REGULATIONS, CURRICULUM AND SYLLABUS

for

B. TECH

ELECTRICAL & ELECTRONICS ENGINEERING

(w.e.f. 2009-2010)

PONDICHERRY UNIVERSITY
PONDICHERRY-605 014

PONDICHERRY UNIVERSITY
BACHELOR OF TECHNOLOGY PROGRAMMES
(EIGHT SEMESTERS)

REGULATIONS

1. Conditions for Admission:

(a) Candidates for admission to the first semester of the 8 semester B.Tech Degree programme should be required to have passed :

The Higher Secondary Examination of the (10+2) curriculum (Academic Stream) prescribed by the Government of Tamil Nadu or any other examination equivalent there to with minimum of 45% marks (a mere pass for OBC and SC/ST candidates) in aggregate of subjects – Mathematics, Physics and any one of the following optional subjects: Chemistry / Biotechnology/ Computer Science / Biology (Botany & Zoology) or an Examination of any University or Authority recognized by the Executive Council of the Pondicherry University as equivalent thereto.

(b) For Lateral entry in to third semester of the eight semester B.Tech programme :

The minimum qualification for admission is a pass in three year diploma or four year sandwich diploma course in engineering / technology with a minimum of 60 % marks (50% marks for OBC and a mere pass for SC/ST candidates) in aggregate in the subjects covered from 3rd to final semester or a pass in any B.Sc. course with mathematics as one of the subjects of study with a minimum of 60 % marks (50% marks for OBC and a mere pass for SC/ST candidates) in aggregate in main and ancillary subjects excluding language subjects. The list of diploma programs approved for admission for each of the degree programs is given in **Annexure A**.

2. Age Limit :

The candidate should not have completed 21 years of age as on 1st July of the academic year under consideration. For Lateral Entry admission to second year of degree programme , candidates should not have completed 24 years as on 1st July of the academic year under consideration. In the case of SC/ST candidates, the age limit is relaxable by 3 years for both the cases.

3. Duration of Programme :

The Bachelor of Technology degree programme shall extend over a period of 8 consecutive semesters spread over 4 academic years – two semesters constituting one academic year. The duration of each semester shall normally be 15 weeks excluding examinations.

4. Eligibility for the award of Degree:

No candidate shall be eligible for the award of the degree of Bachelor of Technology, unless he/she has undergone the course for a period of 8 semesters (4 academic years) / 6 semesters (3 academic years for Lateral Entry candidates) in the faculty of Engineering and has passed the prescribed examinations in all the semesters.

5. Branches of Study:

Branch I	- Civil Engineering
Branch II	- Mechanical Engineering
Branch III	- Electronics & Communication Engineering
Branch IV	- Computer Science & Engineering
Branch V	- Electrical & Electronics Engineering
Branch VI	- Chemical Engineering
Branch VII	- Electronics & Instrumentation Engineering
Branch VIII	- Information Technology
Branch IX	- Instrumentation & Control Engineering
Branch X	- Biomedical Engineering

or any other branches of study as and when offered. The branch allocation shall be ordinarily done at the time of admission of the candidate to the first semester.

6. Subjects of Study:

The subjects of study shall include theory and practical courses as given in the curriculum and shall be in accordance with the prescribed syllabus. The subjects of study for the first two semesters shall be common for all branches of study.

7. Examinations:

The theory and practical examinations shall comprise continuous assessment throughout the semester in all subjects as well as university examinations conducted by Pondicherry University at the end of the semester (November / December or April / May).

(a) Theory courses for which there is a written paper of 75 marks in the university examination**.**

The Internal Assessment marks of 25 has to be distributed as 10 marks each for two class tests and 5 marks for class attendance in the particular subject. The distribution of marks for attendance is as follows.

5 marks for 95% and above
4 marks for 90% and above but below 95%
3 marks for 85% and above but below 90%
2 marks for 80% and above but below 85%
1 mark for 75% and above but below 80%

In total, three tests are to be conducted and the better two are to be considered for assessment.

(b) Practical courses for which there is a university practical examination of 50 marks**:**

The internal assessment marks of 50 has to be distributed as 20 marks for the periodic practical works and records submitted thereof, 15 marks for an internal practical examination, 5 marks for an internal viva voce, and 10 marks for class attendance in the particular subject. The distribution of marks is as given below.

10 marks for 95% and above
8 marks for 90% and above but below 95%
6 marks for 85% and above but below 90%
4 marks for 80% and above but below 85%
2 marks for 75% and above but below 80%

8. Requirement for appearing for University Examination:

A candidate shall be permitted to appear for university examinations at the end of any semester only if:

(i) He / She secures not less than 75% overall attendance arrived at by taking into account the total number of periods in all subjects put together offered by the institution for the semester under consideration.

(Candidates who secure overall attendance greater than 60% and less than 75% have to pay a condonation fee as prescribed by University along with a medical certificate obtained from a medical officer not below the rank of Asst. Director)

(ii) He / She earns a progress certificate from the Head of the institution for having satisfactorily completed the course of study in all the subjects pertaining to that semester.

(iii) His / Her conduct is found to be satisfactory as certified by the Head of the institution.

A candidate who has satisfied the requirement (i) to (iii) shall be deemed to have satisfied the course requirements for the semester.

9. Procedure for completing the course:

A candidate can join the course of study of any semester only at the time of its normal commencement and only if he/she has satisfied the course requirements for the previous semester and further has registered for the university examinations of the previous semester in all the subjects as well as all arrear subjects if any.

However, the entire course should be completed within 14 consecutive semesters (12

consecutive semesters for students admitted under lateral entry).

10. Passing Minimum:

(i) A candidate shall be declared to have passed the examination in a subject of study only if he/she secures not less than 50% of the total marks (Internal Assessment plus University examination marks) and not less than 40% of the marks in University examination.

(ii) A candidate who has been declared "Failed" in a particular subject may reappear for that subject during the subsequent semesters and secure a pass. However, there is a provision for revaluation of failed or passed subjects provided he/she fulfills the following norms for revaluation.

(a) Applications for revaluation should be filed within 4 weeks from the date of declaration of results or 15 days from the date of receipt of marks card whichever is earlier.

(b) The candidate should have attended all the college examinations as well as university examinations.

(c) If a candidate has failed in more than two papers in the current university examination, his/her representation for revaluation will not be considered.

(d) The request for revaluation must be made in the format prescribed duly recommended by the Head of the Institution along with the revaluation fee prescribed by the University.

The internal assessment marks obtained by the candidate shall be considered only in the first attempt for theory subjects alone. For the subsequent attempts, University examination marks will be made up to the total marks. Further the University examination marks obtained in the latest attempt shall alone remain valid in total suppression of the University examination marks obtained by the candidate in earlier attempts.

11 Award of Letter Grades:

The assessment of a course will be done on absolute marks basis. However, for the purpose of reporting the performance of a candidate, letter grades, each carrying certain points, will be awarded as per the range of total marks (out of 100) obtained by the candidate, as detailed below:

Range of Total	Letter	Grade
90 to 100	S	10
80 to 89	A	9
70 to 79	B	8
60 to 69	C	7
55 to 59	D	6

50 to 54	E	5
0 to 49	F	0
Incomplete	FA	

'F' denotes failure in the course. 'FA' denotes absent / detained as per clause 8.

After results are declared, grade sheets will be issued to the students. The grade sheets will contain the following details:

(a) The college in which the candidate has studied.

(b) The list of courses enrolled during the semester and the grades scored.

(c) The Grade Point Average (GPA) for the semester and The Cumulative Grade Point Average (CGPA) of all enrolled subjects from first semester onwards.

(d) GPA is the ratio of sum of the products of the number of credits (C) of courses registered and the corresponding grades points (GP) scored in those courses, taken for all the courses and sum of the number of credits of all the courses

$$GPA = \left(Sum\ of\ \ (C \times GP) / Sum\ of\ \ C \right)$$

CGPA will be calculated in a similar manner, considering all the courses enrolled from first semester. FA grades are to be excluded for calculating GPA and CGPA.

The conversion of CGPA into percentage marks is as given below

$$\%\ Marks = (CGPA - 0.5) \times 10$$

12 Award of Class and Rank:

(i) A candidate who satisfies the course requirements for all semesters and who passes all the examinations prescribed for all the eight semesters (six semesters for lateral entry candidates) within a maximum period of 7 years (6 years for lateral entry candidates) reckoned from the commencement of the first semester to which the candidate was admitted shall be declared to have qualified for the award of degree.

(ii) A candidate who qualifies for the award of the degree passing in all subjects pertaining to semesters 3 to 8 in his/her first appearance within 6 consecutive semesters (3 academic years) and in addition secures a CGPA of 8.50 and above for the semesters 3 to 8 shall be declared to have passed the examination in **FIRST CLASS** with **DISTINCTION**.

(iii) A candidate who qualifies for the award of the degree by passing in all subjects relating to semesters 3 to 8 within a maximum period of eight semesters after his/her commencement of study in the third semester and in addition secures CGPA not less than 6.5 shall declared to have passed the examination in **FIRST CLASS**.

(iv) All other candidates who qualify for the award of degree shall be declared to have passed the examination in **SECOND CLASS**.

(v) For the Award of University ranks and Gold Medal for each branch of study, the CGPA secured from 1st to 8th semester alone should be considered and it is mandatory that the candidate should have passed all the subjects from 1st to 8th semester in the first attempt. Rank certificates would be issued to the first ten candidates in each branch of study.

13. Provision for withdrawal:

A candidate may, for valid reasons, and on the recommendation of the Head of the Institution be granted permission by the University to withdraw from writing the entire semester examination as one Unit. The withdrawal application shall be valid only if it is made earlier than the commencement of the last theory examination pertaining to that semester. Withdrawal shall be permitted only once during the entire course. Other conditions being satisfactory, candidates who withdraw are also eligible to be awarded DISTINCTION whereas they are not eligible to be awarded a rank.

14. Discontinuation of Course:

If a candidate wishes to temporarily discontinue the course for valid reasons, he/she shall apply through the Head of the Institution in advance and obtain a written order from the University permitting discontinuance. A candidate after temporary discontinuance may rejoin the course only at the commencement of the semester at which he/she discontinued, provided he/she pays the prescribed fees to the University. The total period of completion of the course reckoned from the commencement of the first semester to which the candidate was admitted shall not in any case exceed 7 years, including of the period of discontinuance.

15. Revision of Regulations and Curriculum:

The University may from time to time revise, amend or change the regulations of curriculum and syllabus as and when found necessary.

ANNEXURE – A

B.Tech courses in which admission is sought	Diploma courses eligible for admission
Civil Engineering	Civil Engineering Civil and Rural Engineering Architectural Assistantship Architecture Agricultural Engineering
Mechanical Engineering	Mechanical Engineering Automobile Engineering Agricultural Engineering Mechanical and Rural Engineering Refrigeration and Air-conditioning Agricultural Engineering & Farm Equipment Technology Metallurgy Production Engineering Machine Design & Drafting Machine tool maintenance and Repairs Printing Technology / Engineering Textile Engineering / Technology Tool Engineering
Electrical and Electronics Engineering Electronics & Communication Engineering Electronic and Instrumentation Engineering Instrumentation and Control Engineering Bio Medical Engineering	Electrical Engineering Electrical and Electronics Engineering Electronics and Instrumentation Engineering Instrumentation Engineering / Technology Electronics and Communication Engg. Electronics Engineering Medical Electronics Instrumentation and Control Engineering Applied Electronics
Chemical Engineering	Chemical Engineering Chemical Technology Petrochemical Technology Petroleum Engineering Ceramic Technology Plastic Engineering Paper & Pulp Technology Polymer Technology
Information Technology Computer Science & Engineering	Computer Science and Engineering Computer Technology Electrical and Electronics Engineering Electronics & Communication Engineering Electronics & Instrumentation Engineering Instrumentation Engineering / Technology

I SEMESTER

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	Theory							
T101	Mathematics – I	3	1	-	4	25	75	100
T102	Physics	4	-	-	4	25	75	100
T103	Chemistry	4	-	-	4	25	75	100
T110	Basic Civil and Mechanical Engineering	4	-	-	4	25	75	100
T111	Engineering Mechanics	3	1	-	4	25	75	100
T112	Communicative English	4	-	-	3	25	75	100
	Practical							
P104	Physics lab	-	-	3	2	50	50	100
P105	Chemistry lab	-	-	3	2	50	50	100
P106	Workshop Practice	-	-	3	2	50	50	100
	Total	**22**	**2**	**9**	**29**	**300**	**600**	**900**

II SEMESTER

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	Theory							
T107	Mathematics – II	3	1	-	4	25	75	100
T108	Material Science	4	-	-	3	25	75	100
T109	Environmental Science	4	-	-	3	25	75	100
T104	Basic Electrical and Electronics Engineering	3	1	-	4	25	75	100
T105	Engineering Thermodynamics	3	1	-	4	25	75	100
T106	Computer Programming	3	1	-	3	25	75	100
	Practical							
P101	Computer Programming Lab	-	-	3	2	50	50	100
P102	Engineering Graphics	2	-	3	2	50	50	100
P103	Basic Electrical & Electronics Lab	-	-	3	2	50	50	100
P107	NSS / NCC *	-	-	-	-	-	-	-
	Total	**22**	**4**	**9**	**30**	**300**	**600**	**900**

* To be completed in I and II semesters, under Pass / Fail option only and not counted for CGPA calculation.

III SEMESTER

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	**T**	**P**		**IA**	**UE**	**TM**
	Theory							
MA T31	Mathematics - III	3	1	-	4	25	75	100
EE T32	Electric Circuit Analysis	3	1	-	4	25	75	100
EE T33	Electrical Machines – I	3	1	-	4	25	75	100
EE T34	Electronic Devices and Circuits	4	0	-	3	25	75	100
EE T35	Electromagnetic Theory	3	1	-	4	25	75	100
EE T36	Fluid and Thermal Machines	4	-	-	3	25	75	100
	Practical							
EE P31	Electrical Machines Lab - I	-	-	3	2	50	50	100
EE P32	Electronics Lab – I	-	-	3	2	50	50	100
EE P33	Fluid and Thermal Machines Lab	-	-	3	2	50	50	100
	Total	**20**	**4**	**9**	**28**	**300**	**600**	**900**

IV SEMESTER

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	**T**	**P**		**IA**	**UE**	**TM**
	Theory							
MA T41	Mathematics - IV	3	1	-	4	25	75	100
EE T42	Electrical Machines – II	3	1	-	4	25	75	100
EE T43	Electronic Circuits	3	1	-	4	25	75	100
EE T44	Linear Control System	3	1	-	4	25	75	100
EE T45	Pulse and Digital Circuits	4	-	-	3	25	75	100
EE T46	Object Oriented Programming	4	-	-	3	25	75	100
	Practical							
EE P41	Electrical Machine Lab - II	-	-	3	2	50	50	100
EE P42	Electronics Lab – II	-	-	3	2	50	50	100
EE P43	Object Oriented Programming Lab	-	-	3	2	50	50	100
SP P44	Physical Education*	-	-	-	-	-	-	-
	Total	**20**	**4**	**9**	**28**	**300**	**600**	**900**

* To be completed in III and IV semesters, under Pass / Fail option only and not counted for CGPA calculation.

V SEMESTER

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	Theory							
MA T51	Mathematics - V	3	1	-	4	25	75	100
EE T52	Analog and Digital Integrated Circuits	3	1	-	4	25	75	100
EE T53	Transmission and Distribution	3	1	-	4	25	75	100
EE T54	Power Electronics	3	1	-	4	25	75	100
EE T55	Measurements and Instrumentation	4	-	-	3	25	75	100
EE T56	Communication Engineering	4	-	-	3	25	75	100
	Practical							
EE P51	Electronics Lab – III	-	-	3	2	50	50	100
EE P52	Measurement and Control Lab	-	-	3	2	50	50	100
HS P53	General Proficiency -I	-	-	3	2	100	-	100
	Total	**20**	**4**	**9**	**28**	**350**	**550**	**900**

VI SEMESTER

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	Theory							
EE T61	Power System Analysis	3	1	-	4	25	75	100
EE T62	Utilization of Electrical Energy	4	-	-	3	25	75	100
EE T63	Microprocessors and Applications	3	1	-	4	25	75	100
EE T64	Electrical Machine Design	3	1	-	4	25	75	100
EE T65	Digital Signal Processing	3	1	-	4	25	75	100
EE T66	Energy Engineering	4	-	-	3	25	75	100
	Practical							
EE P61	Power Electronics Lab	-	-	3	2	50	50	100
EE P62	Micro Processor Lab	-	-	3	2	50	50	100
HS P63	General Proficiency - II	-	-	3	2	100	-	100
	Total	**20**	**4**	**9**	**28**	**350**	**550**	**900**

VII SEMESTER

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	Theory							
EE T71	Industrial Management	4	-	-	4	25	75	100
EE T72	Solid State Drives	3	1	-	4	25	75	100
	Elective – I (Group A)	4	-	-	4	25	75	100
	Elective – II (Group A)	4	-	-	4	25	75	100
	Elective – III (Group A)	4	-	-	4	25	75	100
	Practical							
EE P71	Power System Simulation Lab	-	-	3	2	50	50	100
EE PW7	Project Phase - I	-	-	6	2	100	-	100
EE P72	Seminar	-	-	2	1	100	-	100
EE P73	Training /Industrial Visit	-	-	-	1	100	-	100
	Total	**19**	**1**	**11**	**26**	**475**	**425**	**900**

VIII SEMESTER

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	Theory							
EE T81	Power system operation and control	3	1	-	4	25	75	100
EE T82	Protection and Switchgear	3	1	-	4	25	75	100
	Elective – IV (Group B)	4	-	-	3	25	75	100
	Elective – V (Group B)	4	-	-	3	25	75	100
	Elective – VI (Group B)	4	-	-	3	25	75	100
	Practical							
EE PW8	Project Phase - II	-	-	9	6	50	50	100
EE P81	Comprehensive Viva	-	-	3	2	100	-	100
EE P82	Professional Ethical Practice	-	-	2	1	100	-	100
	Total	**18**	**2**	**14**	**26**	**375**	**425**	**800**

LIST OF ELECTIVES

GROUP - A

EE E71	Analog and Digital Filters
EE E72	Computer Aided Planning and Drafting
EE E73	Data Structures and Algorithms
EE E74	Digital Control Systems
EE E75	Digital System Design Using VHDL
EE E76	Fuzzy and Neural Systems
EE E77	High Power Solid State Systems
EE E78	High Voltage Engineering
EE E79	Information Technology
EE E710	Power System Economics

GROUP - B

EE E81	Advanced Control Engineering
EE E82	Biomedical Instrumentation
EE E83	Computer and Communication Networks
EE E84	Design and Layout of Power Apparatus and Systems
EE E85	DSP Techniques for Speech and Image Processing
EE E86	Embedded System Design
EE E87	FACTS Controllers
EE E88	HVDC Transmission
EE E89	Power System Restructuring and Deregulation
EE E810	Special Electrical Machines

T101 MATHEMATICS – I

UNIT I

Calculus: Curvature, radius of curvature, evolutes and involutes. Beta and Gamma functions and their properties.

UNIT II

Multiple Integrals and Applications: Multiple integrals – change of order of integration. Applications: Areas (double integration) and volumes by triple integration (Cartesian and polar) – mass and center of mass (constant and variable densities).

UNIT III

Analytical Solid Geometry: Directional cosines and ratios – angle between two lines – the equation of plane - equations to a straight line and shortest distance between two skew lines.

UNIT IV

Differential Equations: Exact equations, First order linear equations, Bernoulli's equation, orthogonal trajectories, growth and decay, geometrical applications and electric circuits. Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT V

Differential Equations (Higher order): Linear differential equations of higher order – with constant coefficients, the operator D - Euler's linear equation of higher order with variable coefficients - simultaneous linear differential equations – solution by variation of parameters method – simple applications to electric circuits.

Text Book

1. M.K.Venkataraman, Engineering Mathematics (First Year), Second Edition, The National Publishing Company, Madras, 2001.

Reference Book

1. N.P. Bali and Manish Goyal, A Text Book of Engineering Mathematics, Lakshmi Publications, New Delhi , 2007.

T102 PHYSICS

UNIT I

Acoustics and NDT: *Ultrasonics* - *U*ltrasonic Waves Productions (Piezoelectric and Magnetostriction method) – Detections (Acoustic Grating)

Acoustics - Factors affecting Acoustic of Buildings (Reverberation, Loudness, Focusing, Echo, Echelon Effect and Resonance) and their Remedies - Sabine's formula for Reverberation Time . *NDT applications* - Pulse Echo Method - Liquid Penetrant Method

UNIT II

Optics: *Interference* - Air Wedge – Michelson's Interferometer – Wavelength Determination– Interference Filter – Antireflection Coatings. *Diffraction* - Diffraction Grating – Dispersive power of grating - Resolving Power of Grating and Prism. *Polarisation* - Huygens Theory of Double Refraction – Quarter and Half Wave Plates – Specific Rotary Power – Laurent Half Shade Polarimeter

UNIT III

Lasers and Fiber Optics: *Lasers* - Principles of Laser – Spontaneous and Stimulated Emissions - Einstein's Coefficients – Population Inversion and Laser Action – Optical resonators – Types of Lasers - NdYAG, CO_2 laser, GaAs Laser

Fiber Optics - Principle and Propagation of light in optical fiber – Numerical aperture and acceptance angle – Types of optical fibers (material, refractive index, mode)

UNIT IV

Wave Mechanics: Matter Waves – de Broglie Wavelength – Uncertainty Principle – Schrödinger Wave Equation – Time Dependent – Time Independent – Application to Particle in a One Dimensional Box – Quantum Mechanical Tunneling – Tunnel Diode.

UNIT V

Nuclear Energy Source: General Properties of Nucleus (Size, Mass, Density, Charge) – Mass Defect – Binding Energy - Disintegration in fission – Nuclear Fusion (p-p and C-N cycle) – *Nuclear Reactor:* Materials Used in Nuclear Reactors. – PWR – BWR - FBTR

Text Books

1. A S Vasudeva, Modern Engineering Physics, S. Chand & Co, New Delhi, 2006.
2. V Rajendran, Engineering Physics, TMH, New Delhi 2008.

Reference Books

1. Richtmyer, Kennard and cooper , Introduction to Modern Physics, TMH, New Delhi 2005.
2. Ajay Ghatak, Optics, TMH, New Delhi, 2007.
3. Thiagarajan and Ghatak, Laser and Application, TMH, New Delhi, 2008.
4. Arthur Beiser, Concept of Modern Physics, TMH, New Delhi, 2008.
5. Avadhanulu M N and Kshir Sagar , A Text Book of Engineering Physics, S. Chand & Co, New Delhi, 2007.
6. R. Murugeshan, Modern Physics, S. Chand & Co, New Delhi, 2006.
7. K.R.Nambiar, Lasers, New Age International, New Delhi, 2008.

T103 CHEMISTRY

UNIT I

Water: Hardness of water – units and calcium carbonate equivalent. Determination of hardness of water- EDTA method. Disadvantages of hardwater-boiler scale and sludge, caustic embrittlement, priming and foaming and boiler corrosion. Water softening method – internal and external conditioning – lime-soda process, zeolite process and ion exchange process. Desalination – reverse osmosis and electrodialysis.

UNIT II

Polymers : Classification, types of polymerization reactions - mechanism of radical, ionic and Ziegler-Natta polymerizations. Polymer properties - chemical resistance, crystallinity and effect of temperature. Thermoplastics and thermosets. Polymerization techniques - bulk, suspension, emulsion, solution and gas phase polymerization. Preparation, properties and uses of PVC, TEFLON, Nylons, Bakelite, polyurethane, Mn and Mw. Rubbers - vulcanization, synthetic rubber, buna S, buna N, silicone and butyl rubber. Conducting polymers - classification and applications. Polymer composites – FRP - laminar composites.

UNIT III

Electrochemical Cells: Galvanic cells, single electrode potential, standard electrode potential, electromotive series. EMF of a cell and its measurement. Nernst equation. Electrolyte concentration cell. Reference electrodes-hydrogen calomel, Ag /AgCl and glass electrodes. Batteries - primary and secondary cells, laclanche cell, lead acid storage cell, Ni-Cd battery and alkaline battery. Fuel cells - H_2-O_2 fuel cell.

UNIT IV

Corrosion And Its Control: Chemical and electrochemical corrosion-Galvanic series-galvanic, pitting, stress and concentration cell corrosion. Factors influencing corrosion-corrosion control methods - cathodic protection and corrosion inhibitors. Protective coating - types of protective coatings-metallic coating-tinning and galvanizing, cladding, electroplating and anodizing.

UNIT V

Phase Rule: Definition and derivation of phase rule. Application to one component system - water and sulphur systems. Thermal analysis, condensed phase rule. Two component alloy systems - Pb-Ag, Cu-Ni and Mg-Zn systems.

Text books

1. P.C. Jain and Monika Jain, Engineering Chemistry, Dhanpat Rai and Sons, New Delhi 2004.
2. N. Krishnamurthy, P. Vallinayagam and D. Madhavan, Engineering Chemistry, 2nd edition. PHI Learning PVT., LTD, New Delhi, 2008.

Reference Books

1. S. S. Dara, A Textbook of Engineering Chemistry, S. Chand & Co., Ltd. New Delhi.
2. B. K. Sharma, Engineering Chemistry, 3rd edition Krishna Prakashan Media (P) Ltd., Meerut, 2001.

T 110 BASIC CIVIL AND MECHANICAL ENGINEERING

PART-A CIVIL ENGINEERING

UNIT I

Buildings, Building Materials: Buildings-Definition-Classification according to NBC-plinth area, Floor area, carpet area, floor space index-construction materials-stone, brick, cement, cement-mortar, concrete, steel- their properties and uses.

UNIT II

Buildings and their Components: Buildings- Various Components and their functions. Soils and their classification Foundations-Functions and types of foundations, Masonry, Floors-functions and types of floors, Roofs and types of roofs.

UNIT III

Basic Infrastructure: Surveying-classification, general principles of surveying – Basic terms and definitions of chain, compass and leveling surveying , uses of surveying , contours, their characteristics and uses. Roads-types, Water bound macadam road, cement concrete road, bituminous road. Bridges-components and types of bridges. Dams-Purpose, selection of site, types of dams and components. Water supply-sources and quality requirements. Rainwater harvesting.

PART - B MECHANICAL ENGINEERING

UNIT IV

Internal and External Combustion Systems: Working principles of IC engines – Classification – Diesel and petrol engines: two stroke and four stroke engines. Steam generators(Boilers) – Classification – Constructional features (of only low pressure boilers) – Boiler mountings and accessories.

Conventional Power Generation Systems: Hydraulic, steam and gas turbines power plants – Schemes and layouts – Selection criteria of above power plants.

UNIT V

Non-Conventional Energy Systems (Description Only): Solar thermal systems – Solar photovoltaic – Solar pond – wind, wave, tidal, geothermal and ocean thermal energy conversion systems.

Casting : Green and dry sand moulding processes for ferrous and non-ferrous metals – applications.

UNIT VI

Metal Joining: Elements of arc and gas welding, brazing and soldering – Bolted joint types – Adhesive Bonding; classification of adhesives – applications. Sheet Metal Processing-Punching, blanking, shearing, bending, and deep drawing processes; descriptions and applications .

Text Books:

1. Purushothama Raj.P., Basic civil engineering, 3rd Edn., Dhanam Publications, Chennai, 2001.
2. Natarajan, K V, Basic Civil Engineering, 11th Edition, Dhanalakshmi Publications Chennai, 2001.
3. Lindberg, R.A.Process and Materials of Manufacture, PHI, 1999.
4. Nagpal, Power Plant Engineering, Khanna Publishers, Delhi, 1998.

Reference Books

1. Rajput, R K, Engineering Materials, S Chand & Co. Ltd., New Delhi, 2002.
2. Punmia, B.C., et. al., Surveying , Vol-I, Laxmi Publishers, New Delhi, 2002.
3. Punmia, B.C., et.al Building Construction, Laxmi Publishers, New Delhi ,2002.
4. El.Wakil, M.M., Power Plant Technology, Mc Graw Hill Book Co.,1985.
5. Hajra Choudhry, et. al., Workshop Technology Vol I and II, Media Promoters Publishers Pvt. Ltd., Bombay, 2004.

T111 ENGINEERING MECHANICS

UNIT I

Fundamental of Mechanics: Basic Concepts Force System and Equilibrium, Definition of Force, Moment and Couple, Principle of Transmissibility, Varignon's theorem, Resultant of force system – Concurrent and non concurrent coplanar forces, Condition of static equilibrium for coplanar force system, stability of equilibrium, concept of free body diagrams, applications in solving the problems on static equilibrium of bodies.

UNIT II

Plane Trusses: Degrees of freedom, Types of supports and reactions, Types of loads, Analysis of Trusses-method of joints, method of sections

Friction: Introduction, Static dry friction, simple contact friction problems, ladders, wedges, screws and belt friction.

UNIT III

Properties of Surfaces: Properties of sections – area, centroids of lines, areas and volumes, moment of inertia first moment of inertia, second moment of inertia and product moment of inertia, polar moment of inertia, radius of gyration, mass moment of inertia.

UNIT IV

Kinematics and Kinetics of Particles: Equations of motion - Rectilinear motion, curvelinear motion, Relative motion, D'Alembert's principle, work- Energy equation – Conservative forces and principle of conservation of energy, Impulse – momentum, Impact – Direct central impact and oblique central impact.

UNIT V

Kinematics and Kinetics of Rigid bodies: Plane motion, Absolute motion, Relative motion, translating axes and rotating axes, work and energy, impulse and momentum

Text Books

1. Bhavikatti,S.S and K.G.Rajashekarappa, Engineering Mechanics, New Age International (p) Ltd, New Delhi,2008.
2. Rajesekaran, S and Sankara Subramanian., G., Engineering Mechanics, Vikas Publishing House Private Ltd., 2002.

Reference Books

1. Palanichamy, M.S. Nagan, S., Engineering Mechanics – Statics & Dynamics, Tata McGraw-Hill,2001.
2. Beer, F.P and Johnson Jr. E.R, Vector Mechanics for Engineers, Vol. 1 Statics and Vol.2 Dynamics, McGraw – Hill International Edition, 1997.

T112 COMMUNICATIVE ENGLISH

UNIT I

Basic Communication Theory: Importance of Communication – stages of communication, modes of communication – barriers to communication – strategies for effective communication – Listening: Importance, types, barriers – Developing effective listening skills.

UNIT II

Comprehension and Analysis: Comprehension of technical and non-technical material – Skimming, scanning, inferring-Note making and extension of vocabulary, predicting and responding to context- Intensive Reading and Reviewing

UNIT III

Writing: Effective sentences, cohesive writing, clarity and conciseness in writing – Introduction to Technical Writing – Better paragraphs, Definitions, Practice in Summary Writing – Four modes of writing – Use of dictionaries, indices, library references – making bibliographical entries with regard to sources from books, journals, internet etc.

UNIT IV

Business Writing / Correspondence: Report writing – Memoranda – Notice – Instruction – Letters – Resumes – Job applications

UNIT V

Oral Communication: Basics of phonetics – Presentation skills – Group Discussions – Dialogue writing – Short Extempore – Debates-Role Plays-Conversation Practice

Reference Books:

1. Ashraf M.Rizvi., Effective Technical Communication. Tata-McGraw, 2005.
2. Boove, Courtland R et al., Business Communication Today, Pearson Education, New Delhi, 2002.
3. Meenakshi Raman and Sangeeta Sharma., Technical Communication Principles and Practice,OUP, 2007.
4. Robert J.Dixson. ,Complete Course in English, Prentice-Hall of India Pvt. Ltd., New Delhi,2006.
5. Robert J.Dixson., Everyday Dialogues in English, Prentice-Hall of India Pvt. Ltd., New Delhi,2007.
6. Sethi,J and Kamalesh Sadanand., A Practical Course in English Pronunciation, Prentice-Hall of India Pvt. Ltd, New Delhi,2007.

P104 PHYSICS LABORATORY

List of experiments (Any 10 Experiments)

1. Thermal conductivity – Lee's DISC
2. Thermal conductivity - Radial flow
3. Spectrometer – Prism or Hollow prism
4. Spectrometer – Transmission grating
5. Spectrometer - Ordinary & Extraordinary rays
6. Newton's rings
7. Air – wedge
8. Half shade polarimeter – Determination of specific rotatory power
9. Jolly's experiment – determination of α
10. Magnetism: i – h curve
11. Field along the axis of coil carrying current
12. Vibration magnetometer – calculation of magnetic moment & pole strength
13. Laser experiment: wavelength determination using transmission grating, reflection grating (vernier calipers) & particle size determination
14. Determination of optical absorption coefficient of materials using laser
15. Determination of numerical aperture of an optical fiber

P105 CHEMISTRY LABORATORY

List of experiments (Any 10 Experiments)

1. Determination of dissolved oxygen in water.
2. Determination of total hardness of water by EDTA method.
3. Determination of carbonate and bicarbonate in water.
4. Estimation of chloride content in water.
5. Estimation of magnesium by EDTA.
6. Estimation of vinegar.
7. Estimation of ferrous by permanganometry.
8. Estimation of ferrous and ferric iron in a solution mixture by dichrometry.
9. Estimation of available chlorine in bleaching powder.
10. Estimation of copper in copper sulphate solution.
11. Estimation of calcium by permanganometry.
12. Estimation of iron by colorimetry.

Demonstration Experiments(Any two of the following)

1. Determination of COD of water sample.
2. Determination of lead by conductometry.
3. Percentage composition of sugar solution by viscometry.

P106 WORKSHOP PRACTICE

Sl.No.	Trade	List of Exercises
1.	Fitting	Study of tools and Machineries. Exercises on symmetric joints and joints with acute angle.
2.	Welding	Study of arc and gas welding equipment and tools – Edge preparation – Exercises on lap joint and V Butt joints – Demonstration of gas welding
3	Sheet metal work	Study of tools and Machineries – exercises on simple products like Office tray and waste collection tray.
4.	Carpentry	Study of tools and Machineries – Exercises on Lap joints and Mortise joints

LIST OF EXERCISES

I Fitting

1.Study of tools and Machineries
2.Symmetric fitting
3.Acute angle fitting

II Welding

1.Study of arc and gas welding equipment and tools
2.Simple lap welding (Arc)
3.Single V butt welding (Arc)

III Sheet metal work

1.Study of tools and machineries
2.Funnel
3.Waste collection tray

IV Carpentry

1.Study of tools and machineries
2.Half lap joint
3.Corner mortise joint.

T107 MATHEMATICS – II

UNIT I

Algebra: Binomial, exponential and logarithmic series (without proof) – problems on summation, approximation and coefficients.

UNIT II

Matrices: Inverse of matrix by row transformation – Eigen values and Eigen vectors - Cayley-Hamilton theorem (without proof) – Diagonalisation – rank of matrix – solution of a general system of m linear algebraic equations in n unknown ($m \leq n$).

UNIT III

Trigonometry: Expansions for $\sin^n \theta$, $\cos^n \theta$, $\tan^n \theta$, $\sin(n\theta)$, $\cos(n\theta)$, $\tan(n\theta)$. Exponential, circular, hyperbolic, inverse hyperbolic and logarithmic functions of a complex variable – separation of real and imaginary parts.

UNIT IV

Vector Analysis: Scalar fields and Vector fields – Gradient, Divergence and Curl – their properties and relations – Gauss and Stokes theorems (without proof), simple problems for their verification.

UNIT V

Statistics: Moments, kurtosis and skewness based on moments only. Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions. Correlation and regression – rank correlation.

Text Books:

1. M.K. Venkataraman, Engineering Mathematics (First Year), Second Edition, The National Publishing Company, Madras, 2001.
2. M.K. Venkataraman, Engineering Mathematics (Third Year-Part A), The National Publishing Company, Madras, 2001.

Reference Book:

1. N.P. Bali and Manish Goyal, A Text Book of Engineering Mathematics, Lakshmi Publications, New Delhi, 2007.

T108 MATERIAL SCIENCE

UNIT I

Crystal Structure and Defects: Crystal Systems – Bravais Lattices – Coordination Number, Atomic Radius, Packing Factor for FCC & HCP structures – Miller Indices for a cubic crystal– Powder X Ray Diffraction Method - Lattice defects – Qualitative ideas of point, line, surface and volume defects

UNIT II

Dielectric Properties: Dielectric Polarization and Mechanism – Internal or local Field - Clausius-Mossotti relation – Dielectric loss - Temperature and frequency dependence of dielectric constant – Measurement of Dielectric constant and loss using Scherring bridge – Elementary ideas of Piezoelectrics, Ferroelectrics and Pyroelectric materials and its Applications

UNIT III

Magnetic Properties: Elementary Ideas of classification of magnetic materials (Dia, Para, Ferro & Ferri) – Quantum theory of Para & Ferro Magnetism – Domain Theory of Hysteresis – Heisenberg Theory of Exchange Interaction (without derivation) – Qualitative ideas of Anti ferromagnetic Ordering – Structure and Properties of Ferrites – Properties of Soft & Hard Magnetic Materials – Applications: floppy disks, CD ROM, Magneto optical recording

UNIT IV

Semiconductors and Superconductors: Derivation of Carrier concentration in intrinsic Semiconductor – Hall effect in Semiconductors -- Application of Hall Effect - Basic Ideas of Compound Semiconductors (II-VI & III-V) - Basic concepts of superconductivity – transition temperature – Meissener effect – Type I and II superconductors – high temperature superconductors – 123 superconductor.

UNIT V

Advanced Materials: Liquid Crystals – Types – Application as Display Devices – Metallic Glasses – Nanomaterials (one, Two & three Dimensional) – Physical Properties and Applications of Carbon Nano Tubes

Text books:

1. V Raghavan , Materials Science and Engineering- A First Course, PHI Learning, 2008.
2. M Arumugam , Materials Science, Anuratha Printers, 2004.

Reference Books:

1. M Ali Omar, Elementary Solid State Physics, Addison Wesley Publishing Co., 2000.
2. William D Callister Jr., Material Science and Engineering, John Wiley and sons, 2006.
3. Srivatsava J P, Elements of Solid State Physics, PHI Learning, 2001.
4. Charles Kittel, Introduction to Solid State Physics, John Wiley & sons, Singapore ,2007.
5. S.O Pillai , Solid State Physics– New Age International,2005.
6. Charles P Poole and Frank J Owens, Introduction to Nanotechnology, Wiley Interscience, 2003.

T109 ENVIRONMENTAL SCIENCE

UNIT I

Environmental Segments and Natural Resources: Environmental segments-lithosphere, hydrosphere, biosphere and atmosphere-layers of atmosphere. Pollution-definition and classification. Pollutants-classification.Forest resources-use and overexploitation, deforestation, forest management. Water resources-sources, use and conflicts over water, dams-benefits and problems. Mineral resources-mineral wealth of India, environmental effects of extracting and using mineral resources. Food resources-world food problems, environmental impact of modern agriculture-fertilizer and pesticides, overgrazing and land resources-land degradation- land slides, soil erosion and desertification. Energy resources-growing energy needs renewable and non-renewable energy resources and use of alternate-energy sources.

UNIT II

Ecosystem and Biodiversity: Concept of an ecosystem-structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of forest, grass land, desert and aquatic (fresh water, estuarine and marine) ecosystem. Biodiversity-definition-genetic species and ecosystem diversity. Value of biodiversity – consumptive use, productive use, social, ethical, aesthetic and option values. Hot spots of biodiversity. Threats to biodiversity-habitat loss, poaching of wild life, human-wildlife conflicts. Endangered and endemic species. Conservation of biodiversity-in situ and ex-situ conservation of biodiversity.

UNIT III

Air Pollution: Air pollution-sources of air pollution. Sources, effects and control measures of oxides of nitrogen, oxides of sulphur, oxides of carbon, hydrocarbon, chlorofluro carbons and particulates. Green house effect-causes and effects on global climate and consequences. Ozone depletion-causes, mechanism and effect on the environment. Smog-sulfurous and photochemical smog-effect on the environment. Acid rain-theory of acid rain and effects.

UNIT IV

Water Pollution and Solid Waste Management Sources: effects and control measures of – water pollution, soil pollution, marine pollution, noise pollution, thermal pollution and radioactive pollution. Solid waste management – causes, effect and control measures of urban and industrial wastes.

UNIT V

Social Issues and the Environment: From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, water shed management. Resettlement and rehabilitation of people. Environmental ethics. Consumerism and waste products. Environmental protection act-air (prevention and control of pollution) act, water (prevention and control of pollution) act, wildlife protection act, forest conservation act. Role of an individual in prevention of pollution.

Human population and the environment-population growth, variation among nations, population explosion, role of information technology in environment and human health.

Text Books:

1. K. Raghavan Nambiar, "Text Book of Environmental Studies" 2nd edition, Scitech Publications, India, Pvt. Ltd, Chennai, 2008.
2. A. K. De, "Environmental chemistry" 6rd edn; New age international (P) Ltd, New Delhi, 2006.

Reference Books:

1. B.K. Sharma, "Environmental chemistry" goel publishing house, Meerut, 2001.
2. G. S. Sodhi, Fundamental concepts of environmental chemistry, Narosa publishing house, New Delhi
3. S .S.Dara, " A text book of environmental chemistry and pollution control, S. Chand and Company Ltd, New Delhi, 2002.
4. Richard T. Wright, environmental science, 9th edition, Pearson education inc, New Delhi, 2007
5. P. Meenakshi, "Elements of environmental science and engineering" PHI Learning, New Delhi, 2006.

T104 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

PART A – ELECTRICAL

UNIT – I

Review of Kirchoff's laws - series and parallel circuits, equivalent resistance, star/delta conversion. Concepts of AC circuits – rms value, average value, form and peak factors – real and reactive power – power factor.

UNIT – II

Node and mesh methods of analysis of DC circuits and simple AC circuits - Introduction to three phase circuits, Introduction to three phase system - phase and line parameters – relations, power measurement – voltmeter and ammeter method, two and three wattmeter methods.

UNIT – III

Principle of DC generator and motor - Transformer, synchronous generator, induction motor (single phase). Sources for electrical energy conversion-thermal and hydraulic plant (Block diagram approach only). Components of AC transmission and distributions systems – line diagram.

PART B – ELECTRONICS

UNIT – IV

Half-wave rectifier and Full-wave rectifier- filters - Amplifiers-common emitter and common collector amplifiers- Hartley oscillator and RC phase shift oscillator.

Transducers – Resistance temperature detector (RTD) – Linear variable differential transformer (LVDT) - Strain gauge – Piezo electric transducer.

UNIT - V

Boolean algebra – Reduction of Boolean expressions – De-Morgan's theorem – Logic gates – Implementation of Boolean expressions – Flip flops – RS, JK, T and D. Combinational logic – Half adder, Full adder and Subtractors. Sequential logic – Ripple counters and shift registers.

UNIT - VI

Model of communication system – Analog and digital – Wired and wireless channel. Block diagram of various communication systems – Microwave, satellite, optical fiber and cellular mobile system. Network model – LAN, MAN and WAN – Circuit and packet switching – Overview of ISDN.

Text Books

1. Hughes revised by John Hiley, Keith Brown, Ian McKenzie Smith, Electrical and Electronics Technology, Pearson Education Limited, New Delhi, 2007.
2. Smarajit Ghosh, Fundamentals of Electrical and Electronics Engineering, Second Edition, PHI Learning, 2007.
3. George Kennedy and Bernard Davis, Electronics communication Systems, Tata McGraw-Hill Ltd, New Delhi, 2007.

Reference Books

1. D.P.Kothari and I.J.Nagrath, Theory and Problems of Basic Electrical Engineering, PHI Learning., New Delhi.
2. J.B.Gupta, A Course in Electrical Power, Katson Publishing House, New Delhi,

T105 THERMODYNAMICS

UNIT I

Basic Concepts and Definitions: Energy conversion and efficiencies - System, property and state - Thermal equilibrium - Temperature - Zeroth law of Thermodynamics.

UNIT II

First Law of Thermodynamics: The concept of work and adiabatic process - First law of thermodynamics - Conservation of Energy principle for closed and open systems - Calculation of work for different processes of expansion of gases

UNIT III

Second Law of Thermodynamics: Equilibrium and the second law - Heat engines - Kelvin-Planck statement of second law of thermodynamics - Reversible and irreversible processes - Carnot principle - Clausius inequality- Entropy

UNIT IV

Gas Power Cycles: Air standard cycles: The air standard Carnot cycle - Air standard Otto cycle, diesel cycle, dual cycle and Bryton cycles and their efficiencies

UNIT V

Refrigeration Cycles and Systems: Reverse Carnot cycle - COP - Vapor compression refrigeration cycle and systems (only theory) - Gas refrigeration cycle - Absorption refrigeration system (only theory)- Liquifaction and solidification of gases

Text Books:

1. Nag, P. K., “Engineering Thermodynamics”, 4th edition, Tata McGraw Hill Publishing Co. Ltd., New Delhi,1995.
2. Wark, K., “Thermodynamics”, 4th edition, McGraw Hill, N.Y.,1985

Reference Books :

1. Arora, C.P., “Thermodynamics” , Tata McGraw Hill Publishing Co. Ltd., New Delhi,1998.
2. Burghardt, M.D., “Engineering Thermodynamics with Applications”, 4th edition, Harper and Row, N.Y., 1986.
3. Huang, F.F., “Engineering Thermodynamics” 2nd edition , Macmillan Publishing Co. Ltd., N.Y.,1989.
4. Cengel, Y.A. and Boles, M.A., "Thermodynamics - An Engineering Approach", 5th edition, McGraw Hill, 2006

T106 COMPUTER PROGRAMMING

UNIT – I

History of Computers – Block diagram of a Computer – Components of a Computer system – Classification of computers - Hardware – Software – categories of Software – Operating System – Applications of Computers - Role of Information Technology – Internet and its services – Intranet – Study of word processor – Preparation of worksheets

UNIT – II

Problem solving techniques – Program – Program development cycle – Algorithm design – Flowchart - Pseudo code.

Introduction to C – C tokens – data types – Operators and expressions – I/O functions

UNIT – III

Decision making statements – branching and looping – arrays – multidimensional arrays – Functions – Recursion – Passing array to functions

Storage classes – Strings – String library functions

UNIT – IV

Structures – Arrays and Structures – nested structures – passing structures to functions – user defined data types– Union

Pointers – pointers and arrays – pointers and functions - pointers and strings - pointers and structures

UNIT – V

Files – operations on a file – Random access to files – command line arguments

Introduction to preprocessor – Macro substitution directives – File inclusion directives – conditional compilation directives – Miscellaneous directives

Text Books

1. Ashok N Kamthane, “Computer Programming”, Pearson education, Second Impression, 2008.
2. K. Venugopal and C.Kavichithra, “Computer Programming”, New Age International Publishers, First Edition, 2007.

Reference Books

1. Balagurusamy. E, “Programming in ANSI C”, Tata McGraw Hill, Third edition, 2006.

P101 COMPUTER PROGRAMMING LAB

List of Exercises

OS Commands, Word Processor and Spreadsheets

1. Study of OS commands-Compilation and execution of simple C programs
2. Use of mail merge in word processor
3. Use of spreadsheet to create Charts(XY, Bar, Pie) and apply the formulae wherever necessary C Programming (Flowcharts and algorithms are essential for the programming exercises)
4. Greatest of three numbers using conditional operator and if statement
5. Read two numbers and swap those two numbers using temporary variable and without using temporary variable.
6. Solve quadratic equation for different sets of inputs.
7. Use of Switch….Case statements
8. Generation of prime and Fibonacci series
9. Evaluate the COSINE series using for, while and do..while loops
10. Matrix operations

1. Addition
2. Transpose
3. Multiplication

11. Evaluate the sin(x) series using functions and recursive functions
12. Read a string and find solution to remove the duplicates of a given string from the given sentence

Create an array of structures for a list of items with the following details

Item_Code	Item_ Name
102	Paste – Colgate
102	Paste –Pepsodent
102	Paste –Close-up
101	Soap-Cinthol
101	Soap-Lux
101	Soap-Hamam
101	Soap-Dove

Arrange the set of items in ascending order of its Item_Code and descending order of its Item_ name as given below

Item_Code	Item_ Name
101	Soap-Lux
101	Soap-Hamam
101	Soap-Dove
101	Soap-Cinthol
102	Paste –Pepsodent
102	Paste –Colgate
102	Paste – Close-up

14. Use of Structure to define a user defined data types, input the data and write the data into the file
15. Use of pointers and array of pointers
16. Functions with static data types
17. Write command line program to implement the following DOS commands using files
    - Del
    - Copy

P102 ENGINEERING GRAPHICS

Unit 0

Introduction to Standards for Engineering Drawing practice, Lettering, Line work and Dimensioning

Unit I

Conic sections, Involutes, Spirals, Helix. Projection of Points, Lines and Planes

Unit II

Projection of Solids and Sections of Solids.

Unit III

Development of surfaces - Intersection of surfaces (cylinder-cylinder, cylinder-cone)

Unit IV

Isometric projections and Orthographic projections

Unit V

Computer Aided Drafting: Introduction to Computer Aided Drafting hardware - Overview of application software - 2D drafting commands (Auto CAD) for simple shapes - Dimensioning.

Text Books

1. K.R. Gopalakrishna and Sudhir Gopalakrishna, Engineering Graphics, Inzinc Publishers, 2007.
2. K.V. Natarajan, A Text Book of Engineering Drawing, Dhanalakshmi Publishers, 2006.
3. BIS, Engineering Drawing practice for Schools & College, 1992.

Reference Books

1. N.D. Bhatt, Engineering Drawing, 49th edition, Chorotar Publishing House, 2006.
2. K. Venugopal, Engineering Drawing and Grahics + Auto CAD, 4th edition, New Age International Publication Ltd., 2004 .
3. David I cook and Robert N Mc Dougal, Engineering Graphics and Design with computer applications, Holt – Sounders Int. Edn. 1985.
4. James D Bethune and et. al., Modern Drafting, Prentice Hall Int., 1989.

P103 BASIC ELECTRICAL AND ELECTRONICS LAB

ELECTRICAL LAB

1. Study of tools and accessories
2. Study of joints
3. Staircase wiring
4. Doctor's room wiring
5. Godown wiring
6. Tube Light and Fan connection
7. Lamp controlled from three different places-wiring

ELECTRONICS LAB

1. Rectifiers

Construction of half wave and full wave rectifiers with and without filters – Calculation of ripple factors.

2. Frequency Response of RC Coupled Amplifiers

Determination of frequency response of given RC coupled amplifier - Calculation of bandwidth.

3. Verification of Kirchoff's Voltage and Current Laws

Determine the voltage and current in given circuits using Kirchoff's laws theoretically and verify the laws experimentally.

4. Study of Logic Gates
    1. Verification of Demorgan's theorems
    2. Verification of truth tables of OR, AND, NOT, NAND, NOR, EX-OR, EX-NOR gates and Flipflops - JK, RS, T and D
    3. Implementation of digital functions using logic gates

5.Study of CRO
    1. Measurement of AC and DC voltages
    2. Frequency and phase measurements (using Lissajou's figures)

6.Study of Transducers
    1. Displacement and load measurements with transducers
    2. Temperature measurement with thermocouple

P107 NCC / NSS

NCC/NSS training is compulsory for all the Undergraduate students

1. The above activities will include Practical/field activities/Extension lectures.
2. The above activities shall be carried out outside class hours.
3. In the above activities, the student participation shall be for a minimum period of 45 hours.
4. The above activities will be monitored by the respective faculty incharge and the First Year Coordinator.
5. Pass /Fail will be determined on the basis of participation, attendance, performance and behaviour. If a candidate Fails, he/she has to repeat the course in the subsequent years
6. Pass in this course is mandatory for the award of degree.

MA T31 MATHEMATICS - III

UNIT I: LAPLACE TRANSFORM

Definitions - Laplace transform of unit impulse and step functions - Laplace transform of periodic functions - Exponential shift formula - Initial and final value theorems - Laplace transform of derivatives and integrals - Convolutions theorems - Inverse Laplace transform - methods of determining inverse Laplace transform - Solutions of linear differential equations using Laplace transforms.

UNIT II: FUNCTION OF A COMPLEX VARIABLE

Functions of a complex variable - continuity, derivatives and analytic function - Cauchy - Riemann equations – Necessary and sufficient conditions for analyticity - Harmonic and orthogonal properties of the real and imaginary parts - Conformal mapping - Bilinear transformations.

UNIT III: COMPLEX INTEGRATION

Cauchy's theorem - Cauchy's integral formula - Taylor's and Laurent series - Residue theorem – Contour integration round the units circle and semi-circular Contour.

UNIT IV: FOURIER SERIES

Dirichlet's conditions - Expansion of periodic functions into Fourier series - Change of interval - Half-range Fourier series. Complex form of Fourier series - Root mean square value - Parseval's theorem on Fourier coefficients - Harmonic analysis.

UNIT V: FOURIER TRANSFORM

Fourier Integral Theorems (statements only) - Fourier transform - inverse Fourier transforms, Fourier sine and cosine transforms, definition and properties.

TEXT BOOKS

M.K.Venkataraman, Engineering Mathematics, Vol. II, National Publishing co. Madras, 2009 (for Units I, II, and III).

M.K.Venkataraman, Engineering Mathematics, Vol. III, National Publishing co. Madras, 2009 (for Units IV & V).

REFERENCE BOOKS

N.P. Bali & Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, New- Delhi, 2008.

Erwin Kreyszig, Advanced Engineering Mathematics, John- Wiley sons, New-York, 2005.

B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New-Delhi, 2008.

EE T32 ELECTRIC CIRCUIT ANALYSIS

UNIT I: NETWORK THEOREMS

Review-Loop and Nodal method for DC circuits. Theorems-Thevenin's, Norton's, superposition, compensation, Tellegan's, Reciprocity, maximum power transfer theorems, Millman theorem – Applications to DC circuits.

UNT II: AC CIRCUITS

Steady state analysis of a.c circuits using loop and nodal methods. Network theorems-Thevenin's, Norton's, superposition, maximum power transfer theorems, Millman theorem-Application to AC circuits.

UNIT III: TRANSIENTS

Transient response of RL , RC and RLC circuits to DC excitation-Natural and forced oscillations - ac transients - application of Laplace transform for transient solution.

UNIT IV: RESONANCE AND APPLICATIONS

Resonant circuits-series, parallel, series-parallel circuits-effect of variation of Q on resonance. Relations between circuit parameters- Q, resonant frequency and bandwidth.
Inductively coupled circuits-single tuned and double tuned circuits - bandwidth and frequency response.

UNIT V: THREE PHASE CIRCUITS AND NETWORK TOPOLOGY

Solution of 3 phase balanced circuits by node and mesh method and by using single-phase equivalents; power measurement by two-wattmeter method; solution of 3 phase unbalance circuits by node and mesh methods.
Basic concepts of graph theory-tree for two port networks, branch, chord, incidence and reduced incidence matrices-application to network solutions. Link current and tie set, tree branch voltage and cut set, duality and dual networks.

TEXT BOOKS

1.Hayt and Kemmerly, "Engineering circuit analysis", McGraw Hill, 6th edition,2002.
2.M.Arumugam and Premkumar, "Circuit theory", Khanna publishers, 2003.

REFERENCE BOOKS

3.A. Sudhakar and S.P.Shyammohan "Circuits and Networks Analysis and Synthesis", TMH, 10th edition 2005.
4.Schaum series, "Circuit theory", McGraw Hill, New Delhi,4th edition, 2005.
5.Charles K Alexander and Mathew N.O Sadiku,"Fundamental of Electric Circuits", 2nd edition, TMH, New Delhi, 2003.
6.S.N.Sivanandam, "Electric Circuit Analysis", Vikas Publishing House Pvt. Ltd., New Delhi, 2008.

EE T33 ELECTRICAL MACHINES – I

UNIT I: MAGNETIC CIRCUITS AND TRANSFORMER

Simple magnetic circuit calculations– Single phase transformers – Principle-Construction – No load operation – Ideal transformer-Vector diagram- no load and on load -Equivalent circuit – Testing-Losses — Efficiency, voltage regulation and all day efficiency- Parallel operation and load of single-phase transformers-Applications. Auto-transformer-construction and saving in copper

UNIT II: POLYPHASE TRANSFORMER

Three phase transformers – Principle - Construction - Poly phase connections – Star, Zig-zag, Open-delta, Scott connection, Le Blanc connection-three-phase to single phase conversion – Testing and parallel operation - On load tap changing; Special transformers-variable frequency transformer (VFT), pulse transformer, high frequency transformer

UNIT III: ELECTRO MECHANICAL ENERGY CONVERSION

Principles of electro mechanical energy conversion – Energy, Co-energy – Forces of electromagnetic origin – Single and multiple excited magnetic field system – Elementary concepts of rotating machines – mmf of distributed winding - Rotating magnetic field – Torque – Magnetic Leakage.

UNIT IV: DC GENERATOR

DC Generator- Construction – Lap and wave winding – emf equation-excitation and types of generators- Characteristics - armature reaction-methods of improving commutation- testing-power flow diagram-Applications.

UNIT V: DC MOTOR

DC Motor-torque equation – types-back emf and voltage equations-charateristics- Starting-Speed control- testing-direct, indirect and regenerative tests-Power flow and efficiency-separation of losses-retardation test- Braking - DC machines dynamics; Introduction to solid state power control of DC machines.

TEXT BOOKS

1. I.J. Nagrath and D.P. Kothari, “Electric machines” T.M.H. publishing Co.Ltd., New Delhi, 3rd Edition, 2005.

2.B.L. Theraja, “Electrical Technology Vol.II AC/DC Machines”, S. Chand, 2008

REFERENCE BOOKS

1.Battacharya S K, “Electrical Machines”, Technical Teachers Training institute”, 2nd edition.2003.

2.J.B.Gupta,”Theory and Performance of Electrical Machines”,J.K.Kataria & Sons, 13th edition,2004.

3.P.C.Sen,”Principles of Electric Machines and Power Electronics, Wiley Student Edition,2nd edition,2008.

4. K.Murugesh Kumar, “Induction and Synchronous Machines”, Vikas Publishing House, 2008, New Delhi.

EE T34 ELECTRONIC DEVICES AND CIRCUITS

UNIT I: SEMICONDUCTOR THEORY AND DIODES

Energy band structure of insulators, conductors and semiconductors – conductivity of an intrinsic semiconductor – Fermi Dirac distribution and energy band diagram – Fermi levels in extrinsic semiconductor – Hall effect.

PN Junction Diode – operation, forward, reverse bias characteristics- Diode equation, Temperature effects – DC and AC Resistance – Diode equivalent circuit – Transition and Diffusion Capacitance – Diode Switching Times – Diode Applications.

UNIT II: TRANSISTORS

PNP and NPN transistors-current flow-characteristics-transistor parameters-ebbers moll equations -biasing and stabilization of transistor-Operating point – bias stability- different types of bias, fixed bias, collector to base bias and self-bias – stabilization against variation in V_{BB} and I_{CO} – bias compensation. Thermistor and sensistor compensation – thermal runaway and thermal stability

UNIT III: FIELD EFFECT TRANSISTORS

Theory of JFET, characteristics, small signal characteristics and parameters – small signal equivalent circuit – pinch off voltage – MOSFET structure – depletion and enhancement modes of operation – characteristics – biasing of FET.

UNIT IV: POWER DEVICES AND RECTIFIERS

Theory of operation and characteristics of UJT, SCR, TRIAC, DIAC, Power diodes, SCS, GTO, PUJT and IGBT with simple applications Half wave and full wave rectifiers – bridge rectifiers – filter using Inductors and capacitors – multiple LC filters-regulation- regulated power supplies – shunt and series voltage regulators.

UNIT V: SPECIAL DEVICES

Construction, Principle of operation, application and characteristics of SchottkyBarrier Diode, Varactor diode, Zener diode, Tunnel diode, PIN Diode.

Photo emissivity and photo electric theory – Theory, construction and characteristics: light emitting diodes, liquid crystal cell, seven segment display, photo conductive cell, photodiode, solar cell, photo transistor, opto couplers and laser diode.

TEXT BOOKS

Jacob Millman & Christos C.Halkias, "Electronic Devices and Circuits" Tata McGraw–Hill,2003.

R.L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", PHI Learning Pvt. Ltd, 9th edition, 2008.

David A. Bell, "Electronic Devices and Circuits", PHI Learning Private Ltd, 4th edition, 2008.

REFERENCE BOOKS

1. R.S.Sedha, A Textbook of Applied Electronics", S. Chand, 2008.

2. Allen Mottershead, "Electronic Devices and Circuits", PHI Learning Private Ltd, 2003.

3.Ben G Streetman, "Solid-state electronic devices", Prentice Hall of India, 6th edition, 2008.

Theodre. F. Boghert, 'Electronic Devices & Circuits', Pearson Education, VI Edition, 2003.

Ben G. Streetman and Sanjay Banerjee, 'Solid State Electronic Devices', Pearson Education, 2002 / PHI.

EE T35 ELECTROMAGNETIC THEORY

UNIT I: ELECTROSTATIC FIELD

Introduction - Coulomb's law – Electric field intensity – electric fields due to point, line, surface and volume charge distributions – Electric flux density – Gauss law – Electric potential – potential gradient – Divergence and divergence theorem – Poisson's and Laplace equations.

UNIT II: ELECTROSTATIC APPLICATIONS

Field due to dipoles – dipole moment – Current and current density – Conductors and Dielectrics - Boundary conditions – capacitance – Dielectric interface – Capacitance of system of conductors – Dielectric constant and Dielectric strength - Energy stored in capacitor – Energy density.

UNIT III: STEADY ELECTRO-MAGENTIC FIELDS

Introduction – Biot - Savart Law – Ampere's Circuital Law – Applications – Curl – Stoke's theorem – Magnetic flux – Magnetic flux density – The Scalar and Vector magnetic potentials – Force on a moving charge and current elements – Force and Torque on closed circuit.

UNIT IV: MAGNETO STATICS AND APPLICATIONS

Introduction to magnetic materials – Magnetization and Permeability – Magnetic boundary conditions – Magnetic circuit – Potential energy and forces on Magnetic materials – Inductance and mutual inductance – Inductance of solenoids, toroids, and transmission lines – Faraday's Law – Time varying magnetic field.

UNIT V: ELECTROMAGNETIC FIELDS AND WAVE PROPAGATION

Conduction current and Displacement current – Maxwell's equation in point and integral forms – Wave propagation in free space – Wave propagation in Dielectrics – Power and the Poynting Vector – Propagation in good conductors – Wave polarization

TEXT BOOKS

1.William Hayt," Engineering Electromagnetics", McGraw Hill, New york, 7th edition,2005.
2.K.A.Gangadhar, "Field theory", Khanna publishers, New Delhi,15th edition,2004.

REFERENCE BOOKS

1.David K Cheng, "Field and Wave Electromagnetics",Pearson Education, 2nd edition,2004.
2.John D. Kraus, "Electromagnetics" McGraw Hill, 5th Edition,1999.
3.N. Narayana Rao, "Elements of Engg. Electro Magnetics", Prentice Hall of India, 6rd Edition,2008.
4.T.V.S. Arun Murthy, " Electromagnetic Fields", S.Chand, 2008.
5.David J Griffiths, "Introduction to Electrodynamics, PHI, 3rd edition, 2008.

EE T36 FLUID AND THERMAL MACHINES

(Qualitative Analysis Only)

UNIT – I: FLUID MECHANICS

Definition of fluid – viscosity – Newton's Law of viscosity – Pressure and its measurement: simple manometers – Application of Bernoulli's equation of flow measurement: venturi meter, orifice meter and pitot tube – head loss due to friction in pipes – minor losses: sudden expansion, sudden contraction and bends - pipes in series, pipes in parallel.

UNIT – II: HYDRAULIC MACHINERY

Turbines: Head and efficiencies associated with turbines – Classification of turbines – Pelton wheel: parts and working principle – Francis turbine: parts and working principle – Specific speed and its application. – unit quantities – governing of turbines.

Pumps: Roto-dynamics and positive displacement pumps – centrifugal pumps: parts and working principles – priming – cavitation – Specific speed – Reciprocating pump: main parts and working principle – indicator diagram – effect of acceleration and friction on indicator diagram – use air vessel – Gear pump.

UNIT – III: STEAM POWER GENERATION

Properties of steam Steam power plant: Components of steam power plant – Rankine cycle – reheat cycle – calculation of efficiencies – Steam turbines: Impulse and reaction turbines – compounding of impulse turbines – condensers and cooling towers.

UNIT – IV: INTERNAL COMBUSTION ENGINE AND AIR CONDITIONING

Components of SI and CI engines – testing of IC engines – fuel feed systems – ignition systems – cooling system – lubricating system – governing of IC engines – Air Conditioning: psychometric properties of air - summer and winter air conditioning – automobile air conditioning systems.

UNIT – V: GAS TURBINES AND AIR COMPRESSORS

Gas turbine power plant: Components, cycle of operation and classification – effect of reheating on cycle efficiency – Methods of heat recovery from the exhaust of gas turbine – Air Compressors: Reciprocating air compressor – influence of clearance volume and inter cooling on the cycle efficiency – Rotary Compressors: Comparison of fan, blower and compressor – features of centrifugal compressor – working of vane compressor and roots blower.

TEXT BOOKS

1.Modi P N and Seth S M, Hydraulics and Fluid mechanics, Standard Publishing House, Delhi, 2007

2.Balaney P L, Thermal Engineering, Khanna Publishers, New Delhi, 2007

REFERENCE BOOKS

1.Rajput, RK. "Fluid Mechanics and Hydraulic Machines", S. Chand & Company, New Delhi, 2002.

2.Nag, P. K., "Engineering Thermodynamics", 4th edition, Tata Mc Graw Hill Publishing Co. Ltd., New Delhi,1995

3.Mathur M.L. and Sharma R.P "Internal Combustion Engines" *Dhanpat Rai &* Sons, New Delhi; 1992.

EE P31 ELECTRICAL MACHINES LAB-I

(A minimum of TEN experiments to be conducted in the following Topics)

AC MACHINES

1.Load test on single/three-phase transformer
2.O.C and S.C test on single/three-phase transformer
3.Parallel operation of single/three-phase transformer
4.Sumpner's test on single/three-phase transformer
5.Study of connections STAR/DELTA/ Scott connection on single/three-phase transformer

DC MACHINES

6.Load test on DC Motor (Shunt/series/Compound Motors)
7.Load test on DC Generators (Shunt/series/Compound Motors)
8.O.C.C of D.C Generators (shunt/separately)
9.Swimburne's /Hopkinsen's test on DC Machines
10.Study on Retardation test and Speed control of DC Motors.
11.Field test of DC series Motor.

EE P32 ELECTRONICS LAB – I

(A minimum of TEN experiments to be conducted in the following Topics)

DEVICE CHARACTERISTICS

1.Characteristics of Diodes (PN Junction / Zener diode).
2.Characteristics of a BJT (common base/Emitter/Collector)
3.Characteristics of a UJT/FET/IGBT.
4.Characteristics of an SCR/GTO/Triac.
5.Characteristics of photon devices.

BIASING AND APPLICATIONS

6.Biasing Techniques for BJT(Fixed/collector to base/voltage divider biasing)
7.Biasing Techniques FET.
8.Rectifiers and Filters.
9.Diode clippers and clamping circuits.

EE P33 FLUID AND THERMAL MACHINES LAB

(A minimum of TEN experiments to be conducted in the following Topics)

1. Determination of co-efficient of discharge of venture-meter / orifice-meter.
2. Determination of friction factor and minor losses due to pipe implements.
3. Determination of force due to Impact of jet on vanes.
4. Performance characteristics of pumps (Centrifugal/Reciprocating/Submersible/Jet/Gear Pump).
5. Performance characteristics of Turbine (Pelton Wheel/Francis Turbine).
6. Performance test of a Blower.
7. Performance test of a Reciprocating air compressor.
8. Testing of IC engine with an AC generator loading.
9. Conducting an experiment on Cooling Tower / Refrigeration using test rig.

MA T41 MATHEMATICS – IV

UNIT I: PARTIAL DIFFERENTIAL EQUATIONS

Formation by elimination of arbitrary constants and arbitrary functions - General, singular, particular and complete integrals - Lagrange's linear first order equation - Higher order differential equations with constant coefficients.

UNIT II: SOLUTIONS TO PARTIAL DIFFERENTIAL EQUATIONS

Solution of partial differential equation by the method of separation of variables - Boundary value problems - Fourier series solutions - Transverse vibration of an elastic string.

UNIT III: HEAT FLOW EQUATIONS

Fourier series solution for one dimensional heat flow equation - Fourier series solutions for two-dimensional heat flow equations under steady state conditions (Cartesian and polar forms)

UNIT IV: APPLIED STATISTICS

Curve fitting method of least squares - fitting of straight lines, second-degree parabolas and more general curves. Test of significance; Large samples test for single proportions, differences of proportions, single mean, difference of means, difference of standard deviations.

UNIT V: CORRELATIONS AND FITNESS

Small samples: Test for single mean, difference of means and correlations coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

TEXT BOOKS

M.K.Venkataraman, "Engineering Mathematics", Vol. II & III, National Publishing Co., Madras, 2007.

S.C. Gupta & V.K. Kapoor "Fundamentals of Mathematical Statistics", Sultan Chand Sons, New-Delhi, 2008.

REFERENCE BOOKS

N.P. Bali & Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, New- Delhi, 2008.

Erwin Kreyszig, "Advanced Engineering Mathematics", John- Wiley sons, New-York, 2005.

B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New-Delhi, 2008.

EE T42 ELECTRICAL MACHINES – II

UNIT I: THREE PHASE INDUCTION MOTOR

AC windings- establishment of magnetic poles, Three phase induction motor– Construction, types and operation – rotating magnetic field –Torque equation – Mechanical characteristics- effect of supply voltage and rotor resistance on torque. - Tests- derivation of exact equivalent circuit – Torque-Power relationships – Performance characteristics/calculations - Circle diagram.

UNIT II: INDUCTION MOTOR STARTING AND SPEED CONTROL

Starting methods– braking-Cogging and crawling – Speed control methods and influence on speed-torque curve– Double cage rotor – Induction generator – types – Induction machine dynamics – Synchronous induction Motor.

UNIT III: SYNCHRONOUS GENERATOR

Types, construction and principle of operation - emf equation- winding factor , effect of chording and winding distribution- armature reaction, causes for voltage variation - regulation by synchronous impedance, MMF and Potier triangle methods - load characteristics.

Parallel operation of synchronous generators, Synchronizing to infinite bus-bars- power transfer equations, capability curve- two reaction model of salient pole synchronous machines and power angle characteristics - determination of X_d & X_q by slip test- Short circuit transients in synchronous machine.

UNIT IV: SYNCHRONOUS MOTOR

Principle of operation, methods of starting, power flow, power developed by Synchronous motor, phasor diagrams – torque angle characteristics, effects of varying load and varying excitation, excitation and power circles for synchronous machine- 'V' – and inverted 'V' curves - hunting. Synchronous phase modifier, Induction motor Vs Synchronous motor.

UNIT V: SINGLE PHASE AND SPECIAL MACHINES

Single phase induction motors – Rotating magnetic Vs alternating magnetic field - Double revolving field theory – Torque-speed characteristics - types.

Reluctance motor– Two phase Servo motor– Stepper motors – Universal motor- linear induction motor - permanent magnet DC motor.

TEXT BOOKS

1. I.J. Nagrath and D.P. Kothari, "Electric machines" T.M.H. publishing Co.Ltd., New Delhi, 3rd Edition, 2005.
2. B.L. Theraja, "Electrical Technology Vol.II AC/DC Machines", S. Chand, 2008.

REFERENCE BOOKS

1. Battacharya S K, "Electrical Machines", Technical Teachers Training institute", 2nd edition, 2003.
2. J.B.Gupta,"Theory and Performance of Electrical Machines",J.K.Kataria & Sons, 13th edition, 2004.
3. P.C.Sen,"Principles of Electric Machines and Power Electronics, Wiley Student Edition, 2nd edition, 2008.
4. K.Murugesh Kumar, "Induction and Synchronous Machines", Vikas Publishing House, 2008, New Delhi.

EE T43 ELECTRONIC CIRCUITS

UNIT I: SMALL SIGNAL AMPLIFIERS

Two port devices and hybrid model – transistor hybrid model and h parameters - determination of h-parameters from the characteristics – Analysis of transistor amplifier using h-parameters – emitter follower -comparison of transistor amplifier configurations – CE amplifier with an emitter resistance;

Low frequency FET model –Common Source and Common drain amplifiers.

UNIT II: MULTI STAGE AMPLIFIERS

Cascading amplifiers – direct coupled and capacitor coupled two stage CE amplifiers – Differential amplifier - Darlington Pair - Cascode Amplifier- Tuned Amplifiers - single tuned –double tuned -stagger tuned amplifiers.

UNIT III: LARGE SIGNAL AMPLIFIERS

Classification of Power amplifiers - Class A Power Amplifier- direct and Transformer coupled amplifiers; - Class B - Push-pull arrangements & Complementary symmetry amplifiers; Conversion efficiency calculations, cross over distortion – Class AB amplifier - Amplifier distortion – Power transistor heat sinking – Class C and D amplifiers.

UNIT IV: Feedback Amplifiers

Feedback concept – Barkhausen criterion – Gain with feedback – General characteristics of negative feedback amplifiers – Four basic types of feedback and effect on gain – Input and output resistances – Multistage feedback amplifiers – Frequency response and stability.

UNIT V: Oscillators

Conditions for oscillations – LC oscillators – Analysis of Hartley, colpitt and tuned oscillators – R.C. oscillators – Phase shift and wein bridge types and analysis of these circuits – Crystal oscillators and frequency stability – UJT relaxation oscillators

TEXT BOOKS

1. Millman and Halkias, "Integrated Electronics", Tata McGraw Hill International,2008.
2. R.L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", PHI Learning Pvt. Ltd, India, 9th edition, 2008.
3. D.Roy Choudhury &Shail B Jain, "Linear Integrated Circuits", 3rd edition. 2007.

REFERENCE BOOKS

1. David. A. Bell, "Electronic Devices and Circuits", PHI Learning Private Ltd, India, 4th edition 2008.
2. R.A. Gayakwad, "Op-Amps and Linear integrated circuits", PHI, 2008.

EE T44 LINEAR CONTROL SYSTEM

UNIT I: INTRODUCTION

Introduction to control systems – Control theory concepts - Open loop and feedback control systems – Mathematics modeling of control systems – Analysis of control systems using Laplace transforms – Block diagram reduction techniques – Signal flow graphs. Controller components - types.

UNIT II: TIME RESPONSE ANALYSIS

Time Response Analysis - Analysis of transient and steady state behavior of control systems – Standard test signals – Time response of first order and higher order systems – Steady state errors – Error criterion.

UNIT III: ROOT – LOCUS AND FREQUENCY RESPONSE ANALYSIS

Root locus concepts - Construction of root loci – Root contours
Time and frequency response correlation – Polar plot – Bode plot – All pass minimum phase and non-minimum phase systems.

UNIT IV: SYSTEM STABILITY

Stability concepts – Conditions for stability – Routh, Hurwitz stability criteria – Relative stability analysis - Stability in frequency domain – Nyquist stability criterion – Relative stability analysis – Gain margin – Phase margin – Frequency response specification – Constant M circles – Constant N circles – Nichol's chart.

UNIT V: STATE SPACE ANALYSIS OF LINEAR CONTINUOUS SYSTEMS

Introduction - State space representation using physical variables – Phase variables and canonical variables – Derivation of transfer function from state model – Solving the time invariant state equation – State transition Matrix – Its properties and computation. Introduction to controllability and observability

TEXT BOOKS

1. I.J.Nagrath and M.Gopal, " Control systems Engineering", 5th edition, New Age International (P) Limited, New Delhi, 2007.
2. K. Ogata, "Modern control engineering", pearson Education,4th edition,2004.

REFERENCE BOOKS

1. Norman S. Nise,"Control System Engineering", 4th edition, Wiley Student Edition, 2008.
2. B.C.Kuo "Automatic control systems", 8th edition, Wiley Student Edition, 2008.
3. D.K.Cheng, Analysis of linear systems" Narosa Publishing House, New Delhi,2002.

EE T45 PULSE AND DIGITAL CIRCUITS

UNIT I: COMBINATIONAL CIRCUITS

Binary arithmetic – BCD addition and subtraction – Code converters - Parity generator – Binary to BCD and BCD to binary conversions – Design of combination circuits using NAND and NOR gates – Design of encoders, decoders, multiplexers, demultiplexer – Serial adders – Binary multiplier – Simplification of k-map.

UNIT II: SEQUENTIAL CIRCUITS

Design of counters using Flip-flops– Synchronous, asynchronous, Up/Down counters, decade counter, ring counter, BCD counter – Shift registers and bi-directional shift registers. Parallel/serial converters.

Memory types and terminology – ROM – RAMs –Non-volatile RAMS – Sequential memories

UNIT III: DESIGN OF SEQUENTIAL CIRCUITS

Design of Synchronous sequential circuits: Model Selection – State transition diagram – State synthesis table – Design equations and circuit diagram – State reduction technique.
Asynchronous sequential circuits – Analysis – Problems with asynchronous sequential circuits – Design of asynchronous sequential circuits State transition diagram, Primitive table, State reduction, state assignment and design equations

UNIT IV: LINEAR WAVE SHAPING CIRCUITS:

Linear wave shaping circuits: RC, RL and RLC circuits – Pulse transformer – Steady state switching characteristics of devices – Clipping and clamping circuits – Switching circuits.

UNIT V: MULTI-VIBRATORS AND TIME BASE CIRCUITS:

Bistable, monostable and astable multi-vibrators – Schmitt trigger – Voltage and current sawtooth sweeps – Fixed amplitude sweep – Constant current sweep – UJT – Sawtooth Miller and bootstrap time base – Multivibrators using negative resistance devices (UJT and tunnel diodes).

TEXT BOOKS

1. David A Bell, “Solid State Pulse Circuits”, 4th edition,PHI,2008.
2. A.P. Malvino and D.P. Leach, “Digital Principles and Applications”, TMH, 2006.

REFERENCE BOOKS

1. Floyd & Jain, “Digital Fundamentals”,Pearson Education, 2007.
2. William Gothmann,”Digital Electronics,:An Introduction to Theory and Practice”,2nd edition,PHI-2008.
3. M.Morris Mano,”Digital Logic and Computer Design”, PHI,2007.
3. Millman & Taub, “Pulse, Digital and Switching Waveforms”, McGraw Hill Book Co., 2005.

EE T46 OBJECT ORIENTED PROGRAMMING

UNIT I: INTRODUCTION TO OOP

Limitations of structure programming **-** Object-oriented paradigm, elements of object oriented programming – Merits and demerits of OO methodology - Data types - loops - pointers –arrays – structures – functions – Classes – Objects- Constructor and destructor

UNIT II: OVERLOADING FUNCTIONS AND FILES

Operator overloading – function overloading - Inheritance –multiple – multilevel – hierarchical - virtual base class - friend function - Polymorphism –this pointer - virtual functions-pure virtual function- Input / Output streams - Files streams — manipulators – Templates

UNIT III: INTRODUCTION TO JAVA

Introduction to Java –Java vs. C++ - data types – operators – Decision making - branching - loops - classes – objects-arrays- strings- methods - string handling.

UNIT IV: PACKAGES AND EXCEPTION HANDLING

Inheritance- Packages – API packages – creating packages – adding class to package - interfaces –multiple inheritance - Exception handling- predefined and user defined.

UNIT V: THREADS AND APPLETS (Qualitative Analysis)

Multithreaded programming –creating threads- extending the thread class- life cycle of threads- Applet Programming – applet life cycle-creating executable applet – passing parameters to applets - Streams in Java.

TEXT BOOKS

1. E.Balaguruswamy, "Object Oriented Programming with C++",(4th Edition), Tata McGraw Hill Publications Limited, 2008 (Unit I & II)
2. E. Balaguruswamy, "Programming with Java- A Primer " (3rd Edition), Tata McGraw Hill Publications Limited, 2007. (Unit III,IV,V)
3. Patrick naughton , "The Java Handbook ",Tata McGraw Hill Publications Limited, 2006.(Unit III,IV,V)

REFERENCE BOOKS

1. K.R.Venugopal, Rajkumar Buyya, T.Ravishankar, "Mastering C++", TMH, 2003
2. Robert Lafore – "OBJECT ORIENTED PROGRAMMING IN Turbo C++", Waite Group; 3rd edition (December 1998)
3. Bruce Eckel, "Thinking in Java", (4th Edition) Prentice Hall PTR, 2006
4. Herbert Schildt, "the Java 2 : Complete Reference", Fourth edition, Tata McGraw Hill Publications Limited, 2002.

EE P41 ELECTRICAL MACHINES LAB – II

(A minimum of TEN experiments to be conducted in the following Topics)

INDCUTION MACHINES

1. Load test on 3 phase squirrel cage/ slip ring Induction Motor
2. No load & Blocked rotor test on 3-phase squirrel cage Induction Motor (Performance 3. determination using equivalent circuit and circle diagram)
3. Load test on 1 phase Induction Motor
4. Load test on 3 phase Induction Generator
5. Study of speed control of Induction Motor

SYNCHRONOUS MACHINES

6. Load test on 1/3 phase Alternator
7. Pre-determination of voltage regulation of 3 phase Alternator by EMF/MMF/ZPF Method.
8. Synchronization/parallel operation of Alternators.
9. V and inverted V curve of an auto synchronous motor and observation on reactive power
10. Determination Direct axis reactance and quadrature axis reactance of a salient pole Alternator by slip test.

EE P42 ELECTRONICS LAB – II

(A minimum of TEN experiments to be conducted in the following Topics)

ANALOG CIRCUIT APPLICATIONS

1. Frequency response characteristics of a single stage RC Coupled Amplifier
2. Design verification of Oscillator (RC phase shift/UJT Relaxation Oscillator)
3. Design verification Schmitt Trigger
4. Design verification Multivibrator (Astable/Bistable)
5. Design and characterization of Power Amplifiers.

DIGITAL CIRCUIT APPLICATIONS

6. Study of logic gates (verification of De'Morgans laws/basic gates using universal gates)
7. Study and design of flip-flops using universal gates (RS/D/T /JK)
8. Master slave flip-flops using logic gates.
9. Arithmetic circuits – Adders and subtractors – Implementation of a Logical Functions – Karnaugh's map simplification.
10. Multiplexer and De-Multiplexer.
11. Counters (Up/Down).

EEP43 OBJECT ORIENTED PROGRAMMING LAB

(A minimum of TEN experiments to be conducted in the following Topics)

PROGRAMS IN C++ / JAVA

1. Classes and objects, Constructor and Destructors.
2. Function Overloading.
3. Inheritance.
4. Operator overloading.
5. Friend function, Templates.
6. Simple Java applications - Handling Strings in java.
7. Simple Package creation - Developing user defined packages in Java.
8. Interfaces in JAVA.
9. Threading and Multithreading (Simple Experiments).
10. Exception Handling Mechanism in Java - Handling pre - defined exceptions - Handling user-defined exceptions.
11. Applets creations.

SP P44 PHYSICAL EDUCATION

Physical Education is compulsory for all the Undergraduate students and a Pass in this course is mandatory for the award of degree. Physical Education activities will include games and sports / extension lectures. The student participation shall be for a minimum period of 45 hours. Physical Education activities will be monitored by the Director of Physical Education. Pass /Fail will be determined on the basis of participation, attendance, performance and conduct. If a candidate fails, he/she has to repeat the course in the subsequent years.

EE T51 MATHEMATICS – V

UNIT I: THEORY OF EQUATIONS

Relation between the roots and the coefficient of an equation - Calculation of symmetric functions of the root of an equation - Transformation of equations -Reciprocals of the roots - Reciprocal equation - Roots of given equation multiplied by a constant m - Equations whose roots are diminished by the same quantity - Horner's method.

UNIT II: LINEAR EQUATIONS AND SOLUTIONS

Series to second order linear equations with ordinary points and regular singular points (Erogenous method).

UNIT III: FUNCTIONS AND POLYNOMIALS

Bessels functions and Legendre polynomials - series solutions - Generating functions - Recurrence relations at orthogonal property.

UNIT IV: STOCHASTIC PROCESSES

Definition, classification of stochastic process, Poisson's process. Introduction of discrete parameters Markov Chain, computation of n-step transition probabilities – Chapman – Kolmogorou equation – state classification and limiting probabilities – M/G/I queuing system – Pollaczek – Khirchine transform equation.

UNIT V: CONTINUOUS PARAMETER MARKOV CHAINS

The birth and death process (M/M/I, M/M/C, M/M/I/N, M/M/C/N (where C < N)), M/M/C/C, M/M/$\propto$ models only, derivation of mean number of customer in a system - in the queue and waiting time – simple applications – pure birth and pure death process.

TEXT BOOKS

1. Kishor.S.Trivedi, "Probability and statistics with reliability, queuing and computer science applications", John Wiely and Sons, 2nd edition, 2002.
2. M.K.Venkataraman, "Higher Engineering Mathematics for Science and Engineering", National Publishing Co., Madras, 2007.
3. M.K.Venkataraman, "Numerical Methods for Science and Engineering", National Publishing Co., Madras, 2007.
4. Gupta & Hira, "Operations Research", S. Chand & Co., New- Delhi, 2008.

REFERENCE BOOKS

5. Donald Gross and Carl.M.Harris, "Fundamental of queuing Theory " Wiely series in Probability and mathematical statistics, 2008.
6. N.P. Bali & Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, New- Delhi, 2008.
7. Erwin Kreyszig,"Advanced Engineering Mathematics", John- Wiley sons, New-York, 2005.
8. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New-Delhi,2008

EE T52 ANALOG AND DIGITAL INTEGRATED CIRCUITS

UNIT I: IC FABRICATION:

Monolithic IC technology – planar process – Bipolar junction transistor – FET fabrication – CMOS technology .

DIGITAL IC's. Logic families; DTL, HTL, RTL, TTL, ECL, PMOS, CMOS, I^2L performance criteria - Comparison, applications, advantages.

UNIT II: OPERATIONAL AMPLIFIERS:

Introduction to Linear ICs – Operational amplifier IC741 – Block diagram and Characteristics - Inverting , non inverting and differential amplifier – Summer, Subtractor, Integrator, Differentiator - Comparator – Window detector- Precision rectifier - Current to voltage converter - Current converter - Log and antilog amplifiers - Analog multiplier - Instrumentation amplifiers - Waveform generators.

UNIT – III: ANALOG IC APPLICATIONS

Series op-amp regulator – IC voltage regulator – Switching regulator – Digital to analog converters – Analog to digital converter – Voltage to frequency converter – Frequency to voltage converter – Active filters – State variable filter.

UNIT IV: PHASE LOCKED LOOP AND TIMER

Phase comparator - PLL block diagram - lock range and capture range - PLL applications. IC timer - design of Astable, monostable Schmitt trigger, missing pulse detector using 555 timer - dual timer - Applications.

UNIT V: SYSTEM DESIGN

Design of Sample and Hold circuits – data loggers - frequency synthesizer - function generator - noise generator - examples of display systems - line driver/receiver - programmable counter/timer. Seven segment(LED/LCD) display – Digital Voltmeter – Digital Phase Meter.

TEXT BOOKS

1.R.A. Gayakwad, “Op-Amps and Linear integrated circuits”, PHI, 2008.

2.D. Roy Choudhuy, Shail Jain, “Linear Integrated Circuits”, New Age International (P) Ltd, 2008.

REFERENCE BOOKS

3.Millman & Taub, "Digital Integrated Electronics" Mc Graw Hill Company, 1984.

4.B.S.Sonde, "Introduction to system design using IC's Wiley eastern, 2008

5.Robert.F.Coughlin and Frederick F. Driscoll , “ Operational amplifiers and Linear Integrated Circuits”, PHI Learning Pvt. Ltd, 6th edition, 2008.

EE T53 TRANSMISSION AND DISTRIBUTION

UNT I: DISTRIBUTION SYSTEMS

Structure of electric power systems - one Line Diagram - generation, transmission and distribution systems, comparison of distribution systems – radial and ring – two wire dc, ac single phase and three phase systems – current and voltage calculations in distributors with concentrated and distributed loads – Kelvin's law for the design of feeders and its limitations.

UNIT II: TRANSMISSION LINE PARAMETERS

Resistance, inductance and capacitance of single and three phase transmission lines - symmetrical and unsymmetrical spacing – transposition - single and double circuits - stranded and bundled conductors - application of self and mutual GMD – Skin and Proximity effect - inductive interference - Corona - characteristics.

UNIT III: PERFORMANCE OF TRANSMISSION LINES

Development of equivalent circuits for short, medium and long lines – efficiency and regulation - attenuation constant and phase constant - surge impedance loading - power circle diagrams for sending and receiving ends - transmission capacity, steady state stability limit – voltage control of lines - shunt and series compensation.

UNIT IV: INSULATORS AND CABLES

Insulators – types and comparison – voltage distribution in string insulator – string efficiency – methods of improving string efficiency – Stress and sag calculations – effect of wind and ice – supports at different levels – stinging chart - cables – types – capacitance of cables – insulation resistance - dielectric stress and grading - dielectric loss - thermal characteristics - capacitance of three core cables.

UNIT V: RECENT TRENDS IN TRANSMISSION

Design of rural distribution, planning and design of town electrification schemes – comparison of EHVAC & HVDC system – economic distance for HVDC – terminal equipment for HVDC systems – description of DC transmission system – planning-advantages-interconnection of HVDC & AC systems – Introduction to FACTS technology.

TEXT BOOKS

1.C.L . Wadhwa, Electrical Power Sytems, 5th edition, New Age International (P) Limited, New Delhi, 2006.
2.V.K.Metha & Rohit Metha,"Principles of Power System", S.Chand,2005.

REFERENCE BOOKS

1.S.L.Uppal, Electrical Power, Khanna Publishers, New Delhi, 2002.
2.Chakrabarti. A, Soni M I, Gupta P V, "Textbook on power system engineering", Dhanpat Rai & Co,2008.
3.S.N.Singh, Electric Power Generation, Transmission & Distribution, Prentice Hall of India, New Edition, New Delhi, 2008.
4. Soni, Bhatnagar and Gupta, Electrical Power, Dhanpat Rai & Sons, New Delhi,2006.

EE T54 POWER ELECTRONICS

UNIT I: POWER SEMI CONDUCTOR DEVICES

Power switching devices overview: ideal & real switching characteristics - power diode, BJT, SCR, TRIAC, MOSFET, GTO, IGBT- V-I characteristics, turn-on, turn-off methods; Protection-di/dt, dv/dt, over current, over voltage; specifications, losses, thermal characteristics, series and parallel operation, triggering circuits.

UNIT II: CONTROLLED RECTIFIERS

Operation and analysis of single and three phase rectifiers – half and fully controlled converters with R, RL and RLE loads with and without freewheeling diodes; converter and inverter operation – waveforms, gate time control, output voltage, input current, power factor, effect of load and source inductances.

Power factor and harmonic improvement methods: multi-phase width controlled symmetrical angle controlled; series converter, twelve pulse converters; converter modes–four-quadrant operation with and without circulating current; firing circuits.

UNIT III: CHOPPERS

Principles of high power chopper circuits – voltage commutated, current commutated chopper, multi-phase chopper, multi-quadrant operation, switched mode regulators – principle of operation of buck, boost and buck boost regulators; time ratio control, variable frequency control, duty cycle.

UNIT IV: INVERTERS

Principles of high power VSI and CSI inverters, Modified McMurray, auto sequential inverter– waveforms at load and commutating elements; inverters: analysis of three phase inverter circuits with star and delta loads; control and modulation techniques: unipolar, bipolar schemes– voltage and frequency control; harmonics study.

UNIT V: AC CHOPPER AND CYCLO CONVERETERS

Principle of single phase and three-phase AC voltage controller – ON/OFF and phase angle control; principle of single phase and three phase cycloconverters circuits, different control techniques and firing pulse generation.

Higher applications – regulated power supply, UPS, solid-state motor starters, static circuit breakers, HVDC systems, reactive power compensation.

TEXT BOOKS

1.M.H.Rashid, "Power Electronics", PHI, New Delhi, 2007.
2.P.S.Bimbhra, "Power Electronics", Khanna Publishers, New Delhi, 2008.

REFERENCE BOOKS

1.Ned Mohan, M.Underland, William P.Robbins, "Power Electronics Converters, applications and design", John Wiley & sons, Singapore, 2001.
2.M.D.Singh, K.B.Khanchandani, "Power Electronics", Tata McGraw Hill, New Delhi, 2007.
3.Cyril W.Lander, "Power Electronics", McGraw Hill Book Company, Singapore (1993).
4.Williams B.W., "Power Electronics Devices, drivers, applications and passive components", McMillan Press Ltd., London, 1992.

EE T55 MEASUREMENTS AND INSTRUMENTATION

UNIT I: INTRODUCTION TO MEASUREMENT

Elements of Generalized measurement system - Methods of measurement - Classification of instruments – Static & Dynamic characteristics of instruments - Mean, Standard deviation- Probability of errors - Types of error Accuracy, Precision, Sensitivity, Linearity, Resolution, Hysteresis, Threshold, Input impedance, loading effects.

UNIT II: ELECTRICAL MEASURING INSTRUMENT

Basic effects of electromechanical instruments – Ammeter and voltmeter – Moving coil – Moving Iron – Electrodynamometer and induction type – Extension of range. Wattmeter – Dynamometer and induction type energy meter – induction type – Instrument transformers. Power factor meter – Synchroscope – Frequency meter

UNIT III: AC MEASUREMENT & MAGNETIC MEASUREMENTS

Measurement of resistance- Low Medium and High- AC bridges - Maxwell's, Hay's Anderson's for L Desauty's bridge and Schering bridge for C and Wien's bridge for measurement of frequency. B-H curve and hysteresis loop using ballistic galvanometer, and Loss measurement using wattmeter method.

UNIT IV: DISPLAY AND RECORDING DEVICES

LED & LCD Display Dot Matrix Display, 7 Segment Display Strip Chart Recorders Single point and multi point Recorders – X-Y Recorders - Magnetic Tape Recorders - Data Loggers – Electromagnetic and Electrostatic interference

UNIT V: TRANSDUCERS

Temperature transducers- RTD, thermister, Thermocouple - Displacement transducer - Inductive, capacitive, LVDT, Pressure transducer – Bourdon tube, Bellows – Flow transducer – Electromagnetic flow meter – Strain gauges – Piezo electric and Hall effect transducer.

TEXT BOOKS

1.A.K.Sawhney, "A course of in Electrical & Electronics measurement & instrumentation", Dhanpat Rai & sons, 2007.

2.Kalsi H.S, "Electronics Instrumentation, 2nd edition, TMH, 2004.

REFERENCE BOOKS

3.John P.Bentley, "Principles of measurement system", Addison Wesley Longman(pvt.) Ltd., 2000.

4.G.S.Rangan, G.R.Sharma and V.S.V.Mani, "Instrumentation devices and systems", Tata McGraw Hill, 2000.

5.James W. Dally, William F.Riley, Kennath G. McCornell, "Instrumentation for engg. Measurements", John Wiely & Sons (p) Ltd., 2003.

6.D.V.S.Moorthy, "Transducers & Instrumentation", Prentice Hall of India, 2008.

EE T56 COMMUNICATION ENGINEERING

UNIT I: MODULATION SYSTEMS

Time and frequency domain representation of signals, amplitude modulation and demodulation, frequency modulation and demodulation, super heterodyne radio receiver. Frequency division multiplexing. Pulse width modulation.

UNIT II: TRANSMISSION MEDIUM

Transmission lines – Types, equivalent circuit, losses, standing waves, impedance matching, bandwidth; radio propagation – Ground wave and space wave propagation, critical frequency, maximum usable frequency, path loss, white Gaussian noise.

UNIT III: DIGITAL COMMUNICATION

Pulse code modulation, time division multiplexing, digital T-carrier system. Digital radio system. Digital modulation: Frequency and phase shift keying – Modulator and demodulator, bit error rate calculation.

UNIT IV: DATA COMMUNICATION AND NETWORK PROTOCOL

Data Communication codes, error control. Serial and parallel interface, telephone network, data modem, ISDN, LAN, ISO-OSI seven layer architecture for WAN.

UNIT V: SATELLITE AND OPTICAL FIBRE COMMUNICATIONS

Orbital satellites, geostationary satellites, look angles, satellite system link models, satellite system link equations; advantages of optical fibre communication - Light propagation through fibre, fibre loss, light sources and detectors.

TEXT BOOKS

1. Wayne Tomasi, 'Electronic Communication Systems', Pearson Education, Third Edition, 2001.
2. Roy Blake, 'Electronic Communication Systems', Thomson Delmar, 2nd Edition, 2002.

REFERENCE BOOKS

1. William Schweber, 'Electronic Communication Systems', Prentice Hall of India, 2002.
2. G. Kennedy, 'Electronic Communication Systems', McGraw Hill, 4th edition, 2002.
3. Miller, 'Modern Electronic Communication', Prentice Hall of India, 2003.

EE P51 ELECTRONICS LAB – III

(A minimum of TEN experiments to be conducted in the following Topics)

ANALOG IC APPLICATIONS

1. Series and shunt voltage regulators/IC 723 voltage Regulator
2. Design and characterization of amplifiers using IC 741 (Inverting/Non-Inverting/Amplifiers and voltage follower).
3. Design and characterization of log and anti log amplifiers.
4. Differentiator and Integrator using IC 741.
5. Amplifier Application using 741 (Sum/Difference/Error Amplifier)
6. Comparator Application using 741 (Comparator/Regulator (PWM/SPWM)).
7. Frequency Response of Active Filters (first/second order filters).
8. Wein-Bridge oscillator using IC 741.
9. IC 555 – Monostable and Astable operation

DIGITAL IC APPLICATIONS

10. MOD/Decade counters.
11. Multiplexer and De-Multiplexer.

Digital comparator and parity generator/checker circuits.

12. Code converters.
13. Encoders and Decoders.
14. Monostable and Astable Multivibrators using gates and ICs.
15. Digital to Analog converters.

EE P52 MEASUREMENT AND CONTROL LAB

(A minimum of TEN experiments to be conducted in the following Topics)

MEASUREMNETS AND CALIBRATION

1. Measurement of electrical parameters using bridges (resistance/ inductance/ capacitance/ high/ medium/ low).
2. Verification of network theorems (Simulation/Practical method).
3. Extension of range and Calibration of electrical meters (voltmeter/ammeter/energy meter).
4. Measurements on supply systems (frequency/phase/phase sequence).
5. Measurement Magnetic (Flux density(B)/Field intensity (H)/B-H loop/Magnetic Losses).
6. Operation amplifier application to M&I (Instrumentation amplifier/ Signal converter with grounded and floating loads).

CONTROLS

7. Measurement parameters to model the electrical machines using the transfer-function method.
8. Measurement of open loop response of the electrical machine using its transfer-function using simulation.
9. Verification of various exercises and plots in control system using simulation.
10. Stability analysis of a system using simulation.
11. Servo control application for tracking and positioning.

HS P53 GENERAL PROFICIENCY-I

UNIT I: ART OF COMMUNICATION

Verbal and Non-verbal Communication – Barriers to Communication – Importance of Body Language – Effective Listening – Feedback

UNIT II: INTRODUCATION TO SOFT SKILLS

Attitude – Self-Confidence – Leadership Qualities – Emotional Quotient – Effective Time Management Skills – Surviving Stress – Overcoming Failure – Professional Ethics – Interpersonal Skills

UNIT III: WRITING

Importance of Writing – Written Vs Spoken Language – Formal and Informal Styles of writing – Resources for improving writing – Grammar and Usage – Vocabulary Building – SWOT analysis

UNIT IV: SPEAKING PRACTICE

Dialogue – Telephone Etiquette – Public Speaking – Debate – Informal Discussions – Presentations

UNIT V: APTITUDE

Verbal - non verbal - Numerical aptitude

REFERENCE BOOKS

1. Nicholls, Anne. Mastering Public Speaking. Jaico Publishing House,2003.
2. Aggarwal, R.S. Quantitative Aptitude. S.Chand &Co.,2004.
3. Leigh, Andrew and Michael Maynard. The Perfect Leader. Random House Business Books,1999.
4. Whetton .A.David and Kim S. Cameron. Developing Management Skills. Pearson Education, 2007.
5. Sherfield M Robert. Developing Soft Skills Pearson Education, 2005.
6. Hair O' Dan, Friedrich W. Gustav and Lynda Dee Dixon. Strategic Communication in Business and the Professions. Pearson Education, 2008.

EE T61 POWER SYSTEM ANALYSIS

UNIT I: POWER SYSTEM MODEL

Representation of Power system components like synchronous machines, induction machines, transformers, transmission lines, loads etc, for steady state analysis - Per unit Quantities, Impedance and reactance diagram - Formulation of network matrices for the power systems - Bus impedance and bus admittance matrices, reduction techniques on network matrices for network changes – Case study.

UNIT II: LOAD FLOW ANALYSIS

Formulation of load flow equations - Solution of simple problems by considering voltage controlled buses, tap changing transformers, phase shift control, line flow calculations - Effect due to new lines, loads and voltages - Gauss, Gauss-Seidel method, Newton-Raphson - Jacobian and Fast Decoupled method for calculating line voltages and real and reactive powers – Case study.

UNIT III: SYMMETRICAL COMPONENTS

Definition - Introduction - Review of symmetrical components - Transformation matrices used in resolution of unbalanced voltages and currents - Positive, Negative and Zero sequence networks of power system components - Sequence networks of impedance loads, Series impedance and Rotating machines - Representation of various types of faults in sequence networks – Case Study.

UNIT IV: SHORT CIRCUIT ANALYSIS

Formulation of a mathematical model to analyses faults on power system – Symmetrical Faults – Three phase Short Circuit – Unloaded Synchronous Machine –Problem of Arcing faults – Unsymmetrical Faults – System Representation – LG, LL and LLG Fault – Simple Problems - Effect of fault impedance - Use of short circuit study data for relaying and breaking studies – Case study of simultaneous faults on the system.

UNIT V: STABILITY ANALYSIS

Definition and Classification of Power System Stability - Simplified Synchronous Machine Model and System Equivalents – Capability Curve – Reactive Reserve Margin - Stability problems - Swing equation –Equal Area Criterion - Critical Clearing Angle – Numerical Integration of the Swing Equation – Multimachine Stability - Transient Voltage Dip/Sag Criteria – Current Practices – Voltage Stability Margin – Time domain representation - Stability based Power system blackout case studies.

TEXT BOOKS

1. J. D. Glover, M. Sarma and T. Overbye, “Power System Analysis and Design”, Fourth Edition, CENGAGE – Engineering, 2007.
2. Hadi Saadat, “Power System Analysis”, Second Edition, McGraw Hill Publishers, 2002.

REFERENCE BOOKS

3. Arthur R. Bergen and Vijay Vittal, “Power System Analysis”, Third Edition, Prentice Hall of India Private Limited, New Delhi, 2001.
4. John J. Grainger and Stevenson Jr W. D., “Power System Analysis”, Mc Graw Hill, 2003.
5. D. P. Kothari and I. J. Nagrath, “Modern Power System Analysis”, Tata McGraw Hill Publishing Company, New Delhi, 2006.
6. T. K. Nagsarkar and M. S. Sukhija, “Power System Analysis” Oxford University Press, New Delhi, 2007.
7. Prabha Kundur, “Power System Stability and Control”, Second Reprint Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2006.

EE T62 UTILIZATION OF ELECTRICAL ENERGY

UNIT I: ILLUMINATION

Production of light – Determination of MHCP and MSCP – Polar curves of different types of sources – Rousseau's construction – Lighting schemes and calculations – Factory lighting – Flood lighting – Electric lamps – Gaseous discharge – High pressure and low pressure.

UNIT II: ELECTRIC HEATING AND WELDING

Resistance, Inductance and Arc furnaces – Construction and fields of application – Losses in oven and efficiency - High frequency - Dielectric heating – Characteristics of carbon and metallic arc welding – butt welding – spot welding.

UNIT III: ELECTRIC DRIVES AND CONTROL

Group drive – Individual drive – selection of motors – starting and running characteristics – Running characteristics - Mechanical features of electric motors – Drives for different industrial applications - Choice of drives – power requirement calculation – power factor improvement.

UNIT IV: ELECTRIC TRACTION

Traction system – Speed time characteristics – Series and parallel control of D.C motors - Open circuited, shunt and bridge transitions – Tractive effort calculation – Electric braking – Tramways and trolley bus – A.C traction and recent trend.

UNIT V: ELECTROLYTIC PROCESSES

Electrolysis – polarization factor – preparation work for Electro plating – Tanks and other equipments – Calculation of energy requirements – Methods of charging and maintenance – Ni-iron and Ni- cadmium batteries -Components and materials – Capacity rating of batteries. Energy Auditing – Energy Conservation techniques for domestic and industrial applications.

TEXT BOOKS

1.Uppal S.L, "Electric Power", Khanna Publishers,2002.
2.Chakrabarti. A, Soni M I, Gupta P V, “Textbook on power system engineering”, Dhanpat Rai & Co, 2008.

REFERENCE BOOKS

1. N.V.Suryanarayanan, “Utilization of Electric Power”, Wiely Eastern Ltd., 2001.
2. G.C.Garg, “Utilization of Electric Power and Electric Traction”, Khanna Publishers, 2006.

EE T63 MICROPROCESSORS AND APPLICATIONS

UNIT I: MICROPROCESSORS ARCHITECTURES

Basic Microprocessor – Registers, Arithmetic and logic section, Timing and Control section and Interface section – 8085/Z80/MC6800 microprocessor.
8085 microprocessor –Architecture- Machine cycles and bus timings – Wait states.

UNIT II: 8085 PROGRAMMING

Addressing modes-Condition flags-Instruction set – Programming techniques – Arithmetic and logic operations on 8/16 bit binary/BCD numbers, Counter and time delay programs – Stack and subroutines – Code conversion. Software development systems and assemblers.

UNIT III: MEMORY I/O INTERFACING AND INTERRUPTS

Memory Interfacing-Compatibility between memory and microprocessor unit –Address space –Partitioning of address space–Interfacing input devices. Types of data transfer –8085 Interrupt structure-vectored interrupts –Interfacing data converters.

UNIT IV: PROGRAMMABLE PERIPHERAL DEVICES AND SERIAL I/O

Study of Architecture and programming of ICs: 8255 Programmable Peripheral device, 8253 Timer/ Counter, 8279 Programmable keyboard display interface - Interfacing keyboard – Interfacing displays, 8259 Programmable interrupt controller. Serial mode of data transfer - 8251 USART

UNIT V: APPLICATIONS AND MICROCONTROLLER

Applications: Temperature monitoring and control – Traffic light control – Frequency Measurement – Waveform generation – Stepper motor control.

Introduction to Microcontrollers – 8051 – Architecture – hardware - Input/Output ports and circuits-External Memory -Counter and Timers- Serial data Input/Output- Interrupts.

TEXT BOOKS

1. Gaonkar, "Microprocessor Architecture, Programming and Applications with the 8085", Fifth Edition, Penram International Publishing (India) Pvt. Ltd., 2006.
2. Kenneth J. Ayala 'The 8051 Micro controller Architecture, Programming and Aplications', Penram Int. Pub, 1996.

REFERENCE BOOKS

3. Kenneth L. Short, "Microprocessor and Programming Logic", Second Edition, Prentice Hall, 1997.
4. Ajit Pal, "Microprocessors Principles and Applications", Tata McGraw Hill, 2004.
5. Douglas V. Hall, "Microprocessors and interfacing: Programming and Hardware", Second Edition, McGraw Hill Inc, 2006.

EE T64 ELECTRICAL MACHINE DESIGN

UNIT I: INTRODUCTION

Principles of electrical machine design - General design considerations - Specifications of machines- Limitation in design- Recent trends in design – CAD – Flow chart methods - Review of properties of materials used in electrical machines - Magnetic circuit calculations- Introduction to Finite element method - mathematical formulation - magnetic field calculations.

UNIT II: DC MACHINES

Constructional details- Output equation - Choice of specific electric and magnetic loadings - Separation of D and L for rotating machines. Estimation of number of conductors / turns - Coils - armature Slots - Conductor dimension - Slot dimension. Choice of number of poles - Length of air gap - Design of field system, Interpoles, Commutator and Brushes.

UNIT III: TRANSFORMERS

Constructional details-Classification – output equation - Core section - Window dimensions - Yoke dimension - Overall dimension - Determination of number of turns and length of mean turns of windings- Resistance of windings- Leakage reactance- No load current calculation – Regulation, losses and efficiency.

UNIT IV: INDUCTION MOTORS

Three phase Induction Motor: Constructional details - Output equation - Choice of specific loadings - Design of stator, squirrel cage rotor, windings and slots - Calculation of circuit parameters - No load current - efficiency and temperature rise from design data.
Single phase Induction Motor: Design of running and starting windings for capacitor start induction motor.

UNIT V: ALTERNATORS

Constructional details – Output equation – Choice of specific electric and magnetic loadings- Estimation of D and L – Stator slots- Length of airgap- Conductors/turn- Stator yoke design- Design of damper windings- Design of field windings- Rotor design of turbo alternator.

TEXT BOOKS

1. A.K. Sawhney, A.Chakrabarti, "A Course in Electrical Machine Design", Dhanpat Rai & Company, sixth edition 2006.
2. V.N. Mittle and A. Mittle, ‘Design of Electrical Machines’, Standard Publications and Distributors, Delhi, 2002.
3. Sen, S.K, "Principles of Electric Machine Design with Computer Programmes", Oxford & IBH Publishing Co. Pvt. Ltd., 2001, Reprint 2004.
4. M.V.K. Chari and P.P. Silvester, "Finite Elements in Electric and Magnetic Field Problems", John Wiley, 1980.

REFERENCE BOOKS

5. K.G. Upadhyay, ‘Design of Electrical Machines’, New Age International Publishers, 2008.
6. R.K. Agarwal, "Principles of Electrical Machine Design", S.K.Kataria and Sons, Delhi, 2002.
7. Shanmugasundaram, A., Gangadharan G. and Palani R., "Electrical Machine Design Data Book", New Age international publishers (P) ltd., First edition 17979, Reprint 2005.
8. H .M.Rai, "Principles of Electrical Machine Design", Sathya prakashan, Delhi., 1988
9. P.P. Silvester and Ferrari, "Finite Element for Electrical Engineers", Cambridge University Press, 1984.
10. A.E.Clayton, "Performance and design of Direct Current Machines", The English Language Book Society and sir Isaac pitman and sons Ltd., London, 1962.

EE T65 DIGITAL SIGNAL PROCESSING

UNIT I: DISCRETE TIME SIGNALS AND SYSTEMS

Sampling of analog signals–aliasing–standard discrete time signals-classification of discrete time signals-manipulations on discrete time signals-representation of discrete time signals. Discrete time systems-properties-Linear Time Invariant systems-convolution sum-properties of LTI systems-difference equation representation.

UNIT II: DISCRETE TIME SYSTEM ANALYSIS

Z-transform–properties-inverse z-transform-difference equation–solution by z-transform-application to discrete systems-stability analysis-frequency response– convolution – Discrete Time Fourier Series-Discrete Time Fourier Transform.

UNIT III: DFT AND FFT

Discrete Fourier Transform-properties - relationship between z- transform, DTFT and DFT-Frequency analysis of signal using DFT. FFT algorithms - advantages over discrete computation of DFT – radix 2 algorithms-Decimation In Time-Decimation In Frequency-Computation of IDFT using FFT.

UNIT IV: DESIGN OF DIGITAL FILTERS

FIR filter design-linear phase FIR filters-Fourier series method- windowing techniques–frequency sampling techniques.IIR filter design-analog filter design - Butterworth and Chebyshev approximations-digital filter design using impulse invariant technique and bilinear transformation method - warping, prewarping - Frequency transformation.

UNIT V: FILTER IMPLEMENTATION AND FINITE WORD LENGTH EFFECTS

Structures for FIR systems-direct form, cascade and linear phase structures - structures for IIR systems-direct form, parallel, cascade and ladder structures - Representation of numbers-errors resulting in rounding and truncation-quantization of filter coefficients - round off effects in digital filter –product quantization error, overflow limit cycle oscillations.

TEXT BOOKS

1. John G. Proakis and Dimitris G. Manolakis, “Digital Signal Processing: Principles, Algorithms, and Applications”, PHI learning, New Delhi, Fourth Edition 2008.
2. Alan V.Oppenheim and W.schafer,”Discrete Time Signal Processing”, Prentice Hall of India Pvt. Ltd., 2001.

REFERENCE BOOKS

3. Rabiner and Gold, “Theory and Applications of Digital Signal Processing”, Prentice Hall of India Pvt. Ltd., 2001.
4. Mcclellan, Schafer and Yoder, “Signal processing first”, Pearson Education, 2003.
5. Sanjit K. Mitra, “Digital Signal Processing: A Computer Based Approach, Tata McGraw – Hill, Third Edition, 2005.
6. Emmanuel C.Ifeachor and Barrie W.Jervis “Digital signal Processing”, Pearson Education, Second Edition, 2002
7. P.Ramesh Babu, “Digital Signal processing”, Scitech Publications, Fourth Edition, 2007.
8. A.Antoniou,”Digital filters: Analysis and design”, Tata Mc Graw Hill.1990.

EE T66 ENERGY ENGINEERING

UNIT I: INTRODUCTION TO ENERGY RESOURCES

World Energy status – Indian scenario, Energy resources – conventional and renewables, fuel cells, hydrogen energy, small hydro resources; Need for energy storage, energy storage methods; Environmental aspects of energy – Economics.

UNIT II: CONVENTIONAL ENERGY SYSTEMS

Coal fired steam thermal power plant – layout, working, T-S diagram of water and steam, rankine cycle for steam turbine, efficiency.

Gas turbine power plant – various options, layout, working and T-S diagram for simple and combined cycle power plant, comparison, efficiency.

Nuclear power plants: fuels, nuclear fuel cycle, reactors, nuclear power plant, nuclear waste management.

UNIT III: HYDRO ELECTRIC TECHNOLOGY

Hydro Electric plants – Types, energy conversion schemes, power equation, environmental aspects – Hydro-Thermal coordination.

Ocean Energy Technology, Wave and tidal energy - fundamentals - energy converters - power plant - limitations.

UNIT IV: WIND, SOLAR AND BIOMASS ENERGY TECHNOLOGIES

Wind turbine types and construction – power equation – wind energy conversion systems-grid connection - environmental aspects.

Solar energy basics – energy from the sun, solar constant, solar spectrum, clarity index, V-I characteristics of a solar cell – solar module –Solar PV plant – hybrid systems.

Biomass energy resources – conversion technologies – urban waste to energy conversion – Biogas plant

UNIT V: ENERGY CONSERVATION AND MANAGEMENT

Principle of energy conservation - waste heat recovery - Heat pump – Economics of energy conservation, cogeneration, combined cycle plants, electrical energy conservation opportunities.

Definition and Objectives of Energy Management, Energy Management System, Top management support, Energy policy purpose, Roles and responsibilities of energy manager.

Energy Audit: Type and Methodology, Energy audit reporting format, Understanding Energy Costs, Fuel and Energy Substitution, Energy Audit Instruments.

TEXT BOOKS

1. S.Rao and Dr.B.B.parulekar, “Energy Technology”, Khanna pub., Third edition, 1999.
2. Non-conventional energy resources by B.H.Khan, TMH, 2006.
3. Desai,AV, “Energy Demand: Analysis, Management and Conservation”, Wiley Eastern Limited, 1990

REFERENCE BOOKS

4. G.D.Rai, “Non-conventional energy sources”, Khanna pub. Fourth Edition, 2002.
5. Pulfrey, D.L., Photovoltaic Power Generation, Van Nostrand Co., 1983.
6. Abbasik “Renewable Energy Sources and their Environment”, PHI, 2008.
7. B.Mohanty, R.S.Liu, U.V Krishna Mohan Rao, “Energy Audit Management for the Indian Industry”, Directorate the Institute of Charted Accountants of India, New Delhi, 2001.
8. Encyclopedia of Energy – McGraw Hill Publication.
9. Energy Management Handbook, John Wiley & Sons, Wayne C.Turner.
10. Kothari et al. “Renewable Energy Sources and Emerging Technologies”, PHI, 2008.

EE P61 POWER ELECTRONICS LAB

(A minimum of TEN experiments to be conducted in the following Topics)

POWER CONVERTERS

1. SCR Trigger circuits (using RC, UJT, Counters)
2. Study on DC choppers and forced commutation techniques
3. Study on single phase controlled rectifiers with R, RL & RILE loads
4. Study on three phase controlled rectifiers
5. Study on AC Choppers
6. Study on Inverters
7. Study on Cycloconverters

APPLICATIONS

8.Speed control of AC/DC motors using solid-state devices
9.SCR based motor soft stating circuits (starters) & static circuit breakers
10.Regulated power supply

EE P62 MICROPROCESSOR LAB

(A minimum of TEN experiments to be conducted in the following Topics)

ARITHMETIC OPERATIONS

1.8/16 bit arithmetic operations using various number systems.
2.Code Conversions.
3.Block operation using pointers
4.Generation of Series (Fibonacci series & Prime series).
5.Sorting of an Array.

APPLICATION PROGRAMS

8. Message Display (Moving & Flashing).
9. Digital clock Simulation using counters/interrupts.
10. Waveform generations.
11. Digital Calculation Simulation.

INTERFACES

12. Traffic light interface.
13. Stepper motor interface.
14. Key-board/ Display Interface.
15. ADC/DAC interface.
16. Serial interface between processors.

HS P63 GENERAL PROFICIENCY – II

UNIT I: COMPOSITION ANALYSIS

Technical and Non-Technical Passages (GRE Based) – Differences in American and British English – Analyzing Contemporary issues – Expanding Terminology

UNIT II: WRITING

Job Application Letter Writing – Resume Writing

UNIT III: ORAL SKILLS

Group Discussion – Introduction and Practice – Team Work – Negotiation Skills – Organizing and Attending Meetings – Facing Interviews

UNIT IV: ADAPTING TO CORPORATE LIFE

Corporate Etiquette – Grooming and Dressing

UNIT V: APTITUDE

Verbal – non verbal - numerical aptitude.

REFERENCE BOOKS

1. Pushplata and Sanjay Kumar. Communicate or Collapse, " A Handbook of Effective Public Speaking, Group Discussions and Interviews". Prentice-Hall, Delhi,2007.
2. Thorpe, Edgar, "Course in Mental Ability and Quantitative Aptitude", Tata McGraw-Hill, 2003.
3. Thorpe, Edgar, " Test Of Reasoning", Tata McGraw-Hill,2003.
4. Prasad,H.M, "How to prepare for Group Discussion and Interview", Tata McGraw-Hill, 2001.
5. Career Press Editors, "101 Great Resumes", Jaico Publishing House, 2003.
6. Aggarwal, R.S, "A Modern Approach to Verbal & Non-Verbal Reasoning", S. Chand & Co., 2004.

EE T71 INDUSTRIAL MANAGEMENT

UNIT I: PRINCIPLES OF MANAGEMENT

Management concept-Types and principles of management - scientific management- types and functions of organization - merits and demerits- elements of management- planning, organizing, staffing, directing, and control.

Types of ownership-sole proprietorships- partnership- private and public limited companies-Advantages and disadvantages.

UNIT II: FINANCIAL MANAGEMENT

Sources of finance - internal and external - types of investment- Evaluation of Investments-preparation of balance sheet and profit and loss statement - managing working capital-types of accounting and significance of each type-Type of costs, total costs,Average costs, Marginal costs, Break- even analysis.

UNIT III: PRODUCTION AND MATERIALS MANAGEMENT

Types of production -process planning scheduling, Routing- Functions and objects of materials management - stores and material control- Inventory planning and control - functions of inventories.

UNIT IV: SALES AND MARKETING

Core concepts of marketing needs, wants and demand-marketing Vs selling-products and markets- pricing and its related factor- basic concepts in channels of distribution - sales promotion -Advertising-Market research - sales forecasting.

UNIT V: INDUSTRIAL PSYCHOLOGY AND PERSONAL MANAGEMENT

Definition, scope of Industrial psychology - Individual and group-motive and morale. Fatigue, causes and remedy-accidents causes and prevention- manpower planning, job analysis and merit rating- wage and salary administration - causes of Industrial unrest - collective bargaining - (MBO) management by objectives - concepts, advantages and limitations of MBO.

REFERENCE BOOKS

1. J.S.Chandan," Management - Theory and practice", Vikas publications , 2002
2. Joseph Massie," Essential of Management ", 4th Edition prentice Hall 2001
3. Hoonkz C.O. Donnel," MANAGEMENT "8th Ed Mc Graw Hill. year.
4. Pandy I'M.," Financial Management ", Vikas publishing House pvt. year.
5. Monappa Arun and Saiyadi," Personnel Management", - Tata Mc Graw Hill New Delhi. year.

EE T72 SOLID STATE DRIVES

UNIT I: DRIVE CHARACTERISTICS

Characteristics of mechanical system; requirement of drive characteristics; selecting the drive elements; modeling of dc motor; selection of motor rating; P. PI and PID controllers; constant HP and constant torque operations.

UNIT II: DC DRIVES

Single phase and three phase drives - half controlled and fully controlled; Chopper drives - class A, B, C, D and E chopper drives; braking of dc drives.:

UNIT III: STATOR SIDE CONTROLLED INDUCTION MOTOR DRIVE

Stator voltage controlled induction motor drive - slip torque characteristics; different configuration of controller's input current; closed loop operation.

Stator frequency controlled induction motor drive-Slip-torque characteristics; harmonic equivalent circuit; Rotating magnetic fields; harmonic current; efficiency; torque; stability.

UNIT IV: ROTOR SIDE CONTROLLED INDUCTION MOTOR DRIVE

Rotor Resistance Control: slip-torque characteristics; equivalent chopper resistance; chopper circuit filter; constant current operation.

Slip Power Recovery Scheme: Slip power recovery scheme; sub synchronous operation; performance prediction; input power factor.

UNIT V: SYNCHRONOUS MOTOR DRIVES

Open loop volts/hertz control and self-control of synchronous motor: Marginal angle control and power factor control.

Introduction to vector control - Principles and types.

TEXT BOOKS

1. G.K. Dubey, ‘Fundamentals of Electric Drives’ Alpha Science International Ltd. 2001.
2. R. Krishnan, ‘Electric Motor & Drives: Modelling, Analysis and Control’, Prentice Hall of India, 2001.

REFERENCE BOOKS

3. Bimal K. Bose, "Modern Power Electronics and AC Drives", Prentice-hall Of India Pvt Ltd, 2005.
4. M.H.Rashid, "Power Electronic Circuits, Devices and Applications", Prentice Hall International, 2007.
5. P.C.Sen, "Thyristor Drives", John Wiley and sons, 1981.
6. J.M.D.Murphy and F.G. Turnbull, "Power Electronic Control of AC Motors", Pergamon press, 1988.
7. S.S.Dewan, G.R.Sleman and A.Straughen "Power Semiconductor Drives", John Wiley sons, 2008.
8. S.K. Pillai, ‘A First Course on Electrical Drives’, Wiley Eastern Limited, 1993.

EE P71 POWER SYSTEM SIMULATION LAB

(A minimum of TEN experiments to be conducted in the following Topics)

1.Computation of Power System Components in Per Units.
2.Formulation of the bus admittance matrix by Direct inspection and Singular transformation method.
3.Formation of bus impedance matrix by Inverse matrix by pivotal condensation method.
4.Load Flow studies by Gauss – seidel/Newton Raphson/Fast decoupled methods.
5.Symmetrical components for different case studies.
6.Short circuit studies for symmetrical and unsymmetrical (LL, LG, LLG) fault studies.
7.Numerical Integration of Swing equation.
8.The Equal-Area Criterion.
9.Transient stability- case studies.
10.Economic/Optimal Load Dispatch.
11.Load Flow Studies.
12.Load Frequency Control.

EE PW7 PROJECT WORK PHASE –I

The objective of the projects is to enable the students to work in convenient group of not more than four members in a group on a project involving analytical, experimental, design combination of these related to one or more areas of Electrical & Electronics Engineering. Each project shall have a guide who is member of faculty of Electrical & Electronics Engineering.

Six periods per week is allotted for the phase-I of the project work. Each group of students should complete the project literature survey, problem statement methodology with few results. The guide and departmental committee shall evaluate the student's work for 100 marks based on one project presentation and internal viva-voice.

EE P72 SEMINAR

The objective of seminar is to enable the students to work in convenient groups (not more than four members in a group) and present a seminar on any chosen topic connected with Electrical & Electronics Engineering. The topic shall be chosen in consultation with a Faculty member. Each group is expected to make a critical review of literature and prepare a report on the topic. The students are expected to present a seminar. A departmental committee shall evaluate the performance of the students for 100 marks.

EE P73 INDUSTRIAL VISITS/TRAINING REPORT

During the course of study from 3rd to 6th semester each student is expected to undertake a industrial visit and training. The minimum requirements shall be three units. A unit is defined as one industrial visit or one week industrial/field training. The students are expected to submit a report, which shall be evaluated by a Departmental Committee at the end of seventh semester for 100 marks.

EE T81 POWER SYSTEM OPERATION AND CONTROL

UNIT I: SECURITY CONCEPTS

Power system security; Factors affecting system security; Different operating states of power systems; energy control centers and its functions; Necessity for regulation of system frequency and voltage; Power systems control problems; P - F and Q - V control structure; SCADA systems.

UNIT II: LOAD FORECAST AND UNIT COMMITMENT

Load and load duration curves; Load forecasting, components of system load, classification of base load, forecasting of the base load by method of least square fit; Introduction to unit commitments constraints on unit commitment, unit commitment using priority ordering load dispatching and dynamic programming method.

UNIT III: ACTIVE POWER CONTROL

Power control mechanism of individual machine; mathematical model of speed governing mechanism, speed load characteristics of governing mechanism; Regulation of two generators in parallel; Division of power system into control areas; LFC control of a single area; static and dynamic analysis of uncontrolled system; proportional plus integral control of a single area; LFC control of two area system - uncontrolled case, static and dynamic response; Tie line with frequency bias control of two area.

UNIT IV: DISPATCH SCHEDULE

Incremental cost curve, co-ordination equations with losses neglected - solution by iteration; co-ordination equations with loss included (No derivation of Bmn co-efficient); solution of co-ordination equations using Bmn co-efficient by iteration method., Base point and participation factors; Economic dispatch controller added to LFC.

UNIT V: VOLTAGE CONTROL

Fundamental characteristics of excitation system; Block diagram model of exciter system; Generation and absorption of reactive power; methods of voltage control; static shunt capacitor/inductor VAR compensator; tap changing transformer; comparisons of different types of compensating equipment for transmission systems.

TEXT BOOKS

1. Olle I. Elgerad, “Electric Energy System Theory and Introduction”, Tata Mc Graw Hill publishing company, New Delhi, 2nd edition, 2004.
2. Allen J.Wood, Bruce F. Wollenbarg, “Power Generation, operation and control”,2nd edition, John Wiley and sons, 2008.

REFERENCE BOOKS

1. D.P.Kothari and I.J.Nagrath, " Modern Power System Analysis” Tata Mc Graw Hill publishing company Ltd., 2003.
2. Prabha Kundur, "Power System Stability and Control" Tata Mc Graw Hill publishing company Ltd., 2006.
3. A.K.Mahalanbias, D.P.Kothari & S.I.Ahson, "Computer Aided Power System Analysis and Control" Tata Mc Graw Hill publishing company, New Delhi, 1990.
4. P.S.R. Murty, "Operation and Control in Power Systems" BS Publications, 2005.

EE T82 PROTECTION AND SWITCHGEAR

UNIT I: INTRODUCTION AND GENERAL PHILOSOPHIES

Basic objectives of System Protection – Essential Qualities and Operating Principles of the Relay – Classification and Performance of Relays – Torque Equation – RX Diagram – Phasors and Polarity – Relay Input Sources – Relay Margin – Blackout Case Study.

UNIT II: RELAY FUNDAMENTALS AND CHARACTERISTICS

Differential Principle - Over current – Back up Relay- Directional Scheme - Distance Relays – Impedance, Reactance and Mho - Under frequency and Negative sequence Relays - Microprocessor Applications and Substation Automation – Zones of Protection.

Static relay circuits using analog and digital ICs for over current, differential, generator field loss, under frequency, distance, impedance and reverse power relays.

UNIT III: COMPONENTS PROTECTION:

Generator Capability Curve – Short circuit Calculations – Ground fault and unbalanced current Protection – Over excitation and Abnormal Frequency Protection - Field winding Protection – Loss of Synchronism – Motor Protection; Transformer Protection – Differential, Inrush and Over Current; Bus zone Protection; Protection of Transmission Lines; Relay coordination of a sample system – Concept of Wide Area Monitoring and Protection.

UNIT IV: DESIGN ASPECTS OF CIRCUIT BREAKERS

Basic considerations for the design - Arcing Phenomena and Arc Quenching; Properties of Arc and Interruption theories - Circuit Breaker Rating – RRRV - Current chopping and Capacitive current breaking – Duties of Switch Gear – Testing of Circuit Breakers - Recent Developments in Circuit Breaker Design and its Operation.

UNIT V: CIRCUIT BREAKERS

Construction and Operating Principles - Oil Circuit Breakers - Air Blast Circuit Breakers – Vacuum Circuit Breaker - SF_6 Circuit Breakers - DC Circuit Breakers – Fuse Characteristics – Operation of HRC fuses.

TEXT BOOKS

1. Blackburn J. Lewis, “Protective Relaying: Principles and Applications”, Third Edition, CRC Press, New York, 2006.
2. B. Ravindranath and N. Chander, "Power Systems Protection and Switchgear", John Wiley & Sons (Asia) Pte Ltd., New Edition, 1988.

REFERENCE BOOKS

3. Stanley H. Horowitz and Arun G. Phadke, “Power System Relaying”, Second Edition, John Wiley & Sons Inc. 1995.
4. Donald Reimert, “Protective Relaying for Power Generation Systems”, Taylor & Francis, New York, 2006.
5. Sunil S. Rao, "Switchgear Protection and Power Systems: Theory, Practice & Solved Problems”, Khanna Publishers, New Delhi, 2007.
6. Y. G. Paithankar and S.R. Shide, “Fundamentals of Power System Protection”, PHI Limited, 2004. Van C Warringlon, “Protective Relays – Their Theory and Practice”, vol. II, Champman & Hall Ltd., London, 1969.
7. T.S.Madhava Rao, “Power System Protection – Static Relays”, Tata McGraw Hill, New Delhi, 1984.

EE PW8 PROJECT WORK PHASE –II

The objective of the projects is to enable the students to work in convenient group of not more than four members in a group on a project involving analytical, experimental, design combination of these related to one or more areas of Electrical & Electronics Engineering. Each project shall have a guide who is member of faculty of Electrical & Electronics Engineering.

Twelve periods per week is allotted for the phase-II of the project work. Each group of students should complete the project and prepare a report covering literature survey, problem statement methodology, results and conclusions. The guide and departmental committee shall evaluate the student's work for 50 marks based on one seminar and one internal viva-voice. The student shall take up the viva-voce before a committee comprising of an external and an internal examiner, which evaluates the students work for 100 marks.

EE P81 COMPREHENSIVE VIVA VOICE

A departmental committee for 100 marks for internal assessment evaluates the students on all areas of Electrical & Electronics Engineering. They also shall be examined by a panel of examiners (An internal examiner and an external) on all areas of Electrical & Electronics Engineering at the end of 8th semester.

EE P82 PROFESSIONAL ETHICAL PRACTICE

The course should cover the following topics by way of Seminars, Expert Lectures and

ASSIGNMENTS

1. Engineering Ethics – Moral issues, Ethical theories and their uses
2. Engineering as Experimentation – Code of Ethics
3. Engineer's responsibility for safety
4. Responsibilities and rights
5. Global issues of engineering ethics

REFERENCE BOOKS

6. Mike Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw-Hill, 2003

EE E71 ANALOG AND DIGITAL FILTERS

UNIT I: INTRODUCTION LTI SYSTEMS

Introduction of continuous linear time invariant systems – Laplace Transform and continuous time LTI system – passive filter synthesis – Design of resistively terminated networks.

UNIT II: ANALOG FILTER DESIGN

Design of butterworth and chebyscheff low pass filters – Design of analog high pass, band pass and band stop filters – Implementation of second orders filter through op amp., R & C elements – Frequency Transformation method sensisvity analysis of second orders analog filter

UNIT III: DIGITAL FILTER DESIGN - IIR

Design of IIR design by bilinear transformation method – Design of low pass IIR Digital filter – High pass – Band pass – Band stop filter methods – Impulse invariant digital IIR filter design – Biquad structure for second order filter – Sensivity analysis
- IIR structure.

UNIT IV: DIGITAL FILTER DESIGN - FIR

Low pass FIR filter design – Band pass High pass filter design – Remez Exchange FIR filter design method – Frequency sampling filter design – Structure of FIR filter – sensitivity and quartization normal study.

UNIT V: POLY PHASE FILTERS

Introduction to multi rate signal processing – Interpolation – Decimation – Sampling rate conversation (I/D) – Poly phase filter structure – Poly phase Implementation – Application of Multirate signal processing

TEXT BOOKS

1. Wai-Kai Chen, “Passive and Active Pilters, Theory and Implementation” John Wiely & Sons (Asia) Pvt. Ltd., 2003.
2. Emmanuel C Ifeachor, Barrie W Jervis, “Digital Signal Processing”, Pearson Education, New Delhi, 2004.

REFERENCE BOOKS

3. Richard G Lyons, “Understanding of Digital Signal Processing”, Pearson Education, New Delhi, 2004.
4. Sanjit K Mitra, “Digital Signal Processing”, Tata McGraw Hill Pvt. Ltd., New Delhi, 2004.

EE E72 COMPUTER AIDED PLANNING AND DRAFTING

UNIT I: INTRODUCTION TO AUTOCAD

Introduction - Creating New drawing – Opening existing drawings – working with tool bars – using short cut menus – pointing devices- setting drawing units- modifying AutoCAD environment – viewing and updating drawing properties – modifying tool bars

UNIT II: COMMANDS AND VARIABLES

Using commands and systems variables – creating objects – Hatching drawing with previsions – controlling the drawing display – Editing method - using layers and object properties – auditing text to drawing – creating dimensions .

UNIT III: AUTO CAD DESIGN

Using blocks and external reference – management content with auto cad design centre – creating a layout to plot – plotting drawings batch plotting – using scripts files – working three – dimensional space – interactive veering in 3D – creating three – dimensional object

UNIT IV: 3D APPLICATIONS

Rendering and imaging – using 3D images- drawing 3D models creating hidden –line images – using render with related applications. Working with raster image –managing raster images- accessing raster image using internet- modifying images and image boundaries

UNIT V: VISUAL LISP AND AUTO LISP

Creating compound documents with OLD – linking and embedding information –using information from other application in AutoCAD. Accessory external database-working with table data- creating labels – accessing the internet visual Lisp and auto Lisp – VBA and active X automation.

TEXT BOOKS

1. J.T Roberts, “Introduction to AutoCAD”, 2002.
2. George Omura, “Introduction to AutoCAD”, 2002.

REFERENCE BOOKS

1. John EL Wilson Arnie Willians, “3D Modelling in AutoCad”, 2002.
2. A.Yarwood, “Introduction to AutoCAD”, 2002.

EE E73 DATA STRUCTURES AND ALGORITHMS

UNIT I: INTRODUCTION TO DATA STRUCTURES

Abstract data types - Sequences as value definitions - Data types in C - Pointers in C -Data structures and C - Arrays in C - Array as ADT - One dimensional array -Implementing one dimensional array - Array as parameters - Two dimensional array -Structures in C - Implementing structures - Unions in C - Implementation of unions -Structure parameters - Allocation of storage and scope of variables. Recursive definition and processes: Factorial function - Fibonacci sequence - Recursion in C - Efficiency of recursion.

UNIT II: STACK, QUEUE AND LINKED LIST

Stack definition and examples – Primitive operations – Example - Representing stacks in C - Push and pop operation implementation. Queue as ADT - C Implementation of queues - Insert operation - Priority queue - Array implementation of priority queue..

Inserting and removing nodes from a list-linked implementation of stack, queue and priority queue - Other list structures - Circular lists: Stack and queue as circular list -Primitive operations on circular lists. Header nodes - Doubly linked lists - Addition of long positive integers on circular and doubly linked list.

UNIT III: TREES

Binary trees: Operations on binary trees - Applications of binary trees - Binary tree representation - Node representation of binary trees - Implicit array representation of binary tree – Binary tree traversal in C - Threaded binary tree - Representing list as binary tree - Finding the K^{th} element - Deleting an element. Trees and their applications: C representation of trees - Tree traversals - Evaluating an expression tree - Constructing a tree.

UNIT IV: SORTING AND SEARCHING

General background of sorting: Efficiency considerations, Notations, Efficiency of sorting. Exchange sorts: Bubble sort; Quick sort; Selection sort; Binary tree sort; Heap sort. Heap as a priority queue - Sorting using a heap-heap sort procedure - Insertion sorts: Simple insertion - Shell sort - Address calculation sort - Merge sort -Radix sort. Sequential search: Indexed sequential search - Binary search - Interpolation search.

UNIT V: GRAPHS

plication of graph - C representation of graphs - Transitive closure - Warshall's algorithm – Shortest path algorithm - Linked representation of graphs - Dijkstra's algorithm - Graph traversal - Traversal methods for graphs - Spanning forests - Undirected graph and their traversals - Depth first traversal - Application of depth first traversal - Efficiency of depth first traversal - Breadth first traversal - Minimum spanning tree - Kruskal's algorithm - Round robin algorithm..

TEXT BOOKS

1. Aaron M. Tenenbaum, Yeedidyah Langsam, Moshe J. Augenstein, "Data structures using C", Pearson Education / PHI, 2004.
2. Ellis Horowitz and Sartaj Sahni "Fundamentals of Data Structures" Galgotia Book Source, Pvt. Ltd., 2004.

REFERENCE BOOKS

3. E. Balagurusamy, "Programming in Ansi C", Second Edition, Tata McGraw Hill Publication, 2003.
4. Robert L. Kruse, Bruce P. Leung Clovis L.Tondo, "Data Structures and Program Design in C", Prentice-Hall of India, Private Ltd., Second edition, 2007.
5. D. Samanta, "Classic Data structures", Prentice-Hall of India, Pvt. Ltd., India 2003.

EE E74 DIGITAL CONTROL SYSTEM

UNIT I: INTRODUCTION

Introduction to discrete time control system - Pulse transfer function –general procedures for obtaining pulse transfer functions-z domain equivalents to s domain – correlation between time response and root location in the z plane – effect of pole zero configuration in z plane – transient response of sampled data systems – steady state error.

UNIT II: STATE VARIABLE TECHNIQUE

State equations of discrete time systems – solution of state equation - state transition matrix, its properties – state space realization and state diagram – pulse transfer function from state equation - characteristic equation - Eigen values - Eigen vectors. Similarity transformation – transformation into various canonical forms.

UNIT III: CONTROLLABILITY, OBSERVABILITY AND STABILITY

Controllability and observability of linear Time Invariant (LTI) discrete data systems – tests for controllability and observability - relationship between controllability, observability and pulse transfer functions

Stability of LTI discrete time systems - Jury's stability tests – Schur - Cohn stability test - Lyapunov stability analysis.

UNIT IV: CONTROLLER DESIGN (CLASSICAL APPROACH)

Transform of digital control systems–design specifications–bilinear transformation and design procedure on the w-plane – Lead, Lag and Lead-Lag compensators - Digital PID controller.

UNIT V: CONTROLLER DESIGN (STATE SPACE APPROACH)

State feedback - Design via pole placement – observer based state feedback – full and reduced order observers.

Optimal state estimation – Kalman filter - Introduction to digital redesign.

TEXT BOOKS

1. K.Ogata, "Discrete time control systems", 2nd edition, Pearson Edu., 2003.
2. Gene F. Franklin, J. David Powell, Michael L. Workman, "Digital control of Dynamic systems", 3rd edition, Pearson Edu., 2002.

REFERENCE BOOKS

3. M.Gopal, "Digital Control and state variable methods", Tata McGraw hill, New Delhi, 2003.
4. Benjamin C. Kuo, 'Digital Control systems', 2nd Edition, Oxford University, 1997.

EE E75 DIGITAL SYSTEM DESIGN USING VHDL

UNIT I: IMPLEMENTATION TECHNOLOGY

Programmable logic devices - PLA,PAL, CPLD and FPGA – Custom chips – CAD Tools – design entry, synthesis, functional simulation, physical design, timing simulation, and chip configuration.

UNIT II: VHDL CONCEPTS

VHDL Terms – Behavioral Modeling – Sequential Processing – process statement, signal , variable assignment, sequential statements, and concurrent assignment problem – Data Types.

UNIT III: VHDL PROGRAMMING

Subprograms and Packages – Predefined Attributes – Configurations – VHDL Synthesis – constraints and attributes.

UNIT IV: COMBINATIONAL CIRCUIT DESIGN

Multiplexers – Decoders – Encoders – Code Converters – Arithmetic Comparison Circuits – VHDL for Combinational Circuits – Flip Flops – Registers – Counters – Simple Processor.

UNIT V: SEQUENTIAL CIRCUITS

Synchronous Sequential Circuits – Design steps- state assignment problem- Finite state machines using CAD tools.

Asynchronous Sequential Circuits – asynchronous behavior, analysis, synthesis, concept of stable and unstable states, hazards and design example – Vending machine controller.

TEXT BOOKS

1. Stephen Brown I Zvonko Vranesic, “Fundamentals of Digital Logic Design with VHDL”, Tata McGraw Hill, Second Edition, 2007
2. Douglas L.Perry, “ VHDL Programming by Example, Tata McGraw Hill”, Fourth Edition, 2002.

REFERENCE BOOKS

3. Charles H. Roth,Jr, “Digital Systems Design Using VHDL,”Thomson Learning, 2007
4. Ben Cohen, “VHDL Coding Styles and methodologies”, Springer, 2nd Edition , 2005
5. Stainley Mazor,Patricia Langstraat,”A guide to VHDL” Springer, 2nd Edition , 2007

EE E76 FUZZY AND NEURAL SYSTEMS

UNIT I: FUZZY SETS AND RELATIONS

Classical sets, fuzzy sets-operation, properties. Fuzzy relations-Equivalence and tolerance relation, Fuzzication- membership function-types, methods.

UNIT II: FUZZY INFERENCE SYSTEM

Building Blocks of a Fuzzy system, fuzzication, fuzzy Rule-based Systems. Composition of rules, types of inference, defuzzication methods. Fuzzy control system- examples.

UNIT III: INTRODUCTION TO NEURAL NETWORKS

Biological Neuron, artificial neuron-comparison, neuron model, architectures-Feedforward and recurrent types. Perceptron -learning rule-graphical, algorithmn, limitations, multilayer network.

UNIT IV: BACKPROPAGATION NETWORKS

Backpropagation algorithm-derivation of up-dation rules, drawbacks. Variants of Backpropagation algorithm-momentum, variable learning rate-simple problems. Data based modeling using backpropagation algotihm – applications - example.

UNIT V: ASSOCIATIVE AND SELF-ORGANIZING NETWORKS

Associative Learning –supervised and unsupervised types- Instar , outstar and Kohonen networks, Bidirectional associative memories, Hopfield Network. Self organizing map algorithm –Simple problems.

TEXTBOOKS

1. Timothy J.Ross, “Fuzzy Logic with Engineering Applications”,Wiley student edtion,2nd edition,2007.
2. Martin T.Hagan,Howard B. Demuth, Mark Beale, “Neural Network Design”,Cenage Learning, 2008

REFERENCE BOOKS

3. S.N Sivanandam, S.Sumathi, S.N.Deepa, “Introduction to Neural Networks using MATLAB 6.0, TMH, 2006.
4. James A.Freeman,David M.Skapura, “Neural Networks algorithm, application, and programming techniques”, Pearson education,2004.
5. Laurene V. Fausett, “Fundamentals of Neural Networks-architecture, algorithm and application”, Pearson Education, 2004.

EE E77 HIGH POWER SOLID STATE SYSTEMS

UNIT I: SOLID STATE COMPENSATORS

Theory of load compensation – voltage regulation and power factor correction – phase balance and PF correction of unsymmetrical loads. Property of static compensator – Thyristor controlled rectifier (TCR) – Thyristor Controlled Capacitor (TSC) – Control Strategies.

UNIT II: HARMONIC CONTROL AND POWER FACTOR IMPROVEMENT

Harmonics and Input power factor for different types of converters, power factor improvement using Load and forced commutated converters. Higher pulse converter and their influence on harmonic and power factor of higher pulse converter.

UNIT III: VOLTAGE CONTROL USING STATIC TAP-CHANGERS

Conventional tap changing methods, solid static tap changers – different schemes and their comparison.. Calculation – number of transformer taps, output voltage – influence of load power factor.

UNIT-IV: UNIFIED POWER FLOW CONTROLLER

Basic operating principles – conventional transmission control capability of UPFC – Independent real and reactive power flow control – control scheme for UPFC – Basic control system for P and Q control – dynamic performance.

UNIT V: UNINTERRUPTABLE POWER SUPPLY SYSTEM

UPS – various schemes, UPS – converters/inverters used, Filters – tuned filters for current/voltage harmonics. UPS – Parallel, Redundant and non- redundant UPS.

TEXT BOOKS

1. Timothy John Eastham Miller, “Reactive power control in Electric systems”, John Wiley and sons, New York, 1982.
2. M.D.Singh, K.B.Khan chandani, “Power Electronics”, Tata McGraw Hill, New Delhi, 2002.
3. Narani G. Hingorani and Laszlo Gyugyi, “Understanding FACTS concepts and technology of flexible AC transmission systems”, IEEE power Engineering society Sponsor, IEEE press, 2001.
4. Mohan, Undeland and Robbins, “Power Electronics Converters, Applications and Design, John Wiley & Son, Inc., 2003.
5. K. R. Padiyar, “HVDC Power Transmission Systems Technology and System Interactions”, New Age International (p) Limited, New Delhi, 2003.

REFRENCES BOOKS/PAPERS

6. R. Mohan Mathur and Rajiv K. Varma, “Thyristor-Based FACTS Controllers for Electrical Transmission Systems”, Edition February 2002, IEEE press-John Wiley and Sons publications, 2002.
7. “Static Compensator for AC power systems”, Proc. IEE vol.128 Nov. 1981. pp 362-406.
8. “A Static alternative to the transformer on load tap changing”, IEEE Trans. On Pas, Vol.PAS-99, Jan. /Feb. 1980, pp86-89.
9. “Improvements in Thyristor controlled static on-load tap controllers for transformers”, IEEE Trans. on PAS, Vol.PAS-101, Sept.1982, pp3091-3095.
10. Gyugyi.L, “Unified Power flow control concept for flexible AC Transmission”, IEEE Proceedings, Vol. 139, no.4, July 1992.

EE E78 HIGH VOLTAGE ENGINEERING

UNIT I: OVER VOLTAGES AND INSULATION CO ORDINATION

Causes of over voltages: lightning and switching over voltages; protection against over voltages; principles of insulation coordination.

UNIT II: GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS

Generation of high AC voltages: cascaded transformers. Generation of high DC voltages: Rectifier and Voltage doubler circuits, Cockroft Walton voltage multiplier circuit and its qualitative analysis. Generation of impulse and switching surges; Marx circuit; generation of high impulse current. Tripping and control of impulse generators.

UNIT III: MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS

Measurement of AC, DC impulse and switching surges using sphere gaps, peak voltmeters, potential dividers and high speed CRO, opto Electronics method; Fiber optic method;

UNIT IV: ELECTRICAL BREAKDOWN IN GASES, SOLIDS AND LIQUIDS

Ionization processes - Townsend & Streamer theory - the sparking voltage - Paschen's law - Time lag for breakdown - Breakdown in non-uniform fields and corona discharges.
Conduction and breakdown in pure and commercial liquids and solids dielectrics.

UNIT V: HIGH VOLTAGE TESTING PRACTICE

Indian Standards/IEC specification for testing, correction factor; high voltage testing of power apparatus: Insulators, Bushings, Isolators, Circuit Breakers, Cables, Transformers and Surge Diverters.

TEXT BOOKS

1. M.S.Naidu and N.Kamaraju, "High voltage Engineering", Third edition, Tata Mc Graw Hill publishing company, New Delhi, 2003.

REFERENCE BOOKS

2. E.Kuffel and W.S.Zaengel, "High voltage Engineering Fundamentals", Pergamon Press, Oxford, London, 2000.
3. Allan Greenwood "Electrical Transients in power systems", Wiley Interscience, a division of John Wiley and sons Inc., New York, 1971.
4. Dieter kind, "An Introduction to High voltage Experimental Techniques", Wiley Eastern Limited, New Delhi. 1978.
5. T.J.Gallagher and A.J.Pearmain, "High voltage Measurement Testing and Design", John Wiley and sons, New York, 1982.

EE E79 INFORMATION TECHNOLOGY

UNIT I: INTRODUCTION

Introduction to IT, Scope for IT, IT Usage, Information System, its functions and applications.

UNIT II: HARDWARE:

Architecture (Mainframe, Mini, PC, Workstations), Real time system, Transaction Processing system, Laptop, Palmtop, Client server, N-Tier. Introduction to Networks: LAN, WAN, MAN, etc. Peripherals: Information about Input devices (Keyboard, Mouse, Joystick, Track ball, etc.) - Details about Storage devices (Floppy disk, Hard disk, Tapes (Cartridge, DAT), Compact Disk), Information about Monitors, Printers (impact, non-impact) - Various types of plotters.

UNIT III: SOFTWARE

Software Classification (System, Application, and Utilities). Operating System: Introduction, Basic functions of OS, Classification of OS. Programming Languages: Generation of Languages and their uses. Packages: Spread sheets, DTP Tools, Presentation tools. Application areas of Software - Commercial, Scientific, Real time application etc.

UNIT IV: MULTIMEDIA AND INTERNET

Introduction to multimedia - Hardware, Software and applications - Introduction to Internet, Service providers, Internet naming and addressing - Information about electronic mail, Remote login, File Transfer, Usenet-BBS, HTML. Intranet, Extranet: Introduction to Intranet and Extranet.

UNIT V: OBJECT ORIENTED SYSTEM

Concepts, Benefits of OOS over conventional system. Enterprise Computing: About ERP, Activities under ERP. Mobile Computing - An Introduction to Mobile Computing.

TEXT BOOKS

1. Brain, K. Williams, et. al., “Using Information Technology”, Third edition, TMH, 2000.
2. Dennis P. Curtin, et.al., “Information Technology - The Breaking View”, TMH, 2000.

REFERENCE BOOKS

3. Turban, Rainer, Potter, “Introduction to Information Technology”, second edition, Wiley Publications.

EE E710 POWER SYSTEM ECONOMICS

UNIT I: ECONOMIC CONSIDERATIONS

Cost of electrical energy - Expressions for cost of electrical energy – Capital-interest – Depreciation - Different methods - Factors affecting cost of operation - Number and size of generating units - Importance of high load factor - Importance of power factor improvement - Most economical power factor - Meeting the KW demand on power stations - Power system tariffs – Regions and structure of Indian Power System.

UNIT II: ECONOMIC DISPATCH

Modeling of Cost Rate Curves – Economic Dispatch Calculation - Losses neglected, with generator Real and Reactive power limits; Losses included - Losses of economy in incremental cost data - Problems - Generator Capability Curve – Effect of Ramping rates – Prohibited Operating Zones - Automatic Load dispatch in Power Systems.

UNIT III: ECONOMIC OPERATION

General loss formula - Evolution of incremental transmission loss rate - Method of calculation of loss coefficients – Systematic development of transmission loss formula - Transmission loss as a function of plant generation – Participation Factor - Non – Smooth Fuel Functions (Quadratic, Valve point loading, CCCP, Multiple Fuel) – Problems - Introduction to Artificial Intelligence Techniques for solving ELD problems.

UNIT IV: INTERCONNECTED SYSTEMS

Interconnected operation - Economic operation of hydro thermal power plants - Iteration scheme - Gradient approach – Newton's method - Modeling and solution approach to short term and long term Hydro-Thermal scheduling problem using Dynamic Programming.

UNIT V: OPTIMAL POWER FLOW AND FUNDAMENTALS OF MARKETS

Problem formulation - Cost minimization - Loss minimization - Solution using NLP and successive LP methods – Constraints - DC and AC OPF (Real and Reactive Power Dispatch) – Effect of Contingencies - Voltage and Phase angle - Transient Voltage Dip/Sag Criteria.

Fundamentals of Markets – Introduction to Efficiency and Equilibrium - Modeling of consumers and producers – Single and Double Auction mechanism - Global welfare – Dead Loss – Spot and Forward Markets.

TEXT BOOKS

1. Allen J Wood and B F Wollenberg, "Power Generation, Operation and Control", John Wiley & Sons, New York, 2004.
2. D. P. Kothari and I. J. Nagrath ," Modern Power System Analysis ", Tata McGraw Hill Publishing Company, New Delhi, 2006.

REFERENCE BOOKS

3. Kirchmayer. L.K,"Economic operation of power system", John Wiley & Sons, 1953.
4. Steven Stoft, "Power System Economics", John Wiley & Sons, 2000.
5. Daniel S. Kirschen and Goran Strbac, "Power System Economics", John Wiley & Sons, Ltd, 2004.
6. Hadi Saadat, "Power System Analysis", Second Edition, McGraw Hill Publishers, Scholarly Transaction Papers, 2002.

EE E81 ADVANCED CONTROL ENGINEERING

UNIT I: INTRODUCTION TO CLASSICAL DESIGN

Introduction to compensating networks – lead, lag, lead-lag compensation – feedback compensation – P, PI, PID controllers – design using Bode plot and root locus techniques.

UNIT II: STATE SPACE ANALYSIS

State space formulation – state variable – phase variables and canonical variables – state model from differential equation – state transition matrix – state space representation of discrete time systems

UNIT III: STATE SPACE DESIGN

Eigen values and Eigen vectors – Diagonalization – canonical forms - Controllability and observability - Controller design by state feedback –Necessary and sufficient condition for arbitrary pole placement- state regulator problem. Observer Design – Full order/reduced order observer design

UNIT IV: STABILITY

Stability concepts – BIBO Asymptotic stability - stability definitions in state space domain – stability theorems on local and global stability – Lyapunov stability analysis - Krasovskii Method.

UNIT V: OPTIMAL CONTROL

Linear quadratic optimal regulator (LQR) problem formulation – optimal regulator design by parameter adjustment (Lyapunov method) – optimal regulator design by Continuous - time Algebraic Riccatti Equation (CARE) – optimal controller design using LQG framework.

TEXT BOOKS

1. K. Ogata, 'Modern control engineering', 3rd edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2000.
2. I. J. Nagrath and M. Gopal, " Control systems Engineering", 4th edition, New Age International Pvt Limited, New Delhi, 2006.

REFERENCE BOOKS

3. Biswa Nath Datta," Numerical methods for linear control systems', Elsevier, 2005
4. M. Gopal, "Digital Control and state variable methods", Tata McGraw Hill, New Delhi, 2003.

EE E82 BIOMEDICAL INSTRUMENTATION

UNIT I: ELECTRO PHYSIOLOGY

Review of Physiology and anatomy – sources of Bioelectric Potentials – Resting and Action Potentials – Propagation of Action Potentials – Electrodes theory – Bio potential electrodes – Bio chemical transducers – Transducers for Bio Medical applications.

UNIT II: BIOMEDICAL MEASUREMENT AND RECORDERS

Physiology of cardiovascular and nervous system – ECE – EEE - EME – Foetal ECE- Phonocardiography – Vector Cardiography – Holtel monitoring – BP – Blood flow – cardiac output – ICCU – Bedside unit and central monitoring unit.

UNIT III: PULMONARY MEASUREMENT AND BIO TELEMETRY

Physiology of respiratory system – Respiratory rate measurement – wine and wireless Biotelemetry – Telemetering multiple information – implanted transmitters – sauces of electrical hazards and safety techniques.

UNIT IV: MEDICAL IMAGING SYSTEM

Ultrasound scanner – Echo cardiography – Coloar Doppler system – CAT and CT scan – MRI Imaging – Cine angiogram – LASER Imaging – Endoscope.

UNIT V: THERAPEUTIC UNITS

Physiotheraphy and Electrotheraphy - Short ware, Microwave diathermy – Defibrillators – Cardio vector – Hearing aid – dialysis machine.

TEXT BOOKS

1. Leshie Cromwell, Fred. J. Weibell and Erich. A. Pfeiffer, “Biomedical Instrumentation and Measurements”, 2nd Edition, PHI, 2003.
2. R.Anandanatarajan, “Biomedical Instrumentation”, PHI Learning Pvt. Limited, New Delhi, 2009.

REFERENCE BOOKS

3. R.S. Khandpar, “Hand Book of Biomedical Instrumentation and measurement”, McGraw Hill publishing Co., 1990.
4. Aston, “Principles of Biomedical Instrumentation and measurements”, McGraw Hill publishing Co., 1990.

EE E83 COMPUTER AND COMMUNICATION NETWORKS

UNIT I: NETWORK MODELS

Data communications- Networks- LAN, MAN and WAN- Internet, Intranet and Extranets- Protocols and standards- The OSI/ISO reference model- Layers in the OSI model-TCP/IP protocol suite- IP addressing- Broadband ISDN- ATM protocol reference model-ATM layers- SONET/SDH architecture- FDDI-DQDB- Structure of circuit and packet switches.

UNIT II: DATA LINK CONTROL

Types of errors- Error detection and correction- Checksum- Framing- Flow control-Error control- Stop and wait protocol- Go-back N- Selective repeat protocols- HDLC-Random access protocols- Controlled access- Wired LANs- Ethernet- Fast Ethernet- Gigabit Ethernet- IEEE standards, IEEE 802.3, 802.4, 802.5 and 802.6- Wireless LANs- IEEE 802.11 and Bluetooth.

UNIT III: NETWORK ROUTING ALGORITHMS

Logical addressing- IPv4 addresses- IPv6- Internet protocol- Transition from IPv4 to IPv6- Mapping logical to physical address- Mapping physical to logical address- ICMP-Direct Vs indirect delivery- Forwarding- Unicast and Multicast routing protocols- Routers and gateways.

UNIT IV: CONGESTION AND TRAFFIC MANAGEMENT

Queuing analysis- Queuing models- Single server and multi server queues- Congestion control in data networks and internets- Effects of congestion- Congestion and control- Traffic management- Congestion control in packet networks- TCP flow control- TCP congestion control- Requirements for ATM traffic and congestion control- Performance of TCP over ATM.

UNIT- V: NETWORK SECURITY

Security issue- threats and responses- Preservation measures- Firewalls, Protection form spam, Home networks security, Intrusion detection systems, intrusion prevention systems- Legal implications- Next generation virus defence- wireless network security- Radiation- Wireless security features- WEP,WPA,TKIP- Defensive strategies- Network auditing and intrusion detection- Network administration.

TEXT BOOKS

1. Behrouz. A. Forouzan, “Data Communication and Networking”, Fourth Edition, Tata McGraw-hill, New Delhi, 2006.
2. Houston. H. Carr and Charles. A. Snyder, “Data Communications and Network security”, Tata McGraw-hill, New Delhi, 2007.

REFERENCE BOOKS

3. William Stallings, “High Speed Networks and Internets”, Second Edition, Pearson Education Asia, New Delhi, 2002.
4. Andrew .S. Tanenbaum, “Computer Networks”, Fourth Edition PHI Learning Private Ltd, New Delhi, 2008.
5. Rainer Handel et al, “ATM Networks”, Addison Wesley, New Delhi, 2004.
6. Sudakshina Kundu, “Fundamentals of Computer Networks”, Second edition, PHI, New Delhi, 2008.

EE E84 DESIGN AND LAYOUT OF POWER APPARATUS AND SYSTEMS

UNIT I: DESIGN AND LAYOUT OF TRANSMISSION LINES

Requirements of transmission Lines - Selection of voltage levels for H.T transmission lines - Choice of conductors - spacing of conductors - Types of Insulators – specifications of transmission lines – Electrical and Mechanical design of transmission lines – Surge Impedance loading – stringing of transmission lines – Tower designs – Types, single circuit, Double circuit towers – Transmission line Earth wires – IEE rules.

UNIT II: DESIGN AND LAYOUT OF DISTRIBUTION SYSTEMS

Primary and secondary distribution system design – Calculation of distribution sizes, voltage drops – voltage regulation – Design scheme for Rural Distribution system – Design scheme for industrial distribution schemes – Power distribution for computer automation – layout for Town Electrification – types of distribution cables – Switchgear for L.T. and H.T. Distributions – IEE rules for Distribution.

UNIT- III: LAYOUT AND INSTALLATION OF POWER EQUIPMENTS

Installation of power transformers – Reactors – Installation of Insulators – Erection of earthing systems and secondary circuits – Installation of CT's and PT's and CVT's – Installation of fuses and their rating – Installation of Isolators and Circuit breakers – Installation of Capacitor banks –IEE rules.

UNIT IV: LAYOUT AND DESIGN FOR ELECTRIC DRIVES

Low voltage and metal clad and Switchgear for Electric drives – single-phase preventer – Contactors Types and their definition – Contactor starters for motors – limit switches for process controls – IEE rules for Motors Erection.

UNIT- V: DESIGN AND LAYOUT OF SUBSTATIONS

Types of Substations – Indoor and outdoor substations – Selection of Site and Location – Layout diagram of 11 kV / 440 V, 220 / 11 KV substations – Substations requirements, their functions and location – Substation – Switchgear installations – Busbar arrangements and design – Load break switches – Switching substations Location CT's and PT's – materials for Busbar – Substations earthing.

TEXT BOOKS

1. M.V. Deshpande, "Elements of Power Station Design", Tata McGraw-Hill, 1984.
2. P. K. Nag, "Power Plant Engineering-Steam and Nuclear", Tata McGraw Hill, 2001.
3. S.S. Rao, "Protection and Switch gear", Khanna Publication, 2006.

REFERENCES BOOKS

4. Frederick T. Morse, "Power Plant Engineering", East West Press Private Limited
5. Mahesh Verma, "Power Plant Engineering", Metrepolitan Book Co, Pvt. Ltd.
6. George W. Sutton (Editor), "Direct Energy Conversion", Inter University Electronics Series Vol- 3, McGraw-Hill, New York.

EE E85 DSP TECHNIQUES FOR SPEECH AND IMAGE PROCESSING

UNIT I: INTRODUCTION DSP CONCEPTS

Introduction – Introduction to discrete time speech signal processing – speech communication path way – Production and analysis of speech – Application.

Review of discrete time signal processing of signals and systems – Discrete – Time Fourier transform – z – transform – properties of LTI system short time fourier transform analysis and synthesis (application to speech signals)

UNIT II: SPEECH PROCESSING

Production and classification of speech sounds – Anatomy and physiology of speech production – categorization of speech sounds – physics of sound – uniform tube model – Discrete time model – Linear prediction analysis of stochastic speech sounds – All pole modeling of deterministic signals – Criterion of goodness – Introduction of speech coding – Application to speech enhancement.

UNIT III: IMAGE PROCESSING

Introduction to Image processing systems – Image sampling and quantization – Basic relationship between pixels – Image enhancement with the spatial domain – Gray level transformation – Histogram processing – Enhancement based on Arithmetic and logic operation – Enhancement based on filter – Enhancement with the frequency domain.

UNIT – IV: NOISE AND FILTERS

Image degradation restoration process – Noise model restoration with the presence of noise only – by spatial domain analysis – Frequency domain analysis – Linear position – invariant degradation – Inverse filtering LMS filtering

UNIT – V: IMAGE COMPRESSION AND SEGMENTATION

Fundamentals of Image compression – Compression models Elements of information theory – Error - Free compression. Segmentation (Image) -Detection of Discontinuity– Edge Linking and Boundary detection – Threshold – Region band segmentation.

TEXT BOOKS

1. Thomas F Quatieri , Discrete time speech signal processing" Pearson Education, 2002.
2. Refall C Gmzalez and Richard E Woods, Digital Image Processing, Prentice Hall of India Pvt. Ltd., New Delhi, 2006.

REFERENCE BOOKS

3. William K Pratt, Digital Image Processing, John Wiley & Sons Inc, 2003.

EE E86 EMBEDDED SYSTEM DESIGN

UNIT I: INTRODUCTION TO EMBEDDED SYSTEM

Introduction to functional building blocks of embedded systems – Register, memory devices, ports, timer, interrupt controllers using circuit block diagram representation for each categories.

UNIT I: PROCESSOR AND MEMORY ORGANIZATION

Structural units in a processor; selection of processor & memory devices; shared memory; DMA; interfacing processor, memory and I/O units; memory management – Cache mapping techniques, dynamic allocation - Fragmentation.

UNIT II: DEVICES & BUSES FOR DEVICES NETWORK

I/O devices; timer & counting devices; serial communication using I^2C, CAN, USB buses; parallel communication using ISA, PCI, PCI/X buses, arm bus; interfacing with devices/ports, device drivers in a system – Serial port & parallel port.

UNIT III: I/O PROGRAMMING SCHEDULE MECHANISM

Intel I/O instruction – Transfer rate, latency; interrupt driven I/O - Non-maskable interrupts; software interrupts, writing interrupt service routine in C & assembly languages; preventing interrupt overrun; disability interrupts.

Multi threaded programming – Context switching, premature & non-premature multitasking, semaphores.

Scheduling – Thread states, pending threads, context switching, round robin scheduling, priority based scheduling, assigning priorities, deadlock, watch dog timers.

UNIT I: REAL TIME OPERATING SYSTEM (RTOS)

Introduction to basic concepts of RTOS, Basics of real time & embedded system operating systems, RTOS – Interrupt handling, task scheduling; embedded system design issues in system development process – Action plan, use of target system, emulator, use of software tools.

TEXT BOOKS

1. Rajkamal, 'Embedded System – Architecture, Programming, Design', Tata McGraw Hill, 2003.
2. Daniel W. Lewis 'Fundamentals of Embedded Software', Prentice Hall of India, 2004.

REFERENCE BOOKS

3. David E. Simon, 'An Embedded Software Primer', Pearson Education, 2004.
4. Frank Vahid, 'Embedded System Design – A Unified Hardware & Software Introduction', John Wiley, 2002.
5. Sriram V. Iyer, Pankaj Gupte, 'Embedded Real Time Systems Programming', Tata McGraw Hill, 2004.
6. Steve Heath, 'Embedded System Design', II edition, Elsevier, 2003.

EE E87 FACTS CONTROLLERS

UNIT I: COMPENSATORS

Introduction to FACTS controllers – Reactive power control: Reactive power, uncompensated transmission line, reactive power compensation – Principles of conventional reactive power compensators: Synchronous condensers, saturated reactor, phase angle regulator and other controllers.

UNIT II: THYRISTOR CONTROLLED SHUNT COMPENSATOR

Objective of shunt compensation – Principle and operating characteristics of Thyristor Controlled Reactor(TCR) – Thyristor Switched Capacitor(TSC) – Static VAR Compensators (SVC) – SVC control system – SVC voltage regulator model – Transfer function and dynamic performance of SVC – Transient stability enhancement and power oscillation damping, mitigation of sub-synchronous resonance.

UNIT III: THYRISTOR CONTROLLED SERIES COMPENSATOR (TCSC)

Series compensation – Principles of operation of TCSC – Capability characteristics of TCSC – Modeling of TCSC – TCSC control system – enhancement of system damping – mitigation of sub-synchronous resonance.

UNIT IV: VSC BASED SHUNT AND SERIES COMPENSATOR

Static Synchronous Compensator (STATCOM): Principle of operation, VI Characteristics, Harmonic performance – Steady state model – SSR mitigation.

Static Synchronous Series Compensator (SSSC): Principle of operation and characteristics of SSSC – control range and VA rating – capability to provide real power compensation – Immunity to sub-synchronous resonance – control scheme for SSSC.

UNIT V: UNIFIED POWER FLOW CONTROLLER

Basic operating principles – conventional transmission control capability of UPFC – Independent real and reactive power flow control – control scheme for UPFC – Basic control system for P and Q control – dynamic performance.

TEXT BOOKS

1. Narain G. Hingorani and Laszlo Gyugyi, "Understanding FACTS concepts and technology of flexible AC transmission systems" Edition 2001, IEEE power Engineering society Sponsor, IEEE press, 2001.
2. R. Mohan Mathur and Rajiv K. Varma, "Thyristor-Based FACTS Controllers for Electrical Transmission Systems", Edition February 2002, IEEE press-John Wiley and Sons publications, 2002.

REFERENCE BOOKS

3. Vijay K. Sood, "HVDC and FACTS Controller: Application of Static Converters in power systems", IEEE Power Electronics and Power Systems series, Kluwer Academic publishers, Boston, First edition January 2004.
4. Timothy John Eastham Miller, "Reactive power control in Electric systems", John Wiley and sons, New York, 1982.
5. Yong Hua Song and Allan T Johns, "Flexible AC Transmission System (FACTS)", IEEE Power Engineering Series-IEEE press, 1999.
6. K. R. Padiyar, "HVDC Power Transmission Systems Technology and System Interactions", New Age International (p) Limited, New Delhi, 2003.
7. Einar V. Larsen, Jaun J. Sanchez-Gasca and Joe H. Chow, "Concepts of design of FACTS Controllers to damp power swings", IEEE Transaction on Power Systems, Vol. 10, no. 2, May 1995.
8. Gyugyi L, "Unified Power flow control concept for flexible AC transmission", IEEE Proceedings, vol. 139, no. 4, July 1992.

EE E88 HVDC TRANSMISSION

UNIT I: INTRODUCTION TO HIGH VOLTAGE TRANSMISSION SYSTEMS

Introduction - Historical sketch - Comparison between AC and DC transmission - kinds of DC links – Planning and modern.

UNIT II: HVDC CONVERTERS

Three phase bridge converter - Simplified analysis, waveforms with and without overlap - Current and voltage relations - Input power factor - principles of control – Control characteristics – Constant ignition angle control – Constant current and extinction angle control.

HVDC converters – twelve - higher pulse operation - introduction to modern convertrs.

UNIT III: HVDC FAULTS AND PROTECTION

Converter faults, commutation failure, axis fire – Disturbance caused by over current and over voltage – Protection against over current and over voltage – Surge arrestors smoothing reactors – Corona effects of DC line – Transient over voltages for DC line – Protection of DC links.

UNIT IV: REACTIVE POWER AND HARMONICS IN HVDC

Sources of reactive power - static VAR system – Reactive power control during transients – Generation of harmonics – Types and design of various AC filters, DC filters – interference-telephone - RI noise.

UNIT V: MULTI TERMINAL HVDC SYSTEMS

Types of MTDC system – Comparison of series and parallel MTDC system – HVDC insulation – DC line insulators – DC breakers – Characteristics and types of DC breakers.

TEXT BOOK

1. K. R. Padiyar, “HVDC Power Transmission Systems Technology and System Interactions”, New Age International (p) Limited, New Delhi, 2003.
2. Edward Wilson Kimbark, “Direct current Transmission”, Wiley Interscience, Vol. I, New York, 1971.

REFERENCE BOOKS

3. Vijay K. Sood, “HVDC and FACTS Controller: Application of Static Converters in power systems”, IEEE Power Electronics and Power Systems series, Kluwer Academic publishers, Boston, First edition January 2004.
4. C. Adamson and N.G. Hingorani, “High voltage DC power Transmission”, Garraway Limited, England, 1960.
5. Mohan, Undeland and Robbins, “Power Electronics Converters, Applications and Design, John Wiley & Son, Inc., 2003.
6. J. Arrialga, “HVDC Transmission”, Peter Peregrinus Ltd., London, 1983.

EE E89 POWER SYSTEM RESTRUCTURING AND DEREGULATION

UNIT I: FUNDAMENTALS AND ARCHITECTURE OF POWER MARKETS

Deregulation of Electric utilities: Introduction-Unbundling-Wheeling- Reform motivations-Fundamentals of Deregulated Markets – Types (Future, Day-ahead and Spot) – Participating in Markets (Consumer and Producer Perspective) – bilateral markets – pool markets.
Independent System Operator (ISO)-components-types of ISO - role of ISO - Lessons and Operating Experiences of Deregulated Electricity Markets in various Countries (UK, Australia, Europe, US, Asia).

UNIT II: TECHNICAL CHALLENGES

Total Transfer Capability – Limitations - Margins – Available transfer capability (ATC) – Procedure - Methods to compute ATC – Static and Dynamic ATC – Effect of contingency analysis – Case Study.

Concept of Congestion Management – Bid, Zonal and Node Congestion Principles - Inter and Intra zonal congestion – Generation Rescheduling - Transmission congestion contracts – Case Study.

UNIT III: TRANSMISSION NETWORKS AND SYSTEM SECURITY SERVICES

Transmission expansion in the New Environment – Introduction – Role of transmission planning – Physical Transmission Rights – Limitations – Flow gate - Financial Transmission Rights – Losses – Managing Transmission Risks – Hedging – Investment.
Ancillary Services – Introduction – Describing Needs – Compulsory and Demand-side provision – Buying and Selling Ancillary Services – Standards.

UNIT IV: MARKET PRICING

Transmission pricing in open access system – Introduction – Spot Pricing – Uniform Pricing – Zonal Pricing – Locational Marginal Pricing – Congestion Pricing – Ramping and Opportunity Costs.

Embedded cost based transmission pricing methods (Postage stamp, Contract path and MW-mile) – Incremental cost based transmission pricing methods (Short run marginal cost, Long run marginal cost) - Pricing of Losses on Lines and Nodes.

UNIT V: INDIAN POWER MARKET

Current Scenario – Regions – Restructuring Choices – Statewise Operating Strategies - Salient features of Indian Electricity Act 2003 – Transmission System Operator – Regulatory and Policy development in Indian power Sector – Opportunities for IPP and Capacity Power Producer.

Availability based tariff – Necessity – Working Mechanism – Beneficiaries – Day Scheduling Process – Deviation from Schedule – Unscheduled Interchange Rate – System Marginal Rate – Trading Surplus Generation – Applications.

TEXT BOOKS

1. S. A. Khaparde and A. R. Abhyankar, “Restructured Power Systems”, Narosa Publishing House, New Delhi, India, 2008.
2. S. C. Srivastava and S. N. Singh, “Operation and Management of Power system in Electricity Market”, Narosa Publishing House, New Delhi, India, 2008.

REFERENCE BOOKS

3. Kankar Bhattacharya, Math H.J. Bollen and Jaap E. Daalder, “Operation of Restructured Power Systems”, Kluwer Academic Publishers, 2001.
4. Loi Lei Lai, “Power system Restructuring and Regulation”, John Wiley sons, 2001.
5. M. Shahidehpour and M. Alomoush, “Restructuring Electrical Power Systems”, Marcel Decker Inc., Scholarly Transaction Papers and Utility web sites, 2001.

EE E810 **SPECIAL ELECTRICAL MACHINES**

UNIT I: SINGLE PHASE MACHINES

Principle and construction of split phase motors - Shaded Pole motor - Repulsion motor – Universal motor – unexcited synchronous single phase motor – Reluctance and Hysteresis motor – Applications.

UNIT II: STEPPER MOTORS

Constructional features; principle of operation; Types of motors – Modes of operation – Drive system and circuit control of Stepper motor –Static and Dynamic Characteristics and Applications.

UNIT III: SWITCHED RELUCTANCE MOTORS

Constructional details - principles of operation - Static and dynamics Torque production – drive circuits – Current regulation – Torque speed characteristics – Speed and torque control – Static observers for rotor position sensing – volt-ampere requirements – Applications.

UNIT IV: PERMANENT MAGNET BRUSH LESS DC MOTORS

Commutation in DC motors – Difference between mechanical and electronic commutators – Principle of operation - Construction and – drive circuits – Torque and emf equation – Torque and Speed characteristics – sensors and sensorless systems – controllers and applications.

UNIT V: PERMANENT MAGNET SYNCHRONOUS MOTORS

Principles of operation – Constructional features – Phasor diagram – torque speed characteristics – torque and emf equations – vector controllers - applications. Doubly Fed Induction Generator – Principle – construction, characteristics and applications.

TEXT BOOKS

1. P.P.Acarnley, "Stepping Motors, A Guide to Modern theory and practice", Peter Peregrines, London, 2002.
2. Venkataratnam K, “Special Electrical Machines”, Universities Press, Hyderabad, 2008.

REFERENCE BOOKS

3. T.J.E. Miller, "Brush less Permanent Magnet and reluctance Motor Drives", Clarendon Press, Oxford, 1989.
4. A. Hughes, "Electric Motors and Drives", Affiliated East - West Press Pvt., Ltd., 2007
5. S. Heier, “Grid Integration of Wind Energy Conversion Systems”, Wiley, 2006.
6. R.Krishnan Electric Motor Drives Modeling, Analysis, and Control Prentice Hall of India Pvt Ltd, 2003.
7. C.M. Ong, Dynamic Simulation of Electric Machinery Using Matlabr/Simulink. Prentice Hall. PTR, 1998.