UNIVERSITY OF KERALA

B. TECH DEGREE COURSE
2008 SCHEME

ELECTRICAL AND ELECTRONICS ENGINEERING

I to VIII SEMESTER SCHEME AND SYLLABUS

BOARD OF STUDIES IN ENGINEERING AND
FACULTY OF ENGINEERING AND TECHNOLOGY

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.S.C. 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 <u>not less than 75%</u> attendance in the total number of working periods during the first year and in each semester thereafter and shall be physically present for a <u>minimum of 60</u>% of the total working periods. In addition, he/she also shall be physically present in at least 50% of total working periods <u>for each subject</u>
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. In addition to the grade cards for each semester all successful candidate shall also be issued a consolidated statement grades. 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 preferably after fourth semester of 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
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ELECTRICAL AND ELECTRONICS ENGINEERING

I to VIII SEMESTER SCHEME AND SYLLABUS

I to VIII SEMESTERS 2008 SCHEME

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 08.109 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	3	1	-	50	3	100	4
08.302	Humanities	3	-	-	50	3	100	3
08.303	Hydraulic Machines and Heat Engines	2	2	-	50	3	100	4
08.304	Network Analysis and Synthesis	2	2	-	50	3	100	4
08.305	Solid State Devices and Circuits	2	2	-	50	3	100	4
08.306	Electrical Machines I	2	2	-	50	3	100	4
08.307	Hydraulic Machines and Heat Engines Lab	0	0	3	50	3	100	3
08.308	Electrical and Electronic Workshops	0	0	3	50	3	100	3
	Total	15	8	6	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	3	1	-	50	3	100	4
08.402	Digital Electronics and Logic Design	3	1	-	50	3	100	4
08.403	Engineering Electro-magnetics	2	1	-	50	3	100	3
08.404	Electrical Measurements I	2	1	-	50	3	100	3
08.405	Engineering Material Science	2	1	-	50	3	100	3
08.406	Power System Engineering I	2	2	-	50	3	100	4
08.407	Electronic Circuits Lab	0	0	4	50	3	100	4
08.408	Electrical Machines Lab I	0	0	4	50	3	100	4
	Total	14	7	8	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	Engineering Mathematics IV	3	1	-	50	3	100	4
08.502	Electronic Instrumentation	2	1	-	50	3	100	3
08.503	Electrical Measurements II	2	1	-	50	3	100	3
08.504	Power Electronics	3	1	-	50	3	100	4
08.505	Electrical Machines II	2	2	-	50	3	100	4
08.506	Elective I	2	1	-	50	3	100	3
08.507	Digital Circuits Lab	0	0	4	50	3	100	4
08.508	Measurements & Instrumentation Lab	0	0	4	50	3	100	4
	Total	13	8	8	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	Electrical Machines III	2	1	-	50	3	100	3
08.602	Microprocessors & Applications	2	2	-	50	3	100	4
08.603	Numerical Techniques & Computer Programming	2	2	-	50	3	100	4
08.604	Industrial Engineering & Management	2	1	-	50	3	100	3
08.605	Power System Engineering II	2	2	-	50	3	100	4
08.606	Elective II	2	1	-	50	3	100	3
08.607	Power Electronics Lab	0	0	4	50	3	100	4
08.608	Microprocessor Lab	0	0	2	25	2	50	2
08.609	Software Lab	0	0	2	25	2	50	2
	Total	13	8	8	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	Control Systems	2	2	-	50	3	100	4
08.702	Power System Engineering III	2	1	-	50	3	100	3
08.703	Digital Signal Processing	2	1	-	50	3	100	3
08.704	Elective III	2	1	-	50	3	100	3
08.705	Electrical Drawing	0	0	4	50	3	100	4
08.706	Electrical Machines Lab II	0	0	4	50	3	100	4
08.707	Power Systems Lab	0	0	4	50	3	100	4
08.708	Project & Seminar	0	0	4	100	3	-	4
	Total	8	5	16	450		700	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	Advanced Control Theory	2	1	-	50	3	100	3
08.802	Electrical Machine Design	2	2	-	50	3	100	4
08.803	Electrical System Design	2	2	-	50	3	100	4
08.804	Power Semiconductor Drives	2	1		50	3	100	3
08.805	Elective IV	2	1	-	50	3	100	3
08.806	Elective V	2	1	-	50	3	100	3
08.807	Project & Viva voce (Industrial Visits)	0	0	5	100	3	100	5
08.808	Systems & Control Lab	0	0	4	50	3	100	4
	Total	12	8	9	450		700	29

List of Electives offered by the Electrical & Electronics Engineering Department

08. 506 Elective I

(a) Computer Organisation
(b) Superconductivity and Applications
(c) Operations Research
(d) New and Renewable Energy Sources

08. 606 Elective II

(a) Energy Conservation and Management
(b) Biomedical Instrumentation
(c) Software Engineering
(d) Technical English and Communicative Skills

08. 704 Elective III

(a) Electronic Communication
(b) Environmental Engineering
(c) Modern Operating Systems
(d) Management Information System
(e) Nano Technology
(f) Computer Aided Power System Analysis
(g) Microprocessor Based System Design
(h) Embedded System
(i) Illumination technology

08. 805 Elective IV

(a) Robotics and Industrial Automation
(b) Advanced Microprocessor Architecture and Programming
(c) Soft Computing Techniques
(d) Pattern Recognition
(e) HVDC & FACTS
(f) Control & Guidance Engineering
(g) Design of Digital Control Systems

08. 806 Elective V

(a) Computer and Data Networks
(b) Advanced Electronic Communication
(c) High Voltage Engineering
(d) Object Oriented Programming
(e) Digital Image Processing
(f) Wavelets and Applications
(g) Optimal Control Theory
(h) Non-linear Control Theory
(i) Special Electrical Machines

B. TECH DEGREE COURSE
2008 SCHEME

ELECTRICAL AND ELECTRONICS ENGINEERING

Combined I and II Semesters, 2008 scheme
(Common for all branches)

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08.107	Basic Mechanical Engineering	2	1	0	50	3	100	6
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	Total	**17**	**8**	**4**	**500**		**1000**	**58**

08.103 ENGINEERING MATHEMATICS- 1

L-T-P: 2-1-0 **Credit: 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. Kreyszig; *Advanced Engineering Mathematics,* 8th edition, Wiley Eastern.
2. Peter O' Neil ; *Advanced Engineering Mathematics,* Thomson
3. B.S.Grewal ; *Higher Engineering Mathematics,* Khanna Publishers
4. B.V.Ramana*; Higher Engineering Mathematics,* Tata Mc Graw Hill, 2006
5. Michel D Greenberg; *Advanced Engineering Mathematics,*Pearson International
6. Sureshan J, Nazarudeen and Royson; *Engineering Mathematics I,* Zenith Publications

08.102 ENGINEERING PHYSICS

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

MODULE-I

Oscillations and Waves: Basic ideas of harmonic oscillations – Differential equation of a SHM and its solution. Theory of damped harmonic oscillations. Quality factor. Theory of forced harmonic oscillations and resonance. 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 of 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 and packing factor with reference to simple cubic, body centered cubic and face centered cubic crystals. Directions and planes. Miller indices. Interplanar spacing in terms of Miller indices. Super conductivity - Meissner effect. Type-I and Type-II superconductors. BCS theory (qualitative). High temperature superconductors. Applications of superconductors. Introduction to new materials (qualitative) -Metallic glasses, Nano materials, Shape memory alloys, Bio 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 diffraction at a circular aperture (qualitative). Rayleigh's criterion for resolution. Resolving power of telescope and microscope. Plane transmission grating. Resolving power of grating. Grating equation. X-ray diffraction. Bragg's law.

Polarization of Light: Types of polarized light. Double refraction. Nicol Prism. Retardation plates. Theory of plane, circular and elliptically polarized light. Production and analysis of circularly and elliptically polarized light. Polaroids. Induced birefringence. Photo elasticity – isoclinic and isochromatic fringes – photo elastic bench

Special Theory of Relativity: Michelson-Morley experiment. Einstein's postulates. Lorentz transformation equations (no derivation). Simultaneity. Length contraction. Time dilation. Velocity addition. Relativistic mass. Mass energy relation. Mass less particle.

MODULE – III

Quantum Mechanics: Dual nature of matter. Wave function. Uncertainty principle. Energy and momentum operators. Eigen values and functions. Expectation values. Time Dependent and Time Independent Schrodinger equations. Particle in one dimensional box. Tunnelling (qualitative).

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

Laser: Einstein's coefficients. Population inversion and stimulated emission. Optical resonant cavity. Ruby Laser, Helium-Neon Laser, Carbon dioxide Laser (qualitative). Semiconductor Laser (qualitative). Holography. Fiber Optics - Numerical Aperture and acceptance angle. Types of optical fibers. Applications.

REFERENCE:

1. Sears & Zemansky ; *University Physics. XI Edn.,; Pearson*
2. Frank & Leno; *Introduction to Optics. III Edn., , Pearson*
3. J.C. Upadhyaya*; Mechanics., Ram Prasad & Sons*
4. David J Griffiths*; Introduction to Electrodynamics, III Edn, , Pearson*

5. M Ali Omar*; Elementary Solid State Physics., Pearson*
6. S O Pillai*; Solid State Physics., New Age International Publishers*
7. John R Taylor, Chris D Zafiratos & Michael A Dubson*; Modern Physics for Scientists and Engineers. II Edn, Prentice Hall of India*
8. Eugene Hecht*; Optics. IV Edn, Pearson*
9. Robert Resnick ; *Introduction to Special Relativity., John Willey and Sons*
10. Richard L Libboff*; Introduction to Quantum Mechanics. IV Edn, Pearson*
11. Donald A Mcquarrie*; Statistical Mechanics., Vivo Books*
12. Mark Ratner& Daniel Ratner*; Nanotechnology.*
13. T.A. Hassan et al; A Text Book of Engineering Physics.*, Aswathy Publishers, Trivandrum*
14. B. Premlet*; Advanced Engineering Physics , 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.*

08.103 ENGINEERING CHEMISTRY

L-T-P: 2-1-0 **Credit: 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 (DEMONSTRATION ONLY)

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

08.104 ENGINEERING GRAPHICS

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

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

MODULE I

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

08.105 ENGINEERING MECHANICS

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

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 Staff. Measurements in levelling - Temporary adjustments of a level, holding the staff, reading the 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, average ordinate rule, Trapezoidal rule, Simpson's rule (examples)- Introduction to Distomat, Total Station & GPS (Brief description only)

MODULE II

Building construction*:* Selection of site for buildings - types of buildings - Components of buildings.

Foundation: Different types - Spread footing, Isolated footing, Combined footing, Mat foundation¸ Pile foundation (description only).

Safe Bearing Capacity of Soil: Importance of determination of the Safe Bearing Capacity of Soil (brief description only).

Super structure: Masonry - stone masonry, brick masonry –Types- desirable qualities of stone and brick.

Partition: Materials used for making partition - plywood, particle boards & glass.

Doors, windows & ventilators : Types - materials used for the construction of doors and windows - wood, steel & Aluminium.

Plastering: Mortar – properties - Preparation of Cement mortar

Painting: Preparation of surfaces for painting - plastered, wood and steel surfaces- Types of 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, PVC Sheet

MODULE III

Concrete: Ingredients- cement, aggregate, and water. Qualities of ingredients (brief 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 sewage disposal arrangements for residential buildings.

REFERENCE:

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

10. 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: 2-1-0 **Credit: 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. Roy and Choudhary, "*Elements of Mechanical Engineering*"
6. Hajra Choudhary, "*Workshop Technology*"
7. R K Bensal, "*Fluid mechanics and machines*"
8. J Benjamin, "*Basic Mechanical Engineering*"

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. Mittle, "*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
8. Edward Hughes, "*Electrical and Electronic Technology*", Pearson Education, 2002.
9. ML Soni, PU Guptha, US Bhatnagar and A Chakrabarthy, "*A Text Book on Power System Engineering*", Dhanpath Rai & Sons, New Delhi 1997
10. N.N.Bhargava, "*Basic Electronics and Linear Circuits*", Tata McGraw Hill

11. Rangan C.S., Sarma G.R., and Mani V.S.V., "*Instrumentation Devices and Systems*", Tata McGraw Hill, 1992.
12. 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) (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 light transmission through fiber, concepts of Single Mode and Multi Mode optical fiber, working principle of source (semiconductor Laser) & detector (PIN,APD), advantages of optical communication. (5 hrs)

MODULE 3 (Qualitative Treatment)

(a) Computer Architecture: functional units: basic concept of ALU- data path and control, memory hierarchy, caches, main memory, virtual memory, operating systems, microprocessors - functional block diagram of 8085 (9 hrs)

(b) Data communication: overview, analog and digital data transmission, transmission media, digitization of wave forms, PCM , digital modulation techniques- ASK, PSK, FSK, basic concepts of error detection , parity checking. (6hrs)

(c) Mobile communication: basic principles of cellular communications, concepts of cells, frequency reuse, principle and block diagram of GSM,principle of CDMA, WLL & GPRS technologies. (4hrs)

(d) Internet Technology: concepts of networking: client - server computing, IP addresses, domain names, network interface unit - modem, switching technologies- circuit switching and packet switching, LAN,MAN,WAN &World wide web, network topologies, communication protocols- TCP/IP, Introduction to

web languages-HTML ,XML, internetworking concepts, network devices- basic principles of router, bridge, switch, network security- Firewall. (7 hrs)

REFERENCES

1. Santiram Kal, *Basic Electronics – Devices, Circuits and IT fundamentals*, PHI
2. Louis.E.Frenzel, *Principles of Electronic Communication Systems*, TMH
3. William Stallings, *Wireless Communications and Networks*, Pearson Education.
4. M.Moris Mano, *Computer Architecture*, PHI
5. Neil H E Weste,Kamran Eshraghian, *Principles of CMOS VLSI design – A system perspective*, Pearson Education [Module 1(f)]
6. David A. Bell, *Electronic Instrumentation and Measurements*, PHI .[Module 2(a)]
7. N N Bhargava,D C Kulshreshtha,S C Gupta, *Basic Electronics & Linear Circuits*, TMH
8. ITL Education Solution Ltd., *Introduction to Information Technology*, Pearson Education, 5th edition, 2008
9. R.R. Gulati, *Monochrome and Colour Television*, New Age International [Module 2 (c)]
10. K Gopakumar, *Introduction to Electronics & Communication* , 3rd edition, 2008,Phasor Publisher's,Kollam

This subject shall be handled by faculty of Dept.of Electronics and Communication in the Colleges.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

08.110 ENGINEERING WORKSHOPS

L-T-P/D; 0-0-2 **Credits: 6**

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.

B. TECH DEGREE COURSE
2008 SCHEME

ELECTRICAL AND ELECTRONICS ENGINEERING
SCHEME AND SYLLABUS FOR Semester III

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	3	1	-	50	3	100	4
08.302	Humanities	3	-	-	50	3	100	3
08.303	Hydraulic Machines and Heat Engines	3	1	-	50	3	100	4
08.304	Network Analysis and Synthesis	2	2	-	50	3	100	4
08.305	Solid State Devices and Circuits	2	2	-	50	3	100	4
08.306	Electrical Machines I	2	2	-	50	3	100	4
08.307	Hydraulic Machines and Heat Engines Lab	0	0	3	50	3	100	3
08.308	Electrical and Electronic Workshops	0	0	3	50	3	100	3
	Total	15	8	6	400		800	29

08. 301 ENGINEERING MATHEMATICS II (CMPUNERFHBTA)

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

Module I

Multiple Integrals: Double Integrals (Cartisian 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 **2**∏ and **2*l***. 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: Formationof 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 from each module .Each question carries 20 marks.

08. 302 HUMANITIES (MPUNE)

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

PART I ECONOMICS (2 periods per week)

MODULE – I

Definition of Economics – Basic Concepts Goods – Choice of techniques – Production possibility curve National Income concepts - GNP – GDP – NNP – Per Capita Income – Three Sectors of the Economy – Primary – Secondary, Tertiary Sector – Significance of Money.

Meaning of Demand and Supply – Types of demand – Determinants of Demand – Demand forecasting Production function – Law of Variable proportion – Returns to scale - Least cost combination of inputs – Cost concepts – Cost output relationship

Module II

Inflation – causes of inflation – measures to control inflation – Demand – Pull inflation – cost push inflation – effects of Inflation – effects of inflations comparison between inflation and deflation

India's Economic crisis in 1991 – New economic policy – Global Financial meltdown in 2008 – Applicability of Keynesian Theory to UDC'S.

Stock Market and present scenario – Industrial sector past and present – Industry Analysis – Electronics – Chemical – Automobile – FMCG Industry.

Environment and Development – Basic Issues – Sustainable Development and Environmental Accounting – Population – Resources and the Environment – Poverty and the Environment – Growth versus the Environment – The Global Environment .

PART II ACCOUNTANCY (1 Period per week)

Module III

Book- Keeping and Accountancy -Elements of Double Entry -Book- Keeping-rules for journalizing -Ledger accounts –Cash book-Banking transactions – Trial Balance- Method of Balancing accounts- the journal proper (simple problems).

Final accounts: Preparation of trading and profit and loss Account- Balance sheet (with simple problems) - Introduction to Accounting packages (Description only)

References :

1. K.K Dewett, Modern Economic theory
2. Michael – Todaro, Economic Development Addison Wesley Longman Ltd.
3. Mohinder Kumar Sharma _ Business Environment in India
4. D.M. Mithani-Money, Banking, International Trade and Public Finance, Himalaya publishing House, New Delhi.
5. Rudder Dutt and K.P.M Sundaran – Indian Economy
6. Hal R. Varian – Intermediate Micro Economics
7. Koutsiannis (second Edition) Micro Economics
8. Double Entry book Keeping – Batliboi
9. A Systematic approach to Accounting: Dr K.G. Chandrasekharan Nair

Examination Duration: 3 hours

University question

Note: Part I and Part II to be answers in separate answer books.

Part – I Economics

Part A – 30 Marks (short answers) covering entire syllabus (3x10=30)

Part B – 40 marks (50% choice one out of two or two out of four from each module)

Part – II Accountancy

Three questions covering entire syllabus out of which two questions has to be answered (2x15=30)

08. 303 HYDRAULIC MACHINES AND HEAT ENGINES (E)

L-T-P/D; 2-2-0 **Credits- 4**

Module I Fluid Mechanics

Basic concepts and definitions – Properties of fluids – Newton's law of viscosity – Fluid pressure, Pascal's law – manometers – pressure gauges – Atmospheric pressure, Gauge pressure, absolute pressure

Continuity equation – Euler's equation and Bernoulli's equation – Flow measuring devices – Venturimeter - Orifice meter – Pitot tube- Notches and weirs (description only for notches and weirs) - Flow through orifices - hydraulic coefficients of orifice

Flow through pipes : Losses in pipes, Reynolds Number – Laminar and turbulent flow – Hagen Poiseuille formula- Friction factor- Darcy's and Chezy's formula - Transmission of power through pipes

Module II Hydraulic Machines

Hydraulic turbines : Classification –Impulse turbines- Velocity triangles- work done and efficiencies – design aspects- Reaction turbines- Radial flow turbines (Francis) – Axial flow turbines (Kaplan) – Work done – efficiency - draft tubes – cavitation - performance curves of turbines – shape number – Specific speed - governing of water turbines – Hydro electric power plant layout-penstock-surge tank.

Pumps- Classification- Rotodynamic and positive displacement pumps

Rotodynamic pumps – Centrifugal pump - working – static and manometric head – work done – efficiencies – Cavitation – Characteristics curves –Specific speed -Multi stage pumps

Positive Displacement pumps: Reciprocating pump - single acting and double acting – indicator diagram - effect of acceleration and friction on indicator diagram –calculation of max. speed of reciprocating pumps - Air vessels

Module III Heat Engines

I C Engines – Classification - two-stroke and four – stroke engines – SI and CI engines – Governing of I C Engines, performance test – characteristic curves - Brake power , Indicated power – efficiencies – mean effective pressure – Morse test – Retardation test – Heat balance test.

Steam turbines : Impulse and reaction turbines – velocity diagram – condition for maximum efficiency - compounding – pressure compounding and velocity compounding - Governing of turbines.

Gas turbines : Ideal gas turbine cycle – simple cycle with regeneration, reheating, inter cooling, open and closed systems – cycle efficiency and work output – effect of compressor and turbine efficiencies – performance of gas turbine.

References

1. Fluid mechanics and machines _ Modi and Seth
2. Fluid mechanics and machines – Jagadish lal
3. Fluid mechanics and Hydraulics machines – R.K.Bansal.
4. Fluid mechanics and Hydraulics machines – R.K.Rajput
5. Heat Engines – Ballaney
6. Thermal Engineering – R K Rajput
7. I C Engines – V. Ganesan.
8. Gas Turbines – Cohen, Rogers and Saravanamittoo
9. GasTurbines - V. Ganesan

Examination Duration: 3 hours

Note: Question paper will be in two parts. Part A (Total 40 marks) consists of 10 short answer type questions of 4 marks each. Part B (Total 60 marks) will have 2 questions of 20 marks each from each module and the candidate has to answer one question from each module.

08. 304 NETWORK ANALYSIS AND SYNTHESIS (E)

L-T-P/D; 2-2-0 **Credits- 4**

Module - I

Introduction to networks - circuit parameters - active and passive elements - energy sources - dependent and independent sources - standard symbols. Review of mesh analysis and node analysis. Coupled circuits - analysis of coupled circuits. Analysis of 3-phase circuits - star and delta connections - 3-wire and 4-wire systems - neutral displacement. Network theorems - Superposition, Thevenin, Norton, Reciprocity; Millman and Maximum power transfer theorems, Telligen's theorem - application to AC & DC networks.

Module - II

Resonance in series and parallel circuits - energy in a resonant circuit - bandwidth of series resonant circuits - quality factor. Current locus diagrams - Signal representation - Impulse, step, pulse and ramp function. Circuit representation in s-domain - Transients in linear circuits - solution for DC and AC excitations in RL, RC & RLC circuits - response curves - time constants. Parameters of two-port network Z, Y, h and ABCD parameters - determination for given networks - conversion formulae-two port symmetry - Image impedance. Fourier series - application of Fourier series - harmonic analysis - effective value of non-sinusoidal wave - simple circuit applications.

Module - III

Network functions – Poles and zeros - one port network and two port network - necessary conditions for driving point function and transfer functions, Introduction to network synthesis - positive real functions - properties - synthesis of one port LC, RC & RL networks by Foster and Cauer methods. Introduction to filters - low pass, high pass, band pass and band elimination filters - design of constant k and m derived filters.

REFERENCES

1. Roy Choudhury D., "Network and Systems", Wiley Eastern Ltd., 2nd Reprint, July 1991.
2. A. Sudhakar, S.P. Shyammohan, "Circuits & Networks - Analysis and Synthesis", Tata McGraw Hill Publishing Company Ltd, NEW DELHI
3. Edminister JA, "Electric circuits", Schaum's Outline Series, Tata McGraw Hill, New Delhi, 1999.
4. Boylestad, "Introductory Circuit Analysis" 10/e Pearson Education, India, 2003.
5. Van Valkenburg M.E., "Network Analysis", Prentice Hall, Third edition, 1989
6. Rajeswaran, "Electric Circuit Theory", Pearson Education, 2003.
7. James W Nilson, Susan A Riedel, "Introductory Circuits for Electrical and Computer Engineering." Pearson Education, 2002.
8. S.R. Paranjothi, "Electric Circuit Analysis", second edition, New Age International publishers, New Delhi 2001.
9. C L Wadhwa : " Network Analysis and Synthesis", New Age International.

Examination Duration: 3 hours

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).

08.305 SOLID STATE DEVICES AND CIRCUITS (E)

L-T-P/D; 2-2-0 **Credits - 4**

Module 1

Review of BJT configurations - CB, CC and CE. Biasing and bias stability –Stability factors - design of potential divider bias and collector feed back bias circuits. Bias compensation circuits - diode bias and thermistor bias. Factors causing bias instability.

Transistor modeling - h parameter equivalent circuit - graphical determination of h parameters. BJT Small signal analysis of CE amplifier at low frequencies - current gain, input impedance, voltage gain, output impedance and power gain using exact equivalent circuit.

Field effect transistor - construction and characteristics of JFETs - JFET parameters - ratings and specifications JFET bias circuits - voltage divider bias. JFET small signal analysis of common source and common drain amplifiers. MOSFET construction and characteristics - depletion and enhancement type - specifications - CMOS devices - advantages.

Module II

Multistage amplifiers - RC coupled, transformer coupled and direct coupled transistor amplifiers - Cascade amplifier - General frequency considerations of single stage amplifier - Low frequency considerations - High frequency considerations - hybrid pi model (qualitative study) - Overview of frequency response of cascaded FET amplifiers, Large signal amplifiers - Classifications of amplifiers - Maximum power and efficiency of class A (series fed and transformer coupled) amplifier Class B and Class C amplifiers - Push pull and complementary symmetry power amplifiers - Distortion in amplifiers - causes and effect (analysis not required).

Feedback amplifiers - effect of feed back - principle of negative feed back - gain and frequency response - standard amplifier circuits. Oscillator circuits - General theory - Barkhausen criterion for oscillation - Phase shift, Wein Bridge, Colpitts, Hartley and Crystal oscillator circuits.

Module - III

Operational Amplifiers - differential amplifier - emitter coupled differential amplifier - analysis - transfer characteristics - typical IC operational amplifiers – 741 & 301 - gain, CMRR, offset, slew rate - drift compensation - frequency compensation.

Opamp circuits - inverting and non-inverting amplifiers - summer, integrator differentiator and comparator circuits - comparator IC 311 - voltage level detectors - zero crossing detectors - wave form generation using Op-Amps.

References:

1. Millman and Halkias, "Integrated Electronics: Analog and digital circuits and systems", McGraw-Hill Book Co.
2. Roy Choudhury.”Linear Integrated Circuits”, New Age International Publishers.

P.T.O

3. Robert Boylestad and Louis Nashelsky: "Electronic Devices and Circuit Theory", 8th edition, Pearson Education, 2002.
3 Thomas L Floyd "Electronic Devices", 6th edition Pearson Education India, 2002.
4 Malvino, "Electronic Principles," Tata McGraw Hill Publishing Co.
5 B. Somanathan Nair, "Electronic Devices and Applications" Prentice Hall India, New Delhi, 2002.
6 Gopakumar,” Design and Analysis of Electronic Circuits, Phasor Books.
7 Ben G. Streetman, Sanjay Banerjee, "Solid State Electronic Devices", Pearson Education Asia, 2002.
8 Bogart: "Electronic Devices and Circuits", Universal Book Stall, New Delhi.

Examination Duration: 3 hours

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).***

03.306 ELECTRICAL MACHINES –1(E)

L-T-P/D; 2- 2 - 0 **Credits - 4**

Module I

DC machines - constructional features - principle of generator and motor- Armature winding – types - DC generator - e.m.f equation. Different types of excitation. Armature reaction, effects, methods of compensation - Commutation - Open Circuit and Load Characteristics - Applications - parallel operation of dc generators.

Module II

DC motor - production of torque - torque equation - performance characteristics - starting of dc motors. Starters - design of starter resistances. Speed control of dc motors - field control - armature control. Braking of dc motors - Losses and efficiency - Testing of dc motors -Hopkinson's test, Swinburne's test and retardation test - dc motor applications. Permanent magnet DC motors.

Module III

Single phase transformers - principle of operation - constructional details - operation on no load - Magnetising Current phasor diagram - Equivalent circuit - transformer losses - Methods of cooling. Testing of transformers - polarity test, OC test, SC test, Sumpner's test - separation of losses - efficiency - voltage regulation - effect of load and load power factor - all day efficiency - parallel operation of transformers - Auto transformers - dry type transformers. 3-phase transformers - 3-phase transformer connections - choice of transformer connections - Transformer harmonics - oscillating neutral. 3-phase bank of single-phase transformers - Parallel operation of 3-phase transformers – Vector groups – Three winding tansformers - stabilization by tertiary winding - equivalent circuit - Tap changing transformers - no load tap changing - on load tap changing.

References

1. Bimbra P S, Electrical Machinery, Khanna Publishers.
2. Nagarath I J and Kothari D P, Electrical Machines, Tata Mc-Graw Hill.
3. B R Gupta, Vandana Singhal, Fundamentals of Electric Machines, New Age International.
4. H Partab, Art and Utilization of Electrical Energy.
5. Clayton A E & Hancock NN – Performance and Design of DC Machines, ELBS/CBS Publishers, Delhi 1990.
6. M G Say – Performance and Design of AC Machines.
7. Theodore Wildi – “Electrical Machines, Drives and Power Systems”, Pearson Education Asia, 2001.
8. B.L. Tharaja, “A Textbook of Electrical Technology”. S. Chand & Company, New Delhi.

Examination Duration: 3 hours

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).

08.307 HYDRAULIC MACHINES AND HEAT ENGINES LAB (E)

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

Hydraulic Machines Lab.

Study of gauges, meters and vlaves.
Study of pumps and turbines.

Experiments

1. Determination of Coefficient of discharge and Calibration of Notches, Orifice meter and Venturi meter
2. Determination of Chezys constant and Darcy's coefficient on pipe friction apparatus
3. Performance tests on centrifugal and reciprocating pumps
4. Performance tests on Impulse and Reaction turbines

Heat Engines Lab.

Study of IC engines, Blowers and Compressors.

Experiments

1. Load test on SI Engines (Hydraulic/Brake drum dynamometer)
2. Load test on CI Engines (Hydraulic/Brake drum dynamometer)
3. Load test on SI/CI engine with electrical loading
4. Performance test on Blowers
5. Performance test on compressors

Examination Duration: 3 hours

Note :

1. Common Lab record will be used for both Hydraulic Machines Lab and Heat Engines Lab

2. University practical examination will be conducted in Hydraulic Machines Lab and Heat Engines lab by two set of examiners and students will be allotted to the labs by taking lot.

08.308 ELECTRICAL AND ELECTRONIC WORKSHOPS (E)

L-T-P/D; 0- 0 - 3 **Credits – 3**

1. Study of wiring cables and electrical accessories – Electrical and Electronics symbols.
2. Simple wiring circuits- A light is controlled by a single pole single throw (S.P.S.T) switch , addition of a plug point in the light circuit and addition of a calling bell in the wiring circuit.
3. Circuit with Fluorescent tube light
4. Circuits to control a lamp from two independent positions
5. Hospital wiring
6. Godown wiring
7. Wiring of D.B with ELCB and MCB.
8. Testing of circuits - testing of ON/OFF conditions using a tester, test lamp, and location of phase and neutral.
9. Study of analog and digital multimeters and other electronic meters
10. Study of CRO for the measurements of voltage, phase angle., frequency etc.
11. Identification. and testing of Electronic components and devices. (Resister, Capacitor, Diode, Zener Diode, Transistor etc,)
12. assembling of circuits using breadboard
13. Soldering practice – Soldering of circuits (Half wave and Full wave Rectifiers with and without RC filter circuits - Zener Voltage regulator)

Examination Duration: 3 hours

For University examination, the following guidelines should be followed regarding award of marks

(a) Wiring diagram / Circuit diagram - 30%
(b) Wiring / Soldering - 30%
(c) Result - 20%
(d) Viva voce - 20%

B. TECH DEGREE COURSE
2008 SCHEME

ELECTRICAL AND ELECTRONICS ENGINEERING
SCHEME AND SYLLABUS FOR Semester IV

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	3	1	-	50	3	100	4
08.402	Digital Electronics and Logic Design	3	1	-	50	3	100	4
08.403	Engineering Electro-magnetics	2	1	-	50	3	100	3
08.404	Electrical Measurements I	2	1	-	50	3	100	3
08.405	Engineering Material Science	2	1	-	50	3	100	3
08.406	Power System Engineering I	2	2	-	50	3	100	4
08.407	Electronic Circuits Lab	0	0	4	50	3	100	4
08.408	Electrical Machines Lab	0	0	4	50	3	100	4
	Total	14	7	8	400		800	29

08.401 ENGINEERING MATHEMATICS III (CMPUNERFHB)

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

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 Laurents series-zeros and singularities –Residues and residue theorem. Evaluation of real definite integrals-

2π

$\int f(\sin\theta, \cos\theta)\, d\theta$, $\int_{-\infty}^{\infty} f(x)\, dx$ with no poles of $f(z)$

0

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 from each module .Each question carries 20 marks.

08.402 DIGITAL ELECTRONICS AND LOGIC DESIGN (E)

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

Module I

Number systems and codes: Review of number systems - decimal and binary numbers – octal and hexadecimal numbers – Binary arithmetic - 1's and 2's complements. Binary codes - BCD, excess-3 code and gray code - alphanumeric codes ASCII code - EBCDIC.

Logic functions and gates: Review of basic gates and truth tables - Elements of Boolean algebra - De Morgan's theorem - Universality of NAND and NOR gates. Realization of combinational circuits using sum of products (SOP) and product of sums (POS) expression - Minimization of Boolean functions by Boolean algebra, Karnaugh map (up to four variables), Quine McCluskey method (up to 5 variables).

Module II

Combinational logic circuits: Half adder and full adder - parallel binary adder – BCD adder - ripple carry and look ahead carry adders, binary subtracter - parity checker/generator, 4 bit magnitude comparator - multiplexers and de-multiplexers - decoders and encoders - BCD to decimal and BCD to seven segment decoders. Realization of logic functions using multiplexers and decoders.

Logic families: Description of TTL, CMOS and ECL families - advantages and disadvantages of major logic families - Current sourcing and current sinking operations of ICs – fan-in and fan-out – noise margin. Familiarization of commercially available logic gates in 7400/5400 and 4000 series of IC's.

Module III

Sequential logic circuits: Flip flops - SR, clocked SR, D, JK, master slave and T flip flops - level and edge triggering - conversion of one type of flip flop into another, Shift registers - SISO, SIPO, PIPO and PISO shift registers - left shift register - Universal shift register - applications of shift registers - Counters - ripple counter, synchronous counter, modulo N counter – ring counter – Johnson counter, up-down counter- - state diagrams – design of counters for random sequence.

Timer circuits: 555 Timer - astable multivibrator and monostable multivibrator circuits, Programmable Logic Devices: Description of PLA, PAL and FPGA . Memories – ROM- organisation, PROMs, RAMs – Basic structure, Static and dynamic RAMs. Basics of Hardware Description Language - VHDL.

References:

1. Ronald J Tocci and Neal S Widmer, "Digital Systems: Principles and Applications", 8th edition, Pearson Education Asia, 2002.
2. B. Somanathan Nair, "Digital Electronics and Logic Design", Prentice Hall of India, 2002.

P.T.O

3. C. H. Thomas L Floyd: "Digital Fundamentals", Pearson Education,
4. Albert Paul Malvino and Donald P Leach, "Digital Principles and Applications", McGraw Hill International Edition.
5. John F Wakerly, "Digital Design, Principles and Practices", 3rd edition, Pearson Education Asia, 2002.
6. DC Green, "Digital Electronics", 5th edition, Pearson Education Asia, 2001.
7. H. Taub and D. Schilling, "Digital Integrated Electronics", McGraw Hill.
8. Morris Mano, "Logic and Computer Design Fundamentals", Prentice Hall of India/ Pearson Education 2001.

Examination Duration: 3 hours

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).

08.403 ENGINEERING ELECTRO – MAGNETICS (E)

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

Module - I

Vector analysis – vector algebra - cartesian co-ordinate system - cylindrical co-ordinate system - spherical co-ordinate systems - dot and cross product - vector field.

Coulomb's law & electric field intensity - field due to a continuous volume charge distribution - line charge - sheet of charge - flux density - Gauss law – applications – Divergence – Maxwell's first equation - divergence theorem.

Concepts of electric potential, potential difference and energy - line integral -potential field of a point charge - system of charges - conservative property -potential gradient - electric field due to a dipole - energy density.

Conductors and dielectrics - current and current density - continuity of current -conductor properties and boundary conditions - method of images - boundary conditions for perfect dielectric materials. Capacitance - capacitance of co-axial cable - two wire line.

Module - II

Poisson's and Laplace's equations - examples - uniqueness theorem.

Steady magnetic field - Biot-Savart's law - Amperes circuital law - Curl-Stokes theorem - magnetic flux and flux density - scalar and vector magnetic potentials. Magnetic forces - force between differential current elements - magnetic boundary conditions - potential energy. Inductance of a co-axial cable - torroidal coil.

Module - III

Time varying fields and Maxwell's equations - Faradays laws - displacement current - Maxwell's equations in point form-integral form. Uniform plane wave -wave motion in free space - perfect dielectrics - poynting vector - poynting theorem - propagation in good conductors - skin effect.

Reflection of Uniform plane waves – standing wave ratio – transmission lines – transmission line equations – transmission line parameters.

References

1. William H. Hayt, Jr., “Engineering electro-magnetics”, Tata McGraw Hill Edn.
2. David K. Cheng, “Field and wave electromagnetics”, Pearson Edn. Pte. Ltd.
3. P.V. Gupta, “Introductory course in electron-magnetic fields”, Dhanpat Rai & Sons.
4. John D. Kraus: *Electromagnetics,* Mc Graw Hill.
5. Martin A Plonus *: Applied Electromagnetics,* Mc Graw Hill.
6. B. Premlet,” Electromagnetic Theory with Applications”, Phasor books
7.

Examination Duration: 3 hours

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).

08.404 ELECTRICAL MEASUREMENTS – I (E)

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

Module I

Dimensions of electrical quantities and dimensional analysis - error analysis -combination of component errors - accuracy - precision - sensitivity - resolution -loading effects.Principle of PMMC instruments, moving iron instruments and electrodynamometer type instruments. Electrostatic voltmeter - quadrant electrometer. Ohm meter and multimeter.

Module II

DC potentiometers - Vernier potentiometer - calibration of ammeter, voltmeter and wattmeter - AC potentiometer polar and coordinate type.

Wattmeters - electrodynamic type wattmeter - constructional features - errors and compensations - measurement of 3-phase power (active and reactive).

Induction type watt-hour meter - construction - working principle - testing and adjustment - rotating substandard - maximum demand indicator (Merz Price Type only) - trivector meter - TOD meter.

Module III

Frequency meter - moving coil type, Phase angle meter - moving coil and moving iron types.

DC bridges - Wheatstones bridge - Kelvin's double bridge. AC bridges - Maxwell's bridge, Wein bridge, Anderson bridge, Hay's bridge, Schering bridge, Carey Foster bridge.

Measurement of insulation resistance - loss of charge method, insulation megger. Measurement of earth resistance using earth megger, determination of resistivity of earth.

References:

1. Sawhane A K., “A Course in Electrical & Electronic Measurements & Instrumentation”, Dhanpath Rai & Co. 1992.
2. Golding EW & Widdies : Electrical Measurements & Measuring Instruments, Fifth Edition, Wheeler & Co, 1991.
3. Rajendra Prasad: Electrical Measurements and Measuring Instruments (3rd Ed), Khanna Publishers, New Delhi.
4. Albert D. Helfrick & William D. Cooper : Modern Electronic Instrumentation and Measurement Technique, Prentice Hall of India, 1992.
5. Melwille B. Stout: Basic Electrical Measurements, Prentice Hall of India, 1992.
6. Kalsi H S, Electronic Instrumentation, Tata McGraw Hill, New Delhi.
7. Rangan CS, Sarma GR, Mani VSV, Instrumentation Devices and Systems, Tata McGraw Hill, New Delhi.

Examination Duration: 3 hours

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).

08.405 ENGINEERING MATERIALS SCIENCE (E)

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

Module I

Gaseous dielectrics: lonisation and decay process-ionisation by electron collision, Townsend's first ionization coefficient, photo-ionisation, ionisation by metastables, electron detachment, decay by recombination, decay by attachment-decay by diffusion.

Cathode process: Photo electric emission, electron emission by positive ions and excited atom impact, field emission, Townsend's second ionization coefficient.

Electric breakdown in gases: Townsend's criterion for breakdown, the sparking potential, Paschen's law - effect of space charge, the Streamer mechanism, breakdown voltage characteristics in uniform field, penning effect, surge breakdown voltage, time lag, statistical and formative time lags.

Electro-negative gases: Production, properties and application of SF_6 gas, high voltage breakdown and arc phenomenon in SF_6 and its mixtures with nitrogen. Breakdown in high vacuum, application of vacuum insulation.

Corona discharge: Negative point-plane corona, Trichel pulses, positive point corona.

Module II

Liquid dielectrics: Conduction and breakdown in pure liquids and commercial liquids, suspended particle theory, cavitation and bubble theory, thermal breakdown, stressed oil volume theory, treatment and testing of transformer oil, properties of transformer oil and synthetic oil used in transformers.

Solid dielectrics: Classification based on temperature, breakdown in solid dielectrics, intrinsic breakdown, electro-mechanical breakdown - breakdown by treeing and tracking. Thermal breakdown, electro-chemical breakdown, cavity breakdown, internal partial discharges - a b c equivalent circuit, degradation of capacitor insulation by partial discharges. Properties of polyethylene and cross-linking polyethylene and polypropylene films. Properties and applications of paper, rubber, plastic, wood, mica, ceramic and glass as dielectric materials.

Elementary idea of life of insulation: Exponential and inverse power law models, constant stress test, accelerated life test methods.

Module III

Magnetic materials**:** Dia, para, ferro, antiferro and ferri magnetism, magnetic anisotrophy, magnetostriction. B-H curve, reversible and irreversible regions, hysteresis loop for soft and hard magnetic materials, annealing, properties of grain oriented silicon steel. Properties and application of iron, alloys of iron, and harden alloys.

Materials for resistors: Properties of copper, aluminium and its alloys, silver, gold, Nickel, Molybdneum and Tungsten.

Non-linear resistors: Thyrite and ZnO.

Semi-conductor materials: Classification - properties and applications of silicon, germanium, diamond, graphite, selenium, silicon carbide, gallium arsenide, indium, antimonide, gallium phosphide, cadmium compounds as semi conducting materials, merits of semiconductor materials for use in electrical engineering.

Fuses: Different types of fuses and materials used.

Superconductivity: Superconducting elements and compounds, Soft & hard superconductors, applications of superconductivity.

References:

1. Fundamentals of gaseous ionization and plasma electronics: Essam Nassar, Wiley Series.
2. Electrical degradation and breakdown in polymers: Dissado L. A. and Fothergill J.C., British Library cataloging.
3. High Voltage Engineering: M.S. Naidu and V. Kamaraju, Tata McGraw-Hill.
4. SF_6 and vacuum insulation for high voltage applications: M.S. Naidu and V.N. Maller, Khanna Publishers.
5. Electrical Engineering Materials: Dekker A.J. Prentice Hall of India Ltd.
6. Electrical Engineering Materials: Indulkar C.S. and Thiruvenkidam S., S. Chand & Co.
7. Physics of Dielectric Materials: Tareev B., MIR Publishers.
8. Electrical Engineering Materials Science, “M. Jayaraju & B. Premlet”, Phasor Books

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).

08.406 POWER SYSTEM ENGINEERING – I (E)

L-T-P/D; 2- 2- 0 **Credits - 4**

Module - I

Basic Concepts in Power Systems- Power in single phase AC circuits –Complex Power- Power triangle-Power in balanced 3 phase ac circuits.

Per unit quantities- single phase and three phase- selection of base quantities - advantages of per unit system – changing the base of per unit quantities.

Resistance, inductance and capacitance of three phase transmission lines - symmetrical and unsymmetrical spacing - double circuit lines - bundled conductors - effect of earth on transmission line capacitance - performance of transmission lines.

Representation of lines - short and medium lines - equivalent Pi and T networks. Long lines - equivalent circuit of a long line.

Representation of power system components - single line diagram - impedance and reactance diagrams.

Module – II

Mechanical features of transmission lines – sag - sag template.

Insulators - Different types - Voltage distribution, grading and string efficiency of suspension insulators.

Conductors - types of conductors - copper, aluminium and ACSR conductors - Volume of conductor required for various systems of transmission- Choice of transmission voltage, conductor size - Kelvin's law.

Introduction to HVDC transmission -Advantages and Disadvantages only.

Cables -types of cables - insulation resistance - voltage stress - grading of cables - capacitance of single core and 3 - core cables - current rating.

Corona - disruptive critical voltage - visual critical voltage -power loss due to corona -Factors affecting corona - interference on communication lines.

Module- III

Economic aspects — Cost of generation — significance of diversity factor, load factor - plant factor.

Power factor considerations - Methods of power factor improvement.

Tariffs - different types of LT and HT consumers - tariff schemes - uniform tariff and differential tariff.

Power distribution systems – Radial and Ring Main Systems - DC and AC distribution: Types of distributors - Concentrated and Uniform loading - Methods of solving distribution problems.

References :

1. A. Chakrabarti, ML.Soni, P.V.Gupta, V.S.Bhatnagar, “A text book of Power system Engineering”, Dhanpat Rai, 2000.
2. I.J.Nagarath & D.P. Kothari, “Power System Engineering”, TMH Publication, 1994.

P.T.O

3. B.R. Gupta: “Power system Analysis and Design”, Wheeler publishers, 1993.
4 Grainer J.J, Stevenson W.D, “Power system Analysis”, McGraw Hill, 1994.
5. Wadhwa, “Electrical Power system”, Wiley Eastern Ltd. 1993
6. J.B. Gupta, “A course in Electrical Power”, Katharia and sons, 2000.
7. V.K. Mehta & Rohit Mehta,”Principles of Power Systems”, S.Chand & Company.

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).

08.407 ELECTRONIC CIRCUITS LAB. (E)

L-T-P/D; 0- 0 - 4 **Credits - 4**

1. Characteristics of a diode and zener diode.
2. R-C differentiating, integrating, clipping and clamping circuits (using diodes or transistors) -Transfer characteristics.
3. Zener regulator and stabilized power supply using series regulator.
4. Characteristics of an NPN transistor (CE and CB)
5. Characteristics of JFET (Draw the equivalent circuit).
6. Design and testing of a Common Emitter amplifier - frequency response characteristics.
7. Design and testing of a common source JFET amplifier - frequency response characteristics.
8. Design and testing of R-C phase shift and Wein bridge oscillators
9. Crystal oscillator
10. ramp generation using transistor circuit
11. Characteristics of opto-coupler
12. UJT oscillator
13. Study of OPAMP 741 and finding its parameters
14. Inverting and non-inverting amplifiers using OPAMP
15. *Optional - Simulation of some of the above experiments using PSPICE.*

Examination Duration: 3 hours

Note:

For University examination, the following guidelines should be followed regarding award of marks

(a) Circuit and design -30%

(b) Performance -30%

(c)Result -20%

(d) Viva voce -20%

08.408	ELECTRICAL MACHINES LAB. –I (E)
L-T-P/D; 0- 0 - 4	**Credits - 4**

1. OCC of dc generator – Crictical Resistance and crictical speed
2. Load characteristics of dc shunt and compound generators
3. Load test on dc series motor
4. Load test on DC shunt motor
5. Swinburne's and Retardation tests on dc machine.
6. Hopkinson's test
7. Separation of losses in dc machines.
8. Polarity and transformation ratio test on a single phase transformer
9. OC and SC test on single phase transformer - equivalent circuit -predetermination of regulation and efficiency.
10. Sumpner's test on two single phase transformers
11. OC and SC test on three phase transformer
12. Separation of losses in a single phase transformer

Examination Duration: 3 hours

Note:
For University examination, the following guidelines should be followed regarding award of marks
(a) Circuit and design -30%
(b) Performance -30%
(c)Result -20%
(d) Viva voce -20%

B. TECH DEGREE COURSE
2008 SCHEME

ELECTRICAL AND ELECTRONICS ENGINEERING

SCHEME AND SYLLABUS FOR 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	Engineering Mathematics IV	3	1	-	50	3	100	4
08.502	Electronic Instrumentation	2	1	-	50	3	100	3
08.503	Electrical Measurements II	2	1	-	50	3	100	3
08.504	Power Electronics	3	1	-	50	3	100	4
08.505	Electrical Machines II	2	2	-	50	3	100	4
08.506	Elective I	2	1	-	50	3	100	3
08.507	Digital Circuits Lab	0	0	4	50	3	100	4
08.508	Measurements & Instrumentation Lab	0	0	4	50	3	100	4
	Total	13	8	8	400		800	29

08. 506 Elective I

(a) Computer Organisation
(b) Superconductivity and Applications
(c) Operations Research
(d) New and Renewable Energy Sources

08.501 ENGINEERING MATHEMATICS IV (ERHBF)

L/T/P: 3/1/0 **Credits: 04**

MODULE I

Discrete and continuous random variables and their probability distributions- Probability distribution (density) functions-Distribution functions- Mean and Variance - Simple problems -Binomial, Poisson, uniform and exponential distributions - Mean and Variance of the above distributions - Normal distribution - Properties of normal distribution-Computing probabilities using Binomial, Poisson, uniform, exponential and normal distributions

MODULE II

Curve fitting- Principle of least squares-Fitting a straight line-Fitting a parabola-Linear correlation and regression-Karl Pearson's coefficient of correlation-Sampling distributions-Standard error-Estimation- Interval estimation of population mean and proportions (small and large samples)-Testing of Hypothesis- Hypothesis concerning a mean, Equality of means-Hypothesis concerning one proportion, difference of two proportions.

MODULE III

Joint probability density function-Properties-Marginal and conditional distribution- Independence-Random processes -Classification of random processes- Examples-Average values such as mean, autocorrelation, auto covariance, correlation coefficient of random processes- stationarity- strict sense stationary process-wide sense stationary process-Autocorrelation function and its properties-Power spectral density and its properties (no proof)-Related problems-Markov chains. Transition probability matrices-Chapman-Kolmogorov equation (no proof)-Poisson process-Mean and autocorrelation of Poisson process-Related problems

REFERENCES

1. **Papoulis and S.U. Pillai,** *Probability, random variable and stochastic processes,* 4/e, TMH
2. **Veerarajan,** *Probability and Random Processes,* 2/e, TMH
3. **Stark and Woods**, *Probability and Random processes with application to signal processing,* 3/e, Pearson Education
4. **Gubner,** *Probability and Random Processes for Electrical and Computer Engineers,* Cambridge University Press, 2006

The question paper consists of Part A and Part B. Part A is for 40 marks. Part A consists of **10** *compulsory short answer questions each carrying 4 marks covering the entire syllabus.*
Part B is for 60 marks. There will be two questions from each module. The candidate has to answer one question of 20 marks from each module.
No charts, tables, codes are permitted in the Examination hall if necessary relevant data is given along with the question paper by the question paper setter.

08.502 ELECTRONIC INSTRUMENTATION

L/T/P: 2/1/0 **Credits: 03**

Module - I

Process Control - block diagram, identification of elements, sensor time response - first and second order response. Description of control valves, actuators and current to pressure and pressure to current converters.

Transducers - definition - primary and secondary transducers.

Process instrumentation - Temperature measurements - resistance temperature detectors, thermistors and thermocouples - associated signal conditioning circuits. Optical pyrometers, infrared thermometry.

Measurement of humidity - resistive type and capacitive type transducers Measurement of fluid flow - electromagnetic flow meters - ultrasonic flow meters Displacement transducers - LVDT - principle, gray code encoders Measurement of force and pressure - strain gauges - semiconductor strain gauge - bridge configuration of strain gauges - load cells - piezoelectric transducers, Torque measurement Programmable logic controllers - basic structure, operation

Module - II

Review of operational Amplifier circuits - precision rectifier, ZCD, current to voltage converter, phase shifter, Instrumentation amplifier using three Op-Amps, isolation amplifier using opto-coupler.

Filters: active filters - frequency response of major active filters - Butterworth low pass, high pass and band pass filter - comparison between Butterworth and Chebyschev filters.

Display devices - LED, LCD and EPID

Regulated power supplies using linear ICs - regulator ICs 723, 78XX, 79XX, 317. Voltage controlled oscillator, PLL IC 565 and its applications.

Module - III

Data converters - Digital to analog converter - ladder networks - settling time of DAC

Analog to digital converters - successive approximation, dual slope and simultaneous converters, conversion time. Resolution, quantisation error, gain error and linearity error of ADCs.

Digital multimeters - resolution in digital meters. Digital measurement of frequency, phase angle, time interval - electronic energy meter. Principle of digital storage oscilloscope - block schematic, sampling and storage.

Data acquisition systems - block diagram, signal conditioning, sampling rate, sample and hold, analog multiplexing.

REFERENCES

1. Robert F. Coughlin & Fredrick F. Driscoll, "Operational Amplifiers and Linear Integrated Circuits", 6th Edition, Pearson Education, 2001
2. Ramakant S. Gayakward, "Op-amps and Linear Integrated Circuits", Pearson Education/ PHI, 2002
3. Curtis D. Johnson, "Process Control Instrumentation Technology", Pearson Education, 2003.
4. Kalsi H.S., "Electronic Instrumentation", Tata McGraw-Hill, New Delhi
5. Murray D. V.S., Transducers and Instrumentation", Prentice Hall of India, 2003.
6. Albert D. Helfrick and William D. Cooper, "Modern Electronic Instrumentation Devices and Systems", Prentice Hall of India, 1992.
7. Rangan C.S., Sarma G.R., and Mani V.S.V., "Instrumentation Devices and Systems", Tata McGraw Hill, 1992.

Note :

1. ***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).***
2. ***Maximum of four questions and a minimum of three questions from each module should be included in Part A.***

08.503 ELECTRICAL MEASUREMENTS – II

L/T/P: 2/1/0 **Credits: 04**

Module - I

Magnetic Measurements - measurement of flux and permeability - flux meter -Hall effect - Gauss meter. Ballistic Galvanometer - Principle - calibration -applications. Determination of BH curve and hysterisis loop, Lloyd Fisher square — measurement of iron losses

Illumination - Definition of solid angle, Candella, Luminous flux, Luminous intensity, illumination, luminance - Laws of illumination - Inverse square law and Lamberts Cosine Law - Measurement of Candle power - Photometric bench, Bunsen and Lummer Brodhun Photometer heads - Measurement of illumination Macbeth illuminometer - Distribution of Candle Power - Polar curve - Determination of mean spherical candle power by Rosseau's construction - Integrating spheres.

Module - II

Instrument transformers: Need of instrument transformers. Theory of current transformer - Phasor diagram, expression for ratio error and phase angle. Theory of potential transformer - Phasor diagram - expression for ratio error and phase angle error, design consideration for minimisation of errors - variation of error with burden of instrument transformer, precaution while using current transformers. Testing of current transformers - mutual inductance method and Biffs method. Testing of potential transformers (absolute method only).

High voltage measurements. Measurement of high dc voltages - series resistance - microammeters - resistance potential divider - generating voltmeters - measurement of high ac voltages - electrostatic voltmeters - sphere gaps - high frequency and impulse voltage measurements with CRO using resistance and capacitance dividers. Peak voltmeter - Impulse voltage generators.

High current measurements - DC Hall effect sensors - high current AC magnetic potentiometers.

Module - III

Cathode Ray Oscilloscope. Principle of operation - Block diagram of general purpose CRO. Operation of cathode ray tube - electrostatic focussing and deflection - types of screens - vertical deflecting system - vertical amplifier - delay lines - purpose and principle. Horizontal deflection system - basic sweep generator – synchronization – triggering - principle of delayed sweep - XY mode of operation of CRO. Lissajous patterns - applications of CRO - determination of frequency and phase angle - double beam CRO.

Measurement of rotational speed - tachogenerators

Signal Generators - Basic standard signal generator (sine wave), modern signal generator - Function Generator

Textbook:

1. Sawhane A.K., "A Course in Electrical & Electronic Measurements & Instrumentation", Dhanpath Rai & Co. 1992.
2. Golding EW & Widdies : Electrical Measurements & Measuring Instruments, Fifth Edition, Wheeler & Co, 1991.

References

1. Albert D. Helfrick & William D. Cooper: "Modern Electronic Instrumentation and Measurement Technique", Prentice Hall of India, 1992.
2. Naidu M.S. & Kamarai K., "High Voltage Engineering", TMH, 2nd Edition, 1993.
3. Melwille B., "Stout: Basic Electrical Measurements", Prentice Hall of India, 1992.
4. Kalsi HS, "Electronic Instrumentation", Tata McGraw Hill, New Delhi.

Note :

3. ***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).***
4. ***Maximum of four questions and a minimum of three questions from each module should be included in Part A.***

08.504	Power Electronics	
L/T/P: 2/1/0		**Credits: 3**

Module – I

SCRs – Structure – VI characteristics – gate control – two transistor analogy – voltage and current ratings – dynamic characteristics –di/dt and dv/dt ratings – thermal equivalent circuit-heat sink – series and parallel connections of SCRs.

Gate characteristics of SCR – single pulse triggering – carrier triggering – isolation using pulse transformers and opto couplers – triggering circuits – synchronization – R and RC triggering circuits – UJT triggering circuits – Triac – characteristics – gate triggering modes – Diac triggering circuits for triacs in phase control – device operation and VI characteristics of GTO, Power MOSFET, IGBT, power transistor.

Module – II

SCR circuits for phase controlled rectification – single phase half wave and full wave converters – Semi-converter and full converter with R, RL and RLE loads – output voltage expression – effect of free wheeling diode- inverter operation-continuous and discontinuous current mode of operation.

Three pulse and six pulse converters – output voltage expression for m-pulse converter – 3 ϕ fully controlled bridge converter –3 ϕ half controlled bridge converter - effect of source inductance.

Module – III

Choppers – step down and step up choppers –voltage and current commutated choppers – output voltage control.

Inverters – voltage source inverters – basic parallel inverters with commutation– basic series inverters – voltage control in inverters – pulse width modulation – multiple pulse width modulation – sinusoidal pulse width modulation – harmonics reduction in inverters – three phase full bridge inverters – 120^o and 180^o conduction mode. 1 ϕ current source inverter.

REFERENCES

1. Muhammad H. Rashid, “Power Electronic Circuits, Devices and Applications”, Pearson education, Asia 2003.
2. Jay P. Agarwal, “Power Electronic Systems – Theory and Design”, Prentice Hall, New Jersey, 2001.
3. M.D. Singh, K.B. Khanchandani, “Power Electronics””, Tata McGraw – Hill, New Delhi, 1998.
4. G.K. Dubey, S.R. Doradla, A. Joshi, R.M.K.Sinha, “Thyristorised Power Controllers”, Wiley Eastern Ltd., 1986.
5. Ned Mohan Tore M Undeland, William P Robbins., “Power Electronics, Converters, Application and Design”, John Wiley and Sons.
6. P.S. Bimbhra, “Power Electronics”, Khanna Publishers.
7. Philips Krein, “Elements of power electronics”, Oxford University Press.
8. Cyril.W.Lander, “Power Electronics”, McGraw – Hill.

Note :

1. ***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).***
2. ***Maximum of four questions and a minimum of three questions from each module should be included in Part A.***

08.505	ELECTRICAL MACHINES – II	
L/T/P: 2/2/0		**Credits: 4**

Module - I

Alternators - constructional features of cylindrical rotor and salient pole machines - synchronous speed, AC windings - single layer and double layer - different types of single layer windings - double layer winding - lap winding - wave winding - short chorded winding - integral slot and fractional slot winding. EMF equation distribution factor - coil span factor. Field mmf and gap flux density distribution. Harmonics in induced emf - remedial measures. MMF of AC windings - space harmonics - revolving magnetic field. Theory of cylindrical rotor machines - armature reaction - synchronous impedance.

Module - II

Voltage regulation - determination of regulation by EMF, MMF, Potier and ASA method - short circuit ratio.

Theory of salient pole synchronous machines –Blondel"s two reaction theory- direct axis and quadrature axis synchronous reactances - phasor diagram and calculation of voltage regulation - determination of Xd and Xq by slip test. Parallel operation of alternators - performance of two alternators operating in parallel synchronizing power - effect of speed regulation on load sharing - Methods of synchronizing - synchroscope - principle of automatic synchronizing.

Module - III

Synchronous motor-load angle- torque and power relationship - phasor diagram - starting of synchronous motors - losses and efficiency calculations.

Synchronous machines on infinite bus bars - V curves and inverted V curves - synchronous condenser - power flow equations for cylindrical and salient pole machines - power Vs power angle diagram - Reluctance power - maximum power transfer - Stability limit - Control of active and reactive power in synchronous machines on infinite busbars. Electrical and mechanical load diagrams - Hunting in synchronous machines - natural frequency of oscillations - damper windings. Brushless alternators operation – Constructional details and principle of operation.

REFERENCES

1. MG Say, "Performance and design of AC machines", Pitman & ELBS
2. Bimbra P.S., "Electrical Machines", Khanna Publishers
3. Nagarath and Kothari D.P., "Theory of AC machines", Tata McGraw Hill, New Delhi)
4. B R Gupta, Vandana Singhal, "Fundamentals of Electric Machines", New Age International.
5. Alexander S Langsdorf, "Theory of alternating current machinery", Tata Mcgraw Hill, New Delhi.
6. Theodore Wildi, "Electrical Machine Drives and Power Systems", Pearson Edn. Asia 2001.

Note ***:***

1. ***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).***
2. ***Maximum of four questions and a minimum of three questions from each module should be included in Part A.***

08.506 (Elective – I) (a) COMPUTER ORGANISATION	
L/T/P: 2/1/0	**Credits : 3**

Module 1

Basic Operational concepts - Von-Neumann architecture, Bus structure - monobus and multibus structures, PCI Bus, Addressing methods. Instruction formats - Instruction sequencing.

Processing unit - fundamental concepts - single bus organisation of CPU - multiple bus organisation of CPU, memory read and memory write operations - Data transfer using registers. Execution of a complete instruction - sequencing of control signals.

Computer Arithmetic - Constructing an arithmetic logic unit - A 32 bit ALU, Basic Operations - Signed and unsigned addition - carry look ahead adder, subtraction, Multiplication algorithm - Booths algorithm, Division algorithm.

Module - II

Control unit - hardwired control and micro-programmed control - grouping of control signals - microinstruction with next field address - Pre-fetching of microinstructions -Emulation.

Input/output organisation - Organisation of interrupts - vectored interrupts - Setting of priorities - Interrupt masking - Servicing of multiple input/output devices - Polling and daisy chaining schemes. Direct memory accessing(DMA). I/O channels (introduction only). I/O interfacing - Interfacing I/O devices to memory, processor and operating systems, I/O overheads in various methods of data transfer. Bus standards - IEEE standards – SCSI.

Module - III

Main memory unit - Memory organisation - memory cells – static memory-dynamic memories -multiple module memory - Memory interleaving - Cache memory - principles -elements of cache design - mapping function - associate mapping - set associative mapping - fully associative mapping - aging.

Advanced computer architecture - Organisation of multi-user computer system. Principles of RISC machines - Overview of parallel processor, multiprocessor and bit-slice architecture. Pipelining, Overview of data-flow architecture.

TEXT BOOKS

1. V. Carl Hamacher, "Computer Organisation", McGraw-Hill Publishing Company, 2002.
2. Hennessy & Patterson, Computer Organisation and design, "Harcout Asia Pte Ltd., 2000.
3. Stallings, " Computer Organisation and Architecture".

Note :

1. ***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).***
2. ***Maximum of four questions and a minimum of three questions from each module should be included in Part A.***

08.506 (Elective – I) (b) SUPERCONDUCTIVITY AND APPLICATIONS
L/T/P : 2/1/0 Credits : 3

Module I
Discovery - Early history - Meissner Effect - Superconductor as a Thermodynamic phase - Perfect Diamagnetism- Super currents - penetration depth - Magnetic Phase Diagram - Critical field and Critical temperature - Type I and Type II Superconductors - Flux Quantization - Josephson Effects and Tunnelling - SQUID- superconductivity and super fluidity- superconducting materials at Liquid Helium Temperatures- High-T_c Cuprates - General features of Cuprate superconductors - Copper-free oxide superconductors - Preparation of superconducting of materials.

Module II
Theories - The London equation - Ginzburg-Landau Theory - The BCS Theory-The first Cuprate family - The Normal (Metallic) state of Cuprate superconductors - Electronic structure of Cuprates - Relevant orbitals and a two-band model -Phonon mechanism - spin fluctuations - Excitonic Mechanisms - Interlayer Tunnelling - Low-temperature (Liquid He) superconductors - High temperature superconductors - pressure induced structural changes in superconducting compounds - The classical superconductors - BSCCO2223 - Thin film superconductors - 1-2-3 superconductor - Thallium, barium, calcium, copper and oxygen compound - Hg-Ba-Cu-O System – $YBa_2Cu_3Se_7$.

Module III
3-D images Derived magnetic resonance images - Superconducting Magnetic Energy Storages (SMES) - Actively shielded transportable SMES Systems - High temperature superconductors and their potential for utility applications - Design of air-core superconducting power transformer-cable transmission system - High temperature superconducting magnetic motor - Superconducting power generation - Power systems of the future - Superfast magnetically levitated train-Superconducting quantum interference device (SQUID)– Supercomputers -Superconductors in defence application - Advantages of HTSC - ore refining (magnetic separators) - Magnetic shielding - Large Physics machines (colliders, fusion confinement) – semiconductor - superconductor hybrids (A-D converters) -Active Superconducting elements (FETs) – Optoelectronics - Matched filters.

Textbooks

1. Superconductivity Today by T V Ramakrishnan and C N R Rao published by Wiley Eastern Limited, New Delhi, 1993.
2. Superconductivity by Charles P Poole, Jr, Horacio A Farach, Richard J Creswick, Published by Academic Press, New York, 1996.
3. Superconducting Magnets by M N Wilson published by Clarendon Press, Oxford, 1983.
4. Superconducting Quantum Electronics (ed.) by V Kose, Springer Verlag, Berlin, 1989.
5. Superconductivity And Applications by Premlet and M Jayaraju,Phasor Books,2008.

Note :
1. ***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).***
2. ***Maximum of four questions and a minimum of three questions from each module should be included in Part A.***

	08.506	**(Elective-I)**	**(c)**	**Operations Research**
L/T/P : 2/1/0				**Credits : 3**

Module – I

Definition of OR, Modeling in OR, general methods of solving OR models, Scientific methods in OR.

Mathematical formulation of Linear Programming Problem, Graphical solution, Simplex Algorithm and its applications, use of artificial variables, (quality, economic interpretation), degeneracy and elementary sensitivity analysis.

The transportation problem, mathematical formulation, Solution, degeneracy, unbalanced transportation problem.

Assignment problem, mathematical formulation, the assignment algorithm, unbalanced assignment problems.

Module – II

Replacement model, types of replacement problem, problem of choosing between two machines, determination of best replacement age of machine using present worth and discount rate, group replacement.Sequencing.

Game theory – definition of a game, pay-off, two person zero sum game, graphical solution, application in marketing, advertisement etc.

Decision theory – decision under risk – expected value of profit or loss, expected variance criterion, decision trees, decisions under uncertainty – the Laplace criterion, the mini-max criterion, minimax regret criterion, Hurwicz criterion.

Inventory problems, the economic lot size system, Newspaper boy problem, purchase, inventory model with price breaks.

Module – III

Network analysis, project scheduling by PERT – CPM, Arrow head representation, calculation of critical path, probability and cost consideration in project scheduling. Construction of the time chart-resource leveling, queuing theory, basic elements of the queuing model problems connecting (m/m/I) and (m/m/k) – Problems – various applications in commercial subjects.

REFERENCES

1. B.S. Goel and S.K. Mittal, “Operations Research”.
2. Frederick S. Hiller and Generald J. Lieberman, “Operations Research”, CBS Publishers & Distributors, Delhi.
3. Frank S. Budnick, Dennis McLeavey and Richard Mojena, “Principles of Operations Research for Management”, AITBS Publishers, Delhi.

Note :

1. ***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).***
2. ***Maximum of four questions and a minimum of three questions from each module should be included in Part A.***

08.506 (Elective – I) (d) NEW AND RENEWABLE SOURCES OF ENERGY
L/T/P : 2/1/0 Credits : 3

Module I

Renewable and non-renewable sources of energy - Brief review of conventional sources of energy - Energy production and world energy consumption - Greenhouse effect and global warning.

Solar energy option - Thermal conversion - Design, fabrication and performance of flat plate collectors - Description of solar thermal devices (stills, water heaters, furnaces, cookers and refrigerators) - Solar thermal power generation systems - thermal storage.

Photovoltaic conversion - Conceptual description of photovoltaic effect - Electrical characteristics of silicon PV cells and modules - Solar cell materials and prospects - Instruments for measurement of solar radiation - Empirical equations for predicting availability of solar radiation.

Module - II

Wind energy - Wind turbines - Horizontal axis and vertical axis wind turbines - Power and energy from wind turbines - Wind characteristics.

Energy from oceans: Wave energy - Physical principles - Wave characteristics and wave power - Wave energy technology - Fixed devices - Floating devices.

Ocean thermal energy conversion (OTEC) - Principles - Methods of power generations - Heat exchangers - Basic ideas about other practical considerations.

Tidal power - Basic principles - Power generation - Limitations of tidal generation.

Module - III

Biomass: Extracting energy from bio-fuels - Direct combustion, gasification, pyrolysis, anaerobic digestion, fermentation - Energy from refuse - Refuse derived fuel (RDF) - Energy farming.

Small hydro power: Classification as micro, mini and small hydro projects - Basic concepts and types of turbines - Design and selection considerations.

Recent trends (only brief description expected): Fuel cell, hydrogen energy, alcohol energy, nuclear fusion, power from satellite stations.

REFERENCES:

1. Renewable energy resources - John W. Twidell and Anthony D. Weir, English Language Book Society (ELBS), 1996.
2. Renewable energy - power for sustainable future - Edited by Godfrey Boyle, Oxford University Press in association with the Open University, 1996.
3. Renewable energy sources and their environmental impact - S. A. Abbasi and Naseema Abbasi, Prentice-Hall of India, 2001.
4. Non-conventional sources of energy - G.D. Rai, Khanna Publishers, 2000.
5. Solar energy utilization - G.D. Rai, Khanna Publishers, 2000.
6. Renewable and novel energy sources - S.L. Sab, MI. Publications, 1995.
7. Energy Technology - S. Rao and B.B. Parulekar, Khanna Publishers, 1999.
8. Direct Energy Conversions - George Sutton - McGraw Hill Publications.

Note ***:***

1. ***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).***
2. ***Maximum of four questions and a minimum of three questions from each module should be included in Part A.***

08.507	Digital Circuits Lab	
L/T/P: 0/0/4		**Credits : 4**

1. Characteristics of TTL and CMOS gates
2. Familiarisation of Logic Gates
3. Verification and Realisation of DeMorgan's theorem and Realisation of SOP and POS functions after K map reduction
4. Half adder and full adder (using XOR, AND and OR gates)
5. 4 bit adder/ subtractor and BCD adder using IC 7483/ CMOS equivalent.
6. Realization of RS, T, D, JK flip-flops using gates.
7. Study of Flip Flop ICs (7474, 7476).
8. Design and testing of monostable and astable multivibrators using ICs. (74121 for monoshot and 555 for astable)
9. BCD to decimal decoder and BCD to 7 segment decoder and display
10. Realisation of two bit comparator using gates and study of four bit comparator IC (7485)
11. a) Realisation of MUX using gates and study of MUX IC.
    b) Realisation of combinational circuits using MUX
12. a)Realisation of ripple counters using flip flops
    b)Study of counter ICs (7490, 7493)
13. Design of synchronous up down and Modulo N counters.
14. a)Realisation of four bit serial IN serial OUT registers using flip flops.
    b)Study of Shift register IC 7495, ring counter and Johnsons counter
15. *Optional - Simulation of some of the above experiments using VHDL/PSPICE.*

Examination Duration: 3 hours

Note:
For University examination, the following guidelines should be followed regarding award of marks
(a) Circuit and design -30%
(b) Performance -30%
(c)Result -20%
(d) Viva voce -20%

08.508 MEASUREMENTS AND INSTRUMENTATION LAB

L/T/P : 0/0/4 **Credits 4**

1. Resistance measurement using Kelvin's Double Bridge and Wheatstones's Bridge
2. Calibration of ammeter using slide-wire potentiometer
3. Calibrations of voltmeter, wattmeter using vernier dial potentiometer
4. Calibration of single phase energy-meter by direct and phantom loading
5. Calibration of three phase energy meter using phase-shifter.
6. Plotting the magnetizing curves of (i) ring specimen (ii) transformer core.
7. Simulation of Hysteresis Loop on the CRO.
8. Opamp Circuits: Summer,integrator, differentiator, Wien Bridge Oscillator, Instrumentation amplifier
9. Opamp Comparator circuits: level detector, ZCD, Schmitt Trigger
10. Characteristics of LVDT, Load-cell
11. Characteristics of Thermistor
12. Characteristics of Thermocouple, RTD

Note:

For University examination, the following guidelines should be followed regarding award of marks

(a) Circuit and design -30%
(b) Performance -30%
(c)Result -20%
(d) Viva voce -20%

B. TECH DEGREE COURSE
2008 SCHEME

ELECTRICAL AND ELECTRONICS ENGINEERING

SCHEME AND SYLLABUS FOR 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	Electrical Machines III	2	1	-	50	3	100	3
08.602	Microprocessors & Applications	2	2	-	50	3	100	4
08.603	Numerical Techniques & Computer Programming	2	2	-	50	3	100	4
08.604	Industrial Engineering & Management	2	1	-	50	3	100	3
08.605	Power System Engineering II	2	2	-	50	3	100	4
08.606	Elective II	2	1	-	50	3	100	3
08.607	Power Electronics Lab	0	0	4	50	3	100	4
08.608	Microprocessor Lab	0	0	2	25	2	50	2
08.609	Software Lab	0	0	2	25	2	50	2
	Total	13	8	8	400		800	29

08. 606 Elective II

(a) Energy Conservation and Management
(b) Biomedical Instrumentation
(c) Software Engineering
(d) Technical English and Communicative Skills

08.601	ELECTRICAL MACHINES III (E)	
L/T/P : 2/1/0		**Credits : 3**

Module - I

3-phase induction motor, constructional features - slip ring and cage types - theory of induction motor with constant mutual flux - slip - phasor diagram - expression for mechanical power and torque - torque-slip characteristics - starting torque - full load and pull out torque - equivalent circuit. Circle diagrams - tests on induction motors for determination of equivalent circuit and circle diagram Harmonics - harmonic induction and harmonic synchronous torques - cogging - crawling and noise production in cage motors - remedial measures. Effect of unbalance in supply voltage.

Module - II

Boucherot's double cage motor - analysis by equivalent circuit - approximate current locus - torque-slip curves. Starting of induction motors - DOL starter - auto transformer starting - star-delta starting -rotor resistance starting. Inter lock and over load protection - comparison of different starting methods. Starting current and starting torque. Speed control - stator voltage control – V/f control, Cascaded Control - rotor resistance control. Slip Power Recovery(principle only) - Braking –different methods -Induction generator - principle - phasor diagram – circle diagrams - applications - comparison with synchronous generators. Self-excited induction generator.

Module - III

Synchronous induction motor - circle diagram - Single-phase induction motor - double field revolving theory - equivalent circuit - torque slip curve - starting - split phases-stating- shaded pole repulsion starting- applications. AC Commutator motors - single phase series motor - construction - phasor diagram - universal motor- Brushless DC motor – (Principle) – Switched Reluctance motor – (Principle)

Linear induction motor – principle – different types – end effects – applications – magnetic levitations.

REFERENCES

1. Say M.G, Performance and design of ac machines, ELBS and PITMAN
2. Langsdorf A S - Theory of AC machines, Tata McGraw Hill, New Delhi
3. Fitzgerald and Kingsly - Electrical machinery, McGraw Hill
4. D.R. Gupta, Vandana Singhal, fundamentals of Electric Machines, New Age International
5. Open Shaw Taylor E - , “Performance and design of AC commutator motors”.
6. Theodore Wilde, “Electrical Machines, Drives and Power System”, Pearson Ed. Asia 2001.
7. R.Krishnan, “Electric Drives”,
8. Irving L. Kossov, “Electrical Machinery and Transformers”,

Note :

5. 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).
6. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.602 MICROPROCESSORS & APPLICATIONS

L/T/P : 2/2/0 **Credits : 4**

Module – I

Internal architecture of 8085 microprocessor – pin out diagram - Instruction set of 8085- Instruction format – opcodes and operands – Addressing modes – Classification of instructions.
Assembly language programming – assembler directives – assemblers and cross assemblers – program debugging. Development of standard programs in assembly language – code conversion, sorting – binary and BCD arithmetic. Stack and Subroutines – conditional CALL and RETURN instructions – stack operations.

Timing and control – Machine cycles and clock states – fetch and execute cycles – Timing diagram for instruction and data flow

Module – II

IO and memory interfacing - Interfacing memory – Address decoding – Programmable I/O ports – Programmable peripheral interface PPI 8255- Modes of operation. Methods of data transfer – synchronous and asynchronous data transfer, Programmed data transfer – interrupt driven data transfer – interrupt structure of 8085. Interfacing of LEDs, ADC and DACs. Case study – microprocessor based temperature control consisting of 8085 CPU, 2K RAM, 2K EPROM, PPI 8255, 8 bit A/D converter and LEDs to indicate normal, high and low temperature.

Module – III

Internal Architecture of 8086 Bus interface unit and execution unit – Segment Registers -Instruction Pointer – Flag Register – Index Registers - Stack Pointer Register. Segmentation and Pipe lining. Minimum and maximum modes of operation of 8086. Addressing modes- Instruction set of 8086 – Assembly language programming, Simple programs.

REFERENCES

1. Gaonkar : Microprocessor, Architecture, Programming and Applications, Wiley Eastern Ltd. New Delhi, May 1992.
2. Mathur A : Introduction to Microprocessors, Tata Mc Graw Hill, New Delhi, 1992.
3. Ram : Microprocessors & Applications.
4. Naresh Grover, Microprocessors
5. Douglas V. Hall : Microprocessors and Interfacing, TMH, New Hill
6. M. Rafiquzzaman : Microprocessor Theory and Application, PHI.
7. Ray& Burchandi – Advanced Microprocessor & Peripherals.

Note :

1. 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).
2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.603	Numerical Techniques & Computer Programming
L/T/P : 2/ 2/ 0	**Credits:4**

Module 1

Introduction, basic data types in C , input/output, operators – expression – unary, binary and ternary operators. Decision making – if and switch case . Loops – for, while and do while, Break - continue. Structured data types – array, structure and union.

Module 2

Functions - storage classes – recursive functions. Pointers – array Vs pointer – array of pointers, pointer to a structure – implementation of stack and queue using pointers - pointer to a function. Dynamic allocation of memory, command line arguments. File handling in C – unformatted and formatted files.

Module 3

Programming examples in C for the solution of linear equations using Gauss and Gauss Jordan elimination methods- determinant and inverse of matrices – eigenvalue and eigenvectors, numerical integration – Trapezoidal and Simpson's 1/3 rule, Solution of transcendental equations using newton-raphson method-bisection method, numerical solution of ordinary and partial differential equations- Euler's method – Runga-kutta method.

References:

1) Stephen G Kochan , "Programming in C", CBS Publishing Co.
2) Brian W Kernighan & Dennis M Ritchie, "The C Programming language" Pretice Hall - India-1986
3) Krishnamurthy E. V. & Sen S.K.: "Computer Based Numerical Algorithms", Wiley Eastern.
4) W.H. Press, S.A. Teukolsky, W.T. Vetterling, B.P. Flannery, "Numerical Recipes in C" Cambridge University Press.
5) B.S. Grewal, "Numerical Methods and Computer Programming".

*Note **:***

1. 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).
2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.604	Industrial Engineering and Management (E)	
L/T/P : 2/1/0		**Credits : 3**

Module I

Evolution of Scientific Management and Industrial Engineering. Acivities of Industrial engineering –techniques of industrial engineering - Industrial engineering in service sector. Functions of Management - Brief description of each function.

Types of Organisation structures.Types of companies and their formation.

Personal Management - Objectives and functions - Recruitment, Selection,Training, Induction concepts and techniques.

Production cost concept and break even analysis –simple problems

Introduction to financial management- scope of financial management - functions - objectives of financial management. Working capital- factors affecting working capital- working capital cycle

Depreciation - methods of calculating depreciation.

Module II

Facility location : Factors influencing plant location- Plant layout- different types of layout- material flow pattern-layout planning-systematic layout planning-computerized layout planning techniques

Work study-Methods study and Time Measurement, Steps in methods improvement-Use of chart and diagrams.

Performance rating and Methods - Types of Allowances, computation of basic time and Standard time - Examples.

Wages and Incentives-System of Wage Incentive Plans, Job evaluation and Merit rating.

Module III

Industrial relations- Fatigue and methods of eliminating fatigue.

Industrial disputes -collective bargaining-Trade unions

Production Planning and Control-Functions and Objectives-job, batch, mass and continuous production-Materials Management – Importance, Inventory, Determination of EOQ, selective inventory control techniques.

Quality Engineering-Quality control- Control chart for variables and attributes-Introduction to ISO-9000 series-ISO 14000 series- Total Quality Management, Six sigma concept –quality circles-Quality Information systems, Bench marking and Documentation.

Introduction to Marketing and its Environment -Marketing concept, market Segmentation methods- Marketing mix- Product life cycle.

Project management- Phases-Planning using PERT and CPM (concepts only)

References:

1 M. Mahajan, Industrial engineering and Production management, Dhanpat Rai&Co

2.Martand Telsang, Industrial engineering and Production management, S Chand &CO Ltd.

3. Grant and Levenworth, . Statistical Quality Control, TMH.

4. Krafewsk, Operations Management –Pearson Education 6th Edn.

5. Introduction to Work Study- ILO

6. Besterfield, Total Quality management –Peaarson Education.

7 Richard L. Francis & John .A. White, Facility Layout & Location - Prentice Hall

8. Kotler, Marketing Management - Pearson Education.

9. Roger G. Schroedu, Operations Management - Mc Graw Hill

10. Khan and Jain, Financial Management, TMH.

11. Pandey I.M., Financial Management, VIkas Publishers.

12.Prasenna Chandra,Project Planning Analysis Selection Implementation and review-TMH

Note :

1. 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).
2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.605 POWER SYSTEM ENGINEERING - II

L/T/P : 2/2/0 **Credits : 4**

Module – I

Power system faults - symmetrical faults - short circuit MVA - current limiting reactors, Symmetrical components - sequence impedances and sequence networks of generators, transformers and transmission lines. Unsymmetrical faults - single line to ground, line to line, double line to ground faults -consideration of prefault current.

Module – II

Fuses: Fuse Characteristics, Types of Fuses, Selection of Fuses

Circuit breakers - Arc voltage, Arc interruption - Restriking voltage and Recovery voltage, Resistance Switching, Current chopping, Interruption of capacitive current

Classification of Circuit Breakers: Oil circuit Breaker - Air Blast Circuit Breaker, Air Break Circuit Breaker, SF_6 Circuit Breaker, Vacuum Circuit Breaker- Operating Mechanism, Selection of Circuit Breakers - High voltage dc Circuit Breakers, Rating of Circuit Breakers - Testing of Circuit Breakers

Protective relays - Introduction - Zones of Protection - Primary and Back up Protection - Essential qualities of protection - Classification of Protective relays - Basic Relay Terminology and characteristics- Types of Electromagnetic relays - Over current protection - Distance protection - Pilot relaying schemes(basic concepts only) – Principle of Relay coordination

Module - III

AC Machines Protection: Generator: Stator, rotor and other miscellaneous protections - Transformer Protection: Percentage Differential Protection, Overheating Protection - Buchholz Relay - Protection against magnetizing inrush current – earth fault protection of power transformer – overfluxing protection - Bus zone protection: Differential current protection.

Static relays - Merits and Demerits - Types of Amplitude and Phase Comparators Microprocessor based Protective relays: Block schematic and flow charts of over current relay, impedance relay and directional relay.

Power System earthing – objective- tolerable limits of body current – step and touch voltage (tolerable and actual values) – impulse behaviour of earthing systems – neutral earthing – Arc suppression coils – grounding practice.

TEXTBOOK

1. Badri Ram & A N Vishwakanna. “Power System Protection and Switchgear, TM H, 1994
2. B.R. Gupta: “Power system Analysis and Design”, Wheeler publishers, 1993.

REFERENCES

1 IJ.Nagrath, D.P.Kothari, “Power system Engineering”, TMH, 1994.
2 C .L. Wadhwa, “Generation, Distribution and Utilisation of Electrical Energy Wiley Eastern Ltd., 1993
3 S.S.Rao, “Switchgear & Protection”, KhannaPublishers, 1986
4 B Ravindranath & M Chander, “Power System Protection and Switchgear, Wiley Eastern Ltd, 1997.
5 M, V. Deshpande, “Switchgear and Protection”, TMH, 1997.
6 Grainer JJ, Stevenson W.D, “Power system Analysis”, McGraw Hill, 1994
7 P Switchgear Handbooks

Note :

1. 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).
2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.606 (Elective – II)	(a)ENERGY CONSERVATION AND MANAGEMENT
L/T/P : 2/1/0	Credits : 3

Module - I

Global energy scenario, Global warming and need for energy conservation - Energy intensity -Energy - GDP coupling - General principles of energy management and energy management planning. Establishing energy database - Energy audit - Identifying, evaluating and implementing feasible energy conservation opportunities - energy audit report. Study of various governmental agencies related to energy conservation and management.

Module II

The energy management profession - Thermodynamics and energy - Energy efficiency analysis - Coefficient of performance - Energy effectiveness. Management of heating, ventilating and air-conditioning (HVAC): principles, opportunities and case studies. Management of process energy: principles, opportunities and case studies. - Management opportunities with electric drives, lighting, heating and electrolytic systems - Electrical load analysis - Peak demand control. Energy efficient motors.

Management of electrical load and lighting - Energy Efficient lightings- CFL's, advantages and disadvantages. LED, power LED's, advantages and disadvantages. Surface mounted devices. Solar powered lightings.

Module III

Financial evaluation of energy projects: Evaluation of proposals - Payback method - Average rate of return method - Internal rate of return method - Present value method - Life cycle costing approach, Life cycle cost – analysis of lamps. Least cost power planning; end-use oriented energy scenario - DEFENDUS strategy.
Use of computers in energy management (description about basic ideas only). Co-generation of electricity.

TEXTBOOKS

1. Industrial energy conservation - Charles M. Gottschalk - John Wiley & Sons, 1996.
2. Energy management principles - Craig B. Smith - Pergamon Press.
3. Introduction to Energy Conservation And Management by M Jayaraju and Premlet,Phasor Books,2008.

REFERENCES:

1. IEEE recommended practice for energy management in industrial and commercial facilities, IEEE std 739 - 1995 (Bronze book).
2. Optimizing energy efficiencies in industry - G.G. Rajan, Tata McGraw Hill, Pub. Co., 2001.
3. Energy management - Paul O'Callaghan - McGraw Hill Book Co.
4. Energy management Hand Book - Wayne C.Turner - The Fairmount Press, Inc., 1997.
5. Energy Technology - S.Rao and B.B. Parulekar, Khanna Publishers, 1999.

Note :

1. 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).
2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.606 (Elective – II) (b) Biomedical Instrumentation (E)
L/T/P : 2/1/0 Credits : 3

Module-1

Action potentials- Propagation, Bioelectric potentials.
Electrodes, sensors and transducers- Electrodes for ECG, EEG, EMG and Micro-electrodes, Transducers for the measurement of Pressure, temperature and respiration rate. Measurement of Heart rate and Respiration rate. Measurement of Blood Pressure- Direct and indirect methods. Measurement of Blood flow.

Module-II

Electrocardiography- Principle, lead system, standards, Block diagram of ECG machine-Pre-amplifier, driver and recorder. Block diagram of computer aided ECG.
Electroencephalography- Lead system, Position of Electrodes, Block diagram and features.
Electromyography- block diagram of EMG recorders, Applications
Bed side monitors- Block diagram.

Module-III

Modern imaging systems
Basic x-ray machines, CAT scanner- Principle of operation, scanning components, Ultrasonic imaging- principle, types of Ultrasound imaging, MRI scanning.(Principle only)
Therapeutic equipments Cardiac pace makers, de-fibrillators, hemo-dialysis machines, artificial kidney, short wave and Micro wave diathermy machines.
Patient Safety: Shock hazards – leakage current – safety and test instruments

References

1. Handbook of Biomedical Instrumentation, RS Khandpur, TMH Publishing Company Ltd. New Delhi, 2000.
2. Introduction to Biomedical Equipment Technology, Joseph J. Carr, John M. Brown, Pearson Education(Singapore) Pvt. Ltd., 2001.
3. Biomedical Instrumentation and Measurements, Leslie Cromwell, Prentice Hall of India Pvt. Ltd, New Delhi, 2000.
4. Medical Instrumentation, application and design – John G.Webster (Editor) – John Wiley and sons
5. Biomedical Electronics and Instrumentation, S K Venkata Ram, Galgotia Publishing, New Delhi. 2000.
6. Medical Electronics and Biomedical Instrumentation , C.Raja Rao and S.K.Guha, Universities Press, 2007.
7. Biomedical Engineering, S.N.Sarbadhikari, Universities Press,India PVT LTD, 2006.
8. Biomedical Instrumentation Dr.R.Arumugham

Note :

1. 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).
2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.606 (Elective – II) (c) Software Engineering	
L/T/P : 2/1/0	**Credits : 3**

Module I

Introduction: Software Crisis, Software Processes, Software life cycle models: Waterfall, Prototype, Evolutionary and Spiral models, Overview of Quality Standards like ISO 9001, SEI-CMM

Software Metrics: Size Metrics like LOC, Token Count, Function Count, Design Metrics, Data Structure Metrics, Information Flow Metrics.

Software Project Planning: Cost estimation, static, Single and multivariate models, COCOMO model, Putnam Resource, Allocation Model, Risk management.

Module II

Software Requirement Analysis and Specifications: Problem Analysis, Data Flow Diagrams, Data Dictionaries, Entity-Relationship diagrams, Software Requirement and Specifications, Behavioural and non-behavioural requirements, Software Prototyping.

Software Design: Cohesion & Coupling, Classification of Cohesiveness & Coupling, Function Oriented Design, Object Oriented Design, User Interface Design.

Software Reliability: Failure and Faults, Reliability Models: Basic Model, Logarithmic Poisson Model, Calender time Component, Reliability Allocation.

Module III

Software Testing: Software process, Functional testing: Boundary value analysis, Equivalence class testing, Decision table testing, Cause effect graphing, Structural testing: Path testing, Data flow and mutation testing, unit testing, integration and system testing, Debugging, Testing Tools & Standards.

Software Maintenance: Management of Maintenance, Maintenance Process, Maintenance Models, Reverse Engineering, Software Re-engineering, Configuration Management, Documentation.

Interface Design and CASE: GUI design - advantages - types of user interfaces. Styles of human-computer interaction - Human-Computer interface design - interface design models.

Computer Aided Software Engineering (CASE) tools - Tool integration - object management - Analysis and design tools - programming tools - Integration and testing tools - Maintenance tools.

Note :The semester assignment is a mini project which consists of the preparation of a software project proposal, planning and management.

Text:

1. R. S. Pressman, “Software Engineering – A practitioner’s approach”, 3rd ed., McGraw Hill Int. Ed., 1992.
2. K.K. Aggarwal & Yogesh Singh, “Software Engineering”, New Age International, 2001.
3. Rajib Mall, “Fundamentals of Software Engineering”, Prentice Hall of India, 2006

Reference:

1. R. Fairley, “Software Engineering Concepts”, Tata McGraw Hill, 1997.
2. P. Jalote, “An Integrated approach to Software Engineering”, Narosa, 1991.
3. Stephen R. Schach, “Classical & Object Oriented Software Engineering”, IRWIN, 1996.
4. James Peter, W Pedrycz, “Software Engineering”, John Wiley & Sons
5. Sommerville, “Software Engineering ”, Addison Wesley, 1999.

Note :

1. 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).
2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.606 Elective II (d) TECHNICAL ENGLISH AND COMMUNICATIVE SKILLS (B, H, E)
L/T/P : 2/1/0 Credits : 3

MODULE I

Vocabulary and Functional English: This area attempts at making learners withstand the competition at the transnational technical environment so as to enable them to undertake various professional operations.
1) Vocabulary – a basic word list of one thousand words.
2) Functional grammar, with special focus on Common Errors in English.
3) Idioms and Phrasal verbs.
(A brief review of the above topic is only desired)

Listening, Speaking and Reading: This area exposes the learners to the standard expressions including stress, rhythm and various aspects of isolated elements and connected speech.
The use of diphthongs, elements of spoken expression, Varieties of English, accent neutralization

Listening Skills: Listening for general content, Intensive listening, listening for specific information. Sounds, stress, intonation, question tag, listening to lectures, audio/video Cassettes, asking and answering questions, note-taking, dialogue-writing.

Speaking Skills: Oral practice: Describing objects/situations/people-Role play-(Individual and group activities) Just A Minute (JAM)/Group Discussion.

Reading Comprehension: This area exposes the learners to the techniques deciphering and analyzing longer texts pertaining to various disciplines of study.

Types of Reading, Sub skills of Reading, Eye span – fixation, Reading Aloud and Silent Reading, Vertical and Horizontal Reading, Vocalization and sub-vocalization.

Reading Skills: Skimming the text- exposure to a variety of technical articles, essays, graphic representation, and journalistic articles.

MODULE II

Written Communication Skills

This area exposes the learners to the basic tenets of writing; the style and format of different tools of written communication

Description (through paragraph writing), Reflection (through essay writing), Persuasion (through indented letter writing), skills to express ideas in sentences, use of appropriate vocabulary -sentence construction-paragraphs development-note making, informal letters, essentials of telephonic conversation, invitations, minutes of a meeting, editing a passage and essay writing.

Technical communication skills

Technical report writing (informational, analytical and special reports), technical vocabulary, technical communication- features, distinction between general and technical communication, and language as a tool of communication: levels of communication, interpersonal, organizational, mass communication, the flow of communication: upward, downward and lateral, importance of technical communication, barriers to communication.

Technical English for specific purposes (ESP): Business letters-sales and credit letters, letter of enquiry, letter of quotation, placing order. Job application and resume. Official letters, government letters, letter to authorities.

Reports-types, significance, structure and style, writing reports, condensing .Technical proposals-writing a proposal –the steps involved. Technical papers, projects, dissertation, thesis writing. Preparing audio-visual aids.

MODULE III

A non-detailed study of the autobiography: "Wings of Fire-An Autobiography by APJ Abdul Kalam".
Students should read the book on their own and selected topics may be discussed in the class.

REFERENCES

1. **Andrea J Rutherford**, *Basic Communication Skills for Technology, Pearson* Education.
2. **Mohan K and Sharma R C**, *Business Correspondence and Report Writing,* Tata Mc Graw Hill
3. **Barun K Mitra,** *Effective Technical Communication,* Oxford University Press, New Delhi.
4. **Robert J Dixson,** *Everyday Dialogues in English,* Prentice Hall of India.
5. **Lakshmi Narayanan K.R,** *English for Technical Communication,* Vol. I and II, Sci Tech Publications.
6. **Abdul Kalam A.P.J,** *Wings of Fire-an autobiography, Universities* Press, 2004.
7. **Randolph Quirk,** *Use of English Ist Edn,* Pearson, 1962
8. **Thomson A.J and Martinet A.V,** *Oxford Practical English Grammar 3rd Edn*, University
9. **Thomas Eliot Berry,** *Most Common Mistakes in English Usage,* McGraw Hill
10. **Sarma B.S,** *Structural Patterns and Usage in English,* Poosha Series
11. **John Langan, College Writing Skills**, Tata McGraw Hill, 2001.

University Examination:.
Six short questions to be answered out of 8 questions from Module I. Each answer carries 5 marks. (30 marks). Questions to be limited to the topics *Writing Skills& Basics of Technical Communication.* 2 questions out of 4 has to be answered from Module II. Each answer carries 15 marks. (30 marks).Two essays out of Four has to be answered from module III.. Each answer carries 20 marks. (40 marks).

	08.607	**Power Electronics Lab**
L/T/P : 0/ 0/4		**Credits : 4**

1. Study of Power devices- SCR, TRIAC, Power MOSFET, IGBT, etc.
2. Static VI characteristics of SCR
3. Characteristics of Power MOSFET.
4. Characteristics of IGBT
5. *Phase control circuit using R and RC triggering.
6. *UJT trigger circuit for single phase controlled rectifier.
7. *AC voltage controller using Triac.
8. *Regulated power supplies using 723.
9. *Study of PLL IC – Determination of lock in range and capture range.
10. *Ramp Control trigger circuit
11. *Digital trigger circuit.
12. Single phase fully controlled SCR bridge circuit.
13. Control of step down MOSFET/IGBT Chopper.
14. Triggering circuit for step down SCR Chopper.
15. Study of single phase Transistorized inverter.
16. Study of motor control using converter.

*Design of the triggering circuit is part of the experiment

Note: According to the facility available in the laboratory a minimum of 15 experiments should be conducted.

Examination Duration: 3 hours

Note:

For University examination, the following guidelines should be followed regarding award of marks

(a) Circuit and design -30%
(b) Performance -30%
(c)Result -20%
(d) Viva voce -20%

08.608 MICROPROCESSOR LABORATORY

L/T/P : 0/0/2 **Credit : 2**

1. Study of 8085 Microprocessor kit and Instruction set.
2. Data transfer instructions using different addressing modes and block transfer.
3. Arithmetic operations in binary and BCD-addition, subtraction, multiplication and division.
4. Logical instructions- sorting of arrays in ascending and descending order.
5. Binary to BCD conversion and vice versa.
6. Digital I/O using PPI-square wave generation.
7. Interfacing D/A converter- generation of simple waveforms-triangular wave, ramp etc
8. Interfacing A/D converter
9. Study of 8086 microprocessor.-8 bit and 16 bit multiplication and division.
10. Stepper motor control (8085).
11. D.C. motor control-interfacing of 12 V PMDC motor (8085).

Examination Duration: 2 hours

Note:
For University examination, the following guidelines should be followed regarding award of marks
(a) Circuit and design -30%
(b) Performance -30%
(c)Result -20%
(d) Viva voce -20%

	08.609	**SOFTWARE** LAB
L/T/P : 0/0/2		**Credit : 2**

1. Simple programs using input output statements
2. Simple programs using decision statements
3. Programs using Control statements
4. Array manipulation
5. Functions Pass by value Pass by reference
6. Recursive functions
7. String manipulation – compare, copy, reverse operations
8. Matrix operations: addition multiplication, determinant and inverse
9. Reading from a file and writing to a file merging and appending of files.
10. Solution of algebraic and transcendental equations: bisections, Newton- Raphson method- comparison
11. Numerical Integration – Simpson's 1/3rd rule-comparison.
12. Solution of set of linear equations-Gauss, Gauss-Jordan, Gauss-Siedel- comparison
13. Solution of differential equation – Euler, Runge-Kutta, step size- comparison

Examination Duration: 2 hours

Note:
For University examination, the following guidelines should be followed regarding award of marks
(a) Circuit and design -30%
(b) Performance -30%
(c)Result -20%
(d) Viva voce -20%

B. TECH DEGREE COURSE
2008 SCHEME

ELECTRICAL AND ELECTRONICS ENGINEERING

SCHEME AND SYLLABUS FOR 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	Control Systems	2	2	-	50	3	100	4
08.702	Power System Engineering III	2	1	-	50	3	100	3
08.703	Digital Signal Processing	2	1	-	50	3	100	3
08.704	Elective III	2	1	-	50	3	100	3
08.705	Electrical Drawing	0	0	4	50	3	100	4
08.706	Electrical Machines Lab II	0	0	4	50	3	100	4
08.707	Power System Lab	0	0	4	50	3	100	4
08.708	Project & Seminar	0	0	4	100	3	-	4
	Total	8	5	16	450		700	29

08. 704 Elective III

(a) Electronic Communication
(b) Environmental Engineering
(c) Modern Operating Systems
(d) Management Information System
(e) Nano Technology
(f) Computer Aided Power System Analysis
(g) Microprocessor Based System Design
(h) Embedded System
(i) Illumination Technology

08.701 CONTROL SYSTEMS	
L/T/P : 2/2/0	**Credits : 4**

Module - I

Open loop-and closed loop control systems: Transfer function -T.F of simple - Mechanical and Electromechanical systems – Force voltage and force current analogy - block diagram representation - block diagram reduction - signal flow graph - Mason's gain formula - characteristics equation.

Control system components: DC and AC servo motor – synchro - magnetic amplifier - gyroscope - stepper motor - Tacho meter.

Module - II

Time domain analysis of control systems: Transient and steady state responses - test signals - time domain specifications - first and second order systems - impulse and step responses - steady state error analysis - static error coefficient of type 0,1,2 systems - Dynamic error coefficients - PID controllers -Tradeoff between steady state and transient behaviour

Concept of stability: stability of feedback system - Routh's stability criterion - Root locus -General rules for constructing Root loci - effect of addition of poles and zeros.

Module - III

Frequency domain analysis: Introduction - Bode plot-Polar plot-Log magnitude v_s phase plot, Nichols chart. Frequency domain specifications: - Non-minimum phase system -transportation lag- Nyquist stability criterion-gain margin - phase margin - stability analysis using bode plot.

Compensation design: Realization of basic compensators-Design of compensator using bode plot.

TEXT BOOKS

1. Katsuhiko Ogata, “Modern Control Engineering”, Fourth edition, Pearson Education, New Delhi, 2002.
2. Nagarath I.J. and Gopal M., “Control System Engineering”, Wiley Eastern, New Delhi.
3. Richard C. Dorf, Robert. H. Bishop, “Modern Control Systems”, Pearson Education, New Delhi – 11th Edition, 2007.
4. Norman S. Nise ,“Control Systems Engineering”, 5th Edition, Wiley Eastern, 2007.

REFERENCES

1. Kuo B.C., “Automatic Control Systems”, Prentice Hall of India, New Delhi, sixth edition, 1991.
2. Gibson & Tutter, “Control System Components”, Mc Graw Hill.

Note :

1. 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).
2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.702	POWER SYSTEM ENGINEERING - III	
L/T/P : 2/1/0		**Credits : 3**

Module 1

Load flow studies – Introduction-types-network model formulation - formation of bus admittance matrix, Gauss-Siedel, Newton-Raphson (Qualitative analysis only) and Fast Decoupled methods-principle of DC load flow.

Economic Operation - Distribution of load between units within a plant - transmission loss as a function of plant generation - distribution of load between plants - Method of computing penalty factors and loss coefficients.

Unit commitment: Introduction — Constraints on unit commitments: Spinning reserve, Thermal unit constraints - Hydro constraints.

Module - II

Automatic Generation and Voltage Control: Load frequency control: single area and two area systems - Automatic voltage control

Reactive power control- synchronous compensators- reactors, capacitors, static VAR compensators.

FACTS Introduction, Objectives - Basic types– Basic concepts of Static Var Compensator (SVC), Static Compensator (STATCOM), Thyristor Controlled Series compensator (TCSC), Static Synchronous Series Compensator (SSSC) and Unified Power Flow Controller (UPFC).

Power system stability - steady state, dynamic and transient stability-power angle curve-steady state stability limit Mechanics of angular motion-Swing equation - Point by Point method - RK method - Equal area criterion-application - Methods of improving stability limits.

Module - III

AC traction -Traction mechanics - main line, suburban service requirements - Speed-time graph - Specific energy consumption.

HVDC Transmission-types of DC links-constant extinction angle control-constant current control- control characteristics-power flow in HVDC systems-ground return-Application of HVDC back to back links-HVDC developments in India.

Over voltages and insulation requirements - Generation of over voltages - Switching surges -Protection against over voltages - Surge diverters-Insulation co-ordination -propagation of surges -Termination in inductance and capacitance - Determination of system voltages produced by travelling waves - Bewly lattice diagram -effects of line loss.

TEXTBOOK

1. Hadi Saadat,"Power System Analysis", TMH, 2003.
2. B.R. Gupta, "Power System Analysis and Design", Wheeler Publishing Company, 2nd edition 1993.
3. I. J.Nagarath, A P. Kothari, "Modern Power System Analysis", TMH. 1994.

REFERENCES

1. Olle l Elgerd, "Electric Energy Systems Theory",Second Edition, TMH, 2004.
2. B.M. Weedy, "Electric Power Systems", John Wiley & sons, Newyork, 1987.
3. A.R. Bergen & Vijay Vittal, "Power System Analysis", 2/e, Pearson Edn. 2001.
4. W. D. Stevenson, "Elements of Power System Analysis, TMH, 1982
5. Allen, J. Wood, Bruce. F. Wollenburg, "Power Generation, Operation & Control", John Wiley & Sons, 1984.
6. K.R. Padiyar, "FACTS Controllers in Power Transmission and Distribution", New Age International Publishers, 2007.
7. H Partab ; "Art and Science of Utilisation of Electrical Energy", DhanpatRai & Sons.
8. C.L.Wadhwa,"Electrical Power Systems", New Age International Publishers, 2007.

Note :

1. 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).
2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.703	**DIGITAL SIGNAL PROCESSING**
L/T/P : 2/1/0	**Credits : 3**

Module I:

Review of continuous time signals and systems: Fourier series and Fourier Transforms. Discrete sequences . Discrete systems and their classifications and properties. Linear time-invariant systems: convolution.
Discrete Time Fourier Transform. Properties of DTFT, response of Discrete time LTI systems.
Sampling of continuous time signals. Reconstruction of band limited signal from its samples. Aliasing,. ADC sample and Hold, Zero order and first Order Hold, . Quantization, coding. DAC

Module II: .
The Z transforms, Region of convergence Inverse Z transform. Properties analysis of LTI Systems using Z transforms. Transient and steady state response, causality and stability using z transforms, Schur Cohn stability

Discrete Fourier transform: Frequency domain sampling, Discrete Fourier transform (DFT): DFT pair, properties of DFT, frequency response analysis of signals using the DFT, circular convolution using DFT , linear filtering based on DFT, Fast Fourier tram(FFT); Introduction, Radix -2 decimation in time FFT algorithm, Radix-2 decimation in frequency algorithm.

Module III:
Structures for realization of discrete time systems – structures for FIR and IIR systems – signal flow graphs, direct-form, cascade-form, parallel form, lattice and transposed structures and linear Phase FIR filters.
Design of digital filters – general considerations – causality and its implications, characteristics of practical frequency selective filters – design of FIR filters – symmetric and antisymmetric, linear phase–design of IIR filters from analog filters – using impulse invariance, bilinear transformation. Characteristics of standard filters and their designs – Frequency transformations in the analog and digital domains

REFERENCES

1. Alan. V. Oppenheim, Alan. S. Wilsky and Lan T Young, "Signals ans Systems", 2nd edition, Pearson Education.
2. Emmanuel Ifeachor and Barrie Jervis, "Digital Signal Processing", 2nd edition, Pearson Education.
3. B. Somanathan Nair, "Digital Signal Processing and Filter Design", Prentice Hall of India, 2003.
4. Proakis and Manolakis," "Digital Signal Processing – Principle, Algorithms and Applications", 4th Edition, Prentice Hall of India, 2000.
5. Johny R Johnson, "Introduction to digital Signal Processing", Prentice Hall of India, 1992.
6. Alan. V. Oppenheim and Ronald W Schafer, "Digital Signal Processing", 2nd edition, Pearson Education.
7. Lonnie C. Ludeman, " Fundamentals of Digital Signal Processing", John Wiley and Sons.
8. Ambardar, "Analog and Digital Signal Processing", 2nd edition, Thomson Learning, 1999.

Note :

1. 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).
2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08-704	Elective III	(a)ELECTRONIC COMMUNICATION
L/T/P : 2/1/0		Credits : 3

Module - I: Radio Communication

Theory of amplitude modulation (AM) - generation of (block diagrams only) double sideband full carrier, double sideband suppressed carrier, single sideband suppressed carrier - propagation of electromagnetic waves - block diagrams of low power and high power AM transmission - AM receivers: straight receivers superhetrodyne receiver - choice of intermediate frequency - simple AVC circuit.

Theory of frequency modulation (FM) - sidebands - FM broadcasting - block diagrams of direct FM transmitter and Amstrong transmitter - FM receivers (balanced - slope detector and Foster-Seely discriminator only).

Carrier communication: General principles of multi-channel system and power-line carrier - terminal equipment. Electronic telephone exchange(basic idea only).

Module - II: Radar, Facsimile and Television

Principles of digital communication – pulse modulation- sampling process-PAM –Quantization - pulse code modulation (PCM) (basic principles only)

Television: TV standards - frequency bands - TV Cameras -TV picture tube -interlacing and synchronisation - bandwidth - composite video signal - TV receiver and transmitter block diagrams: black and white, color (PAL system only) - high definition television.

Module - III: Mobile Telephone service

Evaluation of mobile telephone - two-way communication services - cellular telephone: basic concepts, frequency reuse, interference cell splitting, sectoring, cell system layout, cell processing.

Analog cellular telephone: Basic concept, block diagram of analog cellular tranceiver.

Digital cellular telephone (basic concept) - code division multiple accessing (CDMA) - block diagram of global system for mobile (GSM) architecture -overview of personal communication satellite system (PCSS).

TEXT BOOKS:

1. George Kennedy, "Electronic communication systems", McGraw Hill [for module l & II]
2. Dennis Roddy and John Coolen, "Electronic communications", 4th Edition, Prentice Hall of India, 2002 [for module I & II].
3. Wayne Tomasi, "Electronic communication systems ", 4th edition, Pearson Education, 2001 [general and specifically for module - III].

REFERENCES

1. Frank. R, Dungan, "Electronic communication systems", 3rd edition, Vikas Publishing House, 2002.
2. Herbert Taub and Donald L. Schilling, "Principles of communication systems", McGraw Hill.
3. Wayne Tomasi, "Electronic communication systems ", 4th edition, Pearson Education, 2001 [general and specifically for module - III].

Note :

1. 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).
2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.704	Elective III (b)ENVIRONMENTAL ENGINEERING	
L/T/P : 2/1/0		**Credits : 3**

Module1

Technology and sustainability - Integrated system, Technological evolution, Contemporaneous thinking, Forward thinking The greening of engineering, The relevance of biological ecology to technology. Technological change and evolving risk- Historical patterns in technological evolution. The social dimensions of industrial ecology - industrial ecology and sustainable engineering within society, cultural constructs and temporal scales, social ecology, consumption, government and governance, legal and ethical concerns, economics and industrial ecology,

The concept of sustainability - Sustainable engineering - engineering and the industrial sequence, green chemistry, green engineering, pollution prevention. Industrial product development Approaches to design for recycling, guidelines for ecodesign. An introduction to life-cycle assessment, the concept of the life cycle.

Module II

Common Sources of Energy -Calculating Energy and Power, Energy Impacts: Finding the Cleanest Source of Power, Energy and GHG Emissions, Heat, Noise, Light, and Radio Emissions, Process-Related GHG Emissions, Energy Efficiency in Product Design, Examples of Energy Efficiency in Data Centers. Waste and Renewal.

Water and Other Natural Resources- ,Social ConsiderationsBusiness Considerations, Calculating the Water Footprint, Trading Virtual Water, Other Natural Resources. Water and industrial ecology - water and products, the water footprint, water quality.

Urban industrial ecology, The status of resources - mineral resources scarcity, cumulative supply curves, energy resources, water resources. Industrial ecology and sustainable engineering in developing countries.

Eco-Engineering – Eco-Engineering, Carbon Neutrality, Greenwashing and Green Noise, Measuring and Sharing with OpenEco,

Module III

Citizen Engineer - ,Responsibilities of the Citizen EngineerKnowledge Base of the Citizen Engineer, nges Cha ,in the Nature of EngineeringEngineering on a Whole New Scale, Externally Driven Changes in Engineering, Perspectives on an Engineering Transformation.

Environmental Responsibility - .Engineering-Core Challenges of Eco ,Responsible Engineering-Eco **Intellectual Responsibility** - Intellectual Property Law Fundamentals - Patents, Copyright, Trademarks, Trade Secrets, Nondisclosure Agreements, Employment Contracts and IP Ownership, Tip Sheet: Inbound and Outbound, How to Protect Your IP in Emerging Markets, Back to Patent Protection: The Good, the Bad, and the Ugly. **Open Source Software: Licenses and Leverage** - g-Nonfree but Free ,h Software Licenses؛Free ,Sounding Software LicensesA Closer Look at the GPL , Contributor Agreements, Software Indemnity,

References:

1. T. E. Graedel, Braden Allenby, “Industrial Ecology and Sustainable Engineering”, Perason Education India
2. Srinivasan D, “Environmental Engineering”, Prentice Hall India
3. David Douglas, Greg Papadopoulos, John Boutelle, “Citizen Engineer”, Pearson Education India
4. P Venugopal rao, “Text book of Environmental Engineering”, Prentice Hall India

Note :

1. 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).

2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08-704	Elective III	(c) Modern Operating Systems
L/T/P : 2/1/0		Credits : 3

Module - I

Introduction - Operating system as an extended machine - Operating system as a resource manager - Operating system concepts – overview. System calls - for process management - file management - directory management . Operating system structure - monolithic systems - layered systems.

Introduction to processes - The process model - creation - termination - hierarchies - states - implementation of process. Threads - thread model, thread usage, Inter-process communication - race condition - critical sections - Mutual exclusion with busy waiting - sleep and wakeup - Semaphores, Mutexes

Process Scheduling -Goals - First come first served scheduling - Shortest job first - Shortest remaining time next - Round robin scheduling - Priority scheduling

Deadlocks - Conditions for deadlock - deadlock modeling - ostrich algorithm - deadlock detection - recovery from deadlock - deadlock avoidance - resource trajectories - safe and unsafe states. Bankers algorithm for single and multiple resources - deadlock prevention.

Module - II

Memory management - mono-programming without swapping or paging - Multiprogramming with fixed partitions. Modeling multi-programming, Analysis of multiprogramming system performance, relocation and protection, Swapping - Memory management with bit maps

Virtual memory - Paging - Page tables – TLBs - Page replacement algorithms - Optimal page replacement algorithm - Not recently used algorithm - First-in first-out algorithm - Second chance page replacement algorithm - Clock algorithm - Least recently used algorithm - the working set page replacement algorithm - Beladys anomaly, local verses global policies - page size.

Module - III

I/O - devices - device controllers - principles of I/O software - I/O software layers - Disks - formatting, disk arm scheduling algorithms, Error handling, RAID disks.

File Systems - file structure - file "types - file access - file attributes - file operations - Directories - single level directory systems - Two-level directory systems - hierarchical directory systems - path names, Directory operations, File system implementation - implementing files - file system layout - implementing directories .

TEXT BOOK:

1. Andrew S Tanenbaum – “Modem Operating systems" - Pearson Education, Asia 2002.

REFERENCES

1. IL. Peterson and A Silbershaltz, "Operating Systems
2. Madnik and Donovan, "Operating Systems" - McGraw Hill
3. P.K. Sinha, "Distributed Operating Systems"

Note :

1. 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).
2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08 .704	Elective III	(d)MANAGEMENT INFORMATION SYSTEM
L/T/P : 2/1/0		Credits : 3

Module 1

Introduction to Information Systems. Information Systems for Competitive Advantage. Using Information Technology to Engage in Electronic Commerce. System Users and Developers.

Organizations, Management and the Networked Enterprise - Information Systems in Global Business Today. Global E-Business: How Businesses Use Information Systems. Information Systems, Organizations, and Strategy. Ethical and Social Issues in Information Systems

Module II

Computing and Communications Resources. Database Management Systems. Systems Development. Information in Action . IT Infrastructure and Emerging Technologies- Foundations of Business Intelligence: Databases and Information Management. Telecommunications, the Internet and Wireless Technology. Securing Information Systems.

Module III -

E-Commerce: Digital Markets, Digital Goods - Managing Knowledge. Enhancing Decision Making. Building and Managing Systems. Building Information Systems. Project Management: Establishing the Business Value of Systems and Managing Change. Managing Global Systems

References

1. Kenneth C. Laudon “Management Information Systems : Managing the Digital Firm, 10/e” Pearson Education India
2. Raymond McLeod, George Schell , “Management Information Systems, 10/e”
3. SADAGOPAN S. “MANAGEMENT INFORMATION SYSTEMS” Prentice hall India
4. KELKAR, S. A. “MANAGEMENT INFORMATION SYSTEMS : A Concise Study” Prentice hall India

Note :

1. 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).

2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.704	Elective III	(e)Nano-Technology
L/T/P : 2/1/0		Credits : 3

Module I (Introduction)

Neccessity to study Nanotechnology, why nanoscale behavior deviates from bulk behavior, applications- present and future, threats and scope.

Design principles and implementation of nano-engineered materials in the development of nanotechnology applications.

Novel structural functionality, sensory functionality, and information processing capabilities of nanomaterials.

Molecular self-assembly phenomena, molecular materials and architectures; Nanoscale materials characterization and metrology.

Physical properties of nano-structured semiconductors critical to nanoscale optoelectronic devices.

References

1. K. E. Drexler, Engines of Creation (Fourth Estate, London, 1990).
2. E. Regis, Nano. The Emerging Science of Nanotechnology: Remaking the World – Molecule

Module II (Nano material charachterisation)

Electronic properties of atoms and solids, the isolated atom, bonding between atoms, giant molecular solids.

Nanocrystalline materials, Nanoscale x-ray -electron and neutron diffraction techniques, Scanning electron microscopy, Transmission electron microscopy , Atomic force microscopy (AFM), Scanning tunneling microscopy (STM).

Spectroscopic Techniques

References

1. Callister, William D. Jr., Fundamentals of Materials Science and Engineering: An Integrated Approach 2nd Ed., John Wiley and Sons, 2003
2. S. N. Sahu, R. K. Choudhury, and P. Jena, Nano-scale Materials: From Science to Technology, Nova Science Publishers, 2006.
3. Yannick Champion , Hans-Jörg Fecht, Nano-Architectured and Nanostructured Materials: Fabrication, Control and Properties, Wiley-VCH,2005.
4. Robert K, Ian H, Mark G, Nanoscale Science and Technology, John Wiley & sons Ltd.,2005

Module III (Micro Electro Mechanical Systems)

Overview of micro electro mechanical devices and technologies.

Introduction to architecture design, process flow, fabrication, packaging and testing. MEMS Fabrication - MEMS device concepts (micro sensors/actuators) - Use of capacitive, inductive, optical, piezoresistive, piezoelectric methods for sensing.

MEMS Applications- Microsystems Packaging.

Introduction to existing and next-generation metrology tools for MEMS and NEMS inspection and qualification.

References

1. Mohamed Gad – el – Hak (ed.), The MEMS Handbook, Second Edition, CRC Press, 2005.
2. James J. Allen , Micro Electro Mechanical System Design, CRC, 2005.
3. K. Subramanian , Micro Electro Mechanical Systems: A Design Approach, Springer, 2008.

Note :

1. 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).
2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.704	**Elective III**	**(f)COMPUTER AIDED POWER SYSTEM ANALYSIS**
L/T/P : 2/1/0		**Credits : 3**

Module - I

Bus Reference Frame: Injections and Loads, System Graph: Loop, Cutest and Incidence Matrices . Y Bus Formation-Inversion of YBUS for large systems: Tinney's Optimally ordered Triangular formulation.

Formulation of Bus Impedance matrix for elements without Mutual Coupling- Bus impedance matrix with mutual coupling.

Network fault and Contingency Calculations. Fault calculations using ZBUS, Fault Calculations using the YBUS Table of Factors, Contingency analysis in Power systems, Contingency studies using the YBUS table of factors.

Module - II

Central Operation and Control of Power Systems: introduction, Control center of a Power System, Digital Computer Configuration, SCADA for power systems.

Power Flow on Transmission line Networks: Slack bus, ZBUS formulation for load flow equation, Gauss and Gauss-Seidel Iteration using YBUS, Newton-Raphson method, Fast Decoupled Load Flow (FDLF)- (Not more than two iteration problems) - Adjustment of network operating conditions - Operational Power flow.

Module - III

Generation Base Power Setting: Economic dispatch of Generation without transmission line losses - Economic dispatch with line losses –Loss-Coefficient calculation techniques-Execution of the Economic dispatch – Iterative techniques. Economic dispatch using shared Generators - Economic exchange of power between areas.

Optimal power flow- concepts – applications- security constrained optimal power flow – deregulated systems.

Note:

A Mini Project can be given involving computer aided analysis of power systems as a semester assignment.

TEXT BOOK

1. G.L.Kusic, Computer Aided Power System Analysis, PHI, 1989
2. W. D. Stevenson, “Elements of Power System Analysis, TMH, 1982
3. Allen, J. Wood, Bruce. F. Wollenburg, “Power Generation, Operation & Control”, John Wiley & Sons, 1984.
4. M. A. Pai, Computer Techniques in Power Systems Analysis, Tata McGraw-Hill, Second edition 2005

REFERENCES

1. LP. Singh, “Advanced Power System Analysis and Dynamics”, 3/e, New Age Intl, 1996.
2. J. Arriliga and N.R. Watson, Computer modelling of Electrical power systems, 2/e, John Wiley, 2001
3. Stagg and El Abiad, "Computer methods in Power system Analysis", McGraw Hill,1968.
3. I.J.Nagrath and D.P.Kothari, "Modern Power System Analysis", Tata McGraw Hill, 1980
4. Olle l Elgerd, “Electric Energy Systems Theory”, Second Edition, TMH, 2004.

Note :

1. 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).
2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08 – 704 Elective III (g) MICROPROCESSOR BASED SYSTEM DESIGN
L/T/P : 2/1/0 **Credits : 3**

MODULE I

I/O ports-INTEL 8212-programmable peripheral interface-INTEL 8155 and INTEL8255 interface chips-application of 8255 for display and stepper motor control. INTEL8253 timer chip-architecture and programming. Interrupts- multiple interrupts-device polling- vectored interrupt. Interrupt controller INTEL 8259 architecture and features

MODULE II

DMA controller-8257-architecture and features- DMA execution.
Serial communication- transmission format. Programmable communication interface 8251 architecture, features and applications. Interfacing keyboard and display CRT operation- scanning- charter generator- display format-timing- CRT controller INTEL 8275- architecture- features.

MODULE III

INTEL 8279- programmable keyboard /display. Interface- architecture- features.display and keyboard interfacing with 8279.
16-bit microprocessor-8086- architecture- addressing modes-segmentation-instruction set of 8086. Interfacing of display, matrix keyboard and printer.

REFERENCES

1. Gaonkar : Microprocessor, Architecture, Programming and Applications, Wiley Eastern Ltd. New Delhi, May 1992.
2. Mathur A : Introduction to Microprocessors, Tata Mc Graw Hill, New Delhi, 1992.
3. Ram : Microprocessors & Applications.
4. Naresh Grover, Microprocessors
5. Douglas V. Hall : Microprocessors and Interfacing, TMH, New Hill
6. M. Rafiquzzaman : Microprocessor Theory and Application, PHI.
7. Ray& Burchandi – Advanced Microprocessor & Peripherals.

Note :

1. 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).
2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

Note :

1. 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).

2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.704	Elective III (h)	EMBEDDED SYSTEMS
L/T/P : 2/1/0		**Credits : 3**

Module 1

Introduction to Embedded Systems- An Embedded system, features, Current trends and Challenges, Product live Cycle, Processor, Tool Chain, Hardware Design Issues, System memory Layouts, Realtime Systems, Hard and Soft,

Programming Concepts - Review of C-Programming, Data Structures, C++, Software Life Cycle Models, Embedded Systems Design, Implementation and Testing , Project Management

Embedded Systems Programming - Embedded System Design Issues Challenges & Trends in Embedded Systems Assemblers, Compilers, linkers, Loaders, Debuggers Profilers & Test Coverage Tools.

Module II

8051- 8 bit Microcontrollers and Interfacing –

Hardware: Microprocessor basics. Terminology and principles. 8051 Microcontroller Architecture: Function and basic description of 8051components to include Special Function Registers (SFRs). Interfacing and address decoding techniques. Essential hardware for computer control, Interfacing, address decoding, analogue and digital input/output. input/output control A/D and D/A conversion, Interrupts, bus timing, serial and parallel communications. Bus timing, Interrupts Real-time systems.

Module III

Software: Assembly Language programming. Embedded C programming - Program creation, flow charting. Algorithms for embedded control. Structured programming, Data structures and types, Program classification. Computer control: Components of embedded control systems to include terminology and components. Classification of programs, programs for sequential tasks, multitasking systems, real-time systems. Real World Interfacing – LCD, ADC, Sensors, Stepper motor, keyboard and DAC.

Project on 8051 - Application based on 8051 microcontroller.

Core references:

1. MAZIDI,“ The 8051 Microcontrollers & Embedded Systems”, Pearson Education Asia
2. RAJ KAMAL, “Embedded Systems ”,Tata Mc Graw hill, 2003
3. SHULTZ, T. W, “C and the 8051: programming for multitasking”, Prentice-Hall, 1993

References

1. BARNETT. R. H, “The 8051 family of Microcontroller”, Prentice Hall, 1995,
2. AYALA, K. J., “ The 8051 Microcontroller: architecture, programming, and applications”, West Publishing, 1991,
3. STEWART, J. W., “The 8051 Microcontroller: hardware, software and interfacing”,Regents/Prentice Hall, 1993
4. YERALAN, S, AHLUWALIA, A. ,”Programming and interfacing the 8051 Microcontroller”, Addison-Wesley,1995

Note :

1. 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).

2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.704	**Elective III (i)**	**Illumination Technology**	
L/T/P : 2/1/0			**Credits : 3**

Module-I

Illumination- Laws of Illumination - Polar Curves - Photometry - Luminous Efficiency - Measurement of Illumination of Different Light Sources - Illumination of Surfaces - Levels of Illumination- Types of lamps, filament lamps, flurecent lamps, arc lamps, mercury/sodium vapour lamps, CFL (Compact flurecent lamps), Effect of Voltage variation.

Module II

Lighting Design & Calculation
Lighting field of luminaire- Practical coordinate systems, Transformation of coordinate system from point, line area source, Illuminance calculation- Derivation of luminous flux from luminous intensity, flux transfer and inter-reflection luminance calculations, Discomfort glare. Optical design- reflector system, refractor system. Principal of lighting design- Indoor lighting design by lumen method, by point method, Designing problem and solution and designing documentation. Exterior lighting system- Road lighting system and highway lighting system

Module III

Lighting Power Conditioning, Monitoring and Control
Lighting control strategies, techniques & equipment, sensors and timers, switches versus dimming control algorithm, harmonics, EI from lighting equipment – its measurement & suppression techniques.

References:

1. Jack L. Lindsey, Applied Illumination in Engineering, Second edition, Fairmont Press, USA.
2. John L. Fetters, Applied Illumination Engineering, Third Edition, Fairmont Press, USA.

Note :

1. 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).

2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.705	ELECTRICAL DRAWING
L/T/P : 0/0/4	**Credits : 4**

1. DC Machine: (3 sheets)
   Assembly of pole and yoke of a medium size DC Machine
   Assembled views of armature and commutator
   Sectional elevation and end views of DC machines.
2. Transformer: (2 sheets)

Sectional plan and elevation of core type and shell type single phase transformer.
Sectional plan and elevation of three phase transformer.

3. Induction Motor, (2 sheets)
   Sectional elevation and end views of squirrel cage induction motor.
   Sectional elevation and end views of slip ring induction motor.
4. Synchronous Machines: (3 sheets)
   Dimensional sketches of hub, spider

Half sectional elevation and end views of salient pole with spider and without spider (2 sheets).

5. Single line diagram of
   (a) Generating station switch yard (1 sheet)
   (b) 220 kV substation (I sheet)
6. Sketches of
   (a) Pin insulator, Disc insulator and bushings (I sheet)
   (b) 220 kV and 400 kV double circuit transmission towers. (1 sheet)

References

1. Electrical Engineering Drawing, KL Narang, Satya Prakashan, New Delhi.
2. Electrical Engineering Drawing, SK Bhattacharya
3. Electrical Machine Design, Sahney A.K.

Note: The question paper shall contain two parts, in Part A, there will be three questions of 25 marks each out of which two should be answered. In Part B, there will be two questions of 50 marks each out of which one should be answered.

08.706	ELECTRICAL MACHINES LABORATORY – II
L/T/P : 0/0/4	**Credits : 4**

1. Regulation of alternator by direct loading - Effect of prime mover speed and Generator Excitation.
2. Regulation of alternator by emf and mmf methods - Potier triangle Calculation
3. Regulation of alternator by Potier and ASA methods
4. Slip test - regulation of salient pole alternator using two reaction theory
5. Synchronization of alternator to mains by dark lamp and bright lamp methods and control of reactive power - effect of normal excitation, under excitation & over excitation in an alternator connected to infinite bus - V and inverted V curves as generator and motor
6. Study of induction motor starters
7. Variation of starting torque with rotor resistance in slip-ring induction motors
8. Direct load test on three phase induction motor
9. No load and block rotor test on three phase induction motor - predetermination of performance characteristics from circle diagram and determination of equivalent circuit
10. Pole changing induction motor - predetermination of performance characteristics
11. Induction generator - Circle diagrams and Direct load test
12. Synchronous induction motor - V-curves and predetermination of field current
13. Single phase induction motor -equivalent circuit
14. V/f Control of Three phase Induction motor (optional).

Note:
For University examination, the following guidelines should be followed regarding award of marks
(a) Circuit and design -30%
(b) Performance -30%
(c)Result -20%
(d) Viva voce -20%

08 – 707	POWER SYSTEM LAB
L/T/P : 0/0/4	**Credits : 4**

Hardware Tests

1. Power frequency testing of electrical equipment like insulators, fuses, AB switches, lightning arresters etc.
2. Determination of string efficiency of string insulators.
3. Calibration of HV measuring equipment using sphere gap
4. Impulse voltage test on insulators, lightning arresters etc.
5. Measurement of dielectric strength of air, solid and liquid insulating materials.
6. Determine the characteristic , pick up time etc. of different types of electromagnetic relays
7. Determine the characteristic, pick up time etc. of different types of static relays.
8. Measurement of earth resistance and soil resistivity.
9. Testing of insulation of 3 core and 4 core cable
10. Characteristics of Current Transformers and Potential Transformers
11. Power measurement using current transformer & potential transformer.
12. Power factor improvement with capacitor banks.
13. Testing of energymeters
14. Ferranti Effect and its mitigation
15. Transient stability study

Software Simulation Tests

16. Load flow analysis- Gauss Siedal Method
    Newton Raphson Method
    Fast decoupled method
    Of test systems with buses not exceeding 6 numbers.
17. Short circuit studies – 3 phase LG, LL, LLG fault.
18. Simulation of FACTS devices (Shunt Compensation).
19. Analysis of Transient stability and Voltage stability of power systems (using Power angle and PV curves respectively).
20. Simulation of AGC for single area and two area systems using SIMULINK.
21. Formulation of Ybus matrix with mutual coupling using MATLAB.

Note: (i) Ten of the twelve Hardware Experiments and all the Six Software Experiments are to be conducted.

(ii) University Question paper will contain one hardware and one software question for the exam. Each student must answer both parts.

Note:
For University examination, the following guidelines should be followed regarding award of marks
(a) Circuit and design -30%
(b) Performance -30%
(c)Result -20%
(d) Viva voce -20%

08-708	Seminar and Project
L/T/P : 0/0/4	**Credits : 4**

The students shall present a seminar on a topic which is of high relevance to Electrical and Electronics engineering field. A report on seminar shall be submitted at the end of the semester. The seminar report should also be submitted for Project and Viva voce at the end of 8th semester .

The Students shall do a project work, which can be the preliminary work of final project, and submit a report at the end of seventh semester. The credit for the project work will be based on the seminar presentation of the project at the end of the semester.

25% credit for Project, and 75% credit for Seminar.

B. TECH DEGREE COURSE
2008 SCHEME

ELECTRICAL AND ELECTRONICS ENGINEERING

SCHEME AND SYLLABUS FOR 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	Advanced Control Theory	2	1	-	50	3	100	3
08.802	Electrical Machine Design	2	2	-	50	3	100	4
08.803	Electrical System Design	2	2	-	50	3	100	4
08.804	Power Semiconductor Drives	2	1		50	3	100	3
08.805	Elective IV	2	1	-	50	3	100	3
08.806	Elective V	2	1	-	50	3	100	3
08.807	Project & Viva voce (Industrial Visits)	0	0	5	100	3	100	5
08.808	Systems & Control Lab	0	0	4	50	3	100	4
	Total	12	8	9	450		700	29

08. 805 Elective IV

(a) Robotics and Industrial Automation
(b) Advanced Microprocessor Architecture and Programming
(c) Soft Computing Techniques
(d) Pattern Recognition
(e) HVDC & FACTS
(f) Control & Guidance Engineering
(g) Design of Digital Control Systems

08. 806 Elective V

(a) Computer and Data Networks
(b) Advanced Electronic Communication
(c) High Voltage Engineering
(d) Object Oriented Programming
(e) Digital Image Processing
(f) Wavelets and Applications
(g) Optimal Control Theory
(h) Non-linear Control Theory
(i) Special Electrical Machines

08 . 801	ADVANCED CONTROL THEORY
L/T/P : 2/1/0	Credits : 3

Module – I

State space analysis of systems: Introduction to state concept - state equation of linear continuous time systems, matrix representation of state equations. Phase variable and canonical forms of state representation- solution of time invariant autonomous systems- state transition matrix- relationship between state equations and transfer function. Properties of state transition matrix- controllability & observability. State feed back design via pole placement technique.

Module – II

Sampled data control system . Sampling process - Z transform method-solving difference equation by the Z transform method- pulse transfer function- system time response by Z transform method - analysis of the sampling process - data reconstruction and hold circuits - zero order hold circuit - Sampling theorem.
Stability of sampled data system - Routh Hurwitz criterion and Jury's test

Module – III

Nonlinear systems : Introduction- characteristics of nonlinear systems. Types of non-linearities. Describing function analysis - Determination of describing function of static nonlinearities (saturation and ideal relay only)- application of describing function for stability analysis of autonomous system with single nonlinearity. Phase Plane Analysis: Concepts-Singular points-focus-centre node and saddle points-Limit cycle. Liapunov Stability- definition of stability- asymptotic stability and instability - Liapunov methods to linear and nonlinear systems.

REFERENCES

1. Katsuhiko Ogata: “Modern Control Engineering”, fourth edition, Pearson Education, NewDelhi, 2002.
2. Nagarath I. J and Gopal M, “Control System Engineering”, Wiley Eastern, NewDelhi,.
3. Gopal M, “Modern Control System Theory”, Wiley Eastern Ltd., New Delhi.
4. Kuo B.C, “Analysis and Synthesis of Sampled Data Systems”, Prentice Hall Publications.

Note :

1. 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).

2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.802	ELECTRICAL MACHINE DESIGN
L/T/P : 2/2/0	Credits : 4

MODULE-1

Principles of electrical machine design - General design considerations - specifications of machines - types of enclosures - types of ventilation - heating - short time rating - overload capacity - temperature rise time curve - hot spot rating.

Review of properties of materials used in electrical machines.

Design of transformers - single phase and three phase transformers - distribution and power transformers - output equation - core design - window area - window space factor - overall dimensions of core. Windings – no. of turns - current density - conductor section - Cooling of transformers - design of cooling tank and tubes.

Module – II

Magnetic circuit calculation - calculation of field ampere turns - air gap mmf - effect of slot and ventilating duct - active iron length - mmf for teeth - real and apparent flux densities - mmf per pole.

Design of DC machines - output equation - specific loading - choice of speed and no of poles - calculation of main dimensions - choice of type of winding - number of slots - number of conductors per slot-current density - conductor section - slot insulation - length of air gap - design of field winding - conductor cross section - height of pole - design of interpole - flux density under interpole - calculation of turns of interpole winding – design of compensating winding – brushes of commutatators.

Module – III

Design of synchronous machines - specific loading - output equation - main dimensions - types of winding - number of turns - number of slots and slot design - field design for water wheel and turbo alternators - cooling of alternators.

Design of three phase induction motors - main dimensions - stator design - squirrel cage and slip ring types - number of stator and rotor slots - rotor bar current - design of rotor bar - end ring current - design of end ring - design of slip ring rotor winding.

Introduction to computer aided design. Analysis and synthesis methods -hybrid techniques - optimization - electrical machine design - general procedure - simple design programs

TEXT BOOK

1. Sahney A.K, “A Course in Electrical Machine Design”, Dhanpat Rai & sons, Delhi.

REFERENCES

1. M.V. Deshpande: “Design and Testing Of Electrical Machines”, Wheeler Publishing
2. R.K. Agarwal: “Principles Of Electrical Machine Design”, Esskay Publications, Delhi.
3. Ramamoorthy M. “Computer Aided Design of Electrical Equipment”, East-West Press.

Note :

1. 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).

2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.803	ELECRTICAL SYSTEM DESIGN	
L/T/P : 2/2/0		**Credits : 4**

Module 1

National Electric Code (NEC)- scope and safety aspects applicable to low and medium (domestic) voltage installations, Electric services in buildings, Classification of voltages, standards and specifications. IE Rules, IS Codes (IS 3043, IS 732, IS 2675, IS 5216-P1-2, IS 2309). General aspects of the design of electrical installations for domestic dwellings–connected load calculation, selection of main distribution board, sub distribution board, MCCB, ELCB, MCB and cables for sub circuits. Precommissioning tests of domestic installations. Air-conditioning loads and its specifications. Energy conservation techniques.

Module II

Medium and HV installations – selection of cables and cable glands, guidelines for cable installation in detail. Installation of induction motors. Design of distribution systems with light power and motor loads. Selection and installation of transformers, switchgears and protective devices – Design of indoor and outdoor 11 KV substation upto 630 KVA - Design of earthing system - Pipe, plate and mat earthing – lightning arresters. Metering and protection. HT and LT breaker control panels .Selection of standby generator – installation and its protection. Pre-commissioning tests of cables, transformers and generators.

Module – III

Design of illumination systems – Yard lighting, street lighting and flood lighting.. Kerala Cinema Regulation Act – 1958, design and layout of installation for recreational or assembly buildings, cinema theatre and high rise building. Design of Electrical system related to fire fighting, lifts and escalators.

REFERENCES

1. National Electric Code, Bureau of Indian Standards publications, 1986.
2. Relevant Indian Standard – specifications (IS – 732, IS – 746, IS – 3043, IS – 900), etc.
3. Approved data and reference manuals (to be permitted to use in the exam hall).

Note :

1. 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).

2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.804	POWER SEMI CONDUCTOR DRIVES
L/T/P : 2/1/0	Credits : 3

Module 1:- Introduction to electric drives. Block diagram- Ac and Dc drives. Dynamics of motor load system, fundamental equations, classification of load torques, Four quadrant operation of drives. Speed torque characteristics of fan, centrifugal pump, compressor, hoist, traction, coiler drives, diesel electric locomotive. Steady state stability. Introduction to closed loop control of drives.

Cycloconverters:- basic principle, step up and step down cycloconverter, single phase to single phase, three phase to single phase and three phase to three phase cycloconverters. Applications of cycloconverters . Frequency and voltage control, out put equation of cycloconverter. Load commutated cycloconverters.

Module 2:- Dc motor drives- using controlled rectifiers, single phase semi converter and single phase fully controlled converter drives. Three phase-semi converter and fully controlled converter drives. Dual converters, applications of dual converter for speed control of dc motor. Chopper controlled dc drives. Analysis of single quadrant chopper drives. Regenerative braking control. Two quadrant chopper drives. Four quadrant chopper drives. Closed loop control of dc drives – block diagram only

Module3:- three phase induction motor speed control. Using semiconductor devices. stator voltage control, stator frequency control. Stator voltage and frequency control(v/f). steady state performance- Rotor chopper speed control. Slip power recovery scheme - sub synchronous and super synchronous speed variations. Current source inverter control. Voltage source inverter drives. Speed control of synchronous motors. Frequency control –volt/Hertz operation – voltage source inverter drives.

References

1. DUBEY G.K “power semiconductor controlled drives” PrinticeHall, Englewood cliffs, New Jersy, 1989
2. Bimal.K.Bose “Modern power electronics and Ac drives” pearson education Asia 2003
3. N.K De, P.K.Sen “Eletrical drives” Printice Hall of India 2002
4. JMD Murphy “Thyristor control of Ac drives.
5. Dr. P.S. Bimbra “Power electronics” Khanna publishers.
6. Ned Mohan , Tore M Undeland, William P Robbins, “Power electronics converters, applications and design”, John Wiley and sons
7. PILLAI S.K “A First Course on Electric Drives” Wieley Eastern Ltd, New Delhi
8. Dewan S.B, G.R. Slemon, A.Straughen, “Power Semiconductor Drives”, John Wiley and Sons.

Note :

1. The question paper will consists 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).
2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.805 Elective IV (a) ROBOTICS AND INDUSTRIAL AUTOMATION	
L/T/P : 2/1/0	**Credits : 3**

Module – I

Introduction to robotics. Robot fundamentals, classification, specifications, notations, Direct Kinematics: Co-ordinate frames-rotations-Homogeneous coordinates-The Arm equation-Kinematic analysis of a typical Robot-example of a 3 arm robot, Inverse Kinematics: -Tool configuration-Inverse kinematics of a typical Robot-example of a 3 arm robot -Workspace analysis and trajectory planning-Work envelope of different robots-The pick and place operation –Continuous path motion- Tool configuration Jacobian matrix and manipulator Jacobian-Manipulator Dynamics-Dynamic model of a robot using Lagrange's Equation

Module – II

Robot control: The control problem-state equations-Single axis PID control-PD gravity control-Computed torque control-Variable Structure control-Impedance control.
Robot vision : Image representation , Perspective and inverse perspective Transformations, camera calibration.
Robot programming and programming languages.:
Robot applications-Characteristics-Robot cell design-Types of applications-Industrial applications: material handling applications-Processing , assembly and inspection, Machine loading and unloading-spot welding-arc welding-spray painting. Non Industrial applications- robots in medicine

Module – III

Evolution of instrumentation and control, Role of automation in industries, Benefits of automation, basic elements of an automation system, Levels of automation Introduction to automation tools PLC, DCS, SCADA, Hybrid DCS/PLC.

TEXT BOOKS

1. Fundamentals of robotics – Analysis and control – Robot. J. Schilling – Prentice Hall of India 1996.
2. Mickell. P. Groover – Automation, Production and computer integrated manufacturing – Prentice Hall of India, 1992.
3. Janakiraman P A , "Robotics and Image Processing", Tata McGraw Hill, New Delhi, 1995.
4. Introduction to Robotics (Mechanics and control), John. J. Craig, Pearson Education Asia 2002.
5. S R Deb, " Robotcs Technology and Flexible Automation", Tata McGraw Hill, New Delhi.

REFERENCES

1. Robot technology & Applications, Ulrich Rembold – Marcel Dekker,1990.
2. 'Robots for Engineering', Yoran Kaen,McGraw Hill.

Note :

1. 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).

2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08 .805 Elective IV (b) ADVANCED MICROPROCESSOR ARCHITECTURE AND PROGRAMMING

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

Module I:

History of Intel Pentium 4 Processor Architecture, performance and Moores's Law, Floating-point unit, Detailed description of Pentium Processor Net Burst Micro architecture, Hyper Threading, Basic Execution Environment-Modes of operation, overview, Execution trace Cache, MESI protocol, Real and Protected mode Memory organization, Registers, Operand size address size, procedure calls, Interrupts and exception. Overview of IA 64 architecture.

Module II:

Data type & Address modes-Fundamental data type, numeric, pointer, string data type, floating point, SIMD Techniques, MMX data type, operand addressing, I/O port addressing, instruction set, MMX and SSE instructions, floating point instructions, system instruction, string operations, segment register instruction.

Module III:

Introduction to assembly language programming, simple arithmetic programming, floating point programming, MMX Programming, Interrupt programming, Advanced I/O Programming, Exception handling, Real Mode and Protected Mode programming, communication programming.

Text Books:

1. Intel Architecture Software Developer's Manual- Volume 1, Basic Architecture.
2. Peter Able: *IBM Assembly Language & Programming*, PHI, 2003.
3. Intel Architecture Software Developers Manual- Vol-3, System Programming Guide

References:

1. Intel Architecture Software Developers Manual- Volume-2, Instruction Set reference.
2. Randall Hyde, *The Art of Assembly Language Programming*.

Note :

1. 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).

2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.805 Elective IV (c)SOFT COMPUTING TECHNIQUES

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

Module I

Statement of a nonlinear Optimization problem. Unconstrained and constrained optimization problem Derivative-based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method – Step Size Determination Derivative-free Optimization – Genetic Algorithms – Simulated Annealing

Module II

Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN. Perceptrons and the LMS Algorithm, Limitations of the Perceptron Model.– Backpropagation Mutilayer Perceptrons – Radial Basis Function Networks – Unsupervised Learning Neural Networks – Competitive Learning Networks – Kohonen Self-Organizing Networks

Module III

Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions. Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods. Fuzzy logic control.

REFERENCES

1. "Engineering optimization: Theory and practice"-by S. S.Rao, New Age International (P) Limited, 3rd edition, 1998

Simon Haykin, "Neural Networks- A comprehensive foundation", Pearson Education, 2001.

2.. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997.

3. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley,N.Y.,1989.

4. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.

5. S.N.Sivanandam, S.Sumathi,S. N. Deepa "Introduction to Neural Networks using MATLAB", TMH, 2006.

6. James A Freeman and Davis Skapura, "Neural Networks Pearson Education", 2002.

7. Dimitri P. Bertsekas Nonlinear Programming: 2nd Edition, 2004

Note :

1. 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).
2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08-805	Elective IV (d) PATTERN RECOGNITION	
L/T/P : 2/1/0		Credits : 3

Module 1

Introduction: feature detection, classification. Review of linear algebra and probability- linear transformations, Estimation of parameters from samples, conditional probability and Bayes rule .Statistical Decision Making: Introduction, Multiple features, Conditional independent features, Decision boundaries, Estimation of error rates, Characteristic curves .Template-based recognition, eigenvector analysis, feature extraction.

Module 2

Non Parametric Decision making: Introduction, Histograms, Kernel and Window Estimators, Nearest neighbor classification techniques. Adaptive decision boundaries, Adaptive discriminant functions
Artificial Neural Networks: Introduction, Multilayer neural networks- Feed forward operation and classification, Back propagation algorithm.
Supervised learning and clustering: Introduction, Hierarchical clustering, partial clustering, Networks without hidden layers.

Module 3

Processing of waveforms and images: Introduction, transformations, geometric image scaling and interpolations, logarithmic gray level scaling, the statistical significance of image features. Image Analysis: Introduction, Scene segmentation and labeling.
Applications of Pattern Recognition-Examples

Text Books

1. E. Gose, R. Johnsonbaugh, and S. Jost, *Pattern Recognition and Image Analysis*, Prentice Hall of India, NewDelhi, 1999

2. R. O. Duda, P. E. Hart, and D. G. Stork, *Pattern Classification*, 2nd ed., John Wiley & Sons, New York, 2001

2. R. O. Duda and P. E. Hart, *Pattern Classification and Scene Analysis*, John Wiley & Sons, New York, 1973.
3

Reference Books

1. K. S. Fu, *Syntactic Pattern Recognition and Applications*, Prentice Hall, Eaglewood cliffs, N.J., 1982
2. C. M. Bishop, *Neural Network for Pattern Recognition*, Oxford University Press, New York, 1998

Note :

1. 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).
2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.805 Elective -IV (e) HVDC and FACTS	
L/T/P : 2/1/0	**Credits : 3**

Module I

Introduction : Need of reactive power flow control in load and transmission line. Fundamental theory of compensation - Power factor correction and voltage regulation in single phase systems, Analysis of uncompensated AC line, Passive reactive power compensation- series capacitor connected at the midpoint of the line, shunt capacitor connected at the midpoint of the line. Comparison between series and shunt capacitor. Introduction to FACTS ; Benefits from FACTS technology, Basic types of FACTS controllers. Compensation by Static Compensator (STATCOM) and Static synchronous series compensator (SSSC).

Module II

Principle of operation, configuration and control characteristics of Static VAR compensator (SVC) - TCR, TSC and FC+TCR. Expression for voltage and power of SVC. Principle of operation and configuration of Thyristor controlled series compensator (TCSC) and Thyristor controlled phase angle regulator (TCPAR).
Static synchronous compensators : Principle of operation, configuration and control characteristics of STATCOM and SSSC, Principle of operation and configuration of Unified Power Flow controller (UPFC).

Module III

DC Power transmission technology- introduction, comparison of AC and DC transmission, application of DC transmission. Types of DC links, converter station equipments, Analysis of HVDC converters- simplified analysis of Graetz circuit. Power flow control in DC link, converter control characteristics. HVDC breakers- basic concepts of DC circuit interruption. Reactive power requirements of converter, Monopolar operation.

REFERENCES

1. "FACTS Controllers in Power Transmission and distribution" , K.R.Padiyar, New age international Publishers 2007.
2. "Reactive Power control in Power systems", T.J.E. Miller, John Wiley 1982.
3. "Understanding FACTS", N.G. Hingorani and L.Gyugyi, IEEE Press 2000
4. "Flexible AC Transmission systems (FACTS)", Y.H. Song and A.T.Jones, IEEE Press 1999.
5. "High Voltage DC Transmission", K.R.Padiyar, Wiley 1993.
6. "Electric Power Systems", C.L.Wadhwa, Wiley eastern Ltd

Note :

1. 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).

2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.805	Elective IV	(f)CONTROL & GUIDANCE ENGINEERING
L/T/P : 2/1/0		Credits : 3

Module I

Space Environment-Terrestrial Environment-The Solar System-Celestial Mechanics--General principles of early conventional navigation systems-Geometric Concepts of navigation-Reference frames-Direction cosine matrix-Euler angles-Transformation of angular velocities-Quaternion representation in co-ordinate transformations-Comparison of transformation methods.

Module II

Guidance information requirements-Energy Conservation Methods-Time Conservation Methods-Collision Warning and Avoidance-Rendezvous - Satellite Orbit maintenance-Inertial navigation-block diagram representation of essential components-Inertial sensors, Gyros: Principle of operation-TDF and SDF gyros-precession-Nutation-gimbal lock-gimbal flip-gyro transfer function-rate gyro-integrating gyro-Constructional details and operation of floated rate integrating gyro-Dynamically tuned gyro-Ring laser gyro-Fiber optic gyro-gyro performance parameters-Accelerometers-transfer function-Pendulous gyro integrating accelerometer-Vibrating String accelerometer-Accelerometer performance parameters- Navigation equations-Schuler principle and mechanization-

Module III

Inertial platforms-Stabilized platforms-Gimbaled and Strap down INS and their mechanization-Gyrpcompassing for initial alignment-*Externally aided inertial navigation systems*-TACAN, TERCOM, LORAN, OMEGA, DECCA, VOR, DME, JTIDS, FLIR-Basics of satellite based navigation systems: Global Positioning Systems (GPS) and Global Navigation of Satellite Systems (GNSS)

Reference Books

1. Anthony Lawrence , '*Modern Inertial Technology'* , second Edition, Springer-Verlag New York, Inc, 1998.
2. George M Siouris ,'*Aerospace Avionics Systems- A Modern Synthesis*', Academic Press, Inc.
3. Ching-Fang, '*Modern Navigation, Guidance, and Control Processing'*, Lin-Prentice-Hall Inc, Engle Wood Cliffs, New Jersey, 1991
4. Manuel Fernadez and George R Macomber , '*Inertial Guidance Engineering*', Prentic-Hall, Inc., Engle Wood Cliffs, New Jersey, 1962
5. Myron Kayton and Walter R Fried , '*Avionics Navigation Systems'*, John Wiley & Sons Inc, 1969

Note :

1. 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).

2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.805	Elective IV (g) DESIGN OF DIGITAL CONTROL SYSTEMS	
L/T/P : 2/1/0		Credits : 3

Module I

Basic digital control system- Examples - mathematical model-ZOH and FOH- choice of sampling rate-principles of discretisation-Mapping between s-domain and z-domain-Pulse transfer function- Different configurations for the design- Modified z-transform- Multi-rate discrete data systems. Time responses of discrete data systems-Steady state performance

Module II

Cascade compensators using Root Locus- Design of PID controllers- Cascade compensation by continuous data controllers using bilinear transformation - Feedback continuous data controller- Two degrees of freedom compensation-Digital controller using bilinear transformation- Dead-beat response design- Deadbeat controller without and with prescribed manipulated variable-Choice of sample time for deadbeat controller-Realization of digital controllers. Computer based simulation.

Module III

State variable model of discrete data systems with S/H devices- State transition equations- state diagrams-Transfer function- Transformation to Jordan canonical form and phase variable form- Computation of state transition matrix using Cayley-Hamilton theorem and z-transform method- Response between sampling instants- Controllability, Observability, stabilizability and reachability- Loss of controllability and observability due to sampling- Pole placement design using state feedback for SISO systems. Computer based simulation.

Reference Books

1. M.Gopal,Digital control and State Variable methods, Tata McGraw –Hill , 1997
2. Mohammed S. Satina , Allen R. Stubberud and Gene H. Hostetter " Digital Control System Design " Second edition, Saundess College Publishing, United States of America 1994.
3.
4. B.C.Kuo, Digital Control Systems, 2nd Ed., Oxford University Press,1992.
5. Constantine H. Houpis and Gary B. Lamont, Digital control systems Theory, hardware software, Mc-Graw Hill Book Company, 1985.
6. R.Isermann, Digital control systems, Volume I, Fundamentals , Deterministic control,(2nd revised edition),Springer Verlag, 1989.
7. R.G.Jacquot, Modern digital control systems, (second edition),Marcel Dekker, Inc., 1995.
8. Philips and Nagle, Digital control system analysis and design, Prentice Hall, 1984.
9. G.F.Franklin, J.David Powell and M.Workman,Digital Control of Dynamic Systems, 3rd Ed.,,Addison Wesley, 2000.

Note :

1. 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).

2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.806 (Elective – V) (a) COMPUTER AND DATA NETWORKS

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

Module – I

Uses of computer networks - Network hardware - Classification of networks - LAN - MAN - WAN (overview only) - Network software. Protocol hierarchical issues for the layers - interfaces and services - connection oriented and connectionless services - service primitives - relationship of services of protocol. Reference models - OSI reference model - TCP/IP reference model.

The Physical layer

Transmission media - twisted pair - base band coaxial cables - broadband cables - fiber optics-unguided media.

The Data link layer

Design issues - services provided to the network layer - framing - error control - flow control - elementary data link protocols - unrestricted simplex protocol - simplex stop and wait protocol - simplex protocol for noisy channel.

Module – II

The medium access sub-layer

The channel allocation problem - static channel allocation - dynamic channel allocation - multiple access protocols - ALOHA - CSMA protocols - collision free protocols - limited contention protocols - CDMA. Introduction to IEEE 802 standards – 802.3.

The network layer

Design Issues - services provided to the transport layer - internal organisation of the network layer - comparison of virtual circuit and datagram subnets. Routing algorithms - optimality principle - shortest path routing - Dijekstra's algorithm - flooding - flow based routing - distance vector routing - link state routing - Hoffmans algorithm - hierarchical routing.

Module - III

Congestion control algorithms - principles - prevention policies - traffic shaping - leaky bucket and token bucket - flow specification - choke packets - load shedding - jitter control.

The transport layer

The transport service - services provided to the upper layer - quality of service -transport layer primitives. Elements of transport protocols –TCP and UDP. Addressing-Establishing a connection, Releasing a connection. Flow control and buffering-Crash recovery

The Application layer

Basic ideas of network security - public key cryptography, DNS, SNMP, e-mail, WWW IPV6

Text Book;

1. Andrew S. Tanenbaum, "Computer networks", PHI.

REFERENCES:

1 Peterson and Davie, “Computer networks", Harcourt India Pvt. Ltd.
2 Bertsekas D and Gallager, "Data networks", second edition Prentice Hall, 1992.
3 William Stalling, "Data and Computer Communication".

Note :

1. 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).

2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.806 (Elective – V) (b) Advanced Electronic Communication

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

Module - I: Microwave Satellite and Digital Communication

Microwave frequency bands - propagation characteristics and line-of-sight communication - repeater - microwave radio link systems - land-line and satellite -comparison - advantages and disadvantages - microwave application - Maser.

Principles of digital communication – pulse modulation- sampling process-PAM –Quantization - pulse code modulation (PCM) - block diagrams of PCM transmitter and receiver - digital microwave techniques - basic principles of PSK - basic principles of ISDN.

Module - II: Optical Communication, Spread spectrum communication

Optical communication - basic principles - types of optical fibres - losses in fibres - optical sources: light emitting diodes, injection laser diodes, optical detectors -comparison of LED and ILD - optical communication systems - direct detection and heterodyne receivers - advantages of coherent optical communication.

Spread spectrum communication - direct sequence or pseudo noise, frequency hopping, time hopping, hybrid and chirp spread spectrum systems - comparison of modulation methods - generation and detection of spread spectrum signals -and applications

Module - III: Computer Communication

Need for computer communication - basic principles of computer communication networks - data communication protocols - (elementary treatment of) open systems interconnection (OSI) protocol - multiple accessing - basics of TDMA, FDMA, CDMA, CSMA/ CD.

Inter-networking techniques (elementary treatment only) - Internet and ATM networks - important services provided by internet - TCP/IP - connecting to the internet - ISDN - types of MODEMs - Intranets.

REFERENCES

1 Wayne Tomasi, "Advanced Electronic communication systems ", 5th edition, PHI India, 2002

2 Wayne Tomasi, "Electronic communication systems", 4th edition, Pearson Education, 2001.

3 Frank R.Dungan, "Electronic communication systems", 3rd edition, Vikas Publishing House.2002.

4 Gred Keiser, "Optical Fibre Communications ", McGraw Hill.

5 G.R.Cooper and C.D.McGillem, "Modern communications and spread spectrum", McGraw Hill.

6 Dennis Roddy and John Coolen, "Electronic communications", 4th Edition, PHI 2002.

7 Andrew S. Tanenbaum. "Computer Networks". 3rd edition. Prentice -Hall of India.

Note :

1. 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).

2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.806	Elective -V	(c)	HIGH VOLTAGE ENGINEERING (E)
L/T/P : 2/1/0			Credits : 3

Module - I

Generation of High dc voltages - Half wave and full wave circuits - Ripple voltages in HW and FW rectifiers. Voltage doubler circuits - Simple voltage doubler and cascade voltage doubler. Voltage multiplier circuits - Cockcroft-Walton Voltage multiplier circuits. Ripple and regulation. Electrostatics machines – principles - Van de Graaff generator.

Generation of High AC voltages: Cascade transformers, resonant transformers- parallel and series resonant test systems.

Generation of High frequency high voltages- Tesla coil.

Generation of impulse voltages- Standard impulse wave shape - Basic circuits for producing impulse waves - Analysis of commercial impulse generator circuits -Wave shape control. Multistage impulse generators - Marx circuit - modified Marx impulse generator circuit - Components of multi-stage impulse generator. Generation of switching surges.

Generation of impulse currents- Definition of impulse current waveform - Circuit for producing impulse current waves.

Module - II

Over voltages in power system - Over voltages and their significance. Switching over voltages - origin and characteristics - switching over voltages in EHV and UHV systems. Insulation requirements of EHV line.

Protection of power system apparatus against over voltages. Surge arresters - dynamic volt-ampere characteristics and surge diverter operation characteristic. Connections and rated voltages of surge arresters. Thyrite and ZnO arresters. Protective devices against lightning over voltages - rod - rod gaps – over-head ground wires.

Control of over voltages due to switching - method of reducing switching over voltages.

Principle of insulation co- ordination on HV and EHV power systems: Insulation level of equipment. Volt-time characteristics. Insulation co-ordination of a substation. Insulation co- ordination of EHV system.

Module - III

Non-destructive testing of dielectric materials-Measurement of resistance, dielectric constant and loss factor. Partial discharge phenomena - discharge detection using straight detectors.

HV testing of electrical apparatus- Definitions - Terms and conditions. Test on insulators, cables, transformers, surge arresters. HV and EHV bushing design, selection, quality control, maintenance and diagnostic testing.

Biological and environmental aspects in EHV and UHV line design. Live line maintenance – Principles - common live line maintenance - Tools for live line maintenance.

TEXT BOOK

1. M.S.Naidu and V.Kamaraju. "High voltage Engineering", Tata Mc Graw Hill, New Delhi.
2. I. J.Nagarath, D P. Kothari, “Modern Power System Analysis”, TMH. 1994.
3.

REFERENCES

1. Kuffel. E and Zaengal W. "High Voltage Engineering", Pergamon Press, Oxford.
2. Dieter Kind. "An Introduction to High Voltage Experimental Techniques”, Wiley Eastern.
3. Diesendrof W. "Insulation Co-ordination in High Voltage Electrical Power Systems", Butterworth, London.
4. "Methods of High Voltage Testing", IS 2021-1976 IEEE Std - 4 - 1978.
5. C.L. Wadhwa "High Voltage Engineering", Wiley Eastern.

Note :

1. 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).

2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.806 ELECTIVE V(d) OBJECT ORIENTED PROGRAMMING

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

Module I

Introduction to object oriented programming – data abstraction – inheritance- polymorphism. Basic data types – operators – expressions, input/output-manipulators. Decision making – if and switch case. Loops – for, while and do while. Array- structure –union. Function –reference parameter – function over loading – default argument – inline functions – recursion – storage classes. Pointers- array of pointers – dynamic allocation of memory – command line arguments – pointer to a function – array and pointer as argument of a function – general purpose functions for handling two dimensional array as arguments.

Module II

Classes – data members – methods – private, public and protected members.

Scope resolution operator – this pointer – static data members and methods, 'const' arguments. Array of class objects – pointer to a class objects. Constructors and destructors – Copy constructor – overloaded methods – friend function and classes – overloading of binary and unary operators – type conversion.

Module III

Inheritance – Private, Public and protected derivation - constructors and destructors in derived classes – friend function and inheritance – over riding methods – pointers to base and derived classes – polymorphism - virtual functions - multiple inheritances. Classes with in classes. Introduction to function templates and class templates. Exception handling – try – catch. File handling in C++ - formatted and unformatted files – sequential and random processing of files. Introduction to Microsoft Foundation Class library.

Text Books

1. S. B. Lippman & J. Lajoie, "C++ Primer", 3rd Edition, Addison Wesley.
2. A. R. Venugopal , Rajkumar, T. Ravishankar, "Mastering C++",TMH.
3. Robert Lafore., Object Oriented Programming in Microsoft C++– Galgotia Book House 1995.

References:

1. Eric Nagler "Learning C++ A hands on approach"- BPB publications.
2. E. Balaguruswamy, "Objected Oriented Programming with C++", TMH.
3. D . Parasons, "Object Oriented Programming with C++",BPB Publication.
4. Rumbaugh et. al. " Object Oriented Modelling & Design" , Prentice Hall
5. G . Booch "Object Oriented Design & Applications", Benjamin,Cummings.
6. Steven C. Lawlor, "The Art of Programming Computer Science with C++", Vikas Publication.
7. Bjarne Strostrup " C++ programming Language"- Addison Publishing Company.

Note :

1. 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).
2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08. 806	Elective V	(e)DIGITAL IMAGE PROCESSING	
L/T/P : 2/1/0			**Credits : 3**

Module I: Digital image fundamentals: Physics of vision, image digitization, sampling and quantization, image resolution, colour perception & processing. pixel based transformation, geometric transformation, Image transforms: Introduction to 2D DFT and FFT – Separable Image Transforms -Walsh Transform , Hadamard Transform, Discrete Cosine Transform, Haar, Slant , and Karhunen – Loeve transforms. Radon transforms

Module II: Image enhancement: Spatial Domain methods: Basic grey level transformation – Histogram equalization – Image subtraction – Image averaging –Spatial filtering: Smoothing, sharpening filters – Laplacian filters – Frequency domain filters : Smoothing – Sharpening filters – Homomorphic filtering.
Image restoration: degradation, noise models inverse filtering, Image denoising, median filtering

Module III: Image segmentation: Region based approach, clustering techniques, thresholding and edge detection.

Image compression: Run length length coding , predictive coding ,Basics of Image compression standards: JPEG, MPEG, Basics of Vector quantization. Basics of Binary and colour Image processing, Wavelet Transforms, Wavelet based Image compression

TEXT BOOKS

REFERENCES

1.Rafael C Gonzalez, Richard E Woods 2nd Edition, Digital Image Processing - Pearson Education 2003.
2. William K Pratt, Digital Image Processing John Willey (2001)
3. Image Processing Analysis and Machine Vision – Millman Sonka, Vaclav hlavac, Roger Boyle, Broos/colic, Thompson Learniy (1999).
4. A.K. Jain, PHI, New Delhi (1995)-Fundamentals of Digital Image Processing.
5. Digital Image Processing : S.Jayaraman, S.Essakkirajan and T. Veerakumar, Tata McGraw Hill Edn (Pvt) Ltd,
6. Chanda Dutta Magundar – Digital Image Processing and Applications, Prentice Hall of India, 2000

Note :

1. 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).
2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08:806	Elective V (f) WAVELETS AND APPLICATIONS	
L/T/P : 2/1/0		**Credits : 3**

Module I

Fundamentals of signal decomposition - brief overview of Fourier transform and short term Fourier transform - Introduction to wavelets - continuous wavelet transform - definition - scaling – shifting - scale and frequency. CWT as a correlation - time frequency resolution. Introduction to the DWT and orthogonal wavelet decomposition. One Stage filtering - Approximation and Details -Filter bank analysis.

Module II

Multi resolution analysis. orthogonal wavelet decomposition based on the Haar wavelet – digital filter implementation of the Haar wavelet decomposition (Mallat's algorithm). Construction of a general orthonormal MRA - formal definition - implication of the dilation equation and orthogonality.
Introductory concepts of biorthogonal wavelet basis and wavelet packet synthesis.

Module III

Two-dimensional wavelet decomposition - regularity – vanishing moments. Multilevel Decomposition – Number of levels – Wavelet reconstruction – Reconstruction filter- Reconstructing Approximations and details- Multilevel Reconstruction.
Typical Applications - image compression - EZW algorithm - audio compression - signal denoising - edge detection - image fusion - medical applications.

Text book

Rao R.M. & Bopardikar A.S., 'Wavelet Transforms-Introduction to Theory and Applications'

Reference books

1. Sidney Burrus, Gopinath R.A. & Haitao Guo, Introduction to Wavelets and Wavelet Transforms", Prentice Hall International.
2. Chan Y.T., 'Wavelet Basics', Kluwer Academic Publishers
3. Goswami J.C. & Chan A.K., 'Fundamentals of Wavelets - Theory Algorithms and Applications'

Note :

1. 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).
2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.806	ELECTIVE V (g) OPTIMAL CONTROL THEORY	
L/T/P : 2/1/0		Credits : 3

MODULE I

Calculus of variations- Fundamental concepts . Functional of single function- Euler - equation-General variation of a functional-Functionals of several independent functions- Boundary conditions. Piecewise smooth extremals. Constrained extremisation of functionals-Point constraints-differential equation constraints-isoperimetric constraints.

MODULE II

Introduction . Optimal control problem . Problem Formulation . Performance measures for various types of optimal control problems- Linear Regulator problem- Tracking problem-Minimum time problems-Minimum energy problems-Definitions of LQG/LQR problems-Introduction to the applications of optimal control design-Examples.

MODULE III

Variational approach to optimal control problems-Necessary conditions for optimal control with different-Boundary conditions in optimal control problem. Linear regulator problem . Tracking problem. Pontryagin.s minimum principle- State inequality constraints - Minimum time problems- Minimum control effort problems.

Textbook

Donald E. Kirk, Optimal Control Theory: An introduction, Dover Publications 2004.

Reference Books

1. Andrew P. Sage, Optimum Systems Control, Prentice Hall,1977.
2. HSU and Meyer, Modern Control:. Principles and Applications, McGraw Hill,1968.
3. Brian D.O. Anderson, John B Moore, Linear Optimal Control, Prentice hall, 1991.

Note :

1. 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).

2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.806 ELECTIVE V (h) NONLINEAR CONTROL THEORY

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

MODULE I

Introduction and classical techniques- Characteristics of nonlinear systems - classification of equilibrium points - limit cycles - analysis of systems with piecewise constant inputs using phase plane analysis . perturbation techniques- periodic orbits - stability of periodic solutions - singular perturbation model - slow and fast manifolds.

MODULE II

Stability of Nonlinear Systems - Lyapunov stability - local stability - local linearization and stability in the small- Direct method of Lyapunov - generation of Lyapunov function for linear and nonlinear systems - variable gradient method - Centre manifold theorem - region of attraction - Invariance theorems - Input output stability - L stability - L stability of state models.

MODULE III

Feedback Control and Feedback Stabilisation- Analysis of feedback systems- Circle Criterion - Popov Criterion– Concepts of Inverse control-Feedback linearization-Model predictive control-Simultaneous Feedback control- Design via linearization- stabilization - regulation via intgral control- gain scheduling - Exact Feedback Linearization - Input state linearization - input output linearization - state feedback control - stabilization - tracking - integral control.

Reference Books:

1. Hassan K Khalil, *Nonlinear Systems*, Prentice - Hall International (UK), 2002
2. Jean-Jacques E. Slotine & Weiping Li, '*Applied Nonlinear Control*', Prentice-Hall., NJ, 1991
3. Alberto Isidori, *Nonlinear Control Systems*, Springer Verlag, 1995
4. S. Wiggins, *Introduction to Applied Nonlinear Dynamical Systems and Chaos*, Springer Verlag, 1990
5. H. Nijmeijer & A.J. Van Der Schaft,.*Nonlinear Dynamic control Systems*., Springer Verlag Berlin 1990.
6. Arther E Gelb and Vender Velde .*Multiple input Describing function and Nonlinear System Design*., McGraw Hill 1990.
7. John E Gibson, *Nonlinear Automatic Control*, McGrawHill, New York.
8. M Vidyasagar, '*Nonlinear Systems Analysis*', Prentice-Hall, India, 1991
9. Shankar Sastry, '*Nonlinear System Analysis, Stability and Control*', Springer, 1999
10. Ashok D Belegundu, Tirupathi R Chandrupatla, '*Optimization concepts and Applications in Engineering*', Pearson Education, Delhi, 2002

Note :

1. 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).

2. Maximum of four questions and a minimum of three questions from each module should be included in Part A.

08.806 Elective V (i) SPECIAL ELECTRICAL MACHINES

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

Module I

AC Servomotors-Construction-principle of operation-performance characteristics-damped AC servomotors-Drag cup servomotor-applications-DC servomotors-field and armature controlled DC servomotors- permanent magnet armature controlled – seriessplit field DC servomotor.
Stepper motors-Basic principle - construction –variable reluctance- permanent magnet – hybrid type- - comparison – applications

Module II

.Hysteresis motor- constructional details- principle of operation- torque – slip characteristics - applications.
Reluctance motors- Principle of operation- torque equation -torque slip characteristics applications.
Switched reluctance motors - principle of operation- torque equation-different types-comparison-applications.

Module III

Brushless dc motor- construction - trapezoidal type-sinusoidal type -comparison– applications.
Linear motors – different types -Linear induction motors- different types -Expression for linear force- equivalent circuit – applications.

Reference:

1.Irving L.Kosow.'Electrical Machinery and Transformers', Oxford Science Publications.
2.Veinott&Martin,'Fractional & Subfractional hp Electric Motors'.McGraw Hill International Edn.
3.T.J.E.Miller, 'Brushless PM and Reluctance Motor Drives'.C.Larendon Press,Oxford.
4.Theodore Wildi, 'Electric Machines, Drives and Power Systems',Prentice Hall India Ltd.

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08.807	PROJECT & VIVA VOCE (INDUSTRIAL VISIT)
L/T/P : 0/0/5	**Credits : 5**

Out of 100 marks for Sessional work , 20 marks are to be given for industrial visits, to be assessed based on the reports presented. Viva Voce examination may be on Project, Seminar, Industrial visits (Four Visits During V to VIII Semesters) and overall performance.

08. 808	SYSTEMS AND CONTROL LAB
L/T/P : 0/0/4	**Credits : 4**

1. Predetermination and verification of frequency response characteristics of Lag and Lead networks.
2. Transfer Function of AC and DC servomotors
3. Step and frequency response of R-L-C circuit
4. Study of various types of synchros (TX, TR & TDX). Characteristics of transmitter, data transmission using TX-T R pair. Effect of TDX in data transmission.
5. Study of P,PI and PID controllers. Response analysis of a typical system with different controllers, using process control simulator.
6. Study of performance characteristics and response analysis of a typical temperature/ Flow/ Level control system.
7. MATLAB: Use of control system Tool box for the Time domain and frequency domain methods of system analysis and design
8. SIMULINK: Simulation and control of real time systems using SIMULINK
9. Compensator design using Bode plot with MATLAB control system Tool box
10. Programmable Logic controller(PLC): To control a simple process using PLC

Note:
For University examination, the following guidelines should be followed regarding award of marks
(a) Circuit and design -30%
(b) Performance -30%
(c)Result -20%
(d) Viva voce -20%