.504	Precision Engineering(N)	2	1	-	50	3	100	3
08.505	Machine Tools(MN)	3	1	-	50	3	100	4
08.506	Elective I (N)	3	1	-	50	3	100	4
08.507	Machine Tools Lab(N)	0	0	3	50	3	100	3
08.508	Methods and Systems Design Lab(N)	0	0	3	50	3	100	3
	Total	17	6	6	400		800	29

Semester VI

Course No	Name of subject	Weekly load, hours			Max sessional marks	Exam Dur Hrs	Exam max marks	Credits
		L	T	D/P				
08.601	Data Analysis for Management (N)	3	1	-	50	3	100	4
08.602	Advanced Operations Research(N)	3	1	-	50	3	100	4
08.603	Mechatronics(N)	2	1	-	50	3	100	3
08.604	Machine Design(N)	3	1	-	50	3	100	4
08.605	System Modeling & Simulation (N)	3	1	-	50	3	100	4
08.606	Elective II(N)	3	1	-	50	3	100	4
08.607	Manufacturing Automation Lab (N)	0	0	3	50	3	100	3
08.608	Data Analysis and Optimization Lab(N)	0	0	3	50	3	100	3
	Total	17	6	6	400		800	29

Semester VII

Course No	Name of subject	Weekly load, hours			Max. sessional marks	Exam Dur Hrs	Exam max marks	Credits
		L	T	D/P				
08.701	System Dynamics(N)	3	1	-	50	3	100	4
08.702	Reliability Engineering (N)	3	0	-	50	3	100	3
08.703	Quality Engineering(N)	3	1	-	50	3	100	4
08.704	Financial Engineering(N)	3	1	-	50	3	100	4
08.705	Heuristics for Decision making(N)	3	1	-	50	3	100	4
08.706	Elective III(N)	3	1	-	50	3	100	4
08.707	Simulation Lab(N)	0	0	2	50	3	100	2
08.708	Quality Control Lab(N)	0	0	2	50	3	100	2
08.709	Project & Seminar (N)	0	0	2	100			2
	Total	18	5	6	500		800	29

Semester VIII

Course No	Name of subject	Weekly load, hours			Max sessional marks	Exam Dur Hrs	Exam max marks	Credits
		L	T	D/P				
08.801	Facilities Planning & Management (N)	2	1	-	50	3	100	3
08.802	Industrial Scheduling (N)	3	1	-	50	3	100	4
08.803	Supply Chain Management(N)	3	1	-	50	3	100	4
08.804	Manufacturing systems (N)	2	1	-	50	3	100	3
08.805	Elective IV(N)	3	1	-	50	3	100	4
08.806	Elective V(N)	3	1	-	50	3	100	4
08.807	Industrial Seminar(N)	0	0	2	50		50	2
08.808	Project & Viva voce(N)	0	0	5	150		150	5
	Total	16	6	7	500		700	29

List of Electives(B. Tech – 2008 scheme)

08.506 Elective I

08.506.1 Communicative English and Technical Report writing
08.506.2 Human Aspects of Management (N)
08.506.3 Advanced Mechanics of Solids(N)
08.506.4 Computer Aided Design(N)
08.506.5 Energy Management(N)
08.506.6 Management of projects(N)

08.606 Elective II

08.606.1 Decision Support System and Expert Systems(N)
08.606.2 Finite Element Applications in Manufacturing(N)
08.606.3 Fire Science & Industrial Safety(N)
08.606.4 Value Engineering(N)
08.606.5 Design for Manufacturing(N)
08.606.6 Design of Jigs and Fixtures(N)

08.706 Elective III

08.706.1 Total Quality Management (N)
08.706.2 Total Productive Maintenance (N)
08.706.3 Maintenance Management(N)
08.706.4 Customer Relationship Management(N)
08.706.5 Marketing Management(N)

08.805 Elective IV

08.805.1 Advanced Numerical Methods(N)
08.805.2 Advanced Optimization Techniques(N)
08.805.3 Design and Analysis of Algorithms(N)
08.805.4 Managerial Economics(N)
08.805.5 Multi-criteria Decision Making(N)

08.806 Elective V

08.806.1 Flexible Manufacturing Systems (N)
08.806.2 Agile and Lean Manufacturing (N)
08.806.3 Enterprise Resource Planning (N)
08.806.4 Business Process Reengineering (N)
08.806.5 Human Factors in Engineering (N)
08.806.6 Econometrics(N)

08-101 ENGINEERING MATHEMATICS- 1

L-T-P : 2-1-0 Credits: 6

MODULE- 1

Applications of differentiation:– Definition of Hyperbolic functions and their derivatives- Successive differentiation- Leibnitz' Theorem(without proof)- Curvature- Radius of curvature- centre of curvature- Evolute (Cartesian ,polar and parametric forms)

Partial differentiation and applications:- Partial derivatives- Euler's theorem on homogeneous functions- Total derivatives- Jacobians- Errors and approximations- Taylor's series (one and two variables) - Maxima and minima of functions of two variables - Lagrange's method- Leibnitz rule on differentiation under integral sign.

Vector differentiation and applications :- Scalar and vector functions- differentiation of vector functions-Velocity and acceleration- Scalar and vector fields- Operator ∇ - Gradient- Physical interpretation of gradient- Directional derivative- Divergence- Curl- Identities involving ∇ (no proof) - Irrotational and solenoidal fields – Scalar potential.

MODULE-II

Laplace transforms:- Transforms of elementary functions - shifting property- Inverse transforms- Transforms of derivatives and integrals- Transform functions multiplied by t and divided by t - Convolution theorem(without proof)-Transforms of unit step function, unit impulse function and periodic functions-second shifiting theorem- Solution of ordinary differential equations with constant coefficients using Laplace transforms.

Differential Equations and Applications:- Linear differential eqations with constant coefficients- Method of variation of parameters - Cauchy and Legendre equations – Simultaneous linear equations with constant coefficients- Application to orthogonal trajectories (cartisian form only).

MODULE-III

Matrices:-Rank of a matrix- Elementary transformations- Equivalent matrices- Inverse of a matrix by gauss-Jordan method- Echelon form and normal form- Linear dependence and independence of vectors- Consistency- Solution of a system linear equations-Non homogeneous and homogeneous equations- Eigen values and eigen vectors – Properties of eigen values and eigen vectors- Cayley Hamilton theorem(no proof)- Diagonalisation- Quadratic forms- Reduction to canonical forms-Nature of quadratic forms-Definiteness,rank,signature and index.

REFERENCES

1.Advanced Engineering Mathematics : Kreyszig, 8th wiley.
2. Advanced Engineering Mathematics : Peter O' Neil.
3. Higher Engineering Mathematics :B.S.Grewal.
4. Higher Engineering Mathematics :B.V.Ramana.
5. Advanced Engineering Mathematics :Michel D Greenberg.

08.102 ENGINEERING PHYSICS

L-T-P: 2-0-1 Credits: 6

MODULE-I

Oscillations and Waves

Basic ideas of harmonic oscillations – Differential equation of a SHM and its solution. Theory o damped harmonic oscillations. Quality factor. Theory of forced harmonic oscillations an resonace. Types of waves. One dimensional waves – Differential Equation. Harmonic waves Three dimensional waves - Differential Equation and solution. Plane waves and spherical waves Energy in wave motion. Velocity of transverse waves along a stretched string.

Electromagnetic Theory

Del operator – grad, div, curl and their physical significance. Concept of displacement current Deduction of Maxwell's equations. Prediction of electromagnetic waves. Transverse nature o electromagnetic waves. E and H are at right angles. Poynting's theorem (qualitative only)

Physics of Solids

Space lattice. Unit cell and lattice parameters. Crystal systems. Co-ordination number an packing factor with reference to simple cubic, body centered cubic and face centered cubi crystals. Directions and planes. Miller indices. Interplanar spacing in terms of Miller indices Super conductivity - Meissner effect. Type-I and Type-II superconductors. BCS theor (qualitative). High temperature superconductors. Applications of superconductors. Introductio to new materials (qualitative) -Metallic glasses, Nano materials, Shape memory alloys, Bi materials.

MODULE- II

Interference of Light

Concept of temporal and spatial coherence. Interference in thin films and wedge shaped films Newton's rings. Michelson's interferometer. Determination of wave length and thickness Interference filters. Antireflection coating.

Diffraction of Light

Fresnel and Fraunhofer diffraction. Fraunhofer diffraction at a single slit. Fraunhofer diffractio at a circular aperture (qualitative). Rayleigh's criterion for resolution. Resolving power o telescope and microscope. Plane transmission grating. Resolving power of grating. Gratin equation. X-ray diffraction. Bragg's law.

Polarization of Light

Types of polarized light. Double refraction. Nicol Prism. Retardation plates. Theory of plan circular and elliptically polarized light. Production and analysis of circularly and elliptical

polarized light. Polaroids. Induced birefringence. Photoeleasticity – isoclini isochromatic fringes – photoelastic bench

Special Theory of Relativity

Michelson-Morley experiment. Einstein's postulates. Lorentz transformation equatic derivation). Simultaneity. Length contraction. Time dilation. Velocity addition. Rela mass. Mass energy relation. Mass less particle.

MODULE – III

Quantum Mechanics

Dual nature of matter. Wave function. Uncertainty principle. Energy and mon operators. Eigen values and functions. Expectation values. Time Dependent and Independent Schrodinger equations. Particle in one dimensional box. Tunnelling (quali

Statistical Mechanics

Macrostates and Microstates. Phase space. Basic postulates of Maxwell-Boltzmann, Einstein and Fermi-Dirac statistics. Distribution equations in the three cases (no deriv Bosons and Fermions. Density of states. Derivation of Planck's formula. Free electro metal as a Fermi gas. Fermi energy.

Laser

Einstein's coefficients. Population inversion and stimulated emission. Optical resonant Ruby Laser, Helium-Neon Laser, Carbondioxide Laser (qualitative). Semiconductor (qualitative). Holography. Fibre Optics - Numerical Aperture and acceptance angle. Ty optical fibres. Applications.

REFERENCE:

1. University Physics. *XI Edn., Sears & Zemansky; Pearson*
2. Introduction to Optics. *III Edn., Frank & Leno, Pearson*
3. Mechanics. *J.C. Upadhyaya, Ram Prasad & Sons*
4. Introduction to Electrodynamics, *III Edn, David J Griffiths, Pearson*
5. Elementary Solid State Physics. *M Ali Omar, Pearson*
6. Solid State Physics. *S O Pillai, New Age International Publishers*
7. Modern Physics for Scientists and Engineers. *II Edn, John R Taylor, Chris D Zafiratos & Michael A Dubson, Prentice Hall of India*
8. Optics. *IV Edn, Eugene Hecht, Pearson*
9. Introduction to Special Relativity. *Robert Resnick, John Willey and Sons*
10. Introduction to Quantum Mechanics. *IV Edn, Richard L Libboff, Pearson*
11. Statistical Mechanics. *Donald A Mcquarrie, Vivo Books*

12. Nanotechnology. *Mark Ratner& Daniel Ratner*
13. A Text Book of Engineering Physics. *T.A. Hassan et al, Aswathy Publishers, Trivandrum*
14. Advanced Engineering Physics, *B. Premlet, Phasor Books, Kollam.*

LIST OF DEMONSTRATION EXPERIMENTS

1. Newton's Rings – Determination of wave length.
2. Air Wedge – Diameter of a thin wire
3. Spectrometer – Plane transmission grating – wavelength of light.
4. Spectrometer – Refractive indices of calcite for the ordinary and extraordinary rays.
5. Laser – Diffraction at a narrow slit.
6. Laser – Diffraction at a straight wire or circular aperture.
7. Michelson's interferometer – Wavelength of light.
8. Michelson's interferometer – Thickness of thin transparent film.
9. Polarization by reflection – Brewster's law.
10. Computer stimulation – superposition of waves.
11. Computer stimulation – study of **E** & **H**. (Gauss' law & Ampere's law)

Pattern of Question Paper

*University examination is for a maximum of **100 marks**, in **3 hour** duration. The syllabus is spread in 3 modules. The question paper will consist of two parts (A and B).*

***Part A** contains short answer questions for **40 marks**. This part contains 10 questions without any choice, **each of 4 marks** (uniformly taken from all modules).*

***Part B** contains long answer questions for **60 marks**. From each module, this part contains 3 questions out of which 2 are to be answered, **each of 10 marks.** Long answer questions from all the 3 modules will form 60 marks.*

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08.103 ENGINEERING CHEMISTRY

L-P-T: 2-1-0 **Credits: 6**

MODULE-1

Electrochemistry - Electrodes- Electrode potential- Origin of electrode potential- Helmotz double layer- Nernst equation and application- Reference electrodes- Standared hydrogen electrode- Saturated calomel electrode- Quinhydron electrode-Determination of P^H using these electrodes- Concentration cells- Fuel cells- Secondary cells- Lead acid cell- Nickel cadmium cell- Lithium-ion cell. - Coductometric and Potentiometric titrations (acid base, oxidation reduction and precipitation titrations). **(12hrs) Corrosion and its control-** Theories of corrosion (chemical corrosion and electrochemical corrosion)- Galvanic series- Types of corrosion (Concentration cell corrosion, Stress corrosion, Galvanic corrosion) - Factors affecting corrosion (nature of metal and nature of environment) and different methods of corrosion control (corrosion inhibitors, cathodic protection).

(5hrs)

Protective coatings- Metallic coatings- Chemical conversion coatings- paint **(4hrs)**

Nano materials- Introduction-Classification-preparation (laser abrasion technique and sputtering technique)- Chemical method (reduction)-Properties and Applications of nano materials-Nano tubes-Nano wires. **(4hrs)**

MODULE-2

Water treatment- Types of hardness- Degree of hardness- Related problems- Estimation of hardness- by EDTA method- Sludge and scales in boilers- Priming and foaming- Boiler corrosion-Water softening methods, Lime-soda process, Ion exchange methods-Internal treatments (colloidal, carbonate, phosphate and calgon conditioning)- Domestic water treatment- Methods of disinfection of water-Desalination process (Reverse osmosis, electro dialysis- Distillation). **(12hrs)**

Envirnmental damages and prevention- Air pollution- CFCs and ozone depletion- Alternative refrigerents-Green house effect-Water pollution- BOD and COD- Waste water treatment- Aerobic - Anaerobic and USAB processes. **(3hrs)**

Thermal methods of analysis-Basic principles involved in Thermo gravimetry, Differential thermal analysis and applications. **(2hrs)**

Spectroscopy- Molecular energy levels-Types of molecular spectra- Electronic spectra (Classification of electronic transitions- Beer Lamberts law, Vibrational spectra (mechanism of interaction and application), Rotational spectra (Determination of bond length and application). NMR spectra (Basic principle, chemical shift, spin-spin splitting) **(6hrs)**

Chromatography- General principles- High performance liquid chromatography- Gas chromatography. **(2hrs)**

MODULE-3

Polymers- Classifications- Mechanism of polymarisation (Addition, free radical, cationic, anionic and coordination polymarisation)- Thermoplastics and thermosetting plastics-Compounding of plastics-Moulding techniques of plastics (Compression, Injection, Transfer and Extrusion moulding)-Preparation, properties and uses of PVC, PVA, PMMA, Nylon, PET, Bakelite, Urea formaldehyde resin- Silicon polymers- Biodegradable plastics. Elastomers- structure of natural rubber- vulcanisation- synthetic rubbers (Buna-S, Butyl rubber and Neoprene) **(12hrs)**

Organo electronic compounds_-Super conducting and conducting organic materials like Polyaniline, polyacetylene and [polypyrrol and its applications. **(2hrs)**

Fuels- Calorific value- HCV and LCV-Experimental determination of calorific value-Theoretical calculation of calorific value by Dulongs formula - Bio fuels -Bio hydrogen and Bio-diesel **(5hrs)**

Lubricants- Introduction-Mechanism of lubrication- solid and liquid lubricant- Properties of lubricants-Viscosity index- flash and fire point- cloud and pour point- aniline value. **(4hrs)**

Cement- Manufacture of Portland cement- Theory of setting and hardening of cement **(2hrs)**

LAB-EXPERIMENTS

1. Estimation of total hardness in water using EDTA.
2. Estimation of chloride ions in domestic water.
3. Estimation of dissolved oxygen.
4. Estimation of COD in sewage water.
5. Estimation of available chlorine in bleaching powder.
6. Estimation of copper in brass.
7. Estimation of iron in a sample of heamatite.
8. Determination of flash and fire point of a lubricating oil by Pensky Marten's apparatus.
9. Potentiometric titrations.
10. Preparation of buffers and standardisation of P^H meter.
11. Determination of molarity of HCl solution P^H-metrically.
12. Determinations of PH using glass electrode and quinhydron electrode.

REFERENCES

1. Instrumental methods of analysis: H.A. Willard, L.L. Merrit and J.A. Dean.
2. Environmental Chemistry: A.K. De.
3. Nanoscale materials in chemistry: K.J.Klauhunde.
4. Polymer science: B.R. Gowariker.
5. Modern materials: B.W.Gonser.
6. Material Science and engineering. A first course: V.Raghavan.
7. Elements of Material science and Engineering: L.H. Van Vlack
8. Chemistry of liquid crystals: J.W.Goodby.
9. A text book of physical chemistry: S.Glasstone.
10. Engineering Chemistry: P.C. Jain.
11. Engineering Chemistry : Juhaina Ahad.
12. A text book of Engineering Chemistry: Shashi Chawla.
13. Engineering Chemistry: R. Gopalan, D.Venkappayya & S. Nagarajan.
14. Chemistry of Engineering and Technology volume I & II: J.C. Kuriakose and
15. J. Rajaram.

08.104 ENGINEERING GRAPHICS

L- T-D: 1-0-2 **CREDITS: 6**

INTRODUCTION: Introduction to technical drawing and its language. Lines, lettering, dimensioning, scaling of figures, symbols and drawing instruments. (1 sheet practice)

MODULE 1

PLAIN CURVES: Conic sections by eccentricity method. Construction of ellipse: (i) Arc of circles method (ii) Rectangle method (ii) Concentric circles method. Construction of parabola (i) Rectangle method (ii) Tangent method. Construction of hyperbola (i) Arc of circles method (ii) given ordinate, abscissa and the transverse axis (iii) given the asymptotes and a point on the curve. Construction of Tangent and Normal at any point on these curves

MISCELLANEOUS CURVES: Construction of Cycloid, Epicycloid and Hypocycloid, Involute of a circle. Archimedian spiral, Logarithmic spiral and Helix. Construction of Tangent and Normal at any point on these curves

PROJECTION OF POINTS AND LINES: Types of projections, Principles of Orthographic projection. Projections of points and lines. Determination of true length, inclination with planes of projection and traces of lines.

MODULE II

PROJECTION OF SOLIDS: Projection of simple solids such as prisms, pyramids, cone, cylinder, tetrahedron, octahedron, sphere and their auxiliary projections.

SECTIONS OF SOLIDS: Types of cutting planes, section of simple solids cut by parallel, perpendicular and inclined cutting planes. Their projections and true shape of cut sections.

DEVELOPMENT OF SURFACES: Development of surfaces of (i) simple solids like prisms, pyramids, cylinder and cone (ii) Cut regular solids.

MODULE III

ISOMETRIC PROJECTION: Isometric scale, Isometric view and projections of simple solids like prisms, pyramids, cylinder, cone sphere, frustum of solids and also their combinations.

INTERSECTION OF SURFACES: Intersection of surfaces of two solids as given below.

(i) Cylinder and cylinder
(ii)Prism and prism.
(iii) Cone and Cylinder

(Only cases where the axes are perpendicular to each other and intersecting with or without offset.)

PERSPECTIVE PROJECTION: Principles of perspective projection, definition of perspective terminology. Perspective projection of simple solids like prisms and pyramids in simple positions.

CAD: Introduction to CAD systems, Benefits of CAD, Various Soft wares for CAD, Demonstration of any one CAD software.

General Note:

(i) First angle projection to be followed .

(ii) Question paper shall contain 3 questions from each module, except from CAD. Students are required to answer any two questions from each module.

(iii) Distribution of marks

Module -I 2 x 16 = 32
Module -II 2 x 17 = 34
Module III 2 x 17 = 34

100

REFERENCES

1. Fundamentals of Engineering Drawing — Luzadder and Duff
2. Engineering Drawing — N. D. Bhatt
3. Engineering Drawing and Graphics — K. Venugopal
4. Engineering Graphics — P.S. Gill
5. Engineering Graphics — P.I. Varghese
6. Engineering Drawing — K.R. Gopalakrishnan
7. Engineering Drawing — Thamaraselvi
8. Engineering Graphics — K.C. John
9. Engineering Graphics — K.N. Anil Kumar

08.105 ENGINEERING MECHANICS

L-T-P: 2 - 1 – 0 **Credits: 6**

MODULE I (20 HRS)

Idealizations of Mechanics- Elements of vector algebra

Statics of rigid bodies-Classification of force systems- principle of transmissibility of a force-composition and resolution- Resultant and Equilibrant of coplanar concurrent force systems-various analytical methods- - Lami's theorem, method of resolution- Conditions of equilibrium-Moment of a force, couple, properties of couple- Varignon's theorem- Resultant and equilibrant of coplanar non-concurrent force systems- Conditions of equilibrium. Equilibrium of rigid bodies-free body diagrams.(simple problems)

Types of supports - types of beams - types of loading- Support reactions of simply supported and overhanging beams under different types of loading.

Forces in space, equations of equilibrium, Vector approach.

Friction-Laws of friction-angle of friction- cone of friction- ladder friction- wedge friction.

MODULE II (20 HRS)

Properties of surfaces- centroid of composite areas- Theorems of Pappus-Gouldinus- Moment of inertia of areas, Parallel and perpendicular axes theorems- Radius of Gyration- moment of inertia of composite areas.

Dynamics: Kinematics-Combined motion of translation and rotation-instantaneous centre, motion of link, motion of connecting rod and piston, wheel rolling without slipping.

Relative velocity - basic concepts-analysis of different types of problems

Kinetics- Newton's laws of translatory motion- D'Alembert's principle- Motion of lift- Motion of connected bodies.

MODULE III (20 HRS)

Work, Power and Energy - Work-Energy principle-Impulse, Momentum.

Collision of elastic bodies-Law of conservation of momentum-Direct and oblique impact between elastic bodies and impact with fixed plane.

Curvilinear motion- D'Alembert's principle in curvilinear motion- Mass moment of inertia of rings, solid discs and solid spheres (no derivations required)Angular momentum-Angular impulse.

Kinetics of rigid bodies under combined translatory and rotational motion – work – energy principle for rigid bodies.

Centrifugal and centripetal forces – motion of vehicles on curved paths in horizontal and vertical planes – super elevation – stability of vehicles moving in curved paths (qualitative ideas only).

Simple harmonic motion – vibration of mechanical systems - basic elements of a vibrating system – spring mass model – undamped free vibrations – angular free vibration – simple pendulum.

REFERENCES:

1. Beer & Johnston, "Vector Mechanics for Engineers – Statics and Dynamics", Tata Mc-Graw Hill Publishing Company Limited, New Delhi, 2005.
2. Irving. H. Shames, "Engineering Mechanics", Prentice Hall Book Company, 1966.

3. Timoshenko S. & Young D. H., "Engineering Mechanics", Mc-Graw Hill –International Edition
4. Popov, "Mechanics of Solids", Pearson Education,2007
5. Kumar K.L., "Engineering Mechanics", Tata Mc-Graw Hill Publishing Company Limited, New Delhi, 1998.
6. Rajasekaran S. & Sankarasubramanian G., "Engineering Mechanics", Vikas Publishing House Private Limited, New Delhi, 2003.
7. Tayal A K, "Engineering Mechanics- Statics and Dynamics" , Umesh Publications, Delhi,2004
8. Benjamin J., "Engineering Mechanics", Pentex Book Publishers and Distributors, Kollam, 2008

Note

Question For University Examination:- Part A – 8 compulsory questions covering entire syllabus, 5 marks each. (5 x 8 = 40) Part B – Three questions of 10 marks from each module, out of which two should be answered (10 x 2 x 3 = 60).

08.106 BASIC CIVIL ENGINEERING

L-T-P: 2- 1 - 0 **Credits**

MODULE I

Surveying: Object and Principles of Surveying.
Linear Measurements: Direct measurements - Tape & chain only - Ranging out survey lines Taking measurements of sloping ground - Errors - Tape correction (problems).
Levelling: Levelling instruments - Level (Dumpy Level, Tilting Level) Levelling Staf Measurements in levelling - Temporary adjustments of a level, holding the staff, reading th staff - Principles of leveling - recording measurements in the field book - reduction of level height of collimation method only (simple examples).
Contour maps (Brief description only). Computation of areas - Mid ordinate rule, averag ordinate rule, Trapezoidal rule, Simpson's rule (examples)- Introduction to Distomat, Tota Station & GPS (Brief description only)

MODULE II

Building construction: Selection of site for buildings - types of buildings - Components o buildings.
Foundation: Different types - Spread footing, Isolated footing, Combined footing, Ma foundation, Pile foundation (description only).
Safe Bearing Capacity of Soil: Importance of determination of the Safe Bearing Capacity o Soil (brief description only).
Super structure: Masonry - stone masonry, brick masonry –Types- desirable qualities o stone and brick.
Partition: Materials used for making partition - plywood, particle boards & glass.
Doors, windows & ventilators : Types - materials used for the construction of doors an windows - wood, steel & Aluminium.
Plastering: Mortar – properties - Preparation of Cement mortar
Painting: Preparation of surfaces for painting - plastered, wood and steel surfaces- Types o paint - enamel, emulsion & distemper. Flooring: Types - mosaic tiles, ceramic tiles, marble granite and synthetic materials. Roofing: Selection of type of roof -flat roof, sloping roof Concrete roof, tiled roof. Selection of roof covering materials. GI Sheet , AC Sheet, PV Sheet

MODULE III

Concrete: Ingredients- cement, aggregate, and water. Qualities of ingredients (brie description only).
Tests on Cement - consistency, initial and final setting times. Compressive strength -IS Specifications.
Aggregates – desirable qualities of fine and coarse aggregates
Plain Cement Concrete (PCC): preparation-proportioning-mixing of concrete.
Steel-common types used in construction- Mild Steel, HYSD Steel and their properties.
Reinforced Cement Concrete (RCC)-advantages of RCC over Plain Cement Concrete.
Elementary ideas on pre-cast and pre-stressed concrete constructions.
Building services – vertical transportation – stairs – types, escalators and elevators, ramps (brief description only). Plumbing services- brief description of water supply and sewag disposal arrangements for residential buildings.

REFERENCE:

1. Adler R., Vertical Transportation for Buildings, American Elsevier Publishing Company,
2. New York.1970
3. B.C Punmia, "Surveying & Leveling" Vol. – I, Laxmi publications(P) Ltd,N.Delhi, 2004
4. Rangwala., Building Materials,Charotar publishing house, 2001
5. Rangwala, "Building Construction" , Charotar Publishing House., 2004
6. S.K. Roy, "Fundamentals of Surveying" Prentice-Hall of India, New Delhi.2004
7. Rangwala.,"Water Supply and Sanitary Engineering", Charotar Publishing House. 1990
8. Moorthy, "Building Construction", published by S.Dass for Modern Public House
9. distributor., 1957
10. Jha and Sinha, "Construction and Technology"
11. Narayanan and Lalu Mangal ,"Introduction to Civil Engineering"Phasor Books,Kollam.
12. Santha Minu, "Basic Civil Engineering" Karunya Publications,Trivandrum

Note: The question paper will consists of two parts. Part I and part II..
Part I is Compulsory covering the entire syllabus, for 40 marks. It contains 8 questions of 5 marks each.
Part II is to cover 3 modules. There will be two questions (20 marks each) from each module out of which one from each module is to be answered. (20 X 3 = 60)

08.107 BASIC MECHANICAL ENGINEERING

L-T-P/D : 3-1-0 **Credits: 6**

MODULE I

Thermodynamics : Basic concepts and definitions of Zeroth law, First law, Second law of thermodynamics- concept of reversibility and entropy. p-v and T-s diagrams

Air cycles: Carnot, Otto and Diesel cycles-Air standard efficiency (simple problems)

IC Engines: Working and comparison of two stroke and four stroke petrol and diesel engines - general description of various systems using block diagrams – air system, fuel system, ignition system and governing system. A brief description of CRDI, MPFI, GDI and Hybrid Vehicles

Steam boilers: Classification – Cochran boiler, Babcock and Wilcox boiler, Benson boiler-fluidized bed combustion,

MODULE II

Principles and fields of application of - compressors - reciprocating and centrifugal, blower, pumps- reciprocating, centrifugal and jet pumps, steam and hydraulic turbines- impulse and reaction, gas turbine cycles- open and closed

Elementary ideas of hydro electric, thermal and nuclear power plants

Refrigeration & Air Conditioning: Refrigerants, CFC free refrigerants. Vapor compression refrigeration system, Comfort and Industrial air conditioning-typical window air conditioning unit (general description only).

MODULE III

Mechanical Power transmission systems: Belt, rope and gear drives-types, comparison and fields of application-velocity ratio-slip (simple problems) friction disc, single plate clutch, gear trains (no derivations).

Manufacturing processes: Elementary ideas of casting, forging, rolling, welding, soldering and brazing

Machining processes- turning, taper turning, thread cutting, shaping, drilling, grinding, milling (simple sketches and short notes).

Non conventional machining - Electro discharge machining (EDM) and Electro chemical machining (ECM)

Principle, application and advantages of C N C machine

REFERENCES

1. Spalding and Cole, "Engineering Thermodynamics"
2. Gill, Smith and Zuirys, "Fundamentals of IC Engines"
3. Amstead, Ostwald and Begeman, "Manufacturing processes"
4. Crouse, "Automobile Engineering"
5. R K Bensal, "Fluid mechanics and machines"
6. J Benjamin, "Basic Mechanical Engineering"
7. Roy and Choudhary, "Elements of Mechanical Engineering"
8. Hajra Choudhary, "Workshop Technology"

Note: Lectures are to be supplemented by demonstration in laboratories.

Note: The question paper will consist of two parts. Part I is to be compulsory for 40 marks. This may contain 10 questions of 4 marks each. Part II is to cover 3 modules. There can be 3 questions from each module (10 marks each) out of which 2 are to be answered.

08.108 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

L-T-P:2–1-0 Credits 6

MODULE – I

Elementary concepts - Kirchoffs laws - Magnetic Circuits - MMF, field strength, flux density, reluctance – problems in series magnetic circuits. Review of electromagnetic induction - Faradays laws, Lenz's law - statically induced and dynamically induced emf - self and mutual induction - inductance.

Alternating current fundamentals - generation of alternating currents – waveforms - frequency - period - average and rms values - form factor. Phasor representation of alternating quantities - rectangular polar and exponential forms.

Analysis of simple ac circuits – concept of impedance and admittance - phasor representation - j notation - power and power factor in ac circuits - active and reactive components. Solution of RL, RC and RLC series circuits.

Three phase systems - generation of three phase voltage - star and delta connection - relation between phase and line values of voltage and current - phasor representation - three wire and four wire systems.

Measurement of power in three phase circuits (two wattmeter method). Measurement of energy – working of 1-phase energy meter.

MODULE – II

Transformers - Principle of operation - EMF equation - constructional details of single phase and three phase transformers

Methods of bulk generation of electric power. Block schematic of layout of generating stations - hydroelectric, thermal and nuclear power plants. Renewable energy sources - solar, wind, tidal, wave and geothermal energy.

Bulk transmission of electric power - typical electrical power transmission scheme - need for high transmission voltage - substations - substation equipments. Primary and secondary transmission and distribution systems

Different methods of wiring for LT installations. Schematic layout of LT switchboards. Earthing of installations - necessity of earthing - plate and pipe earthing. Protective fuses, MCBs, ELCBs and switches.

Working of incandescent lamps, -fluorescent lamps, energy efficient lamps

MODULE – III

Diodes - PN junction diodes,. V-I characteristics, dynamic & static resistance, principle of working and V-I characteristics of Zener diode, principle of Photo diode, Solar cell, & LED.

Rectifiers & power supplies - block diagram description of a dc power supply, circuit diagram & working of half-wave & full wave rectifier, final equations of Vrms, Vdc, ripple factor and peak inverse voltage in each case, principle of working of series inductor and shunt capacitor filters. Working of simple zener voltage regulator.

Power devices – V – I characteristics and applications of SCR and Triac Working principle of UPS and SMPS

Transducers – Resistance strain guage, thermistor, LVDT

REFERENCES

1. V.N. Mitlle, "Basic Electrical Engineering", Tata McGraw Hill, 1990.
2. DP Kothari, LJ Nagrath, "Theory and Problems of Basic Electrical Engineering", Prentice Hall of India, 2000.
3. B.L. Thereja, "A Text Book of Electrical Technology", Volume I, S Chand & Co, New Delhi, 1992.
4. Francis M Fernandez, "A Basic Course in Electrical Engineering", Rajath Publishers, Ernakulam.
5. TP Imthias Ahmed, B. Premlet, "Introduction to Electrical Engineering", Phaser Books, Kollam
6. Gopakumar, "Introduction To Electronics and Communications", .Phasor Books, Kollam
7. Millman and Halkias, "Integrated Electronics: Analog and digital circuits and systems", McGraw-Hill Book Co Edward Hughes, "Electrical and Electronic Technology", Pearson Education, 2002.
8. ML Soni, PU Guptha, US Bhatnagar and A Chakrabarthy, "A Text Book on Power System Engineering", Dhanpath Rai & Sons, New Delhi 1997 N.N.Bhargava, "Basic Electronics and Linear Circuits",T.M.H.
9. N.N.Bhargava, "Basic Electronics and Linear Circuits", Tata McGraw Hill
10. Rangan C.S., Sarma G.R., and Mani V.S.V., "Instrumentation Devices and Systems", Tata McGraw Hill, 1992.
11. Muhammad H. Rashid, "Power Electronic Circuits, Devices and Applications", Pearson education, Asia 2003.

Note : *The question paper will consist of two parts. Part – A is to be compulsory for 40 marks (10 questions of 4 marks each). Part-B is to cover 3 modules for 60 marks. (50% choice- One out of two or two out of four from each module).*

08.109 BASIC COMMUNICATION AND INFORMATION ENGINEERING

L – T – P: 2-1-0 Credits: 6

MODULE 1(Qualitative Treatment)

(a) Bipolar junction transistors: NPN & PNP transistors, structure, typical doping, working of NPN transistor, concepts of common base, common emitter & common collector configurations, current gain of each, input & output characteristics of common emitter configuration, comparison of three configurations with reference to voltage & current gain, input & output resistances and applications. (6 hrs)

(b) Field effect Transistors : basic principles of JFET, MESFET and MOSFET, comparison with BJT. (3 hrs)

(c) Amplifiers & Oscillators: circuit diagram & working of common emitter amplifier, function of each component in the circuit, need of proper biasing, frequency response, voltage gain and 3dB bandwidth, concepts of class A, B, AB and Class C power amplifiers, circuit diagram & working of push pull amplifiers, concepts of feedback, working principles of oscillators, circuit diagram & working of RC phase shift oscillator (7 hrs)

(d) Integrated circuits: advantages of ICs, analog and digital ICs, functional block diagram of operational amplifier, ideal operational amplifier,use as inverting amplifier, non inverting amplifier, summing amplifier, integrator and comparator. (4 hrs)

(e) Digital ICs:logic gates, realization of logic functions, principle of combinational and sequential logic circuits, flip flop (JK), logic families: TTL and CMOS Logic (No internal diagram) , examples of digital ICs-functional diagram of (7400,7402,7473,CD4011). (4 hrs)

(f) IC fabrication: purification of silicon, crystal growth, wafer preparation. unit process: oxidation, diffusion, ion implantation, epitaxy, deposition, photolithography. (4 hrs)

MODULE 2 (Qualitative Treatment)

(a) Measurements: principle and block diagram of analog and digital multimeter, working principle of CRT, block diagram of CRO, measurements using CRO, principle of digital storage oscilloscope, principle and block diagram of function generator. (5hrs)

(b) Radio communication: principle of AM & FM, wave forms, bandwidths, block diagrams of AM & FM transmitters, principle of AM &FM demodulation, comparison of AM & FM,principle &block diagram of super heterodyne receiver. (4 hrs)

(c) Color television: TV Standards,interlaced scanning, block diagram of PAL TV transmitter & receiver, basic principles of cableTV, CCTV system, basic principles of HDTV, basic principles of LCD & Plasma displays. (5 hrs)

(d) Radar and navigation: principle of radar and radar equation, block schematics of pulsed radar, factors affecting range, applications of radar in measurements and navigation. (4 hrs)

(e) Satellite communication: microwave frequency bands, concept of geo-stationary satellite, frequency bands used, satellite transponder, block diagram of earth station transmitter & receiver, advantages of satellite communication, principle of Global Positioning System(GPS). (3 hrs)

(f) Optical communication: block diagram of the optical communication system, principle of

08.110 ENGINEERING WORKSHOPS

L - T-P/D: 0-0-2 CREDITS: 4

A. Carpentry:

Study of tools and joints. Practice in planning, chiseling, marking and sawing. Joints – Cross joint, T joint, Dove tail joint.

B. Fitting:

Study of tools, Practice in filing, cutting, drilling and tapping. Male and female joints, Stepped joints.

C: Sheet Metal Work:

Study of tools. Selection of different gauge GI sheets for jobs. Practice on riveted joints. Preparing tube joints, frustums, trays and containers.

D. Plumbing:

Study of tools. Details of plumbing work in domestic and industrial applications. Study of pipe joints, cutting, threading and laying of pipes with different fittings using PVC pipes. Use of special tools in plumbing work.

E: Foundry:

Study of tools. Preparation of sand, moulding practice and demonstration of casting.

F. Welding:

Study of welding machines. Straight line practices, Making of Butt joint, T joint and Lap joint.

G: Smithy:

Study of tools. Demonstration on forging of square prism, hexagonal bolt, T bolt and Eye bolt.

H: Machine Tools:

Study and demonstration on working of machine tools. Lathe and Drilling machine.

NOTE: For the university examination the student shall be examined in sections A, B, C, D and E only.

Syllabus

III Semester Industrial Engineering (2008 Admissions)

08.301 ENGINEERING MATHEMATICS II (CMPUNERFHBTA)

L-T-P/D: 3-1-0 **4Credits**

Module I

Multiple Integrals: Double Integrals (Cartesian only).Change of order of integration. Area enclosed by plane curves.Triple integrals.Volume of solids.

Vector integration: Line and surface and volume integrals. Greens theorem in the plane. Stokes theorem and Gauss divergence theorem (no proof).

Module II

Fourier series: Fourier series of periodic functions of period 2π and $2l$. Dirichlet's condition for convergence. Odd and even functions. Half range expansions.

Fourier Transforms: Fourier integral theorem(no proof)-Fourier transforms- Fourier sine and cosine transforms , inverse Fourier transforms, properties

Module III

Partial differential equations: Formation of PDE. Solution of Lagranges linear equation. First order nonlinear equations-standard forms -Homogeneous PDE with constant coefficients.

Application of PDE: Derivation of one dimensional Wave and Heat equations. solution by seperation of variables. Boundary value problems in one dimensional Wave and Heat equations.

References

1. Kreyszig, Advanced Engineering Mathematics, 8th Wiley Eastern.
2. Peter O Neil, Advanced Engineering Mathematics.
3. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers.
4. B.V.Ramana, Higher Engineering Mathematics, Tata Mc Graw Hill.
5. Michel D Greenberg, Advanced Engineering Mathematics, Pearson

Examination Duration: 3 hours

Note: The question paper shall consists of two parts. **Part A** (40 marks) Ten compulsory questions of 4 marks each. **Part B** (60 marks) Student must answer one out of two questions from each module .Each question carries 20 marks.

08.302 MECHANICS OF MACHINES

L-T-P/D: 3-1-0 **4 Credits**

Module I

Kinematics: links-parts-chains, mechanism inversion and machine. Quadratic cycle chain. Slider crank chain-inversions and practical applications. Velocity and acceleration diagrams of simple mechanisms.

Friction: laws of friction: pivot and collar friction. – Plate and disc clutches – Belt (flat and V) and rope drives. Ratio of tensions – Effect of centrifugal and initial tension – Condition for maximum power transmission – Open and crossed belt drive.

Brakes -analysis of internal expanding shoe brakes – applied to rear wheels only, applied to front wheels and applied to all four wheels.-self energizing and self-locking in braking-heat generation in braking. Dynamometers- transmission and absorption types.

Module II

Gear profile and geometry – Nomenclature of spur and helical gears – Gear trains: Simple, compound gear trains and epicylic gear trains - Determination of speed and torque - Cams – Types of cams – Design of profiles – Knife edged, flat faced and roller ended followers with and without offsets for various types of follower motions

Governors, types of governors-simple watt governor, porter, proell, and hartnell governors - sprig controlled governors - effect, power, isochronisms, hunting, sensitivity and stability.

Gyroscope-gyroscopic stability -gyroscopic effect on two wheeled vehicles and automobiles Gyroscopic stabilization of ships, aeroplanes and rockets.

Module III

Static and dynamic balancing – Single and several masses in different planes –Balancing of reciprocating masses- primary balancing and concepts of secondary balancing – Single and multi cylinder engines (Inline) – Balancing of radial V engine – direct and reverse crank method

Vibration: kinematics of vibrating motion-vibration systems having single degree of freedom - equilibrium method and Raleigh's method-criterion of whirling speed-torsional vibrations-multirotor systems-torsional vibrations of general systems. Free Vibration of Elastic Bodies; Longitudinal Vibration of Bars; Transverse Vibration of Beams; Torsional Vibration of Shaft; Approximate Methods - Rayleigh's Method and Rayleigh-Ritz Method. Instruments for Dynamic Measurements.

References

1. P C Ballaney -Theory of machines.
2. Bevan -Theory of machines.
3. Rao, J.S and Dukkipati, R.V, "Mechanism and Machine Theory", Second Edition, Wiley Eastern Ltd., 1992.
4. Malhotra, D.R and Gupta, H.C., "The Theory of Machines", Satya Prakasam, Tech. India Publications, 1989.
5. Gosh, A. and Mallick, A.K., "Theory of Machines and Mechanisms", Affiliated East West Press, 1989.
6. Shigley, J.E. and Uicker, J.J., "Theory of Machines and Mechanisms", McGraw-Hill, 1980.
7. Burton Paul, "Kinematics and Dynamic of Planer Machinery", Prentice Hall, 1979.

Note: The question paper shall consists of two parts. **Part A** (40 marks) Ten compulsory questions of 4 marks each. **Part B** (60 marks) Student must answer one out of two questions from each module. Each question carries 20 marks.

08.303 METALLURGY AND MATERIAL SCIENCE

L-T-P/D:3-0-0 3 Credits

Module I

Classification of engineering materials-selection of materials with reference to properties, service and economic considerations. Thermal, Physical Mechanical, Electrical, Magnetic, Dielectric properties, Super conductivity and Super plasticity of materials. Metallic bonds, crystal structure, space lattice, types of unit cells, Miller indices, co-ordination number, atomic packing factor, allotropy and polymorphism, imperfections in crystals. Elastic and Plastic deformation of metals, Factors affecting plastic deformation, deformation temperature. Slip, Twinning, Dislocation, Critical shear stress, Frank-Read source, Strain hardening, De-lamination theory.

Module II

Diffusion mechanism, Fick's Laws. Theory of alloys, Gibb'phase rule, Solid solutions. Hume Rothery's rule. Equilibrium diagrams-Construction and uses-Equilibrium diagram of binary alloys: Eutectic, Eutectoid, Peritectic and peritectoid reactions. Iron-Carbon Equilibrium diagram, Isothermal TTT diagrams, Critical cooling rate. Heat treatment processes, Hardenability tests. Surface treatments, Case Hardening, Carburising, Nitriding, Cynading,Induction hardening, Precipitation hardening, CVD, PVD, Thermal spraying, Plasma spraying, D-Gun spraying, Recovery, Recrystalisation and Grain Growth.

Module III

Testing of materials-Tensile and Compression test, Impact test, Significance of fracture mechanics, Brittle fracture, Griffith's crack theory, Energy balance approach, Ductile fracture, Factors leading to crack formation, Ductile-brittle transition in steels, Fatigue mechanism, Fatigue crack growth, Creep mechanism. Properties, composition and uses of various types of Cast Iron and Steels - Effect of various alloying elements. Properties, composition and uses of Copper, Aluminum, Titanium and its alloys, Effects of various alloying elements. Introduction to Ceramics, Composites, Smart materials, Nuclear, Nano materials.

References :

1. L.W.Van Wlanck, Elements of Materials Science.
2. Wulff-Series, Material Science Vol-I,II,III,IV.
3. B.K.Agrawal, Introduction of Engineering materials, Tata McGraw Hill.
4. C.W.Richards, Engineering Material Science.
5. R.K.Rajput,S.K.Kataria &Sons, Material Science and Engineering.
6. Y.Lakhtin, Engg Physical Metallurgy.
7. Dieter, Mechanical Metallurgy.
8. Serope Kalpakjain *et al*., Manufacuring Engg and Technology.
9. R.K.Dogra & A.K.Sharma, Advanced Material Science.
10. William D.Callister, John Wiley, Indroduction to Material Science.

Note: The question paper shall consists of two parts. **Part A** (40 marks) Ten compulsory questions of 4 marks each. **Part B** (60 marks) Student must answer one out of two from each module .Each question carries 20 marks.

08.304 MECHANICS OF STRUCTURES

L-T-P/D: 3-0-0 **Credits : 3**

Module I

Concept of stress and strain – normal stress and shear stress, concept of strain, normal strain and shear strain, constitutive relation, Saint-Venant's Principle and stress concentration, lateral strain, Poisson's ratio, Hooke's law, modulus of elasticity, modulus of rigidity, volumetric strain, bulk modulus of elasticity, relationship between elastic constants, deformation of axially loaded bars, members with varying cross section, principle of superposition, composite bars, thermal stress.

Concept of stress and strain tensor, generalised Hooke's law, definition of plane stress, plane strain and examples. Stress transformation (2D only) principal stress and Mohr's circle, Strain energy due to axial loads- gradually and suddenly applied impact loads.

Module II

Shear force and bending moment diagrams– cantilever, simply supported and over hanging beams-concentrated and UD loads, Theory of simple bending-bending stress and shear stress distribution-rectangular, circular and I sections.

Slope and deflection of beams, load- deflection differential equation, computation of slope and deflection of simply supported and cantilever beams- Macaulay's method.

Module III

Torsion of circular shafts-solid and hollow shafts-power transmitted by shafts.

Thin cylinders and shells subjected to internal and external pressures – thick cylinders and spherical shells- Lame's equation – compound cylinders.

Direct and bending stress – short columns – core of section Crippling load-Eulers equation

References :

1 S. B. Junarkar, Mechanics of structures Vol I & II
2 Egor P Popov, Engineering Mechanics of solids,PHI
3 Timoshenko, Strength of Materials
4 Timoshenko S.P. and J.M. Gere, Mechanics of Materials, CBS Publishers & Distributors, New Delhi.
5 Singh G. D., Strength of materials, Ane Books India, New Delhi.
6 L.S. Srinath, Advanced Mechanics of Solids, Tata McGraw-Hill

Note: The question paper shall consists of two parts. **Part A** (40 marks) Ten compulsory questions of 4 marks each. **Part B** (60 marks) Student must answer one out of two from each module .Each question carries 20 marks.

08.305 ELECTRICAL MACHINES

L-T-P/D: 3-0-2 5 Credits

Module I

DC Machines – principles of operation-EMF equations-types of excitations-separately excited, shunt and series excited DC generators- general idea of armature reaction – OCC and load characteristics - simple numerical problems. Principles of DC motors – torque and speed equations – torque – speed characteristic – variations of speed, torque and power with motor current – applications of shunt motor for traction and hoists. Principles of starting, losses and efficiency – testing –load test – simple numerical problems.

Module II

Transformers – principles of operation – EMF equation – vector diagrams – reduction losses and efficiency – OC and Sc tests – equivalent circuit – auto transformers – current voltage transformers – constant voltage transformers – simple numerical problems – Synchronous machines – types – EMF equations – principles of operation of synchronous motor – V curve – methods of starting- methods of improving power factor.

Electric traction – systems of power supply – functional schematic of a.c. electric locomotives – types of motors used in traction systems and methods of speed control – methods of braking.

Module III

3-Phase induction motors – slip ring and squirrel cage – rotating magnetic field – torque slip characteristics, simple circle diagrams, no load and blocked rotor tests, methods of starting, principles of operation and applications of single phase stepper motor, universal motor.

Electric heating – resistance furnaces and ovens- methods of temperature control. Electric arc furnaces and induction furnace. High frequency heating – induction and dielectric heating – applications.

Text books:

1. B.L.Theraja and A.K. Theraja, A Text book of Electrical Technology,
2. Pratab, Art and Utilisation of Electric Energy

References

1. Mehta V.K.,Principles of Electrical Engineering and Electronics
2. Gupta, J.B.,A course in Electric Power

Note: The question paper shall consists of two parts. **Part A** (40 marks) Ten compulsory questions of 4 marks each. **Part B** (60 marks) Student must answer one out of two from each module .Each question carries 20 marks. There is no university examination for Electrical lab, however 40 percent of the sessional marks should be awarded for the performance in the practical classes as per the syllabus given below:

Electrical Lab

Study of DC Motor, DC Generator, Transformer (single phase), Polyphase induction motor, Synchronous machines.

Experiments

1. OCC of DC self Excited shunt Generator
2. Load Characteristic of shunt generator
3. Load test on Series motor
4. Load Characteristics of compound Generator
5. Load characteristics of single phase transformer
6. Load characteristics of slip ring induction motor
7. Starting and Load test of squirrel cage 3 -phase induction motor
8. Synchronising of alternator by Dark Lamp Method
9. Load test on Alternator by Direct Loading
10. Starting and Load test of single phase induction motor – determination of characteristics.

Electrical Workshop

1. Wiring Practice in PVC conduit system

i. Two lamps & a plug (independent control)
ii. Stair case wiring / Tunnel wiring
iii. Main switch & Energy meter connection (study of Earthing system)
iv. Fluorescent Lamp & Ceiling Fan connection.

08.306 THERMAL ENGINEERING

L-T-P/D: 3-1-0 **4 Credits**

Module I

Steam Engineering – Entropy of steam – temperature-entropy diagram – Mollier chart – Rankine cycle, modified Rankine cycle – binary vapor cycle. High-pressure boilers, steam condensers. Steam nozzles – flow through steam nozzles, effect of friction, super saturated flow. Steam turbines; impulse and reaction turbines, Velocity diagrams, condition for maximum efficiency, Multi-stage turbines, condition lines. Cycles with reheating and regenerating heating – reheat factor, degree of reaction, governing of turbines, End thrust balancing, and leakage prevention.

Introduction to heat transfer: Different Modes of heat transfer, Fourier law, derivation of heat transfer equations for all modes of heat transfer from basic assumptions, heat exchangers and designs.

Module II

Fuels and combustion – stochiometry, calculation of A/F ratio, and equivalence ratios, volumetric and gravimetric analysis, fuel properties.

IC engines: normal combustion and flame front propagation in SI engines – auto ignition- pre ignition and detonation – factors affecting detonation, combustion chambers for SI engines. Knocking in CI engines, combustion chambers for CI engines. Engine tests: heat balance, measurement of BP, IP, FP, A/F ratio and calculation of efficiency.

Module III

Compressors: reciprocating compressors – work done and efficiency, volumetric efficiency- effect of clearance, Rotary compressors- roots blowers, vane type compressor, centrifugal and axial type compressors, work done and efficiency, and performance characteristics.

Gas turbines: open, closed and semi closed cycle – ideal gas turbine cycle. Simple cycle, simple cycle with regeneration, intercooling and reheating – cycle efficiency and work output. Performance of practical gas turbine cycle. Compressor and turbine efficiency – type of turbine combustion chambers.

Reference:

1. P. L. Ballaney Thermal Engineering
2. VanWylen-An Introduction to Classical Thermodynamics
3. Keralin- Steam turbines
4. J.B.Heywood, I.C.Engines Fundamentals
5. Cohen, Rogers and Saravanamittoo, Gas Turbine Theory
6. Ob, I.C. Engines
7. Gill and Smith, I.C. Engines
8. Rajput, Thermal Engineering
9. T.D.Eastop and A McConkay, Applied Thermo Dynamics for Engineering Technology Pearson Education.
10. Fundamentals of engineering Heat and Mass Transfer- R. C. Sachdeva

Note: The question paper shall consist of two parts. **Part A** (40 marks) Ten compulsory questions of 4 marks each. **Part B** (60 marks) Student must answer one out of two from each module .Each question carries 20 marks.

08.307 COMPUTER AIDED DRAFTING LAB

L-T-P/D: 0-0-3 3 Credits

Use any Computer Aided Drafting software package.

A. Machine Drawing

Preparation of drawings for machine components -bolts, nuts, Joints, Shaft coupling, connecting rod, cam profile, Assembly drawings of Machine components such as piston, cylinder, crossheads, and Safety Valves, etc.

B. Building Drawing

Principles of building drawing, preparation of drawing of buildings such as office building (for 20 staff), residential building (RCC and tiled roof, single storied and two storied), factory building with steel trusses for small scale industries.

Note : University exam duration is 4 hours, question paper contains two parts (Machine drawing and Building drawing) 50 marks each.

08.308 MACHINE DYNAMICS AND MATERIAL TESTING LAB

L-T-P/D: 0-0-3 3 Credits

Machine Dynamics Lab……..(Sessional mark = 25)

Experiments

1. Determination of time period of oscillation of simple and compound pendulum.
2. Determination of radius of gyration of bifilar and trifilar suspension.
3. Determination of frequency of vibration of Helical Spring.
4. Determination of frequency of vibration of spring mass system.
5. Verification of Dunkerley's method.
6. Characteristic curve of sleeve position against speed of governor.
7. Displacement curve of cam analysis apparatus.

Material Testing Lab……..(Sessional mark = 25)

Study of UTM, Torsion, hardness and Impact testing Machines

Experiments

1. Test on Mild Steel, High carbon Steel and Cast Iron specimens
2. Shear test on MS Rod
3. Torsion test on MS Rod
4. Torsion test using Torsion Pendulum on MS, Aluminum and Brass wire
5. Izod and Charpy Impact tests
6. Hardness test (Rockwell and Brinnel)
7. Spring test (Open and closed)
8. Bending and Compression test on Wood

Note : University exam duration is 3 hours. Maximum Marks 100. The student will be evaluated in one of the labs based on draw of lots.

Syllabus - IV Semester Industrial (2008 Admissions)

08.401 ENGINEERING MATHEMATICS-III (CMPUNERFHB)

L-T-P/D: 3-1-0 4 Credits

Module I

Complex Differentiation: Limits ,continuity and differentiation of complex functions. Analytic functions-Cauchy Reimann equations in Cartesian form (proof of necessary part only) properties of analytic functions-harmonic functions. Milne Thomson method

Conformal mapping: The Transformations $w=1/z$, $w=z^2$, $w=z+1/z$, $w=\sin z$,$w=\cos z$,Bilinear transformation

Module II

Complex Integration: Line integral- Cauchy's integral theorem-Cauchy's integral formula. Power series-radius of convergence-Taylors and Laurent's series-zeros and singularities –Residues and residue theorem. Evaluation of real definite integrals- $\int_0^{2\pi} f(\sin\theta, \cos\theta)\, d\theta$, $\int_{-\infty}^{\infty} f(x)\, dx$ with no poles of $f(z)$ on the real axis (proof of theorems not required)

Module III

Numerical Techniques: Errors in numerical computation-solution of algebraic and transcendental equations by bisection method, regula false method,Newton- Raphson method. Solution linear systems by Gauss elimination and Gauss-Seidal method. Newtons forward and backward interpolation formula. Lagranges interpolation formula.Numerical integration. Trapezoidal and Simpson's rule.Numerical solutionof ODE Taylor series method,

Eulers method, Runge Kutta methods(derivation of formulae not required for the above methods.)

References:

1. Peter v. O'neil, Advanced Engineering Mathematics, Thomson Pub.
2. Erwin Kreizig, Advanced Engineering Mathematics, Weiley Eastern.
3. Greenberg, Advanced Engineering Mathematics, Pearson.
4. B.S Grewal, Higher Engineering Mathematics, Khanna Publishers.
5. B.V Ramana, Higher Engineering Mathematics, Tata Mc Graw hill.
6. C T.Veerarajan and T.Ramachandran, Numerical Methods with programming.
7. S.S.Sastry, Introductory methods of numerical analysis.

Examination Duration: 3 hours

Note: The question paper shall consists of two parts. **Part A** (40 marks) Ten compulsory questions of 4 marks each. **Part B** (60 marks) Student must answer one out of two questions from each module .Each question carries 20 marks.

08.402 COMPUTER PROGRAMMING AND NUMERICAL METHODS(MNPU)

L-T-P/D: 3-1-0 4 Credits

Module – I

Introduction to Computer programming concept - Algorithm and flow chart, Basics of procedure oriented and object oriented programming.

Introduction to C++: Structure of C++ program; Key words; Identifiers; Data types – integer, real, character, string, boolean, enumeration, array and pointer; Constant and Variables; Escape sequences; Operators – assignment, arithmetic, relational, logical, increment & decrement, conditional, size of, comma and bitwise operators; Statements – simple & compound, declaration statements, Control statements -if, if-else, switch, for loop, while, do-while, break and continue statements, Input and output streams, Arrays – one dimensional & two dimensional; Functions- inline functions, function over loading, Functions with default arguments, recursion, pointers. Simple programs using above features.

Module –II

Introduction to Class and Object- definition, data members, member function, private & public member function, member access, friend declaration, class objects, predefined classes, initialization, constructor and destructor; Operator overloading, Inheritance- base class and derived class; Input/output stream libray - ifstream, ofstream , fstream, class flies. Simple problems using the above features.

Module-III

Errors and approximations- floating arithemetic- sources of errors- control of Errors- propogation of errors- condition and stability- rate of convergence. Interpolation- Newton's divided difference, Language, Ajken, Hermite and spline techniques- Inverse interpoloation. Curve fitting- method of least squares- non lilear relationships- Correlation and Regression – Linear correlation – measures of correlation- Standard error of estimate – Coefficent of correlation. Solution of partial differential

equations- classification- Laplace equation- Finite difference methods- relaxation methods. Stability and convergence of solution. Numerical problems and preparation of computer programs for the above methods.

References :

1. Ashok M. Kamthane, Object oriented Programming with ANSI & Turbo C++, Pearson Education.
2. Nagler, Learning C++, A Hands on Approach, Jaico publications.
3. Stanley B. Lippman and Josee Lajoie, C++ Primer, Pearson Education.
4. Balaguruswamy, Object Oriented Programming with C++, TataMcgraw Hill.
5. Nabajyothi barkakati, Object Oriented Programming in C++ , Prentice Hall.
6. Balaguruswamy, Numerical Methods, E. TataMcgraw Hill.
7. C.F. Gerald and P.O.Wheatley, Applied Numerical Analysis , Pearson Education.

Note: The question paper shall consists of two parts. **Part A** (40 marks) Ten compulsory questions of 4 marks each. **Part B** (60 marks) Student must answer one out of two from each module .Each question carries 20 marks.

08.403 FLUID MECHANICS AND HYDRAULIC MACHINES

L-T-P/D: 3-1-0 4 Credits

Module I

Properties of fluids-pressure, density, specific gravity, specific weight, viscosity, compressibility, vapor pressure - gas laws - Capillarity and surface tension-various types of manometers and pressure gauges-transmission of fluid pressure-continuity equation for one-dimensional steady flow. Bernoulli's equation for steady, one dimensional incompressible flow- venturimeter-orifice meter -pitot tube-notches-weirs.

Flow of incompressible fluids through pipes - Laminar flow through circular tubes and Annuli boundary layer concepts - Boundary layer thickness - Reynolds experiment-Laws of fluid friction in laminar flow-steady laminar flow in circular pipes-Haigen-Poissullie law .Darcy Weisbach equation-Chezy's formula-Friction factor - Moody diagram -transmission of power through pipes- Flow through pipes in series and in parallel - Commercial pipes.

Module II

Dimensional analysis: Dimensions and units, the Buckingham π theorem. Discussions on dimensionless

parameters - Models and similitude - Application of dimensionless parameters.

Impact of jets on vanes -flat, curved, stationary and moving vanes-radial flow over vanes-hydraulic turbines-classification - Pelton wheel, Francis turbine and Kaplan turbine-work done and

efficiency-draft tube-surge tank-penstock-governing-cavitation-specific speed-similarity and model testing-selection of water turbines for power plants

Module III

Positive displacement pumps-reciprocating pumps-inertia pressure-air vessels and their purpose-separation and cavitation-slip and efficiency-multi-cylinder pumps

Rotary motion of liquids-free, forced, spiral, and vortex flow, rotodynamic pumps:-centrifugal pumps – impeller, casing - manometric heads, work, efficiency and losses-priming-specific speed. Performance characteristics-multistage pumps -selection of pumps-pumping devices-

Hydraulic ram, jet pumps, gear pumps, vane pump, lobe pump, rotary pumps.

References

1. Fluid Mechanics and Machines: R.K.Bansal .
2. Hydraulics and Fluid mechanics: Lewitt
3. Hydraulics and Fluid mechanics: Dr..Jagadish Lal
4. Fluid flow machines: N.S.Govinda Rao
5. Fluid mechanics and machines : Modi and Seth.
6. Fluid Mechanics (IV th Edn.), J. F. Douglas, Pearson education.
7. Introduction to fluid dynamics, Robert W. Fox, John Wiley and sons
8. Theory and applications of fluid mechanics, K. Subrahmanya, (TMH)

Note: The question paper shall consists of two parts. **Part A** (40 marks) Ten compulsory questions of 4 marks each. **Part B** (60 marks) Student must answer one out of two from each module .Each question carries 20 marks.

08.404 MANUFACTURING PROCESSES(MN)

L-T-P/D: 3-1-0 4 Credits

Module I

Foundry – basic requirements of casting processes. Patterns – types, materials, allowances. Moulding Sand – Properties, testing, Sand Muller, Sand Slinger, Types of mould – Green Sand Mould, Dry Sand Mould, Sodium Silicate – Carbon Dioxide Moulding, Shell Moulding, Ceramic Mould Casting , Plaster mould casting. Cores – Core Sand, Core Types, Core Prints , Core Baking, Principles of gating and Risering – Riser location and Direction Solidification, Blind riser, Chills and Chaplets. Internal, external chills. Pressurised and Unpressurised Gating systems. Gravity die casting Pressure die casting-Hot and Cold chamber type, Squeeze casting, Centrifugal casting, Semi centrifugal casting Centrifuging, Continuous Casting. Sodification of Castings – Cleaning and Inspection of castings, Casting defects.

Module II

Welding- classification, Weldability, Metallurgy of welding, structure of weld, HAZ. Gas welding, types of flames. Arc welding- Carbon arc welding, Shielded metal arc welding, Submerged arc welding, TIG, MIG. Resistance welding- Spot welding, Seam welding, Projection welding, Butt welding, Flash butt welding, Percussion welding. Solid phase welding-forge welding, friction welding, explosive welding, ultrasonic welding. Thermit welding, Atomic hydrogen welding, Electron beam welding. Weld defects and inspection.

Module III

Forming-plastic deformation and yield criteria-relation between tensile and shear yield stress-Rolling-cold, hot rolling-Types of rolling mills-Rolling of channels, I and rail sections. Rolling of tubes, wheels and axles. Defects in rolled products. Forging- open and closed die forging, press forging, roll forging, types of forging presses. Defects in forging. Extrusion-hot and cold extrusion-Wire drawing-Rotary piercing-Rotary swaging, Cold forming-thread rolling, metal spinning. Introduction to powder metallurgy process – Compacting and sintering.

References :

1. Serope Kalpakjian and Steven R Schmid, Manufacturing Engineering and Technology, (Fourth Edition), Pearson Education, Asia.
2. Amitabh Ghosh and Amitkumar Mallik, Manufacturing Science, Affiliated East West press(p) Ltd, NewDelhi, 2002
3. H.F.Taylor, M.C.Flemmings and John Wulff, Foundry Engineering, Wiley Eastern Pvt. Ltd.
4. Campbell, Principles of Manufacturing materials and processes – TMH
5. Paul dE Grarmo , J.T.Black and RA.K Kosher, Materials and process in Manufacturing , PHI.

Note: The question paper shall consists of two parts. **Part A** (40 marks) Ten compulsory questions of 4 marks each. **Part B** (60 marks) Student must answer one out of two from each module .Each question carries 20 marks.

08.405 OPERATIONS MANAGEMENT

L-T-P/D: 3-1-0 **4 Credits**

Module I

Demand forecasting:- basic models, Long and Short-term demand forecasting methods, Regression analysis and smoothing methods, Estimation of trend, cycle, and seasonality components, Analysis of forecast error and computer control of forecasting systems, multi item forecasting, slow-moving item forecasting. Basic inventory models:- assumptions, performance measures, multi-item joint replacement model. Inventory systems under risk:- service levels, safety stock, joint determination of Q and R, time-varying demands.

Module II

Aggregate inventory management:- Exchange curves, stock out situations, safety stock policies, distribution inventory systems. Aggregate planning:- definition, value of decision rules, aggregate planning strategies, methods. Master production schedule:- bill of material, structuring BOM, disaggregation techniques, managing and maintenance of MPS. Material Requirements Planning:- MRP and MRP II, MRP concepts and advantages, implementation.

Module III

Capacity planning and control, controlling continuous production, batch processing technique, Just-in-time, KANBAN system, Lean manufacturing, Agile manufacturing.. Job Shop production activity planning:- scheduling, shop loading, sequencing, priority rules for dispatching jobs, mathematical programming and heuristics. Introduction to Business Process Reengineering, Enterprise Resource Planning.

Text:

1. Krajewski LJ, Operations Management: Strategy and Analysis, Pearson Education
2. Panneerselvam R, Production and Operations management:Prentice Hall India.

Reference:

1. Buffa ,Production and Operations Management ,John Wiley & Sons.
2. Narasimhan et al.,Production Planning and Inventory Control , PHI.
3. James .L. Riggs ,Production systems ,John Wiley & Sons.
4. Silver, Pyke & Peterson, Inventory Management and Production Planning and Scheduling ,John Willey & Sons

Note: The question paper shall consists of two parts. **Part A** (40 marks) Ten compulsory questions of 4 marks each. **Part B** (60 marks) Student must answer one out of two from each module .Each question carries 20 marks.

08.406 INTRODUCTION TO INDUSTRIAL ENGINEERING

L-T-P/D: 3-0-0 3Credits

Module I

History, contribution of various pioneers, scope, objectives, application and role of Industrial Engineering in organisations, Industrial Engineering in the modern world, principles of management, schools of management, management functions, mangement verses Industrial Engineering . Industrial ownership: Introduction, types of ownership, partnership, joint stock company, private limited company, public limited company, public sector and private sector, different scales and levels of industries.

Module II

Operation research: Definition and concept, methods and techniques in operations research, applications of operations research. System Engineering: Introduction, applications of system engineering, system concept, system analysis and approach, techniques in system analysis. Creative Problem Solving: Introduction, basic concepts and models, need for creativity, the creative individual, creative thinking, action programs. Decision making – Styles of Decision Making -Contingency approach, Decision making tools.

Module III

Productivity measurement and improvement: Introduction, nature of productivity, importance of productivity improvement, factors affecting productivity, basic sources of information for developing measures of productivity. Value Engineering: Concepts, methodology and applications. Evaluation and management of human resources: Introduction, subjective aspects of performance, labour relations, performance appraisal, selection and training of personnel.

Book keeping and accounting: Double entry book keeping-Preparation of Trading and Profit and Loss account, Balance sheet. Cost-Volume-Profit analysis.

References:

1. Stephen P. Robbins and David A. Decenzo, Fundamentals of Management, Pearson Education.
2. Philip E. Hicks, Introduction to Industrial engineering and Management Science, Mc Graw Hill.
3. Stewart Black and Lyman W. Porter, Management – Meeting New Challenges, Prentice Hall

4. Gavriel Salvendy, Hand Book of Industrial Engineering & Management, John Willey & Sons.
5. Koontz, Essentials of Management, Tata McGraw Hill
6. Bateman and Snell, Management: Competing in the new era, McGraw Hill
7. Double Entry book Keeping – Batliboi

Note: The question paper shall consists of two parts. **Part A** (40 marks) Ten compulsory questions of 4 marks each. **Part B** (60 marks) Student must answer one out of two questions from each module .Each question carries 20 marks.

08.407 FLUID MECHANICS AND MACHINES LAB (MN)

L-T-P/D: 0-0-3 3 Credits

Study of meters, gauges and valves - pressure gauge, vacuum gauge, manometers, flow measuring equipments-water meters-venturi meter-orifice meter-current meter, stop valve, gate valve and foot valve

Study of pumps- Centrifugal – Reciprocating – Rotary - Jet. Study of Turbines- impact and reaction types. Study of Hydraulic ram, accumulator etc.

Experiments

1. Determination of Coefficient of discharge and calibration of Notches, Orifice meter, Nozzle and Venturimeter.
2. Determination of Chezy's constant and Darcy's coefficient on pipe friction apparatus
3. Determination of Hydraulic coefficients of orifices
4. Determination of Metacentric Height and Radius of gyration of floating bodies.
5. Performance test on Rotodynamic and Positive displacement pumps
6. Performance test on Impulse and Reaction turbines
7. Speed variation test on Impulse turbine
8. Determination of best guide vane opening for Reaction turbine
9. Performance test on variable speed pump and plotting iso-efficiency curves

08.408 THERMAL ENGINEERING LAB

L-T-P/D: 0-0-3 3 Credits

1. Study of I. C engines :-
   a) Diesel engines - all systems and parts
   b) Petrol engines - all systems and parts.

2. Experiment on I C Engines

   a) Performance test on IC Engines (Petrol and Diesel)
   b) Valve timing diagram
   c) Economic speed test

d) Best cooling water Temperature test
e) Retardation test
f) Volumetric efficiency and Air-fuel ratio test

3. Determination of flash and fire points of petroleum products
4. Determination of viscosity of lubricating oil using Redwood Viscometer.
5. Determination of calorific value of solid, liquid and gaseous fuels using Bomb calorimeter and Gas Calorimeter
6. Study of pollution testing equipment and flue gas analyser.
7. Study and Performance Analysis of
    a. Reciprocating compressor
    b. Rotary compressor
    c. Blowers
8. Determination of thermal Conductivity of metals, experiments on convection and radiation heat transfer.
9. Performance analysis of Parallel flow and Counter flow heat exchangers.

Syllabus - V Semester Industrial (2008 Admissions)

08.501 INTRODUCTION TO STOCHASTIC MODELS (N)

L-T-P/D: 3-1-0 **4 Credits**

Module I

Introduction to Probability Theory:- Sample space and Events, Conditional probabilities, Independent events, The Law of Total probability and Bayes' Theorem.
Random Variables:- Discrete and Continuous random variables, Expectation of a Random variable, Moment Generating Functions, Joint Probability distributions.
Limit Theorems:- Markov's Inequality, Chebyshev's Inequality, Strong Law of Large numbers, Central Limit theorem, Stochastic Processes.
Conditional Probability and Continuous Expectation:- Discrete and Continuous cases, Computing Expectation and Variances by Conditioning.

Module II

Markov Chains:- Introduction, Chapman-Kolmogrov Equations, Classification of States, Limiting Probabilities, Applications, Mean Time spent in Transient states, Branching Processes, Time Reversible Markov chains, Markov Decision processes.

Continuous Time Markov Chains:- Birth and Death Processes, Computing the Transition probabilities, Limiting probabilities, Time Reversibility, Uniformization.

Module III

Renewal Theory: - Introduction, Distribution of N(t), Limit Theorems and their Applications, Renewal Reward process, Delayed Renewal processes, Regenerative processes, Alternative Renewal processes, Semi-Markov Processes, Computing the Renewal function, Application to Patterns.

Brownian Motion and Stationary Processes:- Brownian motion, Hitting times, Maximum variable, and the Gambler's Ruin Problem, Variations in Brownian Motion, White Noise, Gaussian Processes, Stationary and Weakly stationary processes.

Introduction to Martingales and Random walks.(Overview only)

References:

1. Introduction to Probability Models – Sheldon M.Ross – Elsevier
2. Stochastic Processes – Sheldon M.Ross – Wiley
3. Probability and Statistics in Engineering – W.W.Hines, D.C.Montgomery, D.M.Goldsman, C.M.Borror – Wiley
4. Probability and Random processes – G.R.Grimmett and D.R.Stizaker – Oxford University Press
5. An Introduction to Probability theory and its Applications,Vol.1 & 2 – W.Feller – John Wiley
6. Introduction to Stochastic processes – E.Cinhr – Prentice Hall Inc.
7. Modeling and Analysis of Stochastic Systems – V.G.Kulkarni – Chapman and Hall London.

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.502 OPERATIONS RESEARCH (N)

L-T-P/D: 3-1-0 **4 Credits**

Module I

Introduction to Operations research, Applications.

Linear programming – General formulation, Matrix form of LP problem, Graphical solutions, Simplex method, Duality, Dual Simplex method and Sensitivity analysis.

Queuing theory – Pure Birth and Pure Death processes, Relationship between Poisson process and Exponential Distribution, Basic Poisson queues. Priority disciplines – Queuing decision models.

Module II

Transportation problems – Formulation, Balanced and Unbalanced problems -Solution methods to find basic feasible solution and optimal solution, Degeneracy in transportation problem-Unimodularity, Trans-shipment problem, Sensitivity analysis in Transportation problem.

Assignment problems – Formulation, Solution methods-Hungarian algorithm-Auction algorithm.

Scheduling on machines- Two-job – Two-machine problem – Johnson's algorithm – graphical solution.

Module III

Introduction to Dynamic programming - Stage coach problem, reliability problem, manpower planning problem, continuous variables etc.

Decision theory- Types of decision making environment- Decision making under uncertainty and under risk-Decision tree analysis

Game theory – Practical application of game theory – Two-person Zero–Sum games – Mixed strategy – Rules of Dominance-solution methods.

Case studies illustrating above models in Industries, introduction to software packages for decisions.

References:

1. Operations Research-G.Srinivasan-PHI
2. Operations Research- J.K Sharma-MacMillan
3. Introduction to Operations Research-Hillier and Lieberman-TMH
4. Introduction to Operations Research – Taha – PHI
5. Principles of Operations Research with Applications to Managerial Decisions – H.M.Wagner – PHI
6. Quantitative Methods in Management – N. D. Vohra – TMH
7. Introduction to Management Science – Taylor – Pearson Education
8. Operations Research – Natarajan, Balasubramani, Tamilarasi – Pearson Education

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.503METHODS AND SYSTEMS DESIGN (N)

L-T-P/D: 3-1-0 **4 Credits**

Module I

Introduction, definition and concept, need for work study, objectives, work-study and productivity. Organization of work study department. Method study: Definition, process analysis, process chart, process chart symbols, outline process chart, flow process charts, multiple activity charts, two handed process charts, flow diagram, string diagram and travel chart. Micro motion, and memo motion analysis.

Module II

Work Measurement: Definition and concept of work measurement, work measurement

technique, Stop watch time study, , Time study equipments, selecting the job to be timed, selection of workers for time study, for time study, performance Rating, Systems of Rating, Predetermined motion time systems, Methods Time Measurement, work factor systems, work sampling, applications of work measurement techniques.

Module III

Human physiological and psychological capabilities and limitations, principles of motion economy, , work place arrangements, systems and controls for the improvement of human work place. Advances in applied biomechanics and ergonomics, heat stress and heat stress management, energy expenditure and factors affecting oxygen uptake. Fatigue measurement, anthropometry and workstation design. Case studies in Work study and ergonomics.

References:

1. Ralph M. Barnes, Motion and Time Study Design and Measurement of Work, John Wiley & Sons.
2. ILO, Introduction to Work Study.
3. Chandler Allen Phillips, Human Factors Engineering, John Wiley and Sons.
4. Bridger R S, Introduction to Ergonomics, Taylor and Francis.
5. Hansen B. L., Work Sampling: For Modern Management ,Prentice Hall.
6. Maynard, Industrial Engineering Handbook ,McGraw Hill.

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.504 PRECISION ENGINEERING (N)

L-T-P/D: 2-1-0 **3 Credits**

Module I

Definition-Standards of measurement-Errors in measurement-Accuracy, precision etc-calibration of instruments,selection and care of instruments.

Length standard-Line and end standard - Slip gauges, micrometers, verniers, dial gauges-comparators, various types-principle and applications-limits, fits and tolerence-design of gauges-interferometry applications-angular measuring intruments-bevel protector, levels, clinometers-sine bar , angle dekkor-alignment telescope,autocollimator.

Module II

Straightness, flatness, alignment errors-surface texture-various measuring instruments-runout and concentricity -tool makers microscope-metroscope. Various elements of threads-2 wire and 3 wire methods-gears elements -various errors and measurements.

Coordinate measuring machine-LASER micrometer-LASER interferometer-Noncontact and in-process inspection , vision system.

Module III

Processing system of nanometre accuraicies-mechanism of material processing-Nano Physical processing of atomic bit-units-Nano-chemical and electrochemical atomic-bit processing. In process or in situ measurement of postion of processing point-Post process and on machine measurement of dimensional features and surface-mechanical measuring systems -optical measuring systems-Electron beam measuring systems-pattern recongnition and inspection systems.

References

1. I.C.GUPTA, " A Text Book of Engineering metrology ", Dhanpat Rai and Sons, 1996.
2. R.K.JAIN and S.C.GUPTA, " Engineering metrology ", Dhanpat Rai and Sons, 1996.
3. G.N.GALYER F.W and C.R.SHOTBOLT, " Metrology for Engineers ", ELBS Edn 1990.
4. " ASTE Handbook of Industries Metrology ", Prentice Hall of India Led., 1992.
   CIRP Annals
5. NORIO TANIGUCHI, Nanotechnology, Oxford University Press, 1996.

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.505 MACHINE TOOLS(MN)

L-T-P/D: 3-1-0 **4 Credits**

Module – I

Introduction to Metal cutting, Orthogonal and Oblique cutting, Chip formation, Types of chips, Tool Signature – Tool Geometry – Machinability – Tool Wear and wear measurement – Factors affecting tool life – Analysis of cutting forces in orthogonal cutting - Merchants theory (simple problems), Work done. Economic of Machining – Cutting Tools for different materials and cutting speeds. Characteristics of Tool materials, Measurement of cutting forces. Tool dynamo meters, Cutting Fluids. Ceramic tools and inserts.

Module II

General Purpose Machine Tools – Principle of operation of Lathe – Types of lathes and size specification, Work holding parts of lathes and their functions – Main operations – attachments – Feeding Mechanisms, Apron mechanism, Shaper mechanism – Calculation of cutting speed – Shaper operation and tools used, Milling Machine – Types – Principal parts – Types of milling cutters – Elements of plain milling cutters – Up milling, Down milling and face milling operations – Indexing – Simple Indexing – Differential indexing. Grinding Machines – Classification – Operations – Surface, Cylinderical and Centreless grinding, Specification of grinding wheels - Glazing and Loading of wheels.-Dressing and Truing of Grinding wheels.

Module III

Semi – automatic Machine Tools – Turret and Capstan Lathes. Automatic Machine Tools – Single Spindle and Multi-spindle machines , Transfer machines, unconventional machining process – EDM, WEDM, ECM, LBM,USM, AJM, EBM and Chemical Machining, High energy rate forming process – Explosive forming , Hydro forming,

Electromagnetic forming. Powder Metallurgy-basic concepts and advantages.

Reference:

1. Manufacturing Engineering & Technology : Kalpakjian – Addison Wesley
2. Materials and Processes in Manufacturing : Poul De Garmo, J.T.Black, R.A.Kosher – Printice Hall of India.Pvt. Ltd. 1997.
3. Tool Engineering & Design : G.R.Nagpal –Khanna Pub.
4. Chernov – Machine Tools, Mir Publishers
5. R.K.Jain – Production Technology, Khanna Publishers
6. R.K.Gupta - Production Technology, Sathya Prakashan
7. Ghosh A and Malic A.K – Manufacturing Science, Affiliated East West Press.
8. Production Technology , HMT, TMH.
9. Elements of workshop technology, Vol II, Hajra Choudary et.al., Media promoters and publishers, pvt. Ltd.

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.506 ELECTIVE I (N) 3-1-0 4 Credits

08.507 MACHINE TOOLS LAB (N)

L-T-P/D: 0-0-3 **3 Credits**

General study of Lathe and Accessories, Tools used for different operations. Exercises involving plane turning, Groove cutting, form turning, taper turing, facing and thread cutting.

Study of shaping and slotting machines, and planning machines, exercises involving production of flat surfaces, grooves and key ways.

Study of Milling Machines and Milling Cutters, Exercise on Milling machines-face milling, end milling – spur and Helical gear cutting – milling of keyways

Study of Grinding machines, surface Grinding and Cylindrical grinding machines – study of Drilling machines,Exercise on Grinding and drilling Machines

08.508 METHODS AND SYSTEMS DESIGN LAB (N)

L-T-P/D: 0-0-3 **3 Credits**

1. Experiment to explain the principles of motion economy
2. Experiment to determine method improvement
3. Experiment to demonstrate learning effects (learning curve)
4. Experiment to experience and practice of performance rating
5. Experiment to determine standard times of different jobs by stop watch time study
6. Experiment to determine standard time by MTM
7. Experiment to determine standard time by work sampling
8. Experiment to determine location for facilities by gravity method, etc.
9. Experiment to determine physiological work for doing different tasks
10. Experiment to explain micro-motion analysis

08.506 Elective I(N)

08.506.2 HUMAN ASPECTS OF MANAGEMENT(MN)

L-T-P/D: 3-1-0 **4 Credits**

Module1

Dimensions of Human Behaviour, Self development, Perception, Motivation and Personality-concepts, theories and applications .Modes of values, beliefs, attitudes and intelligents in determining human behaviour. Group dynamics-nature of groups and group decision making. Leadership –nature and significance ,theories and styles.Conflict management ,Transactional Analysis ,Case studies.

Module 2

Organizational development, Concepts of QWL-strategies for improved QWL, Organizational change, Resistance to change, Goals of organizational change and organizational development, Concept of organizational climate-health and effectiveness. Organizational culture- nature and characteristics, types, impact of culture in organizational behaviour, Motivation of person across cultures, Managerial leadership across cultures, Case studies.

Module 3

Human Resource Management –Concepts and objectives. Man power planning, Recruitment and selection, Training and development. Performance appraisal, Wage and salary administration, Grievance handling, Compensation policies, Safety and health maintenance, Labour legislation, Case studies.

References:

1. Fred Luthans ,Organizational Behaviour ,McGraw Hill.
2. Stephen P. Robbins, Organizational Behaviour ,Pearson Education.
3. Uma Sekharan, Organizational Behaviour-Text and Cases ,Tata Mc Graw Hill.
4. Gary Dessler,Human Resource Management ,Pearson Education.
5. Scott ,Personnel Management ,Tata Mc Graw Hill.

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.506.2 ADVANCED MECHANICS OF SOLIDS (N)

L-T-P/D: 3-1-0 **4 Credits**

Module I

Analysis of stress; State of stress at a point; Rectangular stress components; stress components on an arbitrary plane; Principal stress and Principal planes; Planes of maximum shear; State of pure shear; Differential equations of equilibrium in rectangular co-ordinates; Analysis of stress in two dimensions; Plane stress and plane strain. Transformation of stresses. Analysis of strain, strain-displacement relations– Principal strains and principal axes. Compatibility conditions. Stress-Strain relations.

Module II

Energy methods; Reciprocal relations; Maxwell-Betti-Rayleigh reciprocal theorem; Castigliano's I theorem; Fictitious load method; Theorem of virtual work; Castigliano's II theorem; Engessers theorem.

Bending of beams; Straight beams and asymmetrical bending; shear centre; shear stresses in thin walled open sections; Bending of curved bars (Winkler–Bach formula)

Module III

Torsion -Torsion of General prismatic bars; Torsion of circular, elliptic and equilateral triangular bars; Membrane analogy. Torsion of thin- walled tubes. Torsion of bars with narrow rectangular cross-section. Torsion of thin- walled multiple cell closed sections, Torsion of rolled sections, Center of twist and flexural centre.

References:

1. Advanced Mechanics of Solids-L.S Srinath (T.M.H)

2. Theory of Elasticity –Timoshenko and Goodier (Mc Graw Hill)

3. Solid Mechanics – S.M.A Kazimi (T.M.H)

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.506.3 COMPUTER AIDED DESIGN (N)

L-T-P/D: 3-1-0 **4 Credits**

Module –I

Computer Aided Design – Definition , necessity for CAD Design process – Application of computers in Design- Geometric modeling, Engineering analysis, design review and evaluation, Automated drafting. Benefits of CAD.

Hardware in CAD- components, Design workstation, computer graphics terminal, types of display devices, CRT tubes, directed beam refresh, DVST and raster scan displays, LCD and plasma discharge displays. User interaction devices.

Module II

Computer graphics software, functions of CG packages.

Computer graphics. Methods of defining points, lines- arcs - Bresenhams algorithm. 2D Transformations– translation, scaling, rotation, mirroring, concatenation of transformations. 3D transformations. Windowing and Clipping- Cohen Sutherland line clipping algorithm.

3D modeling, types of models- wire frame - surface and solid models

Module III

Introduction to finite element analysis-steps involved in FEM- Preprocessing phase-discretisation-types of elements-selection of interpolation functions- Formulation of stiffness matrix - formulation of load vector- Transformation of coordinates- assembly of global equations-solution procedure, post processing phase. Simple problems with Axial element - beam element, CST element. Solution of 1D and 2D structural and solid mechanics problems-linear static analysis.

Reference:

1. Daryl Logan, A First course in Finite Element Method, Thomson Learning
2. Groover, CAD/CAM Prentice Hall
3. Roger and Adams, Mathematical Elements of CAD Prentice Hall.
4. Hearn and Baker, Computer Graphics, Prentice Hall
5. Sait, CAD/ CAM,
6. Thirupathi Rao and Belagundu, Introduction to Finite Element Analysis

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.506.4 ENERGY MANAGEMENT (N)

L-T-P/D: 3-1-0 **4 Credits**

Module I

Energy conversion processes and devices – Energy conversion plants – Conventional (Thermal, Hydro, Nuclear fission) and Non – conventional (Biomass, Fuel cells and Magneto Hydrodynamics) – Energy storage and Distribution – Electrical energy route – Load curves – Energy conversion plants for Base load , Intermediate load, Peak load and Energy displacement – Energy storage plants, Energy from waste, Energy plantation.

Module II

Energy Management – Definitions and significance – objectives – Characterising of energy usage – Energy Management program – Energy strategies and energy planning – Energy Audit – Types and Procedure – Optimum performance of existing facilities – Energy management control systems – Energy policy in India – Computer applications in Energy management

Module III

Energy conservation – Principles – Energy economics – Energy conservation technologies – cogeneration – Waste heat recovery – Combined cycle power generation – Heat Recuperators – Heat regenerators – Heat pipes – Heat pumps – Pinch Technology

Energy Conservation Opportunities – Electrical ECOs – Thermodynamic ECOs in chemical process industry – ECOs in residential and commercial buildings – Energy Conservation Measures.

References

1. Energy Efficiency for Engineers & Technologists- T.D.Eastop and D.R. Croft by Longman Group Ltd.
2. Handbook of Energy Audits by Albert Thumann, P.E, C.E.M and Wlliam.J.Younger, C E.M by Fairmont Press Ltd.
3. Energy Management Hand book by Wayne.C.Turner by Fairment Press Ltd.
4. Energy Technology by S.Rao and Dr.B.B.Parulekar, Khanna Publishers.
5. Non – conventional Energy Sources by G.D.Rai, Khanna Publishers.

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.506.5 MANAGEMENT OF PROJECTS (N)

L-T-P/D: 3-1-0 **4 Credits**

Module 1

Project identification and formulation, different types of needs leading to different types of projects, BMRED (Balancing, Modernization, Replacement, Expansion, and Diversification) projects, Macro parameters in project selection, SPACE approach, PRI, different considerations for project under private, public and joint sectors. Project formulation, project report and detailed project report. Project appraisal-different types of appraisal-Technical, Economic, Marketing, Commercial and Financial. Financial techniques for project appraisal and feasibility, discounted cash flow and non-discounted cash flow methods, SCBA.

Module 2

Project financing-pattern of financing, sources of finance, impact of taxation, public loans, deficit financing, foreign aid. Public sector project financing. Role of tax planning in project financing. Project cost systems-project cost accounting and monitoring, Contract Management. Tendering Procedures, appointment of contractor and its problems, labour and equipment costs, accounting, activity based cost accounting, production rates for estimates, control of cost, computer application to cost control.

Module 3

Project administration- progress payments, expenditure planning, Project implementation Planning: scheduling and network planning, use of Critical Path Method (CPM), PERT, GERT, MOST. Schedule of payments and physical progress, Resource leveling and resource allocation. Crashing and time-cost trade off, Post project evaluation. Multiple projects and constraints; Options and Flexibility, Performance Evaluation; Abandonment Analysis; Principles of Project Contracts; Dynamics of Project Costs.

References:

1. Project planning, analysis, selection, implementation and review – Prasannachandra – Tata McGraw Hill
2. Project Management – the Managerial Process – Clifford F. Gray & Erik W. Larson -McGraw Hill

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

Syllabus - VI Semester Industrial (2008 Admissions)

08.601 DATA ANALYSIS FOR MANAGEMENT (N)

L-T-P/D: 3-1-0 **4 Credits**

Module I

Introduction and Descriptive Statistics:- Samples and Populations, Data and Data collection, Percentiles and Quartiles, Measures of Central Tendency, Measures of variability, Grouped data and the histogram, Skewness and Kurtosis, Chebyshev's Theorem, The Empirical Rule, Methods of Displaying Data, Exploratory Data Analysis.
Probability Distributions:- Random variables-discrete and continuous, Cumulative Distribution Function, Introduction to Bernoulli, Binomial, Geometric, Poisson,Triangular, Weibull, Uniform, Normal, Gamma and Exponential distributions.

Module II

Measurement design:- Primary types of Measurement Scales-Nominal, Ordinal, Interval and Ratio scales.

Sampling and Sampling distributions:- Introduction, Sampling process, Non-probability and Probability sampling- different types, Determination of sample size, Introduction to sampling distributions, Central Limit Theorem, Estimators and their properties, Confidence Intervals.

Hypothesis Testing:- One sample and Two sample tests, z-test, t-test, Chi-square test.

Analysis of Variance:- Theory and computations of ANOVA, ANOVA table, Two-way ANOVA, Blocking designs, Design of Experiments.

Module III

Simple Regression and Correlation:- Introduction, Estimation using the regression line, Correlation Analysis.

Multiple Regression:- The k-variable multiple regression model, The F-test of a Multiple Regression model.

Non-Parametric methods:- Introduction, The sign test for paired data, Rank sum tests – The Mann-Whitney U-test and Kruskal-Wallis test, One sample Runs test, Rank correlation, K-S test.

Time Series Analysis and Index numbers:- Trend Analysis, Seasonality and Cyclic behaviour, The Ratio-to-Moving average method, Exponential smoothing methods, Index numbers.

Introduction to Factor Analysis, Multi Dimensional Scaling, Cluster Analysis, Discriminant Analysis and Conjoint Analysis.(Overview only)

References:

1. Complete Business Statistics – Amir D.Aczel and J.Sounderpandian – Tata McGraw Hill
2. Statistics for Management – Richard I. Levin and David.S.Rubin – Pearson EducationI

3. Management Research Methodology – K.N.Krishnaswamy, A.I.Sivakumar and M.Mthirajan – Pearson Education
4. 100 Statistical Tests – Gopal.K.Kanji – Sage Publications
5. Research for Marketing Decisions – Paul.E.Green, D.S.Tull and Gerald Albaum – Prentice Hall
6. Marketing Research –An Applied Approach – Thomas.C.Kinnear and James R.Taylor – McGraw Hill Inc.
7. Fundamentals of Quality Control and Improvement – Mitra – Pearson Education
8. Mathematical Statistics – Irwin Miller and M.Miller – Prentice Hall India
9. Probability and Statistics in Engineering – D.C.Montgomery, D.M.Goldsman, C M.Borror – Wiley

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.602 ADVANCED OPERATIONS RESEARCH (N)

L-T-P/D: 3-1-0 **4 Credits**

Module I

Linear programming problems – revised simplex method, sensitivity analysis. Interior point algorithm. One dimensional cutting stock problem- Column generation-Knapsack problem. Dantzig and Wolfe's Decomposition Algorithm. Dual Simplex method, Bounded variables LP, Parametric Linear Programming. Goal programming.

Module II

Non-linear programming: Unconstrained extreme points-Constrained optimization problems-Lagrangean method-Kuhn Tucker conditions. Quadratic Programming-Wolfe's method, Beale's method.

Integer programming: Zero-One problems-Implicit Enumeration- Branch and Bound algorithm, Gomory's cutting plane algorithm, All Integer Dual algorithm, All Integer Primal algorithm, Benders Partitioning Algorithm.

Module III

Introduction to graph theory-Basic definitions-spanning trees, matching problem,Hamiltonian circuits, Eulerian circuit etc.

Network problems: Minimum spanning tree problem-Prim's algorithm, Kruskal's algorithm. Shortest path problems-Dijkstra' algorithm, Successive Shortest path algorithm, Maximum flow

problems-Flow augmenting path,Shortest Augmenting path algorithm,Labelling algorithm,Preflow push algorithm-Maximum Flow and Minimum Cut, Minimum cost flow problem-Network Simplex method. CPM / PERT networks.

Travelling Salesman Problem(TSP)-Optimal solutions using branch and bound algorithms-Heuristic algorithms for the TSP: Nearest Neighbourhood Algorithm, Pairwise Interchange, Three-opt, Twice around the tree etc.Chinese Postman Problem. Vehicle Routing Problems-Optimal solutions: Little's algorithm and heuristic solutions: savings based algorithm, Holmes and Parker refinement.

Reference:

1. Operations Research-G.Srinivasan-PHI
2. Operations Research- J.K Sharma-MacMillan
3. Introduction to Operations Research-Hillier and Lieberman-TMH
4. Introduction to Operations Research – Taha – PHI
5. Principles of Operations Research with Applications to Managerial Decisions – H.M.Wagner – PHI
6. Quantitative Methods in Management – N. D. Vohra – TMH

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.603 MECHATRONICS(N)

L-T-P/D: 2-1-0 **3 Credits**

Module I

Introduction. Control systems fundamentals- Open loop control systems and closed loop control systems-Response of systems-servo mechanisms-microprocessor based controllers-examples-measurement systems- Adaptive control.

Sensors and transducers – Definition-classification of transducers-active and passive transducers, null and deflection type transducers-performance of transducers-Sensors for displacement, position, proximity, velocity, force, pressure, flow, liquid level, temperature, magnetic flux, vibration and noise-selection of sensors.

Module II

Signal conditioning –Bridge circuits, Amplification, filtration, analog to digital conversion, multiplexing, Data acquisition, PWM, dataacquisition using matlab. Applications of general purpose ICs like Opamps and logic gates.

Mechatronics in industry automation- CNC machines-mechanical, hydraulic and pneumatic actuation systems-electrical actuation systems-stepper and servomotors.stepper motor control circuits. PLCs-ladder diagrams-simple programs-condition monitoring-automatic control and real time control systems.

Module III

Robotics-Robot position and proximity sensing – tactile sensing – sensing touches – sensing slip – Man-Machine interface-AGVs

Artificial intelligence-Neural Networks – fundamentals of ANN – Perceptrons – back propagation,RBF networks. Introduction to Fuzzy logic and Genetic Algorithms. Applications of above algorithms using matlab

References:

Mechatronics, Electronic control systems in Mechanical and Electrical Engineering – W. Bolton – Pearson Education

Mechatronics – Electronics in products and Processes – Bradley D A – Chapman and Hall

MECHATRONICS – HMT, Bangalore

Mechatronics – Denny K Min – Springer

Sensors, A Comprehensive Survey – Vol 1-8 – Gopel W etal. – VCH Publishers

Mechatronics: Designing Intelligent Machines – Institution of Mechanical Engineers – MEP (UK) 1990

Mechatronics: The Integrating of Engineering Design – MEP(UK) 1992

Neural Computing, Theory and Practice – Philip D Wasserman – Reinhold, Newyork,

Neural networks using matlab 6.0, Tat McGraw Hills-S N Sivanandam,S Sumathi,S N Deepa

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.604 MACHINE DESIGN(N)

L-T-P/D: 3-1-0 **4 Credits**

Module I

Design Principles-Common engineering materials and their properties, stress in machine parts, tension, compression, shear, bending and torsional stresses -Variable load- basic concept; Terminology associated with variable loading; Patterns of load or stress variations, Cyclic stressing/straining-and materials response to cyclic loading, The mechanism of fatigue failure; origin and propagation of crack, Stress life relations; S-N curve-fatigue strength and endurance limit, Factors influencing fatigue, Endurance strength modification factors, Effect of stress concentration and fatigue stress concentration definition and its estimation from geometric stress concentration factor, Effect of mean stress- Goodman and Soderberg's relations, Design

approach to fatigue- design for infinite life and finite life, Approach/Methods for design of members under combined (steady and variable) loading conditions

Shafts:- torsion and bending of shafts, Hollow shafts, design of shafts for strength and stiffness-Effect of key ways-Crankshafts, Propeller shafts.

Design of gear tooth- Law of gearing - conjugate action and gear tooth profile-basics Analysis of forces on spur, helical, bevel and worm gears - determination of bearing reaction forces Bending and contact stress in gear tooth-dynamic loading and wear-Lewis and Buckingham equations for design. Design of fixed ratio gear box-general design procedure

Module II

Detachable joints-Pins, Keys, Splines, Cotters, Set screws, Threaded fasteners-Power screws, Shaft couplings, Welded joints- types of joints, strength of welds, fillet welds, stress concentration in welded joints-eccentric loading. Riveted joints:- Types of rivets, strength of rivets, Joints for pressure vessels-Structural joints, eccentric loading.

Thin Cylinders - Thick cylinders- Stresses due to internal and external pressures, Design principles for thick cylinders

Design/analysis of Brakes clutches and fly wheels:-Brakes and clutches -need and functioning - dynamic model, Plate clutches- design for uniform pressure and wear, Shoe brakes- short and long shoe analysis, Automotive shoe brake-design/analysis, Fly wheel basic concepts -design requirements, Moment diagram and energy estimations.

Module III

Springs:- classification and uses of springs, spring material- Design of helical, co-axial and leaf spring. Effect of end trusses, stress concentration factor, energy absorbed- deflection-Design for fluctuation loads- vibration in springs- buckling of springs-length of leaf springs.

Design of sliding and journal bearings:- Types of lubrication- hydro dynamic, hydro static and EHD lubrication. Petroff's equation and the bearing characteristic number, Lubrication regimes-boundary and film lubrication, Hydro dynamic bearings- Pressure distribution-eccentricity and minimum film thickness, Reynolds equation and use of bearing design charts, Heat generation and thermal equilibrium, Rolling contact bearings:- ball and roller bearing, types, static and dynamic load capacity, bearing life. Design of ball and roller bearings, and selection of rolling contact bearings using design data handbook.

Design Data hand books

1. Prof. Narayana Iyengar B. R. & Dr Lingaiah K., Machine Design Data Handbook, Vol. I &II

2. P.S.G., Tech., Machine Design Data Handbook

3. Design data Book -K. Mahadevan – C.B.S Pub.

Reference :

1. Mechanical Engg Design – Joseph Edward Shighy
2. Machine Design -M.F. Spotts
3. Machine Design -Shaum's Series
4. Machine Design – Abdulla Sherief.

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.605 SYSTEM MODELING AND SIMULATION (N)

L-T-P/D: 3-1-0 **4 Credits**

Module I

Systems theory, measures of effectiveness, System modeling, system analysis, system approach to problem solving, applications in industrial and business systems. Areas of application of simulation, steps in simulation study, classification of systems, models of systems-different types, system analysis and system postulation. System simulation:- Monte Carlo method, numerical computation technique for continuous and discrete systems, Distributed Lag models, Cobweb models,. Comparison of simulation and numerical methods. Continuous system models, feedback systems, Real-time simulation. Use of Monte Carlo method to find area under curves, value of π, pure pursuit problem, trajectory simulation, etc.

Module II

Discrete and continuous probability functions, uniformly distributed random numbers, properties of random numbers, generation of Pseudo-Random numbers, random number generators, tests for random numbers:- frequency, gap, run, and Poker tests, tests for autocorrelation. Generation of random deviates for Exponential, Uniform, Weibull, Triangular, and discrete distributions; Inverse Transformation method. Direct transformation method for the Normal and Lognormal distributions. Acceptance-rejection technique:- Poisson and Gamma distributions. Input modeling:- data collection, identifying the distribution with the collected data, goodness of fit tests, selecting input models without data.

Module III

Discrete event simulation techniques:- Next-Event approach/Event scheduling, Fixed Time Increment method, manual simulation using Event Scheduling and Fixed Time Advance methods. Simulation of Queuing models, Production systems, Material handling systems, etc. Verification and Validation of simulation models. Design of simulation experiments, variance reduction techniques, statistical analysis of outputs, and optimization of parameters. Computer simulation languages, packages, and their application.

References:

1. System Simulation – Geoffrey Gordon – PHI
2. System Simulation with Digital Computer – Narsingh Deo – PHI
3. Discrete Event System Simulation – J. Banks – Pearson Education
4. Concepts and Methods in Discrete Event Digital Simulation – Fishman – John Willey & Sons
5. Simulation – Sheldon M.Ross – Elsevier
6. Simulation Modeling and Analysis – A.M.Law and W.D.Kelton – McGrawHill
7. Probability and Statistics with Reliability, Queuing and Computer science applications – K.S.Trivedi – John Wiley

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.606 ELECTIVE II (N)3-1-0 4 Credits

08.607 MANUFACTURING AUTOMATION LAB (N)

L-T-P/D: 0-0-3 **3 Credits**

Experiments:

1. Experiments and programming of PLC
2. Experiments and programming of Motion Controller package
3. CNC Trainer lathe programming
4. CNC Trainer milling machine programming
5. Experiments and programming on industrial robot
6. Experiments on Machine Vision Inspection System
7. Experiments on sensors and transducers
8. Programming on CNC production machines (CNC Turning centre, CNC Machining centre, CNC EDM)

08.608 DATA ANALYSIS AND OPTIMIZATION LAB (N)

L-T-P/D:0-0-3 **3 Credits**

1. Use of OR packages for solving LPP, Transportation, Assignment, Traveling Salesman, Inventory Control, Queuing problems etc.

2. Use of Statistical packages for descriptive statistics, curve fitting, correlation testing, regression analysis, design of experiments etc.

3. Mini project

08.606 Elective II

08.606.1 DECISION SUPPORT SYSTEM AND EXPERT SYSTEMS(N)

L-T-P/D: 3-1-0 **4 Credits**

Module 1

Decision Support System:Decision Concept - Steps-Decision Support System-Components-Characteristics-Classification and Applications.Data Management System:Data Base-Sources of data-Data Directory-Data Structure and Data Base Languages-Query Facility- Data Management System-DBMS as DSS Development Tool.

Module 2

Model Management: Models - Modeling Process-Types of Models-Optimization-Simulation-Heuristic-Descriptive-Predictive-Model Base-Modeling Languages-Model Directory-Model Base Management System-Model Execution, Integration and Command Processing-Model Packages.

Dialog Management: User Interface-Graphics - Multimedia-Visual Interactive Modeling-

Natural Language Processing-Speech Recognition and Understanding-Issues in User Interface. Development of Decision Support System: Development Process-Software and Hardware and Data Acquisition-Model Acquisition-Dialog Development-Integration -Testing and Validation-Training and Implementation.

Module 3

Human and machine intelligence : Concepts of fifth generation computing, programming in A1 environment, developing artificial intelligence system, definition of expert systems, natural language processing, neural networks.

Tools for machine thinking: Forward chaining, backward chaining, use of probability and fuzzy logic.

Expert system development: Choice of domain, collection of knowledge base, selection of inference mechanism, case studies of expert system development in design and manufacturing.

Industrial application of AI and expert systems: Robotic vision systems, image processing techniques, application to object recognition and inspection, automatic speech recognition

References:

Decision Support Systems and Intelligent Systems, Efraim Turban and Jay E. Aronson, Prentice Hall International, 1998.

1. Decision Support Systems; Janakiraman V.S. and Sarukesi.K,Prentice Hall of India,1999.
2. Decision Support System and Management, Lotfi, McGraw Hill Inc., International Edition, New Delhi, 1996.
3. Decision Support System, Marakas, Pearson Education
4. “Comprehensive Guide to AI and Expert Systems”, Robert Levine et al, Mc Graw Hill Inc..
5. “Understanding AI”, Henry C. Mishkoff, BPB Publication, New Delhi, 1986.

Note: Question Paper consists of two parts.
Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.606.2 FINITE ELEMENT APPLICATIONS IN MANUFACTURING(N)

L-T-P/D: 3-1-0 **4 Credits**

Module 1

Basics of FEM – Initial value and boundary value problems – weighted residual, Galerkin and Raleigh Ritz methods – Review of variational calculus – Integration by parts – Basic of variational formulation. Steps in FEA – Discretization, interpolation, derivation of element characteristic matrix, shape function, assembly and imposition of boundary conditions – Solution and post processing – One dimensional analysis in solid mechanics and heat transfer.

Module 2

Global and natural co-ordinates – Shape functions for one and two dimensional elements – Three noded triangular and four noded quadrilateral element – Non linear analysis – Isoparametric elements – Jacobian matrices and transformations – Basics of two dimensional and axi symmetric analysis.

FE analysis of metal casting – Special considerations, latent heat incorporation, gap element – Time stepping procedures – Crank-Nicholson algorithm – Prediction of grain structure – Basic concepts of plasticity – Solid and flow formulation – Small incremental deformation formulation – FE analysis of metal cutting, chip separation criteria, incorporation of strain rate dependency

Module 3

Pre processing, mesh generation, elements connecting, boundary conditions, input of material and processing characteristics – Solution and post processing – Overview of application packages such as ANSYS and DEFORM – Development of code for one dimensional analysis and validation.

REFERENCES

1. Reddy, J.N., "An Introduction to the Finite Element Method", McGraw-Hill, 1985.
2. Rao, S.S., "Finite Element Method in Engineering", Pergammon Press, 1989.
3. Bathe, K.J., "Finite Element Procedure in Engineering Analysis", 1990.
4. Kobayashi, S., Soo-lk-Oh and Altan, T., "Metal Forming and the Finite Element Methods", Oxford University Press, 1989.
5. Lewis R.W., Morgan, K., Thomas, H.R. and Seetharaman, K.N., "The Finite Element Method in Heat Transfer Analysis", John Wiley, 1994.

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.606.3 FIRE SCIENCE & INDUSTRIAL SAFETY (N)

L-T-P/D: 3-1-0 **4 Credits**

Module I

Fire, combustion and explosion, flammability characteristics of chemicals and materials: liquids, vapors, gaseous / vapor mixtures, flame propagation.

Flammability diagram, ignition energy, auto ignition and auto oxidation, fire initiation and propagation – severity and duration, effect of enclosure and heat transfer in fire development, stack and pool fires.

Module II

Critical aspects of fire dynamics, diffusion flame and fire plumes, flame spread, production and movement of smoke, computer simulation of fire dynamics.

Fire detection systems. Fire prevention and control, inerting procedures, static electricity. Control techniques- general design methods, flame arrestors – their design, design of sprinkler systems, flare design, fire extinguishment – different methods.

Module III

Importance of safety in design, relief concepts, definitions. Emergency relief system design, determining pressure relief, types of relief devices, design of relief systems, deflagration venting for dust and vapor explosions, venting system design for fires external to process vessels, reliefs for thermal systems, flare design for toxic release from industries.

Reference:

1. An introduction to Fire Dynamics: Dougal Drysdale

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.606.4 VALUE ENGINEERING (N)

L-T-P/D: 3-1-0 **4 Credits**

Module 1

Innovation as a built-in feature in nature, need and challenges for survival and excellence, biological, physiological, psychological and social motives, entrepreneurial and business aspects-agricultural industrial and information revolution, innovation in diverse fields of arts and science, major landmarks, contributors in scientific, industrial and social (leadership) spheres.

Innovations in products, processes, services and procedures, product life cycles, favorable and unfavorable aspects in innovation; human attitudes, risks ,hardships, examples of failure, case studies of inventors, inventions as intellectual property, patents and patent laws, procedures in India and developed countries, study of patents in different fields and their innovative content, motivating and encouraging innovative attitude in individuals and organizations, entrepreneurial qualities and skills, learning and training.

Module 2

Introduction: History, development and scope of value management, value analysis Vs Value engineering, principles of costing &cost estimation, benefits.

Basic concepts of value engineering: Selection of project, team members, general phase, information phase, creation phase, evaluation phase, investigation and implementation phase, audit.

Module 3

Project work: work sheets, objectives, techniques, guidelines, Checklist, cost worth model, role of creativity.

Value engineering cases: Value Engineering raises production and productivity, Value Engineering is intensive cost search, Value Engineering prevents unnecessary uses of resources.

Methodology, Industrial cases - Product manufacturing, Chemical processing, Automated Production, Semi –Automated production.

References:

1. Value Engineering, S.S. Iyer, New Age International (P) Ltd, New Delhi.
2. Materials Management, Inventory Control and Logistics, A. K. Datta, Jaico Publishing House, Mumbai.
3. Techniques of Value Analysis and Value Engineering, Miles . L. D, McGraw hill.
4. The fourth Eye-Excellance through creativity, Khandwala.P.N, Wheeler Publishing Co.

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.606.5 DESIGN FOR MANUFACTURING (N)

L-T-P/D: 3-1-0 **4 Credits**

Module 1

Introduction to design for manufacture, DFM principles and rules, Systematic approach to Design engineering systems, Collection of information, Role of Engineering design in production, Flow diagrams for design procedures.

Effect of materials and manufacturing processes on design: Major phases of design. Effect of material properties on design. Effect of manufacturing processes on design. The material selection process – cost per unit property, weighted properties, and limits on properties methods.

Module 2

Tolerance analysis: Process capability, mean, variance, skewness, kurtosis, process capability metrics, Cp, Cpk, cost aspects, feature tolerances, geometric tolerances, surface finish, review of relationship between attainable tolerance grades and different machining process. Cumulative effect of tolerances – sure fit law, normal law and truncated normal law.

Selective assembly: Interchangeable part manufacture and selective assembly, deciding the number of groups – Model – I: Group tolerances of mating parts equal; Model-II: total and group tolerances of shaft equal. Control of axial play – Introducing secondary machining operations, laminated shims, examples.

Datum systems: Degrees of freedom, grouped datum systems – different types, two and three mutually perpendicular grouped datum planes; Grouped datum system with spigot and recess, pin and hole; Grouped datum system with spigot and recess pair and tongue – slot pair – computation of translation and rotational accuracy, geometric analysis and applications.

Module 3

True position theory: Comparison between co-ordinate and convention method of feature location, tolerancing and true position tolerancing, virtual size concept, floating and fixed fasteners, projected tolerance zone, assembly with gasket, zero true position tolerance, functional gauges, paper layout gauging, compound assembly, examples.

Form design of castings and weldments: Redesign of castings based on parting line considerations, minimizing core requirements, redesigning cast members using weldments, use of welding symbols.

Tolerance charting technique: Operation sequence for typical shaft type of components. Preparation of process drawings for different operations, tolerance worksheets and centrally analysis, examples, design features to facilitate machining: datum features – functional and manufacturing. Component design – machining considerations, redesign for manufacture, examples.

References:

1. "Designing for Manufacture", Harry Peck, Pitman Publications.
2. "Engineering Design – A systematic Approach", Matousek, Blackie & Son Ltd.
3. "Dimensioning and Tolerance for Quantity Production", Spotts M.F., Prentice Hall Inc. "Tolerance Control in Design and Manufacturing" Oliver R Wade, Industrial Press Inc.
4. "Hand Book of Product Design for Manufacturing", James G Bralla, McGraw Hill Publicatons.
5. "Design for Economic Production", Trucks H.E., Society of Manufacturing Engineers, Michigan, 2nd Edition, 1987.
6. "Materials Selection for Engineering Design", Farag M., Prentice Hall,1 997.
7. Design for Manufacture - Dieter
8. Introduction to Design - Asimow. M
9. Design Methods - Jones J. C
10. Product design for efficient manufacture workshop - Stoll H.W

Note: Question Paper consists of two parts.
Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.606.6 DESIGN OF JIGS AND FIXTURES (N)

L-T-P/D: 3-1-0 **4 Credits**

Module I

Introduction - purpose of work holding devices - principles of jig and fixture design - construction methods and materials used - process planning and typical operation layout product considerations - pre-design analysis - product analysis - operation analysis - machine analysis - operator analysis and cost analysis - examples of pre-design analysis - principles of locating and positioning - definition of location - basic principles - methods of location - pin and button locators - plane, concentric, spherical, radial and V-locators - redundant locators

Module II

Design and mechanics of clamping devices - principles of clamping - standard fixture components - types of clamps - strap, swing, hinge and two-way (multiple) clamps - wedge, pinch and magnetic clamps - latch and self locking clamps - pneumatic, hydraulic and pneumo-hydraulic clamps - design considerations in work holder design and selection - design calculations of lever type clamp - hook type clamp - wedge type clamp - screw clamps - mandrels and collet - chucks - worked examples

Module III

Fixtures - milling fixtures - slot and key-way milling fixtures - fixture for milling flanges - straddle milling fixtures - indexing fixture - face milling fixture with equalizers - profile milling fixtures - universal fixture for profile milling - boring and lather fixtures - fixture design - examples of design and drawing of milling fixtures for machining of simple components - fixtures for inspection testing and assembly - welding fixtures - economics

Drill Jigs -definition - drill guide bushings - jig feet and legs - types of drill jigs -template -vise - leaf box and tumble jigs - indexing jigs - jaw chucks - drive chucks - magnetic chucking devices -mandrels - machine vices - indexing tables and worktables - examples of design and drawing of drill jig for machining of simple components

Reference books

1. Kempster M.H.A., "*An Introduction to Jig and Tool Design"*, ELBS
2. ASTME, *Fundamentals of Tool Design*
3. Grant H.E., "*Jigs and Fixtures - Non Standard Clamping Devices*", Tata McGraw Hill
4. Goroshkin A.K., "*Jigs and Fixtures Hand Book*", MIR Publishers
5. Wilson & Holt, "*Hand book of Fixture Design*", McGraw Hill
6. Colving & Haas, "*Jigs and Fixtures - A Reference Book*", McGraw Hill
7. Cole B., "*Tool Design*", Taraporevala
8. Donaldson, Lecain & Goold, "*Tool Design*", Tata McGraw Hill

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

Syllabus - VII Semester Industrial (2008 Admissions)

08.701 SYSTEM DYNAMICS (N)

L-T-P/D: 3-1-0 **4 Credits**

Module I

Systems Concept and System theories, Evolution of System Dynamics as a System Enquiry Methodology. Structure and Behavior of Dynamic systems:- fundamental modes of dynamic behavior – Exponential growth, goal seeking, oscillation and process point – interactions of fundamental modes. Tools for systems thinking: - Causal loop diagramming. Behavior of low order systems-analytical approach. Elements of System Dynamics Modeling, physical flows, information flows, level & rate variables, flow diagrams, delays, information smoothing, table functions and table function multipliers. First order positive and negative feedback systems, second order systems.

Module II

Steps in system dynamics modeling:- problem identification/conceptualization, fixing model aggregates and boundary, principles of simulation modeling, developing model equations, algorithm for Euler integration, hand simulation of system dynamics models. Qualitative Study of model behavior and policy

recommendation. Case presentation on qualitative analysis. Dynamics of growth:- S-Shaped growth, the Bass diffusion model.

Strategy modeling: Approaches and procedures, techniques - a comparative study. Conceptual models, Suitability of System Dynamics for Policy analysis, Qualitative System Dynamics, Physical resources conversion modules

Module III

Tools for modeling dynamic systems:- delays, formulation of rate equations, formulation of nonlinear relations. Modeling human behavior, modeling expectation formation-forecast. Case of product growth, price stabilization, Manpower flow in R&D organizations, environmental impact analysis, the manufacturing Supply Chain, etc. Model validation and testing, Policy design, Algorithms for resource allocation and dynamic policy option selection. Optimization with SD models. Parameter and sub-structure optimization. Policy design through optimization.

Introduction to Software packages for System Dynamics modeling and simulation.

References:

1. Business Dynamics – Sterman – McGraw Hill
2. System Dynamics – Mohapatra – PHI
3. System Dynamics – Ogata – Pearson Education

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.702 RELIABILITY ENGINEERING (N)

L-T-P/D: 3-0-0 **3 Credits**

Module I

Systems Concept and System theories, Evolution of System Dynamics as a System Enquiry Methodology. Structure and Behavior of Dynamic systems:- fundamental modes of dynamic behavior – Exponential growth, goal seeking, oscillation and process point – interactions of fundamental modes. Tools for systems thinking: - Causal loop diagramming. Behavior of low order systems-analytical approach. Elements of System Dynamics Modeling, physical flows, information flows, level & rate variables, flow diagrams, delays, information smoothing, table functions and table function multipliers. First order positive and negative feedback systems, second order systems.

Module II

Steps in system dynamics modeling:- problem identification/conceptualization, fixing model aggregates and boundary, principles of simulation modeling, developing model equations, algorithm for Euler

integration, hand simulation of system dynamics models. Qualitative Study of model behavior and policy recommendation. Case presentation on qualitative analysis. Dynamics of growth:- S-Shaped growth, the Bass diffusion model.

Strategy modeling: Approaches and procedures, techniques - a comparative study. Conceptual models, Suitability of System Dynamics for Policy analysis, Qualitative System Dynamics, Physical resources conversion modules

Module III

Tools for modeling dynamic systems:- delays, formulation of rate equations, formulation of nonlinear relations. Modeling human behavior, modeling expectation formation-forecast. Case of product growth, price stabilization, Manpower flow in R&D organizations, environmental impact analysis, the manufacturing Supply Chain, etc. Model validation and testing, Policy design, Algorithms for resource allocation and dynamic policy option selection. Optimization with SD models. Parameter and sub-structure optimization. Policy design through optimization.

Introduction to Software packages for System Dynamics modeling and simulation.

References:

4. Business Dynamics – Sterman – McGraw Hill
5. System Dynamics – Mohapatra – PHI
6. System Dynamics – Ogata – Pearson Education

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.703 QUALITY ENGINEERING (N)

L-T-P/D: 3-1-0 **4 Credits**

Module I

History of Quality – Walter Shewhart, W Edwards Deming etc., Quality objectives – Quality control – Quality Assurance – Quality value and engineering-Quality systems- quality engineering in product design - quality engineering in design of production processes - quality engineering in production - quality engineering in service.

Loss function: Derivation –use-loss function for products/system- justification of improvements- loss function and inspection- quality evaluations and tolerances-N type, S type, L type.

Statistical process control, systematic approach, process variability. Process control and Control Charts for variables and attributes.

Module II

CUSUM and Exponentially Weighted Moving Average (EWMA) Control charts.

Process capability analysis, process capability indices, Process Capability analysis using histogram, probability plotting, and control chart.

Acceptance sampling plans – single, double, multiple and sequential - for attributes and variables, minimum inspection per lot, formulation of inspection lots and selection of samples. OC curve. MIL-STD 105E sampling method and its equivalents. Dodge-Romig tables and ABC standards, AOQL and LTPD plans.

Module III

Quality tools–fault tree analysis, event tree analysis, failure mode and effect analysis, Quality Standards-ISO series, Quality Function Deployment, Quality Circles, Quality Audit, Cost of Quality, KAIZEN, 5S, Process Quality Management (PQM)-Online Quality Control.

Six Sigma:: Introduction- definition-methodology- impact of implementation of six sigma-DMAIC method-roles and responsibilities –leaders, champion, black belt, green belts- management role-six sigma tools – sustaining six sigma.

Management of Software Quality, CMM, Taguchi's Methods, Quality in R&D. Introduction to Total Quality Management and Total Productive maintenance.

Introduction to Software packages for SQC, reliability and their features.

References:

1. Fundamentals of Quality Control and Improvement- Amitava Mithra – Pearson Education
2. Statistical Quality Control –Grant - McGraw Hill
3. Introduction to Statistical Quality Control – Montgomery – John Wiley & Sons
4. Quality Control Handbook – Tata McGraw Hill
5. Industrial Engineering Handbook – Maynard
6. SPC - Concepts, Methodologies, and Tools – A. Zaidi – PHI
7. Six Sigma: Breaktrough and Beyond-De Feo J A and Barnard W W, Tata McGraw-Hill, New Delhi, 2005.
8. Quality Engineering in Production Systems-Taguchi G, Elsayed E A and Hsiang, T.CMc-Graw-Hill Book company, Singapore, International edition, 1989
9. Quality Engineering Handbook- Pyzdek T and Berger R WTata-McGraw Hill, New Delhi, 1996

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.704 FINANCIAL ENGINEERING(N)

L-T-P/D: 3-1-0 **4 Credits**

Module I

The Basic theory of interest:- Principal and Interest, Present value, Present and Future values of streams, Internal Rate of Return.

Money market:- Zero coupon Bonds, Coupon Bonds, Money market account, Yield, Bond price formula, Duration, Macaulay duration, Duration of a portfolio, Immunization, Convexity.

Term Structure of Interest rates:- Spot rates and its determination, Forward rates, Floating rate bonds, Fisher-Weil duration.

Module II

Mean-Variance portfolio theory:- Asset return, Portfolio Mean and Variance, The Markowitz model, The Two-Fund theorem, Inclusion of a Risk free asset, The One-Fund theorem.

The Capital Asset Pricing model(CAPM), CAPM as pricing formula, Factor models, CAPM as a factor model, Arbitrage pricing theory, Utility functions and the Mean-Variance criterion, Linear Pricing, Log-optimal pricing, Portfolio choice, Finite state models, Risk-Neutral pricing.

Module III

Derivative Securities:- Forward contracts, Forward prices, Swaps, Futures contracts, Futures prices, Hedging, Minimum-variance hedge, Optimal hedging.

Models of Asset dynamics:- Binomial Lattice model, Additive model, Multiplicative model, Stock price process, Ito's Lemma.

Options Theory:- Concepts, Nature of option values, Put-Call parity, European and American options, Single period Binomial options theory, Multi-period option, The Black-Scholes equation, Option pricing.

References:

1. Investment Science – David.G. Luenberger – Oxford university Press
2. Options, Futures and Other Derivatives – John C.Hull – Prentice Hall
3. Mathematics for Finance – Marek Capinski and T. Zastawnaik – Springer
4. Introduction to stochastic calculus applied to Finance – Damien Lamberton and Bernard Lapeyre – Chapman & Hall
5. Financial Engineering – John F.Marshall, Vipul K.B. – Prentice Hall India

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.705 HEURISTICS FOR DECISION MAKING (N)

L-T-P/D: 3-1-0 **4 Credits**

Module 1

Introduction to Non-traditional optimization, Computational Complexity – NP-Hard, NP-Complete.

Genetic Algorithms: Basic concepts, Encoding, Selection, Crossover, Mutation-Binary GA, Continuous GA, Hybrid GA, Parallel GA-Application of GA in solving Constrained and Combinatorial Optimization problems, Reliability problem, Sequencing problem, Scheduling problem, Transportation problem etc.

Module 2

Simulated Annealing: The algorithm, Acceptance probability, Cooling, Neighbourhoods, Cost function. Applications in sequencing and scheduling, Travelling salesman problem etc.

Tabu Search: Basic Tabu search, Neighbourhood, Candidate list, Short term and Long term memory, Application of TS in solving facility location problem, Quadratic Assignment problem etc.

Introduction to Particle Swarm Optimization(PSO), Application of PSO in solving Transportation problem, Portfolio selection, Flow shop scheduling.

Module 3

Ant Colony Optimization: Basic algorithm, Variants, Formalization and properties of ACO, Application of ACO to solve Travelling salesman problem, Vehicle Routing Problem etc.

Lagrangean Relaxation: Basic methodology,Lagrangean heuristic and problem reduction, Lagrangean multipliers, Dual Ascent algorithm, Tree search. Applications of Lagrangean Relaxation in solving facility location problems, Logistics etc.

References

1. Genetic algorithms and engineering design- Gen and Cheng-John Wiley.
2. Genetic algorithms in Search, optimization and Machine Learning- Goldberg-Addison Wesley.
3. Meta heuristics for Hard Optimization- Dreo, Petrowski, Taillard-Springer
4. Modern heuristic techniques for combinatorial problems- Reeves C-Orient Longman
5. Tabu search- Fred Glover.
6. Ant Colony Optimization- Dorigo M, Thomas Stutzle-MIT press
7. How to Solve it: Modern Heuristics- Michalewicz, Fogel- ACM Press

8. Particle Swarm Optimization- Aleksandar Lazinica- Intechweb.org

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.706 ELECTIVE III(N) 3-1-0 4 Credits

08.707 SIMULATION LAB (N)

L-T-P/D:0-0-2 **2 Credits**

1. Use of simulation packages for building system models for Continuous and Discrete Event simulations.
2. Mini project

08.708 QUALITY CONTROL LAB(N)

L-T-P/D: 0-0-2 **2 Credits**

1: Experiments to prove central limit theorem.

2: Drawing $\overline{X}$ and R charts from actual measurements.

3: Drawing P chart and C chart from actual measurements.

4: Experiments and calculations in Acceptance control.

5: Finished products inspection and certification procedure.

6: Experiments in performance testing and life testing.

7: Demonstrating experiments on NDT equipments

(a) NDE by means of eddy current
(b) NDE utilizing magnetic phenomenon
(c) NDE by means of acoustic emission
(d) NDE by means of ultrasonics
(e) NDE utilizing penetrating phenomenon

08.709 PROJECT AND SEMINAR (N)

L-T-P/D:0-0-2 **2 Credits**

The Students shall do a project work, which can be the preliminary work of final project, and submit a report at the end of semester.

The students shall present a seminar on a topic which is of high relevance to Industrial Engineering. A report on seminar also shall be submitted at the end of the semester. 25% credit should be given for Project , and 75% credit for Seminar.

08.706 Elective III (N)

08.706.1 TOTAL QUALITY MANAGEMENT (N)

Module I

History of quality, total quality, principles of Total Quality Management (TQM), Quality trilogy, models for TQM, core concepts, characteristics and subjects of TQM. Total Quality and Quality Management systems, quality principles. Total quality control, total waste elimination, total employee involvement. Quality assurance: total quality assurance, management principles in quality assurance, objectives of quality assurance system, hierarchical planning for Quality Assurance, Vendor rating,

Module II

Quality improvement: elements, programmes - KAIZEN. Benchmarking; introduction, why benchmark; Planning: what to benchmark, benchmarking partners, data collection methods; Analysis: determining the current competitive gap, projecting future performance levels; Integration: developing action plan, implementing specific actions & monitoring progress, re-calibration; Maturity: beyond benchmarking. Quality in service systems. Total Quality Culture, system approach to TQC.

Module III

Quality function deployment, QFD concept, overview & QFD process, the voice of customer developing a QFD matrix, reviewing the matrix for priority items, organizing teams & planning QFD projects; Process RE-engineering, BPR philosophy, possibilities & pitfalls, BPR framework, opportunity assessment, planning & BPR project, risk & impact assessment, planning & implementing the transition; Failure mode & effect analysis; FMEA: concepts & applications in TQM; Quality cost, concepts, quality cost definitions, quality cost program implementation use of quality cost, reducing quality cost.

Reference

1. Total Quality Management - Sharma - Sultan Chand & Sons
2. Total Quality Management - R.P. Mohanty & RR Lakhi, Jaico Pub, New Delhi,
3. Process Re-Engineering - Lon Roberts, Tata McGraw Hill, New Delhi
4. TQM for Engineering - Mohamed Zairi, Gulf Pub. Co., 2nd Edition, New Delhi

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.706.2 TOTAL PRODUCTIVE MAINTENANCE (N)

Module 1

Overview of TPM implementation: TPM Basic Policy & Objectives, Maximize Equipment Effectiveness through Total Employee Involvement, Improvement, Improve Equipment Reliability, Maintainability & Productivity, Aim for Economical Life cycle costs, Enhance Equipment Expertise & skills, Create a vital, Enthusiastic work environment, Company wide TPM Goals, TPM Promotion Organization & management.

Autonomous maintenance : Implementing Autonomous Maintenance Step, Initial cleaning, Addressing the causes of Dirty Equipment, Improving Access to hard-to-clean Areas, Standardizing Maintenance activities, General Inspection skills, Autonomous Inspection, Organizing & Managing the workplace, Autonomous Management.

The manager's role in autonomous maintenance: Three keys to successful TPM circle, Role of Managers & Supervisors, Learning from Breakdowns, Time table of Autonomous Maintenance Activities, Results & Evaluation.

Module 2

Equipment improvement: Equipment Improvement objectives, Promoting Successful Equipment Improvements, Four levels of Equipment Improvement Activity, Effect of Equipment Improvements.

Quality maintenance (QM): Relation between Quality Assurance & QM, conceptual approach QM, preconditions for promoting QM, techniques for developing QM, implementing QM.

Module 3

Education and training : Education & training system, introductory education, studies in general inspection, studies in PM analysis, cultivating in-house maintenance techniques, training in equipment, diagnostic techniques using vibration using vibration measurements, results of TPM education and training.

Example of implementation programmes: From equipment to product Development and Design, From Equipment Development and Design to Product Development & Design, Establishing and Equipment Design, Preliminary Evaluation (Design), Step by step management, Collecting and using maintenance prevention (MP) data, product set-up procedure & daily management.

Overall effects of TPM implementation: Striving for overall equipment effectiveness, defects prevention systems, relationship between TPM and terotechnology.

References:

1. "Training for TPM", Nahchi-Fujikoshi Corporation, Japan Institute of Plant Maintenance, 1990.
2. "Introduction to TPM, The Purtor Factory", Selichi Nakajima, Japan Institute of Plant Maintenance, 1986.
3. "TPM Myumon", Sciichi Nakjima, Japan Institute for Plant Maintenance, 1989.
4. "TPM Maintenance Prevention Design", Sciichi Nakjima, Productivity Press Inc. First Indian Edition, 1993.
5. "An Advanced Step in TPM Implementation", Unio K Shirose, Oshifumi Kimura Y. and Itsugu Kaneda M, Japan Institute of Plant Maintenance

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.706.3 MAINTENANCE MANAGEMENT (N)

Module I

Maintenance Objectives and Functions – Tero-Technology – Five Zero Concept – Maintenance Costs and Budgets – Maintenance Organisation.

MTBF, MTTF, Useful Life – Survival Curves – Repair Time Distribution – Exponential, Poisson, Normal, Weibull Applications – Stanby Systems – Availability of repairable Systems – Maintainability Prediction – Design for Maintainability.

Module II

Maintenance Policies – Imperfect Maintenance – Concept of Minimal Repair – Statistical Aids for PM and Break-down Maintenance – PM Schedules: Deviations on both sides of Target Values – PM Schedules for Functional Characteristics and large scale system – Replacement models – DOM, Opportunistic Maintenance – Inspection and Repair.

Spare parts Management – Setting the order points – Overall / optimum past availability – Life Cycle Costing – Maintenance Planning and Scheduling – FMEA, VEIN analysis – Human Management, Incentives, UMS – Maintenance Manuals – Maintenance Staffing: learning curves, queuing and simulation techniques.

Module III

Condition monitoring: WDM, Vibration and corrosion monitoring – Signature Analysis – MMIS – Expert Systems – Reliability Centered Maintenance (RCM) – Total Productive Maintenance (TPM) - TPM Basic Policy & Objectives - Autonomous maintenance- Equipment improvement- Implementation- relationship between TPM and terotechnology.

REFERENCES

1. Gopalakrishnan, P. Banerji, A.K., "Maintenance and Spare Parts Management", Prentice Hall of India, 1991.
2. Edward Hartmann, "Maintenance Management" Productivity and Quality publishing Pvt. Ltd., Madras, 1995.
3. Seiichi Nakagima, "Introduction to Total Productive Maintenance" Productivity Press (India) Pvt. Ltd., 1993.
4. "TPM Maintenance Prevention Design", Sciichi Nakjima, Productivity Press Inc. First Indian Edition, 1993.
5. "An Advanced Step in TPM Implementation", Unio K Shirose, Oshifumi Kimura Y. and Itsugu Kaneda M, Japan Institute of Plant Maintenance

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.706.4 CUSTOMER RELATIONSHIP MANAGEMENT (N)

Module I

Conventional marketing approach – drawbacks – emerging challenges in the marketing front – relationship marketing – definition – concepts – relevance of relationship marketing approach – significance - introduction to CRM – new trends and concepts.

Module II

Understanding buyers' expectations – building customer loyalty – types of loyalty – influencing factors – loyalty ladder – significance of loyal customer – impact of lost customers – computing cost of lost customers. Creating customer database – process and approaches to database marketing – application of data base marketing in relationship building.

Module III

Concept of customer-driven organizations – learning organizations – internal marketing. Customer satisfaction audit - developing relationship strategies for different types of business under competitive environment. Information technology application in building customer relationship – emerging new trends. Introduction to SRM and International Marketing.

References:

1. Customer Relationship Management at the Speed of Light – Paul Greenberg
2. The Handbook of Key Customer Relationship Management – Bukowitz - Pearson Education
3. The CRM Handbook – Dyche - Pearson Education

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.706.5 MARKETING MANAGEMENT (N)

Module 1

Marketing conceptual framework - Marketing environment -customer oriented organization- Marketing interface with other functional areas-marketing in a globalised environment

Product Planning and Development - Product Life Cycle- Brand management, Developing New Product - Market segmentation-targeting and positioning. Pricing decisions. Promotion methods: Advertising, personal selling, Public relations-Introduction to industrial marketing.

Module 2

Understanding Buyer Behavior - Influencing factors -responding buyer behavior - Building customer satisfaction-marketing to organizations and marketing of services.

Marketing Research: Types, Process - Tools and Techniques-application of Marketing research- Product launching, demand estimation, advertising, brand preference, customer

satisfaction, customer perception, distribution, Customer Relationship, Competitor analysis and related Aspects- preparation of marketing research report.

Module 3

Distribution: distribution Channels – Physical Distribution – channel design and Management - Logistics – Communicating with customers.

Introduction to International Marketing Management: Overview, International economic institutions, foreign markets, export pricing and finance, India's trade policy.

Web enabled Marketing features - structural requirements – specific characteristics and components of marketing mix under web enabled environment.

On-line marketing – On-line retail – On-line sales promotion – Web enabled advertisements. - Web based Marketing research - Emerging new trends and challenges to marketers. .

References:

1. Marketing Management (Millennium edition) , Philip Kotler, PHI (P) Ltd.
2. Marketing, Zikmund d'Amico, South Western, Thomson Learning
3. Essentials of Marketing Research, Aakar, Day and Kumar, John Wiley & Sons.
4. Marketing Management and Information Technology, Keith Flether, Prentice Hall
5. Marketing Management Indian Perspective, R.L.Varshney, S.L.Gupta, Sultan Chand
6. Internet Marketing, Rafia. Mohammed, McGraw Hill,2001.
7. Building an Intelligent E-Business, David Ferris and Larry Whipple, PHI

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60

Syllabus - VIII Semester Industrial (2008 Admissions)

08.801 FACILITIES PLANNING AND MANAGEMENT (N)

L-T-P/D: 2-1-0 **3 Credits**

Module I

Basic concepts. Evolution and motivation-Layout Design of factories and facilities -Selection of site and location decisions– Product, Process, combination, fixed and cellular layouts – Systematic layout planning – Design of Assembly lines, Line balancing methods - Computer applications in layout designs-construction and improvement algorithms in layout design.

Module II

Design of Auxiliary Service Spaces - Receiving and Shipping, Storage, Aisles, Warehousing and Employee services. Office layout techniques and space requirements. Environmental aspects like lighting, Ventilation, dust control, humidity. Different type of Plant services like steam, compressed air etc.

Elements of Industrial safety- Causes and prevention of accidents – Pollution and environmental considerations.

Module III

Material handling system and equipment –Principles, Material handling in Plants , Stores and warehouses , Receiving and dispatching area – Choice of material handling equipment – Cost control in material handling. Automatic Guided Vehicles- Basic concept, Design and operational control of an AGV system-transportation control, operational control, Combinations. Equipment replacement – Repair, replacement based on technical and economical consideration.

Reference:

Plant layout and Material Handling- John A Sehbin

Plant layout and Material Handling - James A Apple

Plant layout and Material Handling - A W Peymberton

Plant layout and Material Handling - Fred Meyers

Material Handling and Layout – S. C. Sharma

Facilities Location and Layout – an analytical approach – R. L. White and J. A. White – PHI

Intelligent Manufacturing Systems-Kuiak-Prentice Hall

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.802 INDUSTRIAL SCHEDULING (N)

L-T-P/D:3-1-0 **4 Credits**

Module I

Introduction to scheduling, role of scheduling, Terminologies involved in scheduling.

Single Machine Models:- Problems without due dates – Minimizing mean flow time, Minimizing weighted mean flow time. Problems with due dates – Lateness criteria, Minimizing the number of Tardy jobs, Hodgson's Algorithm, minimizing Mean Tardiness, The Wilkerson-Irwin Algorithm.

General Purpose methodologies for single machine problems:- Dynamic Programming approach, Branch & Bound Approach, Neighborhood search techniques.

Module II

Parallel Machine Models:- Parallel Identical processors and Independent jobs, Parallel Identical processors and Dependent jobs.

Flow Shop Scheduling:- Permutation schedule, Johnson's problem, Branch & Bound Algorithms for Makespan problems, Heuristic Approaches, Flow shops without Intermediate Queues.

Module III

Job Shop Scheduling:- Types of schedules, Schedule generation, Branch & Bound Approach, Heuristic procedures, Integer Programming Approach.

Simulation studies of the Dynamic Job shop (Overview only)

Introduction to Stochastic Single Machine and Parallel Machine Models.

Case studies on Scheduling systems.

References:

1. Introduction to Sequencing and Scheduling – Kenneth R.Baker – John Wiley
2. Scheduling – Theory,Algorithms and Systems – Michael Pinedo – Prentice Hall Inc.
3. Theory of Scheduling – R.W.Conway, W.L.Maxwell and L.W.Miller – Addison,Wesley.
4. Computer and Job shop Scheduling Theory – E.G. Coffman – Wiley
5. Sequencing and Scheduling – S.French – Elis Horwood Ltd., Chinchester,U.K
6. Integrated Production Control Systems – D.D.Bedworth and J.E.Bailey - Wiley

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.803 SUPPLY CHAIN MANAGEMENT(N)

L-T-P/D: 3-1-0 **4 Credits**

Module I

Introduction of supply chain management; inbound, internal and outbound supply chains; convergent, serial and divergent supply chains; supply chain performance drivers and metrics; supply chain performance measures and strategic fit; Supply chain decisions under uncertainty.

Module II

Aggregate planning in supply chains; Aggregate planning strategies; Aggregate planning using LP; Network design in supply chains; Production networks and distribution networks; Factors influencing network design; Models for facility location.

Module III

Supply chain inventory management-Deterministic models, Probabilistic models,Discount models,Multi item Models, Lot sizing models; Estimation and management of safety inventory; Different fill rate measures; Forward and reverse bullwhip effect in supply chains; Beer game for bullwhip study in supply-chain management; Introduction to logistics management: modes and styles of transportation, Vehicle Routing problems, Bin packing problems, Fixed charge problems, Knapsack problem; 3PL and 4PL.

References:

1. 1.Supply Chain Management – Sunil Chopra, Peter Meindl-Pearson
2. Logistical Management, Donald J. Bowersox & David J. Closs,TMH.
3. Logistics and supply chain management, Martin Christopher, Financial times management.
4. Modelling and Supply Chain , . Jeremy F. Shapiro, Thomson Learning, 2001.
5. Manufacturing Operations and Supply Chain Management, David Taylor and David Brunt, Vikas Thomson Learning, 2001.
6. Designing and Managing the supply chain, David Simchi – Levi & Philip Kaminsk, McGraw-Hill Companies Inc.

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.804 MANUFACTURING SYSTEMS (N)

L-T-P/D:2-1-0 **3 Credits**

Module I

Overview- Laws in manufacturing- Classification of manufacturing systems

Cellular manufacturing systems: basic principle-Problems and Issues in Cell Design- Challenges – Methods of cell formation-Visual Inspection, Parts classification and coding, Production Flow Analysis-capacity planning- cell layout-Quantitative algorithms: mathematical formulations, Optimization approaches, Search algorithms.Performance measurement and control of CMS.

Manufacturing architecture-Product Oriented Plant architecture, Manufacturing Oriented Plant architecture and Turnover Oriented Plant architecture.

Module 2

Just- In- Time systems: Overview, Basic elements, JIT production-Uniform production rate, Push Vs. Pull System production control- Japanese approach to productivity , Kanban- types,Forming Kanbam Team, Kanban scheduling-Determination of number and size of Kanban, CONWIP. Auditing and Improving Kanban. JIT requirements, MRP Vs Kanban, EOQ Vs Kanban, JIT Logistics, Implementation Issues.

Module 3

Flexible manufacturing: FMS architecture, components and working of an FMS, types of FMS, FMS flexibilities, development and installation issues of FMS.

Synchronous manufacturing and Theory of Constraints: Evolution of SM, Measures of performance-Statistical Fluctuations and Random Events, Principles in SM. Constraints-Types. Constraint based Planning, Drum-Rope-Buffer approach, Capacity Constraint Resource.Comparison of SM and JIT. VAT classification of plants.

References

1. Burbidge, J.L., "Group Technology in Engineering Industry, Mechanical Engineering", Pub. London, 1979.
2. Askin, R.G. and Vakharia, A.J., "GT Planning and Operation, in The automated factory – Hand book: Technology and Management", Cleland, D.I. and Bidananda, B. (Eds), TAB Books, New York, 1991.
3. Irani, S.A., "Cellular Manufacturing Systems", – Handbook.
4. Kamrani, A.K., Parsaei, H.R. and Liles, D.H. (Eds), "Planning, Design and Analysis of Cellular Manufacturing Systems", Elsevier, 1995.
5. E. M.Goldratt "The Goal"
6. T.C.Cheng and S.Podolsky "Just-in-Time manufacturing-An Introduction" -Chapman and Hall
7. John M. Gross and Kenneth R. McInnis -"Kanban made simple" -Amacom
8. Rouf and Ahmed (Editors) "Flexible Manufacturing Systems"
9. JT Black- "The factory of the future"

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.805 ELECTIVE IV (N)

L-T-P/D:3-1-0 **4 Credits**

08.806 ELECTIVE V (N)

L-T-P/D: 3-1-0 **4 Credits**

08.807 INDUSTRIAL SEMINAR(N)

L-T-P/D: 0-0-2 **2 Credits**

The Student shall present a Seminar based on industrial visits undertaken from V-VII semesters. A minimum of four visits are compulsory. A report on industrial visits shall be submitted.

The institution shall arrange minimum four Seminars on latest topics by experts from Industry.

The student shall be evaluated based on the report on industrial visits, presentation, interaction, performance in the class and general awareness on topics of expert lectures

08.808 PROJECT AND VIVA VOCE (N)

L-T-P/D:0-0-5 **5 Credits**

A project work of good quality should be done under the guidance of project guide(s) and a project report should be submitted.

For internal assessment, 50% weightage to be given to the assessment of the guide and 50% to the project presentation.

For University examination a Viva-voce examination shall be conducted. Marks of Viva voce examination shall be based on the overall performance, Project report, Subject knowledge and general awareness in the developments in Industrial Engineering.

08.805 Elective IV(N)

08.805.1 ADVANCED NUMERICAL METHODS(N)

L-T-P/D:3-1-0 **4 Credits**

Module I

Errors and approximations-floating point arithmetic– sources of errors - control of errors –propagation of errors – Condition and stability – Rate of convergence.

Solution of non linear Equations – Review and comparison of various iterative methods – Generalized Newton Raphson Method for multiple roots - Higher order NR methods – Newton's method for Non linear systems.

Solution of Linear Algebraic Equations – Direct and Indirect methods – Gauss Elimination and Gauss Jordan methods – ill-conditioning – pivoting – Jacobi, Gauss – Seidel and Relaxation methods – Conditions of convergence – Eigen value problems – Vector Iteration methods.

Algorithm flow chart and computer programs of Gauss elimination, Gauss Seidel and vector iteration methods.

MODULE II

Curve fitting – Method of least squares – non-linear relationships – Correlation and Regression – Linear correlation - Measures of correlation – Standard error of estimate – Coefficient of correlation. Application of Software packages.

Interpolation – Newton's divided difference, Lagrange, Aitken, Hermite and spline techniques – Inverse Interpolation – Numerical differentiation.

Numerical Integration – Newton Cotes Integration formula – Gauss Quadrature – Double Integration – Trapezoidal and Simpson's methods – Automatic numerical Integration. Algorithm flowcharts and computer programs of linear regression, Newton's divided difference, Lagrange interpolation and integration by Gauss quadrature.

MODULE III

Solution of first order ordinary differential equations – Single step and multi step methods– Picard, Euler, Modified Euler, Taylor series, and Runge Kutta Methods – Milne's and Adams methods – Simultaneous First order differential equations –second order differential equations.

Partial differential equations- classification- Laplace equation – 1 D wave equation and I D heat conduction equation – Finite difference methods – Relaxation methods

Simple computer programs for the RK method and Finite difference methods for the solution of Laplace equation, wave equation and heat equation. Wave equation in two dimensions, computer programs.

REFERENCES

1. Applied Numerical Analysis – Gerald & Wheatley – Addison-Wesley
2. Computer Oriented Numerical Methods – V.Rajaraman
3. Numerical Methods for Scientific and Engineering Computations – M.K.Jain , S.R.K.Iyengar and R.K.Jain.
4. Introductory methods of Numerical Analysis – S.S.Sastry.
5. Numerical Methods in Science and Engg. – S. Rajasekharan

6. Numerical methods for Initial and Boundary Volume problem - S.Rajasekharan
7. Numerical methods in Engg. and Science – B.S.Grewal
8. Statistics – Murrey R Spicgel
9. Elementary Numerical Analysis – Conte and Carl de Book
10. An Introduction to Numerical Analysis – Kendall . E. Atkinson.
11. Numerical methods for Engineers and Scientists- Iqbal H Khan and Q.Hassan

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.805.2 ADVANCED OPTIMIZATION TECHNIQUES (N)

L-T-P/D: 3-1-0 **4 Credits**

Module I

Optimization:- Introduction, Engineering applications of Optimization, Statement of an Optimization problem, Classification of optimization problems.

Classical Optimization Techniques:- Single Variable optimization, Multivariable optimization with no constraints, Multivariable optimization with equality constraints, Multivariable optimization with Inequality constraints.

One Dimensional Unconstrained Minimization:- Unimodality and Bracketing the minimum, Fibonacci method, Golden Section method, Quadratic interpolation method, Direct root methods.

Module II

Unconstrained Optimization Techniques:- Classification, General approach, Necessary and Sufficient conditions for optimality, Convexity, Gradient of a function, The Steepest Descent Method, The Conjugate Gradient Method, Newton's method, Quasi-Newton methods, DFP method, BFGS method.

Constrained Optimization Techniques:- Introduction and Problem formulation, Necessary and Sufficient conditions for optimality, Rosen's Gradient Projection method for Linear constraints, Zoutendijk's Method of feasible directions, Generalized Reduced Gradient method., Sequential Quadratic Programming.

Module III

Penalty Function and Duality based methods:- Basic approach, Exterior Penalty functions, Interior Penalty functions, Duality, The Augmented Lagrangean method, Duality and Geometric programming.

Direct search methods for Non-Linear Optimization:- Grid Search method, Hook and Jeeves Pattern search method, Powell's method of conjugate directions, Rosenbrock's method.

Introduction to Stochastic Linear and Non-Linear programming(Overview only).

Introduction to Simulated Annealing, Tabu Search, Neural Networks, Genetic Algorithms, Ant Colony Algorithm, Particle Swam Algorithm, Frog Leaping Algorithm and simple applications.(Overview only)

References:

1. Engineering Optimization – Theory and Practice – Siniresu.S.Rao – New Age International
2. Optimization Concepts and Applications in Engineering – Ashok D.Belegundu, T.R. Chandrupatla – Pearson Education Asia
3. Optimization in Operations Research – Ronald.L.Rardin – Pearson Education.
4. Optimization – Theory and Practice – Mohan.C.Joshi, Kannan.M.Moudgalya – Narosa Publishing House
5. Practical Methods of Optimization – R.Fletcher – John Wiley
6. Non-Linear Optimization – D.Bertsekas – Athena Scientific Press, USA
7. A First course in Optimization Theory – Rangarajan K.Sundaram – Cambridge University Press
8. Mathematical Programming: Structure and Algorithms – J.F.Shapiro – John Wiley
9. Nonlinear Programming,Theory and Algorithms – M.S.Bazaraa, H.D.Sherali and C.Shetty – John Wiley

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.805.3 DESIGN AND ANALYSIS OF ALGORITHMS(N)

L-T-P/D: 3-1-0 **4 Credits**

Module 1

Algorithms, basic steps in development. Basic tools: Top down, Structured programming, networks, data structure. Review of any one of the structured languages.

Module 2

Sub goals, hill climbing and working backward, heuristics, back track programming, Branch and bound recursion process, program testing, documentation, Meta heuristics.

Module 3

Development of Algorithms for problems like, Sorting, Searching, Combinatorial problems shortest path, Probabilities algorithms etc.

REFERENCES

1. Dromey, "How to Solve in by Computers", Prentice Hall, 1982.
2. Goltfried, B.S., "Programming with Paseal", McGraw-Hill (Schaum series), 1986.
3. "Data Structure and Algorithms in C++", Adam Drozdek, 2000.
4. "Schaum's Outline of Programming on c++", John R.Hubbard, 2000.
5. Goodman S.F. & Headtruemu, S.T., "Introduction to the Design and Analysis of Algorithms", McGraw-Hill, 1977.

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.805.4 MANAGERIAL ECONOMICS(N)

L-T-P/D:3-1-0 **4 Credits**

Module I

Introduction to Managerial Economics, The Nature of the Firm, Economic Profit, Profit in a market system, Economics and Decision making, Total, Average and Marginal concepts, Economic models.

Demand Theory and Analysis:- Individual demand, Market demand, Total and Marginal Revenue, Price Elasticity, Income Elasticity and Cross Elasticity, Use of Regression analysis for Demand estimation.

Economic Forecasting:- Sources of data, Time Series Analysis – Trend projection, Exponential Smoothing; Barometric Forecasting, Input / Output analysis.

Module II

Production Theory and Analysis:- The Production Function, Production with One variable input, Production with Two variable inputs, Economies of Scale and Scope, Estimating the Production Function.

Cost Theory and Analysis:- Economic concept of cost, Production and Cost, Short-Run and Long-Run Cost functions, Profit Contribution Analysis, Operating Leverage, Estimating Cost Functions.

Module III

Market Structure:- Introduction to Market Structure, Perfect Competition, Monopoly, Monopolistic Competition, Oligopoly, Barriers to Entry, Application of Game Theory to Oligopoly, Strategic Behaviour.

Pricing Decisions:- Pricing of Goods and Services, Pricing of Multiple Products, Price Discrimination, Product bundling, Peak-Load pricing, Markup Pricing, Input pricing and Employment, Economic Rent, Wage and Income Differentials, Labor Unions, Minimum Wage Laws.

Study of Technology change and Location of a Firm in Global economy, Introduction to Excise duty, Taxes on Profit, Taxes on Inputs, Property taxes and Tax preferences.

References:

1. Managerial Economics – H. Craig Petersen and W. Cris Lewis - Pearson
2. Microeconomics: Theory and Applications – D.N.Dwivedi - Pearson
3. Game Theory with Economic Applications – H. Scott Bierman and Luis Fernandez - Pearson
4. Principles of Economics – Karl.E.Case and R.C.Fair - Pearson

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.805.5 MULTI-CRITERIA DECISION MAKING (N)

L-T-P/D:3-1-0 **4 Credits**

Module 1

Multi criteria decision making- objectives. SMART- categorization, criterion weights and aggregation

Theory of vector optimization: Solution concepts, vector variational inequalities and vector equilibria, multi criteria fractional programming, multicriteria control problems.

Goal programming: Classification of GP, Integration and combination of GP with other techniques- applications.

Module II

AHP, pairwise comparisons, criterion weights and aggregation, consistency etc.

Evolutionary algorithms and multiple objective optimizations: Definitions, Pareto based and Non-Pareto based techniques- applications.

Data Envelopment Analysis in multi criteria decision making: Basic DEA models, GDEA.

Module III

Scenario analysis, Conflict analysis and negotiations.

Multi objective combinatorial optimization: Properties, Solution methods

Multi criteria scheduling problems: Complexity-Single machines problems, Parallel machines problems, shop problems

REFERENCES

1. Multiple criteria Optimization-Arakawa,Billaut- Kluwer
2. Multi-Criteria decision analysis via ratio and Difference judgement-Lootsma-springer.
3. Data Envelopment Analysis: Theory and Techniques for Economics and Operations Research - Subhash C. Ray. Cambridge University Press
4. Multicriteria Scheduling : Theory, Models and Algorithms -Vincent T'kindt Jean-Charles Billaut, Springer
5. Operations Research: Deterministic Optimization Models- Katta G Murty , Prentice Hall

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.806 Elective V(N)

08.806.1 FLEXIBLE MANUFACTURING SYSTEMS(N)

L-T-P/D:3-1-0 **4 Credits**

Module 1

FMS – An overview: Definition of an FMS – types and configurations concepts – types of flexibility & performance measures. Functions of FMS host computer – FMS host and area controller function distribution.

Development and implementation of an FMS: Planning phases – Integration – System configuration – FMS layouts – simulation – FMS project development steps. Project management- equipment development – host system development - planning – hardware & software development.

Automated material handling and storage: Functions – types – analysis of material handling equipments. Design of conveyor & AGV systems.

Module 2

Automated storages :Storage system performance – AS/RS – carousel storage system – WIP storage system – Interfacing handling storage with manufacturing.

Modeling and analysis of FMS: Analytical, heuristics, queuing, simulation and Petri-net modeling techniques –scope applicability and limitations.

Concepts of distributed numerical control :DNC system – communication between DNC computer & machine control unit – hierarchical processing of data in DNC system – features of DNC systems.

Module 3

Programmable controllers: Control system architecture – elements of programmable controllers: languages, control system flowchart, comparison of programming methods.

Scheduling and loading of FMS :Introduction – scheduling of operations on a single machine – e machine flowshop scheduling – 2 machine jopshop scheduling, 3 machine flow shop scheduling – scheduling 'n' operations on 'n' machines –scheduling rules – loading problems – tool management of FMS – material handling system schedule.

Economic and technological justification for FMS- as GT, JIT – operation and evaluation – personnel and infra structural aspects – typical case studies – future prospects.

References:

1. Flexible Manufacturing-Parrish D J-ButterWorth Heinemann Ltd,Oxford
2. Automation,Production Systems and CIM-Groover M P-PHI
3. Intelligent Manufacturing Systems-Kuiak-Prentice Hall
4. The design and operation of FMS-Ranky P G-IFS Pub.,UK

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.806.2 AGILE AND LEAN MANUFACTURING(N)

L-T-P/D:3-1-0 **4 Credits**

Module 1

Agile Production System: Introduction-manufacturing production system-components of agile manufacturing system-production support-production planning and control-quality assurance purchasing-maintenance-overview of production support-business operations-engineering-marketing-human resources-finance and accounting.

Agile Practices for Product Development: Five steps for making product development-sources of new product ideas-understanding the product development process and its time duration-initiation of new product development –use of design for manufacture tools –pursuance of CAD/CAM/CAE tools and techniques-institutionalization of product development tools and techniques-cycles of learning

Module 2

Manufacturing agile practices: Overview-establishing a manufacturing system design-embedding manufacturing system design in the shop floor-implementing visual methods of control-flow production-agility through group technology-agility through manufacturing cells-agility through set up and changeover reduction-material management strategy for agility-make Vs buy strategy for agility-understanding the value of investing in people-agility Vs perfectionism

Implementing technology to enhance agility: Guidelines for enhancing agility through new technology-checklist for preparing technology implementation-technology applications that enhance agility-decisions making on agility.

Creating the learning factory: Success through learning factory-process of becoming learning factory-road map for becoming a learning factory-learning challenges for learning manufacturing business.

Module 3

Lean manufacturing: Introduction-definition and scope-continuous Vs lean production-benefits and methodology-process oriented continuous improvement teams-lean manufacturing education-product oriented continuous improvement teams-cell manufacturing training-redesign of plant layout-cross training of team members.

Implementation of lean manufacturing: Training of personnel-equipment selection-zero defect quality methods-improving reliability-quick setups-reduction of inventories-shift to shift communication-employee motivation.

References:

1. The transition to agile manufacturing staying flexible for competitive advantage-J.C.Montigomery,L.O.Levine-ASQC Quality press
2. Agile product development for mass customization –D.M.Anderson,Joseph Pine-Irwin Professional Publishing.

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.806.3 ENTERPRISE RESOURCE PLANNING(N)

L-T-P/D:3-1-0 **4 Credits**

Module 1

Enterprise Resource Planning: Principle – ERP framework – Business Blue Print – business Engineering vs. Business process Re-Engineering – Tools – Languages – Value chain – Supply and Demand chain – Extended supply chain management – Dynamic Models – Process Models

Module 2

Technology and Architecture: Client/Server architecture – Technology choices – Internet direction –CRM – CRM pricing – chain safety – Evaluation framework.

ERP System Packages: SAP, People soft, BAAN and Oracle – Comparison – Integration of different ERP applications – ERP as sales force automation – Integration of ERP and Internet – ERP Implementation strategies – Organizational and social issues.

Module 3

Oracle: Overview – Architecture – AIM – applications – Oracle SCM.

SAP: Overview – Architecture – applications -Before and after Y2K – critical issues – Training on various modules of IBCS ERP Package-Oracle ERP and MAXIMO, including ERP on the NET

ERP Procurement Issues – Market Trends – Outsourcing ERP – Economics – Hidden Cost Issues – ROI

References:

1. ERP Demystified, Alexis Leon , Tata McGraw – Hill Publishing company limited, New Delhi, 2002
2. Enterprise Resource Planning, Brady, Thomson Learning, 2001
3. ERP-A Managerial Perspective, Sadagopan.S, Tata McGraw Hill, 2001.
4. The SAP R/3 Handbook, Jose Antonio Hernandez , Tata Mcgraw Hill, 2001.

5. Enterprise Resource Planning Strategy, Vinod Kumar Crag and Bharat Vakharia,Jaico Publishing house, Mumbai, 1999
6. ERPWARE , ERP Implementation Framework, Garg & Venkitakrishnan, Prentice Hall, 1999.
7. Enterprise Resource Planning, Vinod Kumar Grag and N.K.Venkitakrishnan, Prentice Hall of India, New Delhi, 2001.

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.806.4 BUSINESS PROCESS REENGINEERING (N)

L-T-P/D:3-1-0 **4 Credits**

Module 1

Business process reengineering: Introduction – historical outlook – working definition of BPR – overview on four phases of reengineering process.

Setting the foundation for reengineering :Fallacy of programme change – elements of effective change – exploration by the Top Management for reengineering – work force preparation for involvement and change planning for the future : Importance of planning for reengineering – Limitations – key points on planning for reengineering – creating vision, missing and guiding principles – Developing three-to-five year strategic plan – scenario approach – critical.

Issues approach: Goal approach – developing yearly operational or breakthrough plans.

Module 2

Designing change: Process definition – constituents of process – types of processes – process characteristics – processes in service organizations – differences between service and manufacturing processes.

Reengineering steps: Identification of current business processes – Establishing the scope of the process – Mapping project – Mapping and analyzing the process.

Module 3

Process creation: Creating the ideal process – Testing the new process – Implementing the new process.

Evaluation: Evaluating the improvement (criteria) of measurements- hurdles foreseen in designing and implementing meaningful measures – find reengineering steps.

Organization for reengineering: Responsibilities and roles of leader, process owner. Reengineering team, steering committee and reengineering Czar – key points for succeeding at reengineering – case studies.

References:

1. "Reengineering the Organisation – A Step-by-Step Approach to Corproate Revitalisation", Jeffrey N. Lowenthal, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1995.
2. "Reengineering the Corporation – A Manifesto for Business Revolution", Michael Hammer & James Champy, Nicholar Bareky Publishing, London, U.K., 1996.
3. "The Reengineering Revolution Handbook", Michel Hammer, Herper Collins Publishers., London, UK, 1996.

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

08.806.5 HUMAN FACTORS IN ENGINEERING (N)

L-T-P/D:3-1-0 **4 Credits**

Module 1

Concepts of human factors engineering and ergonomics-Man-Machine system and Design Philosophy-Physical work-Heat stress-manual lifting-work posture-repetitive motion.

Physical dimensions of the human body as a working machine-Motion size relationships-Static and dynamic anthropometry-Anthropometric acids-Design principles-Using anthropometric measures for industrial design-Procedure for anthropometric design

MODULE 2

Displays and Controls- shapes and sizes of various controls and displays-multiple display and control situations-design of major controls in automobiles, machine tools etc.- Work place- Seating-design of office furniture-redesign of instruments- Work process-Duration of rest periods-Hand tool design-Design of visual displays-Design for shift work

Ergonomics and product design-ergonomics in automated systems-expert systems for ergonomic design. Anthropometric data and its application in ergonomic design-limitations of anthropometric data-use of computerized database.

Color and light-colour and the eye-colour consistency-colour terms- reactions to colour and colour continuation-colour on engineering equipments

MODULE 3

Temperature-Humidity-Noise-Illumination and contrast-Use of Photometers-Recommended illumination levels-The ageing eye-Use of indirect (Reflected) lighting - Cost efficiency of illumination-Special purpose lighting for illumination and quality control-Measurement of sound-Noise exposure and hearing loss-Hearing protectors-analysis and reduction of noise-Effects of noise performance-annoyance of noise and interface with communication-Sources of vibration discomfort it.

Provision of energy for muscular work-Role of oxygen physical exertion-Measurement of energy expenditure-Respiration-Pulse rate and blood pressure during physical work-Physical work capacity and its evaluation.

References:

1. " Human factors in engineering design ",. E.J.McCORMIC, McGraw Hill 1976.
2. " Physiology of muscular activity ", . P.V.KARPOVICH,W.E.SINNING, W.E.Saunders Co.1971.
3. " Applied Ergonomics HandBook ", I.P.C. Science and Technology Press.1978
4. " A guide to the Ergonomics of manufacturing ", Martin Helander, East West Press,1996.

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

5. Ergonomics-Kroemer et al.-Pearson Education

08.806.6 ECONOMETRICS (N)

L-T-P/D: 3-1-0 **4 Credits**

Module I

Introduction to econometrics, classical linear regression models assumptions and diagnostic tests: Multicollinearity-Parameter stability tests.

Univariate time series modeling and forecasting: Moving average process, Auto regressive process, ARMA process, forecasting in econometrics.

Module 2

Multivariate models: Exogeneity, Vector autoregressive models(VAR). Stationarity and Unit Root testing- Cointegration.

Modeling volatility and correlation: ARCH, GARCH,GJR, EGARCH models. Forecasing covariances and Correlations, multivariate GARCH model

Module 3

Switching models: Modeling Seasonality, Markov switching model, Threshold auto regressive models.

Panel data: The fixed effects model, the time-fixed effects model, random effects model.

Limited dependant variable model: linear probability model, Logit model, Probit model, Ordered Response dependant variable model -Multinomial linear dependant variable, Censored and Truncated variable.

Dynamic Econometric models- Granger Causality test

References

1. Introductory Econometrics for Finance- Chris Brooks-Cambridge.
2. Basic Econometrics- Gujarati-McGraHill
3. Applied Econometric Time Series-Walter Enders-John Wiley
4. An Introduction to Econometrics - G.S.Maddala - Wiley
5. Introduction to Econometrics - Stock - Pearson
6. Econometric Analysis - Greene - Pearson

Note: Question Paper consists of two parts.

Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40), Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)