Program Educational Objectives

Bachelor of Electrical and Electronics Engineering curriculum is designed to prepare the graduates having attitude and knowledge to

1. Have successful professional and technical career
2. have strong foundation in basic sciences, mathematics and computational platforms
3. have knowledge on the theory and practices in the field of electrical power engineering and allied areas
4. engross in life-long learning to keep themselves abreast of new developments
5. practice and inspire high ethical values and technical standards

Program Outcome

a) Ability to apply knowledge of mathematics, sciences and engineering
b) Ability to understand and apply basic theorems and postulates in circuit, field and control theories
c) Ability to identify, formulate, and solve electrical power engineering problems
d) Ability to analyse and apply electronics in the field of electrical power apparatus and systems
e) Ability to understand and apply computational platforms and software tools for engineering applications
f) Ability to understand ethical and professional responsibilities
g) Ability to communicate effectively and work in interdisciplinary groups
h) Ability to review, comprehend and report technological developments

PEO \ PO	a	b	c	d	e	f	g	h
1						√	√	√
2	√		√		√			
3		√	√	√				
4						√	√	√
5						√	√	

ANNA UNIVERSITY :: CHENNAI 600 025

UNIVERSITY DEPARTMENTS

B.E. (PART TIME) ELECTRICAL AND ELECTRONICS ENGINEERING

I to VII SEMESTERS CURRICULUM & SYLLABUS – R 2013

SEMESTER I

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	PTMA8151	Applied Mathematics	3	0	0	3
2.	PTPH8152	Physics for Electrical and Electronics Engineering	3	0	0	3
3.	PTCY8151	Chemistry for Electrical and Electronics Engineering	3	0	0	3
4.	PTEE8101	Electric Circuit Analysis	3	0	0	3
PRACTICAL						
5.	PTGE8111	Computer Practices Laboratory	0	0	3	2
		TOTAL	**12**	**0**	**3**	**14**

SEMESTER II

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	PTEC8204	Electronic Devices and Circuits	3	0	0	3
2.	PTEE8201	Digital Systems	3	0	0	3
3.	PTEE8202	Electromagnetic Theory	3	0	0	3
4.	PTGE8251	Environmental Science and Engineering	3	0	0	3
5.	PTME8252	Power Plant Engineering	3	0	0	3
		TOTAL	**15**	**0**	**0**	**15**

SEMESTER III

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	PTEE8301	Electrical Machines – I	3	0	0	3
2.	PTEE8302	Electrical Measurements and Instrumentation	3	0	0	3
3.	PTEE8303	Linear Integrated Circuits	3	0	0	3
4.	PTEE8304	Microprocessors and Microcontrollers	3	0	0	3
5.	PTEE8305	Transmission and Distribution	3	0	0	3
		TOTAL	**15**	**0**	**0**	**15**

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	PTEE8401	Control Systems	3	0	0	3
2.	PTEE8402	Electrical Machines - II	3	0	0	3
3.	PTEE8403	Power Electronics	3	0	0	3
4.	PTEE8404	Power System Analysis	3	0	0	3
PRACTICAL						
5.	PTEE8411	Electrical Machines Laboratory	0	0	3	2
		TOTAL	**12**	**0**	**3**	**14**

SEMESTER V

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	PTEE8501	High Voltage Engineering	3	0	0	3
2.	PTEE8502	Power System Operation and Control	3	0	0	3
3.	PTMG8551	Principles of Management	3	0	0	3
4.		Elective – I	3	0	0	3
PRACTICAL						
5.	PTEE8511	Control and Instrumentation Laboratory	0	0	3	2
		TOTAL	**12**	**0**	**3**	**14**

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	PTEE8601	Design of Electrical Apparatus	3	0	0	3
2.	PTEE8602	Protection and Switchgear	3	0	0	3
3.	PTEE8603	Utilization and Conservation of Electrical Energy	3	0	0	3
4.		Elective – II	3	0	0	3
PRACTICAL						
5.	PTEE8611	Microprocessors and Power Electronics Laboratory	0	0	3	2
		TOTAL	**12**	**0**	**3**	**14**

SEMESTER VII

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.		Elective –III	3	0	0	3
2.		Elective-IV	3	0	0	3
3.		Elective-V	3	0	0	3
PRACTICAL						
5.	PTEE8711	Project work	0	0	9	6
		TOTAL	**12**	**0**	**9**	**15**

TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE =101

ELECTIVES FOR ELECTRICAL AND ELECTRONICS ENGINEERING

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1.	PTCS8351	Operating Systems	3	0	0	3
2.	PTEC8030	Communication Engineering	3	0	0	3
3.	PTEE8001	Adaptive Control	3	0	0	3
4.	PTEE8002	Advanced Digital Signal Processing	3	0	0	3
5.	PTEE8003	Advanced Control Systems	3	0	0	3
6.	PTEE8004	Analysis of Electrical Machines	3	0	0	3
7.	PTEE8006	Computer Aided Design of Electrical Apparatus	3	0	0	3
8.	PTEE8007	Data Structures and Algorithms	3	0	0	3
9.	PTEE8008	EHV Power Transmission	3	0	0	3
10	PTEE8009	Embedded Automation Systems	3	0	0	3
11	PTEE8010	Embedded System Design	3	0	0	3
12	PTEE8011	Flexible AC Transmission Systems	3	0	0	3
13	PTEE8012	Fundamentals of Computer Architecture	3	0	0	3
14	PTEE8013	Fundamentals of Object Oriented Programming	3	0	0	3
15	PTEE8014	High Voltage Direct Current Transmission	3	0	0	3
16	PTEE8015	Industrial Power System Analysis and Design	3	0	0	3
17	PTEE8017	Medical Instrumentation	3	0	0	3
18	PTEE8018	Micro Electro Mechanical Systems	3	0	0	3
19	PTEE8019	Nano Technology	3	0	0	3
20	PTEE8020	Operations Research	3	0	0	3
21	PTEE8021	Power Electronics for Renewable Energy Systems	3	0	0	3
22	PTEE8022	Power Quality	3	0	0	3
23	PTEE8023	Restructured Power Systems	3	0	0	3
24	PTEE8024	Soft Computing Techniques	3	0	0	3
25	PTEE8025	Solid State Drives	3	0	0	3
26	PTEE8026	Special Electrical Machines	3	0	0	3
27	PTEE8027	VLSI Design and Architecture	3	0	0	3
28	PTEI8751	Industrial Data Networks	3	0	0	3
29	PTGE8551	Engineering Ethics and Human Values	3	0	0	3
30	PTMA8251	Numerical Methods	3	0	0	3
31	PTMA8252	Probability and Statistics	3	0	0	3
32	PTMA8351	Discrete Mathematics	3	0	0	3
33	PTMG8001	Managerial Economics and Financial Accounting	3	0	0	3
34	PTMG8651	Total Quality Management	3	0	0	3
35	PTGE8071	Disaster Management	3	0	0	3
36	PTGE8072	Human Rights	3	0	0	3

PTMA8151 APPLIED MATHEMATICS L T P C
(Common to all branches of B.E / B.Tech (PT) Programmes) 3 0 0 3

OBJECTIVES

- To facilitate the understanding of the principles and to cultivate the art of formulating physical problems in the language of mathematics.

UNIT I MATRICES 9

Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Cayley-Hamilton Theorem – Diagonalization of matrices - Reduction of a quadratic form to canonical form by orthogonal transformation.

UNIT II FUNCTIONS OF SEVERAL VARIABLES 9

Partial derivatives – Homogeneous functions and Euler's theorem – Total derivative – Differentiation of implicit functions – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables - Maxima and minima of functions of two variables.

UNIT III ANALYTIC FUNCTION 9

Analytic functions – Necessary and sufficient conditions for analyticity – Properties – Harmonic conjugates – Construction of analytic function – Conformal Mapping – Mapping by functions w = a + z , az, 1/z, **-** Bilinear transformation.

UNIT IV COMPLEX INTEGRATION 9

Line Integral – Cauchy's theorem and integral formula – Taylor's and Laurent's Series – Singularities – Residues – Residue theorem – Application of Residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

UNIT V LAPLACE TRANSFORMS 9

Existence conditions – Transforms of elementary functions – Basic properties – Transforms of derivatives and integrals –Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear ordinary differential equations with constant coefficients.

TOTAL: 45 PERIODS

OUTCOMES

- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

BOOKS FOR STUDY

1. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, Forty Second Edition, Delhi, 2012.
2. Ramana, B.V. Higher Engineering Mathematics" Tata McGraw Hill Publishing Company, 2008.

REFERENCES

1. Glyn James, Advanced Modern Engineering Mathematics, Prentice Hall of India, Fouth Edition, 2011.

2. Veerarajan, T., Engineering Mathematics (For First Year), Tata McGraw-Hill Pub. Pvt. Ltd., New Delhi, 2007.

PTPH8152 PHYSICS FOR ELECTRICAL AND ELECTRONICS ENGINEERING L T P C
(Common to EEE, E & I and ECE Branches) 3 0 0 3

OBJECTIVES:

- To Illustrate, with suitable examples, the concepts of conductors, semiconductors, dielectric, magnetic and superconducting materials.
- To make the students familiarize with the optical properties of materials.
- To introduce the essential principles of physics for electronics and communication engineering applications.

UNIT I ELECTRICAL PROPERTIES OF METALS 9

Classical theory: Drude model - thermal conductivity, thermal resistance - electrical conductivity of nonmetals: semiconductors, ionic crystals and glasses - thin metal films: conductivity and resistivity - Schrödinger wave equation - particle in a box - Tunneling (qualitative) degenerate states - Fermi-Dirac statistics - density of states: electron concentration and Fermi level - band theory of solids: energy band formation (qualitative) - electron effective mass.

UNIT II SEMICONDUCTORS 9

Intrinsic semiconductors: energy band-diagram - direct and indirect band gap semiconductors - carrier concentrations and conductivity - extrinsic semiconductors: compensation doping - temperature dependence of conductivity - degenerate and nondegenerate semiconductors - recombination and minority carrier injection: direct and indirect recombination - minority carrier lifetime - diffusion and conduction equations and random motion - optical absorption - Hall effect and devices - Ohmic contacts - Schottky diode and solar cell.

UNIT III DIELECTRIC MATERIALS AND INSULATION 9

Matter polarization and relative permittivity: definition - dipole moment and polarization vector P-polarization mechanisms: electronic, ionic, orientational, interfacial and total polarization - frequency dependence - local field and Clausius-Mossetti equation - dielectric constant and dielectric loss - Gauss's law and boundary conditions - dielectric strength and insulation break-down in gases, liquids and solids - capacitor materials - typical capacitor constructions - piezoelectricity, ferroelectricity and pyroelectricity - quartz oscillators and filters - piezo and pyroelectric crystals.

UNIT IV MAGNETIC PROPERTIES AND SUPERCONDUCTIVITY 9

Magnetic dipole moment - origin: atomic magnetic moments - magnetic materials: diamagnetism, paramagnetism, ferromagnetism, antiferromagnetism, ferrimagnetism, ferromagnetism - origin and the exchange interaction - saturation magnetization and Curie temperature - ferromagnetic materials: magnetic domains magnetocrystalline anisotropy, domain walls and motion - M versus H behaviour, demagnetization - soft and hard magnetic materials - examples and uses - Giant Magneto Resistance and materials - superconductivity: properties and classifications - High Tc superconductors - applications.

UNIT V OPTICAL PROPERTIES OF MATERIALS 9

Light waves in a homogeneous medium - refractive index - dispersion: refractive index-wave-length behaviour - group velocity and group index - Fresnel's equations: amplitude, reflection and transmission coefficients, intensity, reflectance and transmittance - complex refractive index and light absorption - Luminescence, phosphors and white LEDs - polarization - optical anisotropy: uniaxial crystals, birefringence, dichroism - electro-optic effect and amplitude modulators.

TOTAL : 45 PERIODS

OUTCOMES:

The student will be able to

- apply the electrical properties of matter while understanding the relevant electrical phenomenon.
- apply the concepts of semi conductors and understand the working principle of all types of semiconductor devices
- apply the concepts of dielectric materials and magnetic properties and understand the electrostatic, electromagnetic, electromechanical behavior of equipments.
- apply the optical properties of materials and understand the electro optic effects.

TEXT BOOKS:

1. Palanisamy, P.K., Materials Science, Scitech, 2003
2. Arumugam, M., Materials Science, Anirudha Publ., 2002.

REFERENCES:

1. Kasap, S.O., Principles of Electronic Materials and Devices, Tata McGraw-Hill, 2007.
2. Ali Omar, M., Elementary Solid State Physics, Adition Wiley, 1974.
3. Kittel, C., Introduction to Solid State Physics, John Wiley, 1996.
4. Millman J and Halkias C, Electronic Devices and Circuits, Tata-McGraw Hall, 2004.

PTCY8151 CHEMISTRY FOR ELECTRICAL AND ELECTRONICS ENGINEERING

L	T	P	C
3	0	0	3

(Common to Electrical and Electronics Engineering and Electronics and Instrumentation Engineering and Electronics and Communication Engineering)

OBJECTIVES:

- To know about the electrochemistry and it is applications.
- To understand the basic concepts about the batteries.
- Importance of Conductivity in Solids and specialty polymers.
- Treatment of water for domestic and industrial purpose.
- Familiarize with various type of material analysis.

UNIT I ELECTROCHEMISTRY **9**

Electrical conductance- Types of electrode- conductivity of solutions of electrolytes- specific conductance- equivalent conductance- molar conductance- ionic conductance- factors affecting conductance- transport (transference) number- inter ionic attraction theory of conductance. Electrochemical cell - redox reaction, electrode potential- origin of electrode potential- oxidation potential- reduction potential- standard electrode potential(E^o), Nernst equation, Measurement of EMF of the cell - EMF and potential difference- potentiometric measurement. Reference electrodes. Standard hydrogen electrodes- calomel, silver-silver chloride and glass electrodes. Single electrode potential. Measurement and applications- electrochemical series. Determination of pH using glass electrode. Concentration cells- types and applications.

UNIT II ENERGY SOURCES **9**

Introduction- nuclear energy- nuclear fission- controlled nuclear fission- nuclear fusion- differences between nuclear fission and fusion- nuclear chain reactions- nuclear reactor power generator- classification of nuclear reactor- components of a reactor- light water reactor- breeder reactor- solar energy conversion- solar cells- wind energy. Batteries and fuel cells. Introduction- batteries- types of batteries- alkaline battery- lead storage battery-

nickel-cadmium battery- lithium battery- fuel cell H_2 -O_2 fuel cell- applications.

UNIT III CONDUCTIVITY IN SOLIDS AND SPECIALTY POLYMERS 9

Electrical properties of solids- band theory of solids- types of energy bands- application of band theory to solids- semiconductors- types-n and p types- super conductors. Classification of insulating materials based on function and physical state- thermal insulators- optical fibers- organic electronic materials- fullerenes. Introduction to thermoplastics and thermosetting plastics- phenolic and epoxy resins, silicone polymers, rubbers; polyelectrolytes, electrically conducting polymers, polymers with piezoelectric, pyroelectric and ferroelectric properties, photonic polymers, photo resists, basics of LCD and LED.

UNIT IV WATER CHEMISTRY 9

Boiler feed water-requirements-formation of deposits in steam boilers and heat exchangers- disadvantages (wastage of fuels, decrease in efficiency, boiler explosion) prevention of scale formation-external treatment (ion exchange method) - internal treatment-(phosphate, calgon, carbonate, colloidal)-boiler compounds-caustic embrittlement-boiler corrosion-priming and foaming- desalination of brackish water – reverse osmosis.

UNIT V ANALYSIS OF MATERIALS 9

Spectroscopic analyses: principle- instrumentation- block diagram-data analysis and applications of Atomic Absorption Spectroscopy, Flame photometry, Microscopic analyses: Scanning Electron Microscopy, Tunneling Electron Microscopy, Scanning Tunneling Microscopy and Atomic Force Microscopy. Thermal methods: Differential Scanning Colorimetry, Thermo-gravimetric analysis.

TOTAL 45 PERIODS

OUTCOMES:

- The knowledge gained on analysis materials, polymers, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXT BOOKS

1 Jain P.C. & Monica Jain., “Engineering Chemistry”, DhanpatRai Publishing Company (P) Ltd, New Delhi, 2010.

2 Kannan P., Ravikrishnan A., “Engineering Chemistry”, Sri Krishna Hitech Publishing Company Pvt. Ltd. Chennai, 2009

REFERENCE BOOKS

1 Pahari A., Chauhan B., “Engineering Chemistry”., Firewall Media., New Delhi., 2010.

2 Sivasankar B., “Engineering Chemistry”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2008.

3 Vairam S., Kalyani P., Suba Ramesh., “Engineering Chemistry”., Wiley India Pvt Ltd., New Delhi.,2011.

PTEE8101 ELECTRIC CIRCUIT ANALYSIS L T P C
3 0 0 3

OBJECTIVES

- To familiarize the basic laws, theorems and the methods of analyzing electrical circuits.
- To explain the concept of resonance and coupling in electric circuits and parallel resonance.
- To familiarize the analysis of three-phase circuits
- To teach the transient response of circuits with dc and sinusoidal ac input
- To impart basic knowledge on network analysis using Laplace transforms

UNIT I BASIC CIRCUITS ANALYSIS 9

Ohm's Law – Kirchhoff's laws – DC and AC Circuits Network reduction: voltage and current division, source transformation – star delta conversion. Thevenin's and Norton Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem.

UNIT II RESONANCE AND COUPLED CIRCUITS 9

Series and parallel resonance – frequency response – quality factor and bandwidth - self and mutual inductance – coefficient of coupling – dot convention – tuned circuits – single tuned circuits.

UNIT III THREE PHASE CIRCUITS 9

Three phase balanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced and unbalanced – phasor diagram of voltages and currents

UNIT IV TRANSIENT RESPONSE IN DC AND AC CIRCUITS 9

Time domain analysis for first order and second order systems, S - domain network – driving point and transfer impedances and their properties – poles and zeros of network functions –transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input.

UNIT V TWO PORT NETWORKS 9

Characterization of two port networks in terms of Z,Y,H and T parameters – networks equivalents – relations between network parameters –transfer function of terminated two port networks, Network Graphs.

TOTAL = 45PERIODS

OUTCOMES:

- Students are able to model, analyze and understand the operation of electrical circuits for both ac and dc excitations.

TEXT BOOKS

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", Tata McGraw Hill publishers, 6th edition, New Delhi, 2003.
2. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGraw-Hill, New Delhi, 2001.
3. Kuo F.F., "Network Analysis and Synthesis", Wiley International Edition, Second Edition, 1966.

REFERENCES

1. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis",Tata McGraw HillNew Delhi, 2007.
2. Chakrabati A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.
3. Van Valkenburg, M.E.,Network Analysis', Prentice – Hall of India Private Ltd., New Delhi, Third Edition, 1974.

PTGE8111 COMPUTER PRACTICES LABORATORY L T P C
0 0 3 2

OBJECTIVES:

The student should be made to:

- Be familiar with the use of Office software.
- Be exposed to presentation and visualization tools.
- Be exposed to problem solving techniques and flow charts.
- Be familiar with programming in C.
- Learn to use Arrays, strings, functions, structures and unions.

LIST OF EXPERIMENTS:

1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions
9. Program using Recursive Function and conversion from given program to flow chart.
10. Program using structures and unions.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- Apply good programming design methods for program development.
- Design and implement C programs for simple applications.
- Develop recursive programs.

PTEC8204 ELECTRONIC DEVICES AND CIRCUITS L T P C
3 0 0 3

OBJECTIVES:

- To acquaint the students with construction, theory and characteristics of the following electronic devices. P-N junction diode, Bipolar transistor, Field Effect transistor, LED, LCD and other photo electronic devices, Power control/regulator devices, Feedback amplifiers and oscillators

UNIT I PN JUNCTION DEVICES 9

PN junction diode – structure, operation and V-I characteristic – current equation – drift current density and diffusion current density – diffusion and transient capacitance – Zener breakdown – zener reverse characteristic – zener as regulator

UNIT II BIPOLAR JUNCTION AND FIELD EFFECT TRANSISTORS 9

BJT – structure, operation and V-I characteristic – JFET – structure, operation and V-I characteristic, CURRENT Equation, MOSFET – structure, operation and V-I characteristic – types of MOSFET

UNIT III AMPLIFIERS 9

BJT small signal model – biasing – analysis of CE, CB, CC amplifiers – Gain and frequency response – MOSFET small signal model – biasing – analysis of CS and source follower – gain and frequency response.

UNIT IV MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER 9

BIMOS cascade amplifier, differential amplifier – common mode and difference mode analysis – tuned amplifiers – single tuned amplifiers – gain and frequency response

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS 9

Advantages of negative feedback – voltage / current, series, shunt feedback – positive feedback – condition for oscillations, phase shift – Wien bridge, Hartley, colpitts and crystal oscillators

TOTAL : 45 PERIODS

OUTCOMES:

- Able to explain the structure of the basic electronic devices.
- Able to design applications using the basic electronic devices.

TEXT BOOKS:

1. David A. Bell, Electronic devices and circuits, Prentice Hall of India, 2004.
2. Sedra Smith, Micro electronic circuits, Oxford University Press, 2004.

REFERENCES:

1. Rashid, Micro electronic circuits, Thomson publications, 1999.
2. Floyd, Electron devices, pearson Asia 5th Edition, 2001.
3. Donald A Neamen, Electronic Circuit Analysis and Design, Tata McGrawHill, 3rd Edition, 2003.

PTEE8201 DIGITAL SYSTEMS L T P C
3 0 0 3

OBJECTIVES:

- To introduce the fundamentals of Digital Circuits, combinational and sequential circuit.
- To study various number systems and to simplify the mathematical expressions using Boolean functions – simple problems.
- To study implementation of combinational circuits
- To study the design of various synchronous and asynchronous circuits.
- To expose the students to various memory devices.
- To introduce digital simulation techniques for development of application oriented logic circuit.

UNIT I NUMBER SYSTEMS ,BOOLEAN ALGEBRA AND COMBINATIONAL CIRCUITS 9

Number system, error detection, corrections & codes conversions Boolean algebra: De-Morgan's theorem, switching functions and simplification using K-maps & Quine McCluskey method.

UNIT II DESIGN OF COMBINATIONAL CIRCUITS , PROGRAMMABLE LOGIC DEVICES, MEMORY 9

Design of adder, subtractor, comparators, codeconverters, encoders, decoders, multiplexers and demultiplexers.
Memories: ROM, PROM, EPROM, PLA, PLD

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 9

Flip flops - SR, D, JK and T. Shift registers, state assignments analysis and design synchronous sequential circuits, state diagram; state reduction.

UNIT IV ASYNCHRONOUS SEQUENCTIAL CIRCUIT 9

Analysis of asynchronous sequential machines, state assignment, asynchronous design problem.

UNIT V LOGIC FAMILIES AND VHDL 9

Logic families: RTL ad DTL circuits ,TTL ECL NMOS and CMOS : Introduction to VHDL : Design – combinational logic – Types – Operators – Packages – Sequential circuit – Sub programs – Test benches. (Examples: adders, counters, flipflops, FSM, Multiplexers / Demltiplexers).

TOTAL : 45 PERIODS

OUTCOMES :

- Various types of digital circuits are analysed and studied Knowledge in memory devices and simulation techniques for the development of digital circuits are achieved.

TEXT BOOKS:

1. M. Morris Mano, 'Digital Design', Pearson Education, 2008.
2. John M.Yarbrough, 'Digital Logic, Application & Design', Thomson, 2002.

PTEE8202 ELECTROMAGNETIC THEORY L T P C
3 0 0 3

OBJECTIVES:

To impart knowledge on the concepts and the computation of Electro-magnetic field which is essential for understanding the working principle, design and analysis of Electrical machines and Systems.

UNIT I INTRODUCTION 9

Sources and effects of electromagnetic fields – Vector fields –Gradient, Divergence, Curl – theorems and applications.

UNIT II ELECTROSTATICS 9

Coulomb's Law – Electric field intensity – Field due to discrete and continuous charges – Gauss's law and applications – Electric potential – Electric field and equipotential plots, Uniform & Non-Uniform field, Utilization factor – Electric field in free space, conductors,

dielectric -Dielectric polarization - Dielectric strength - Electric field in multiple dielectrics – Boundary conditions, Poisson's and Laplace's equations, Capacitance, Energy density, Applications.

UNIT III MAGNETOSTATICS 9

Lorentz force, magnetic field intensity (H) – Biot–Savart's Law - Ampere's Circuit Law – H due to straight conductors, circular loop, infinite sheet of current, Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetization, Magnetic field in multiple media – Boundary conditions, Scalar and vector potential, Poisson's Equation, Magnetic force, Torque, Inductance, Energy density, Applications.

UNIT IV ELECTRODYNAMIC FIELDS 9

Magnetic Circuits - Faraday's law – Transformer and motional EMF – Displacement current - Maxwell's equations (differential and integral form) – Time varying potential – Relation between field theory and circuit theory - Applications

UNIT V ELECTROMAGNETIC WAVES 9

Electro Magnetic Wave Generation and equations – Wave parameters; velocity, intrinsic impedance, propagation constant – Waves in free space, lossy and lossless dielectrics, conductors-skin depth - Poynting vector – Plane wave reflection and refraction – Standing Wave – Applications.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand Electro-magnetic field theory and apply them to electrical engineering problems.

TEXT BOOKS:

1. Mathew N. O. Sadiku, 'Principles of Electromagnetics', 4 th Edition ,Oxford University Press Inc. First India edition, 2009.
2. Ashutosh Pramanik, 'Electromagnetism – Theory and Applications', PHI Learning Private Limited, New Delhi, Second Edition-2009

REFERENCES:

1. Joseph. A.Edminister, 'Schaum's Outline of Electromagnetics, Third Edition (Schaum's Outline Series), Tata McGraw Hill, 2010
2. William H. Hayt and John A. Buck, 'Engineering Electromagnetics', Tata McGraw Hill 8th Revised edition, 2011.
3. Kraus and Fleish, 'Electromagnetics with Applications', McGraw Hill International Editions, Fifth Edition, 2010.
4. Bhag Singh Guru and Hüseyin R. Hiziroglu "Electromagnetic field theory fundamentals", Cambridge University Press; Second Revised Edition, 2009.

PTGE8251 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
(EEE, Civil, Printing, Industrial, Mechanical, Manufacturing, Production, CSE, IT, Chemical, Textile) 3 0 0 3

OBJECTIVES:

- To study the nature and facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.

- To study the dynamic processes and understand the features of the earth‟s interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

Field study of common plants, insects, birds

Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.
Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL : 45 PERIODS

OUTCOMES:

- Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

TEXT BOOKS

1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004).
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, (2006).

REFERENCE BOOKS

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.
2 Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia',Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD,New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press (2005)

PTME8252 POWER PLANT ENGINEERING L T P C
(EEE, Mechanical) 3 0 0 3

OBJECTIVES:

- Providing an overview of Power Plants and detailing the role of Mechanical Engineers in their operation and maintenance.

UNIT I COAL BASED THERMAL POWER PLANTS 10

Rankine cycle improvisations, Layout of modern coal power plant, Super Critical Boilers, FBC Boilers, Turbines, Condensers, Steam & Heat rate, Subsystems of thermal power plants – Fuel and ash handling, Draught system, Feed water treatment. Binary Cycles and Cogeneration systems.

UNIT II DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS 10

Otto, Diesel, Dual & Brayton Cycle - Analysis & Optimisation. Components of Diesel and Gas Turbine power plants. Combined Cycle Power Plants. Integrated Gasifier based Combined Cycle systems.

UNIT III NUCLEAR POWER PLANTS 7

Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors : Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANada Deuterium-Uranium reactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Safety measures for Nuclear Power plants.

UNIT IV POWER FROM RENEWABLE ENERGY 10

Hydro Electric Power Plants – Classification, Typical Layout and associated components including Turbines. Principle, Construction and working of Wind, Tidal, Solar Photo Voltaic (SPV), Solar Thermal, Geo Thermal, Biogas and Fuel Cell power systems.

UNIT V ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS 8

Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants.

TOTAL 45 PERIODS

OUTCOMES:

- Able to understand different types of power plant, and its functions and their flow lines and issues related to them.
- Analyse and solve energy and economic related issues in power sectors.

TEXT BOOK

1. Power Plant Engineering, P.K. Nag, Tata McGraw – Hill Publishing Company Ltd., Third Edition, 2008.

REFERENCES

1. Power Plant Technology, M.M. El-Wakil, Tata McGraw – Hill Publishing Company Ltd., 2010.
2. Power Plant Engineering, Black & Veatch, Springer, 2005.
3. Standard Handbook of Power Plant Engineering, Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, Second Edition, McGraw – Hill, 1998.
4. Renewable energy, Godfrey Boyle, Open University, Oxford University Press in association with the Open University, 2004**.**

PTEE8301 ELECTRICAL MACHINES – I L T P C
3 0 0 3

OBJECTIVES:

- To study the fundamental principles of Magnetic Circuits, Electro-mechanical energy conversion.
- To study the machine windings and the MMF curves of armature and field windings.
- To derive the EMF and torque equations of rotating machines.
- To study the theory, operation and complete steady state behaviour of DC machines and Transformers.

UNIT I MAGNETIC CIRCUITS AND MAGNETIC MATERIALS 6

Ampere's circuit law, i-H and B-H relations – Flux linkage, inductance and energy – Magnetization curve, hysteresis loss and eddy current loss – Sinusoidal excitation and Exciting current – Magnetization and design of Permanent magnet and its materials.

UNIT II ELECTRO-MECHANICAL ENERGY CONVERSION 6

Faraday's law and Lenz's law - time varying and rotational induced emfs – Energy balance, energy and coenergy – force and torque – singly and doubly excited systems – reluctance and mutual torques.

UNIT III BASIC CONCEPTS IN ELECTRICAL MACHINES 9

Windings: D.C Machine armature winding (lap and wave connection), field winding – MMF pattern of commutator winding and field winding – Magnetic fields in rotating machinery - EMF and torque equations – losses in machines.

UNIT IV D.C. MACHINES 12

Construction – Principle of operation – armature reaction – commutation – interpoles and compensating windings – methods of excitation, equivalent circuits and characteristics of generators and motors – testing and efficiency – starting - speed control, Ward-Leonard control - braking, Permanent Magnet DC Machines.

UNIT V TRANSFORMERS 12

Construction – principle of operation – phasor diagrams of ideal transformer and practical transformer using UPF, lagging and leading PF loads – equivalent circuit – testing and efficiency – voltage regulation – auto-transformer – three phase connections – parallel operation of transformers – harmonics – three-winding transformers – per unit system.

TOTAL : 45 PERIODS

OUTCOMES:

- Fundamental concepts of magnetic circuits and energy conversion are studied.
- MMF curves for field and armature windings is realised.
- Generalised form of EMF and Torque equations are obtained.
- Performance characteristics of DC machines and transformers are obtained.

TEXT BOOKS:

1. Fitzgerald, A.E.Charles Kingsley Jr.Stephen D.Umans, 'Electric Machinery', McGraw Hill Book Company, Sixth Edition 2003.
2. Nagrath, I.J. and Kothari.D.P., Electric Machines', T.M.H. publishing Co. Ltd., New Delhi, Fourth edition, 2010.

REFERENCES:

1. Say M.G "Performance and Design of Alternating Machines ' CBS Publishers and Distributors, New Delhi, First Indian Edition, Reprint 1998.

2. Irving L.Kosow, "Electric Machinery and Transformers", Prentice Hall of India Private Ltd., New Delhi, Second Edition, Reprint 2007.
3. Stephen J.Chapman, "Electric Machinery Fundamentals', "McGraw Hill Intl. Edition, New Delhi, Fourth Edition, 2005.

PTEE8302 ELECTRICAL MEASUREMENTS AND INSTRUMENTATION L T P C
3 0 0 3

OBJECTIVES

To enable the student to have a clear knowledge of the basic laws governing the operation of the instruments, relevant circuits and their working:

- To introduce the general instrument system, error, calibration etc.
- To explain the techniques for measurement of voltage and current.
- To explain the techniques for measurement of other electrical parameters namely power, energy, frequency, phase etc.
- To discuss the comparison methods of measurement.
- To give exposure to non-electrical measurements and data acquisition system.

UNIT I MEASUREMENT SYSTEMS 9

Measurement: significance, methods – Instruments: classification, applications – Elements of a generalized measurement system - Static and dynamic characteristics - Errors in measurement - Probable error - Limiting error - Statistical evaluation of measurement data - Gaussian distribution - Standards and calibration

UNIT II MEASUREMENT OF VOLTAGE AND CURRENT 9

D' Arsonval galvanometer: theory, calibration, application – Principle, construction, operation, errors and compensation of moving coil, moving iron, dynamometer, induction, thermal and rectifier types – Extension of range – Calibration – Multimeter: analog and digital

UNIT III MEASUREMENT OF OTHER ELECTRICAL PARAMETERS 9

Single and three phase wattmeter and energy meter – Magnetic measurements – Determination of B-H curve and measurements of iron loss – Measurement of frequency and phase - Instrument transformers – CRT and CRO – DSO

UNIT IV COMPARISON METHODS OF MEASUREMENTS 9

D.C. potentiometer: basic circuit, standard, laboratory (Crompton) type – A.C. potentiometer: polar (Drysdale) type and coordinate (Gall-Tinsley) type - Measurement of low, medium and high resistance: ammeter-voltmeter method, wheatstone bridge, Kelvin double bridge - A.C. bridge: Maxwell, Hay, Wien and Schering – Errors and compensation in A.C. bridges - Multiple earth and earth loops – Grounding techniques - Electrostatic and electromagnetic interference

UNIT V TRANSDUCERS AND DATA ACQUISITION SYSTEMS 9

Classification of transducers – Primary and secondary transducer – Measurement of pressure: Bourdon tube – Measurement of temperature: thermocouple and resistance thermometer; Measurement of displacement: LVDT – Measurement of force: strain gauge – Measurement of angular velocity: A.C. and D.C. tachometer – Digital transducers – Elements of data acquisition system

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to implement and verify different measurement schemes for measuring of electrical and non electrical parameters.

TEXT BOOKS:

1. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, New Delhi, Edition 2011.
2. R.B. Northrop, 'Introduction to Instrumentation and Measurements', Taylor & Francis, New Delhi, 2008

REFERENCE BOOKS:

1. M.M.S. Anand, 'Electronics Instruments and Instrumentation Technology', Prentice Hall India, New Delhi, 2009
2. J.J. Carr, 'Elements of Electronic Instrumentation and Measurement', Pearson Education India, New Delhi, 2011
3. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010

PTEE8303 LINEAR INTEGRATED CIRCUITS L T P C
3 0 0 3

OBJECTIVES

- To study the IC fabrication procedure.
- To analyse circuit characteristics with signal analysis using Op-amp ICs.
- To design application circuits with Op-amp.
- To study internal functional blocks and the applications of special ICs like Timers, PLL
- circuits, regulator ICs, ADCs.

UNIT I IC FABRICATION 9

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realisation of monolithic ICs and packaging.

UNIT II CHARACTERISTICS OF OPAMP 9

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, offset voltage and current: voltage series feedback and shunt feedback amplifiers, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – summer, differentiator and integrator.

UNIT III APPLICATIONS OF OPAMP 9

Instrumentation amplifier, first and second order active filters, V/I & I/V converters, comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit, D/A converter (R-2R ladder and weighted resistor types), A/D converter - Dual slope, successive approximation and flash types, Sigma- Delta ADC.

UNIT IV SPECIAL ICs 9

555 Timer circuit – Functional block, characteristics & applications; 566-voltage controlled oscillator circuit; 565-phase lock loop circuit functioning and applications, Analog multiplier ICs.

UNIT V APPLICATION ICs 9

IC voltage regulators - LM317, 723 regulators, switching regulator, MA 7840, LM 380 power amplifier, ICL 8038 function generator IC, isolation amplifiers, opto coupler, opto electronic ICs.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to analyse comprehend and design analog electronic circuits involving linear ICs.

TEXT BOOKS:

1. Ramakant A.Gayakward, Op-amps and Linear Integrated Circuits, IV edition, Pearson Education, 2009 / PHI.
2. D. Roy Choudhery, Sheil B. Jain, Linear Integrated Circuits, second edition, New Age publishers, 2010.

REFERENCES:

1. Robert F Coughlin, Fredrick, F. Driscold, Opamp and linear ICs, Pearson education, 4th edition, 2002.
2. David A Bell, Opamp and linear ICs, second edition, Prentice hall of India,1997.
3. Joseph J carr, Linear Integrated circuits, Elsevier, 1996
4. David L Tenel, Opamps – design, applications and trouble shooting, Elsevier 2007.

PTEE8304 MICROPROCESSORS AND MICROCONTROLLERS L T P C
3 0 0 3

OBJECTIVES:

- To study the Architecture of 8085, 8086 & 8051.
- To study the addressing modes & instruction set of 8085 & 8051 and to develop skills in simple program writing.
- To introduce commonly used peripheral/ interfacing ICs.
- To study and understand typical applications of micro-processors
- To study and understand the typical applications of micro-controllers.

UNIT I 8085 & 8086 PROCESSOR 9

8085: Functional block diagram –- Signals – Memory interfacing – I/O ports and data transfer concepts – Timing Diagram – Interrupt structure, 8086: Architecture – Memory segments & internal registers – BIU & EU – Memory interfacing with 8086.

UNIT II PROGRAMMING OF 8085 PROCESSOR 9

Instruction format and addressing modes – Assembly language format – Data transfer, data manipulation & control instructions – Programming: Loop structure with counting & Indexing - Look up table - Subroutine instructions, stack.

UNIT III PERIPHERAL INTERFACING 9

Study of Architecture and programming of ICs: 8255 PPI, 8259 PIC, 8251 USART, 8279 Key board display controller and 8254 Timer/ Counter – Interfacing with 8085 - A/D and D/A converter interfacing.

UNIT IV MICRO CONTROLLER 8051 9

Functional block diagram - Instruction format and addressing modes – Interrupt structure – Timer –I/O ports – Serial communication, Simple programming.

UNIT V MICRO CONTROLLER PROGRAMMING & APPLICATIONS 9

Data Transfer, Manipulation, Control & I/O instructions – Simple programming exercises - key board and display interface – Temperature control system - stepper motor control.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to analyse, comprehend, design and simulate microprocessor and microcontroller based systems used for control and monitoring.

TEXT BOOKS:

1. R.S. Gaonkar, 'Microprocessor Architecture Programming and Application', Penram International (P) ltd., Mumbai, 5th edition, 2008.
2. Muhammad Ali Mazidi & Janice Gilli Mazidi, 'The 8051 Micro Controller and Embedded Systems', Pearson Education, 2007.

REFERENCES:

1. Douglas V. Hall, 'Micro-processors and interfacing' Tata Mcgraw hill, 2nd Indian edition, New delhi, 2009
2. Kenneth Ayala, 'The 8051 Microcontroller', Thomson, 2005

PTEE8305 TRANSMISSION AND DISTRIBUTION L T P C
3 0 0 3

OBJECTIVES

- To impart knowledge about the configuration of the electrical power system
- To analyze and model different components of power system

UNIT I STRUCTURE OF POWER SYSTEM 9

Structure of electric power system: generation, transmission and distribution; Types of AC and DC distributors – distributed and concentrated loads – interconnection – EHVAC and HVDC transmission and lines in India - Introduction to FACTS.

UNIT II TRANSMISSION LINE PARAMETERS 9

Parameters of single and three phase transmission lines with single and double circuits - Resistance, inductance and capacitance of solid, stranded and bundled conductors, Symmetrical and unsymmetrical spacing and transposition - application of self and mutual GMD; skin and proximity effects - interference with neighboring communication circuits - Typical configurations, conductor types and electrical parameters of 765 kV, 400 kV, 220 kV, 110 kV, 66 kV and 33 kV lines, corona discharges.

UNIT III MODELLING AND PERFORMANCE OF TRANSMISSION LINES 9

Classification of lines - Short line, medium line and long line - equivalent circuits, Phasor Diagram, attenuation constant, phase constant, surge impedance; transmission efficiency and voltage regulation, real and reactive power flow in lines, Power-angle diagram; surge impedance loading, Methods of Voltage control; Ferranti effect.

UNIT IV INSULATORS AND CABLES 9

Insulators - Types, voltage distribution in insulator string and grading, improvement of string efficiency. Underground cables - Types of cables, Capacitance of Single-core cable, Grading of cables, Power factor and heating of cables, Capacitance of 3- core belted cable, D.C cables.

UNIT V MECHANICAL DESIGN OF LINES AND GROUNDING 9

Mechanical design of transmission line – sag and tension calculations for different weather conditions, Tower spotting, Types of towers, Substation Layout (AIS, GIS), Methods of grounding.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand transmission line models, insulations design and distribution schemes.

TEXT BOOKS:

1. S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of India Pvt. Ltd, New Delhi, 2008.
2. B.R.Gupta, 'Power System Analysis and Design', S.Chand, New Delhi, Fifth Edition 2005-08.

REFERENCES:

1. D.P.Kothari , I.J. Nagarath, 'Power System Engineering',Tata McGraw-Hill Publishing Company limited, New Delhi, 2007.
2. C.L.Wadhwa, 'Electrical Power Systems', New Academic Science Ltd, 2009
3. Luces M.Fualkenberry ,Walter Coffer, 'Electrical Power Distribution and Transmission', Pearson Education, 2007.
4. Hadi Saadat, 'Power System Analysis,' PSA Publishing; Third Edition, 2010.
5. J.Brian, Hardy and Colin R.Bayliss 'Transmission and Distribution in Electrical Engineering', Newnes; Fourth Edition, 2012.

PTEE8401 CONTROL SYSTEMS L T P C
3 0 0 3

OBJECTIVES

The objective of this course is to emphasize the importance of control and empower the students with basic concepts on modeling, analysis and design of control systems restricted to linear continuous time system. The specific objectives of each unit are

- To introduce the classical way of modeling systems, commonly used control components and their mathematical models from physical laws
- To introduce the time domain analysis of transfer function models and understand the concepts of poles, zeros and movement of poles under feedback
- To introduce the various graphical methods available to analyze and asses systems in frequency domain
- To impart knowledge in the modern state variable approach, closed form solution methods and analyzing system properties
- To educate on drawing of specification, choosing of control structures and methods of designing the controllers

UNIT I INTRODUCTION 9

Control system - Basic components - Open and closed Loop - Effect of feedback - System representations - Transfer functions of single input & single output and multivariable systems – Block diagrams – Signal flow graphs – Gain formula – Modeling of control components – Mechanical and electrical systems

UNIT II TRANSFER FUNCTION MODEL AND ANALYSIS 9

Standard test signals- steay state error and error constants - Time response – Damping ratio - Natural frequency – Effects of adding poles and zeros – Dominant poles - Stability – Routh Hurwitz criterion – Root locus plots of typical systems – Root locus analysis

UNIT III FREQUENCY DOMAIN ANALYSIS 9

Frequency response – Resonant peak – Bandwith – Effect of adding poles and zeros – Magnitude and phase plots of typical systems – Nyquist stability criterion – Gain margin – Phase margin - Bode plot – Polar Plot - M & N Circles

UNIT IV STATE VARIABLE MODEL AND ANALYSIS 9

State variable formulation – Non-uniqueness – Solution - State transition matrix – Eigen values – Eigen vectors – Stability - Controllability - Observability

UNIT V DESIGN OF CONTROL SYSTEMS 9

Design Specification – Controller configurations – PID controller - Design using reaction curve and Ziegler-Nichols technique – Compensation schemes - Effect of providing Lag, Lead and Lag- Lead compensation on system performance and design.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to analyse systems using transfer function and state space models
- Ability to design controllers and compensators using conventional techniques

TEXTBOOKS

1. Benjamin C. Kuo, Automatic Control Systems, PHI Learning Private Ltd, 2010.
2. J. Nagrath and M. Gopal, Control Systems Engineering, Tata McGraw-Hill Education Private Limited, Reprint, 2010.

REFERENCES

1. Richard C. Dorf and Robert H. Bishop, Modern Control Systems, Pearson Education, Third Impression, 2009.
2. John J. D'Azzo, Constantine H. Houpis and Stuart N. Sheldon, Linear Control System Analysis and Design with Matlab, CRC Taylor & Francis, Reprint 2009
3. S. Palani, Control System Engineering, Tata McGraw-Hill Education Private Limited, First Reprint, 2010.
4. Yaduvir Singh and S. Janardhanan, Modern Control, Cengage Learning, First Impression 2010.
5. Katsuhiko Ogata, 'Modern Control Engineering', PHI Learning Private Ltd, 5th Edition, 2011.

PTEE8402 ELECTRICAL MACHINES - II L T P C

3 0 0 3

OBJECTIVES

To impart knowledge on

- Theory and performance of salient and non-salient pole synchronous generators.
- Principle of operation and performance of synchronous motor.
- Principle of operation and performance of induction motor and generator.
- Starting and speed control of three-phase induction motors.
- Principle of operation and performance of single phase induction motors and special machines.

UNIT I SYNCHRONOUS GENERATOR 9

Constructional details – Types – Connection of three phase windings – distribution and pitch factors – MMF pattern for alternating and rotating magnetic fields – concept of space phasors – EMF and Power equation – Synchronous reactance – Armature reaction – Voltage regulation – EMF, MMF, ZPF and ASA methods – Synchronization - parallel operation – Operating characteristics – Capability curves.

UNIT II SYNCHRONOUS MOTOR 9

Principle of operation – Torque and Power equations – Operation on infinite bus bars - Operating characteristics with constant load and variable excitation - V-curves – Starting methods – Hunting –Synchronous condenser - Two reaction theory, slip test.

UNIT III INDUCTION MACHINE: THEORY 9

Construction – Types of rotors – Principle of operation – EMF, torque and power flow equations – equivalent circuit – Slip-torque characteristics – harmonics, cogging and crawling - Double cage rotors – Induction generator – Synchronous induction motor.

UNIT IV INDUCTION MACHINE: PERFORMANCE 9

No-load and Blocked rotor tests, equivalent circuit and circle diagram – losses and efficiency – starting methods – Speed control methods, temperature rise and insulation – energy efficient motors.

UNIT V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES 9

Constructional details of single phase induction motor – Double revolving field theory and operation – Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors - Shaded pole induction motor - Reluctance motor - Repulsion motor - Stepper motor - AC series motor, Permanent magnet DC motor.

TOTAL : 45 PERIODS

OUTCOMES:

- Steady state performance analysis of three-phase alternator, three-phase induction machines are studied.
- Predetermination of voltage regulation of salient and non-salient pole generators is done.
- V-curves and inverted V-curves of alternator is studied.
- Various starting and speed control methods of three-phase induction motor are studied.
- Principle of operation of single-phase induction motor and special machines are studied.

TEXT BOOKS:

1. Fitzgerald, A.E.Charles Kingsley Jr.Stephen D.Umans, ‘Electric Machinery’, McGraw Hill Book Company, Sixth Edition 2003.
2. Nagrath, I.J. and Kothari.D.P., Electric Machines’, T.M.H. publishing Co. Ltd., New Delhi, Fourth Edition, 2010.

REFERENCES:

1. Say M.G "Performance and Design of Alternating Machines ' CBS Publishers and Distributors, New Delhi, First Indian Edition, Reprint 1998.
2. Irving L.Kosow, "Electric Machinery and Transformers", Prentice Hall of India Private Ltd., New Delhi, Second Edition, Reprint 2007.
3. Stephen J.Chapman, "Electric Machinery Fundamentals', "McGraw Hill Intl. Edition, New Delhi, Fourth Edition, 2005.

PTEE8403 **POWER ELECTRONICS** **L T P C**
3 0 0 3

OBJECTIVES:

To understand the various applications of electronic devices for conversion, control and conditioning of the electrical power.

- To get an overview of different types of power semiconductor devices and their dynamic characteristics.
- To understand the operation, characteristics and performance parameters of controlled rectifiers
- To study the operation, switching techniques and basics topologies of DC-DC switching regulators.
- To learn the different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
- To study the operation of AC voltage controller and various configurations of AC voltage controller.

UNIT I UNCONTROLLED RECTIFIERS 9

Power Diode – Half wave rectifier – Mid point secondary transformer based full wave rectifier – Bridge rectifier – Voltage doubler circuit – distortion factor – capacitor filter for low power rectifiers – LC filters – Concern for power quality – 3 Φ diode bridge.

UNIT II CONTROLLED RECTIFIERS 9

Two transistor analogy based turn- ON behavior – Snubber Circuit – turn ON losses – thermal protection – Half controlled & Fully controlled converter (1 Φ & 3 Φ) - Displacement factor – RF & HF - pf mitigation, other performance factors – Effect of source inductiance Inverter angle limit.

UNIT III SWITCHING POWER SUPPLIES 9

SCR based step-down & step-up choppers - MOSFET dynamic behavior , Driver & snubber circuits; Low power high switching frequency switching Power supplies , Buck, Boost ,Buck-Boost, converters – Isolated topologies – Resonant converters - switching loss calculations & thermal design.

UNIT IV INVERTERS 9

IGBT - Static dynamic behavior , 1 Φ half bridge and full bridge inverters SCR based six step 3 Φ VSI. SCR based ASCI, PWM (both unipolar & Bipolar) – Third harmonic injected sine pwm - space vector PWM – selective harmonic elimination.

UNIT V AC PHASE CONTROLLERS 9

TRIAC triggering concept with positive gate pulse & negative gate pulse triggering, TRIAC based phase controllers, SCR based 1 Φ & 3 Φ ac phase controller ; various configurations.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to simulate and design different power converters and also to implement and verify the performance specifications of power converters.

TEXT BOOKS:

1. Ned Mohan, T.M.Undeland, W.P.Robbins, Power Electronics: Converters, applications and design, John wiley and Sons, 3rd Edition, 2006.

REFERENCES:

1. Rashid M.H., Power Electronics Circuits, Devices and Applications, Prentice Hall India, 3rd Edition, New Delhi, 2004.
2. Cyril.W.Lander, Power Electronics, McGraw Hill International, Third Edition, 1993.
3. P.S.Bimbra, Power Electronics, Khanna Publishers, Third Edition 2003.
4. Philip T.Krein, Elements of Power Electronics, Oxford University Press, 2004.

PTEE8404 POWER SYSTEM ANALYSIS L T P C

3 1 0 4

OBJECTIVES

- To model and analyze the power system under steady state operating condition.
- To apply numerical methods to solve the power flow problem.
- To model and analyze the system under balanced and unbalanced conditions.
- To model and analyze the stability of power system when it is subjected to a fault.

UNIT I INTRODUCTION 12

Need for system planning and operational studies – basic components of a power system.- Introduction to Restructuring - Single line diagram – per phase and per unit analysis – Generator - transformer – transmission line and load representation for different power system studies.-Primitive network - construction of Y-bus using inspection and singular transformation methods – z-bus.

UNIT II POWER FLOW ANALYSIS 12

Importance of power flow analysis in planning and operation of power systems - statement of power flow problem - classification of buses - development of power flow model in complex variables form - iterative solution using Gauss-Seidel method - Q-limit check for voltage controlled buses – power flow model in polar form - iterative solution using Newton-Raphson method .

UNIT III FAULT ANALYSIS – BALANCED FAULTS 12

Importance of short circuit analysis - assumptions in fault analysis - analysis using Thevenin's theorem - Z-bus building algorithm - fault analysis using Z-bus – computations of short circuit capacity, post fault voltage and currents.

UNIT IV FAULT ANALYSIS – UNBALANCED FAULTS 12

Introduction to symmetrical components – sequence impedances – sequence circuits of synchronous machine, transformer and transmission lines - sequence networks analysis of single line to ground, line to line and double line to ground fault s using Thevenin's theorem and Z-bus matrix

UNIT V STABILITY ANALYSIS 12

Importance of stability analysis in power system planning and operation - classification of power system stability - angle and voltage stability – Single Machine Infinite Bus (SMIB) system: Development of swing equation - equal area criterion - determination of critical clearing angle and time – solution of swing equation by modified Euler method and Runge-Kutta fourth order method

TOTAL : 60 PERIODS

OUTCOMES:

- The students are equipped with power flow, short-circuit and transient stability studies that are useful for transmission expansion planning and day-today operation of power system.

TEXT BOOKS

1. John J. Grainger and W.D. Stevenson Jr., 'Power System Analysis', Tata McGraw-Hill, Sixth reprint, 2010.
2. Hadi Saadat, 'Power System Analysis', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint 2010.

REFERENCES

1. Nagrath I.J. and Kothari D.P., 'Modern Power System Analysis', Tata McGraw-Hill, 14th reprint, 2009.
2. Kundur P., 'Power System Stability and Control, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint 2010.
3. Pai M A, 'Computer Techniques in Power System Analysis', Tata McGraw-Hill Publishing Company Ltd., New Delhi, Second Edition, 2007.

PTEE 8411 ELECTRICAL MACHINES LABORATORY L T P C
0 0 3 2

AIM

To study the performance characteristics of DC machines, Transformers, synchronous machines and induction machines

OBJECTIVES

- To experimentally verify the principle of operation, performance and characteristics of DC machines, Transformers, Synchronous machines and Induction machines using load tests and predetermination tests.
- To study DC motor and three phase induction motor starters.

LIST OF EXPERIMENTS

1. Open circuit and load characteristics of separately excited and self excited D.C. generator
2. Load test on D.C shunt motor
3. Swinburne's test
4. Speed control of D.C shunt motor
5. Load test on single phase transformer
6. Open circuit and short circuit test on single phase transformer (Determination of equivalent circuit parameters)
7. Regulation of three-phase alternator by EMF and MMF methods.
8. V& Inverted V Curves of synchronous motor
9. Load test on three-phase induction motor
10. No load and blocked rotor tests on three phase induction motor (Determination of equivalent circuit parameters)
11. Load test on single-phase induction motor.
12. Study of D.C motor and induction motor starters

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to perform experiments on all conventional electrical machines to study their complete performance characteristics under different operating conditions.

PTEE8501 HIGH VOLTAGE ENGINEERING L T P C
3 0 0 3

OBJECTIVES

To impart knowledge about causes, effects of over voltages, dielectric breakdown mechanism and to emphasis the need for generation, measurement and testing of High voltages and currents.

UNIT I OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS 9

Causes of over voltages and its effects on power system – Lightning, switching surges and temporary overvoltages – Reflection and Refraction of Travelling waves- Protection against overvoltages.

UNIT II DIELECTRIC BREAKDOWN 9

Gaseous breakdown in uniform and non-uniform fields – Corona discharges – Vacuum breakdown – Conduction and breakdown in pure and commercial liquids, Maintenance of **oil** Quality – Breakdown mechanisms in solid and composite dielectrics.

UNIT III GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS 9

Generation of High DC, AC, impulse voltages and currents - Triggering and control of impulse generators**.**

UNIT IV MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS 9

High Resistance with series ammeter – Dividers, Resistance, Capacitance and Mixed dividers - Peak Voltmeter, Generating Voltmeters - Capacitance Voltage Transformers, Electrostatic Voltmeters – Sphere Gaps - High current shunts- Digital techniques in high voltage measurement.

UNIT V HIGH VOLTAGE TESTING & INSULATION COORDINATION 9

High voltage testing of electrical power apparatus as per International and Indian standards – Power frequency, impulse voltage and DC testing of Insulators, circuit breakers, bushing, isolators and transformers- Insulation Coordination.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to analyze the different electrical stress in a Power System and design & develop appropriate insulation schemes

TEXT BOOKS

1. M. S. Naidu and V. Kamaraju, 'High Voltage Engineering', 4th Edition Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2009.
2. E.Kuffel and W.S. Zaengl, J.Kuffel, High voltage Engineering fundamentals, Newnes Second Edition ,Elsevier , New Delhi 2005.

REFERENCES

1. L.L.Alston, High Voltage Technology, Oxford University Press, First Indian Edition 2011.
2. C.L.Wadhwa, High voltage Engineering, New Age International Publishers,Third Edition, 2010

3. Mazen Abdel – Salam, Hussein Anis, Ahdab A-Morshedy, Roshday Radwan, High Voltage Engineering – Theory & Practice,Second Edition Marcel Dekker, Inc., 2010.
4. Subir Ray." An Introduction to High Voltage Engineering "PHI Learning Private Limited, New Delhi, Second Edition-2011

PTEE8502 POWER SYSTEM OPERATION AND CONTROL L T P C
3 0 0 3

OBJECTIVES

To have an overview of power system operation and control.

- To model power-frequency dynamics and to design power-frequency controller.
- To model reactive power-voltage interaction and the control actions to be implemented for maintaining the voltage profile against varying system load.
- To study the economic operation of power system.
- To teach about SCADA and its application for real time operation and control of power systems.

UNIT I INTRODUCTION 8

An overview of power system operation and control - system load variation - load characteristics - load curves and load-duration curve - load factor - diversity factor - Importance of load forecasting and quadratic and exponential curve fitting techniques of forecasting – plant level and system level controls .

UNIT II REAL POWER - FREQUENCY CONTROL 10

Basics of speed governing mechanism and modeling - speed-load characteristics – load sharing between two synchronous machines in parallel - control area concept - LFC control of a single-area system - static and dynamic analysis of uncontrolled and controlled cases - two-area system – modeling - static analysis of uncontrolled case - tie line with frequency bias control - state variable model - integration of economic dispatch control with LFC.

UNIT III REACTIVE POWER–VOLTAGE CONTROL 9

Generation and absorption of reactive power - basics of reactive power control - excitation systems – modeling - static and dynamic analysis - stability compensation - methods of voltage control: tap-changing transformer, SVC (TCR + TSC) and STATCOM – secondary voltage control.

UNIT IV UNIT COMMITMENT AND ECONOMIC DISPATCH 9

Formulation of economic dispatch problem – I/O cost characterization – incremental cost curve - co-ordination equations without and with loss (No derivation of loss coefficients) - solution by direct method and λ-iteration method - statement of unit commitment problem – priority-list method - forward dynamic programming.

UNIT V COMPUTER CONTROL OF POWER SYSTEMS 9

Need for computer control of power systems - concept of energy control centre - functions - system monitoring - data acquisition and control - system hardware configuration – SCADA and EMS functions - network topology - state estimation – WLSE - Contingency Analysis - State transition diagram showing various state transitions and control strategies.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand and analyse power system operation, stability, control and protection.

TEXT BOOKS

1. Olle.I.Elgerd, 'Electric Energy Systems theory - An introduction', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 34th reprint 2010.
2. Allen. J. Wood and Bruce F. Wollenberg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2003.

REFERENCES

1. Abhijit Chakrabarti, Sunita Halder, 'Power System Analysis Operation and Control', PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010.
2. Nagrath I.J. and Kothari D.P., 'Modern Power System Analysis', Tata McGraw-Hill, 14th reprint, 2009.
3. Kundur P., 'Power System Stability and Control, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint 2010.
4. Hadi Saadat, 'Power System Analysis', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint 2010.

PTMG8551 PRINCIPLES OF MANAGEMENT L T P C
(ECE, CSE, Civil, Industrial, EEE) 3 0 0 3

OBJECTIVES

- To study the Evolution of Management
- To study the functions and principles of management
- To learn the application of the principles in an organization

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

Definition of Management –Science or Art – Manager Vs Entrepreneur- types of managers-managerial roles and skills – Evolution of Management –Scientific, human relations , system and contingency approaches– Types of Business organization- Sole proprietorship, partnership, company-public and private sector enterprises- Organization culture and Environment – Current trends and issues in Management.

UNIT II PLANNING 9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III ORGANISING 9

Nature and purpose – Formal and informal organization – organization chart–organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization –Job Design - Human Resource Management –HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

UNIT IV DIRECTING 9

Foundations of individual and group behaviour– motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership –communication – process of communication – barrier in communication – effective communication –communication and IT.

UNIT V CONTROLLING 9

System and process of controlling –budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

TEXT BOOKS:

1. Stephen P. Robbins & Mary Coulter, " Management", Prentice Hall (India)Pvt. Ltd., 10th Edition, 2009.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", Pearson Education, 6th Edition, 2004.

REFERENCES:

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, "Fundamentals of Management" Pearson Education, 7th Edition, 2011.
2. Robert Kreitner & Mamata Mohapatra, " Management", Biztantra, 2008.
3. Harold Koontz & Heinz Weihrich "Essentials of management" Tata McGraw Hill,1998.
4. Tripathy PC & Reddy PN, "Principles of Management", Tata Mcgraw Hill, 1999

PTEE8511 CONTROL AND INSTRUMENTATION LABORATORY L T P C
0 0 3 2

OBJECTIVES

- To provide knowledge on analysis and design of controller for the system along with basics of instrumentation

LIST OF EXPERIMENTS

CONTROL SYSTEMS:

1. P, PI and PID controllers
2. Stability Analysis
3. Modeling of Systems – Machines, Sensors and Transducers
4. Design of Lag, Lead and Lag-Lead Compensators
5. Position Control Systems
6. Synchro Transmitter- Receiver and Characteristics
7. Simulation of Control Systems by Mathematical development tools.

INSTRUMENTATION:

8. Bridge Networks – AC and DC Bridges
9. Dynamics of Sensors/Transducers
    a. Temperature
    b. Pressure
    c. Displacement
    d. Optical
    e. Strain
    f. Flow

10. Power and Energy Measurement
11. Signal Conditioning
    a. Instrumentation Amplifier
    b. Analog – Digital and Digital – Analog converters (ADC and DACs)
12. Process Simulation.

REQUIREMENT FOR A BATCH OF 30 STUDENTS

CONTROL SYSTEMS:

1. PID kit – 1 No.
   DSO – 1 No.
   CRO Probe – 2 nos
2. Personal computers
3. DC motor – 1 No.
   Generator – 1 No.
   Rheostats – 2 nos
   Ammeters
   Voltmeters
   Connecting wires (3/20)
4. CRO 30MHz – 1 No.
   2MHz Function Generator – 1No.
5. Position Control Systems Kit (with manual) – 1 No.,
   Tacho Generator Coupling set
6. AC Synchro transmeter & receiver – 1No.
   Digital multimeters

INSTRUMENTATION:

7. R, L, C Bridge kit (with manual)
8. a) Electric heater – 1No.
   Thermometer – 1No.
   Thermistor (silicon type)
   RTD nickel type – 1No.
   b) 30 psi Pressure chamber (complete set) – 1No.
   Current generator (0 – 20mA)
   Air foot pump – 1 No. (with necessary connecting tubes)
   c) LVDT 20mm core length movable type – 1No.
   CRO 30MHz – 1No.
   d) Optical sensor – 1 No.
   Light source
   e) Strain Gauge Kit with Handy lever beam – 1No.
   100gm weights – 10 nos
   f) Flow measurement Trainer kit – 1 No.
   (1/2 HP Motor, Water tank, Digital Milliammeter, complete set)
9. Single phase Auto transformer – 1No.
   Watthour meter (energy meter) – 1No.
   Ammeter
   Voltmeter
   Rheostat
   Stop watch
   Connecting wires (3/20)
10. IC Transistor kit – 1No.

TOTAL : 45 PERIODS

OUTCOMES:

- Will be able to understand and apply basic science, circuit theory, theory control theory signal processing and apply them to electrical engineering problems.

PTEE8601 DESIGN OF ELECTRICAL APPARATUS L T P C

3 0 0 3

OBJECTIVES

To provide sound knowledge about constructional details and design of various electrical machines, in order

- to study magnetic circuit parameters and thermal rating of various types of electrical machines.
- to design armature and field systems for D.C. machines.
- to design core, yoke, windings and cooling systems of transformers.
- to design stator and rotor of induction machines and synchronous machines.
- to introduce the importance of computer aided design method.

UNIT I INTRODUCTION 9

Major considerations in Electrical Machine Design - Electrical Engineering Materials – Space factor – Choice of Specific Electrical and Magnetic loadings – Thermal considerations - Heat flow – Temperature rise - Rating of machines – Standard specifications.

UNIT II DC MACHINES 9

Construction - Output Equations – Main Dimensions – Choice of specific loadings – Selection of number of poles – Design of Armature – Design of commutator and brushes – design of field pole and coils – performance prediction using design values.

UNIT III TRANSFORMERS 9

Construction - Output Equations – Main Dimensions - KVA output for single and three phase transformers – Overall dimensions – design of yoke, core and winding for core and shell type transformers – equivalent circuit parameters from design data - Operating characteristics – efficiency - Regulation – No load current – Temperature rise in Transformers – Design of Tank and cooling tubes of Transformers.

UNIT IV INDUCTION MOTORS 9

Construction - Output equation of Induction motor – Main dimensions – choice of specific loadings – Design of Length of air gap – Design of squirrel cage rotor and wound rotor – equivalent circuit parameter from design data - Magnetic leakage calculations – Leakage reactance of polyphase machines- Magnetizing current - Short circuit current – Circle diagram - Operating characteristics.

UNIT V SYNCHRONOUS MACHINES 9

Output equations – choice of specific loadings – Design of salient pole machines – Short circuit ratio – shape of pole face – Armature design – Armature parameters – Estimation of air gap length – Design of rotor –Design of damper winding – Determination of full load field mmf – Design of field winding – Design of turbo alternators – Rotor design.

TOTAL : 45 PERIODS

OUTCOMES:

- Understand basics of design considerations for rotating and static electrical machines
- Ability to model and analyze electrical apparatus and their application to Electrical Engineering.

TEXT BOOKS

1. Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai & Sons, New Delhi, **Fifth Edition,**1984.
2. Sen, S.K., 'Principles of Electrical Machine Designs with Computer Programmes', Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, **Second Edition, 2009**.

REFERENCES

1. A.Shanmugasundaram, G.Gangadharan, R.Palani 'Electrical Machine Design Data Book', New Age International Pvt. Ltd., Reprint 2007.
2. 'Electrical Machine Design', Balbir Singh, **Vikas Publishing House Private Limited, 1981.**

PTEE8602 PROTECTION AND SWITCHGEAR L T P C
3 0 0 3

OBJECTIVES:

- To discuss about the nature, types and causes of faults in Power System and the construction and operating principle of protective components.

UNIT I PROTECTION SCHEMES 9

Principles and need for protective schemes – nature and causes of faults – types of faults – fault current calculation using symmetrical components – Methods of Neutral grounding – Zones of protection and essential qualities of protection – Protection schemes

UNIT II ELECTROMAGNETIC RELAYS 9

Operating principles of relays - the Universal relay – Torque equation – R-X diagram – Electromagnetic Relays – Overcurrent, Directional, Distance, Differential, Negative sequence and Under frequency relays.

UNIT III APPARATUS PROTECTION 9

Current transformers and Potential transformers and their applications in protection schemes - Protection of transformer, generator, motor, busbars and transmission line.

UNIT IV STATIC RELAYS AND NUMERICAL PROTECTION 9

Static relays – Phase, Amplitude Comparators – Synthesis of various relays using Static comparators – Block diagram of Numerical relays – Overcurrent protection, transformer differential protection, distant protection of transmission lines.

UNIT V CIRCUIT BREAKERS 9

Physics of arcing phenomenon and arc interruption - DC and AC circuit breaking – re-striking voltage and recovery voltage - rate of rise of recovery voltage - resistance switching - current chopping - interruption of capacitive current - Types of circuit breakers – air blast, air break, oil, SF_6 and vacuum circuit breakers – **comparison** of different circuit breakers – Rating and selection of Circuit breakers.

TOTAL : 45 PERIODS

OUTCOMES:

- Acquire the knowledge about the faults in Power System and analyze the design of protective scheme with suitable selection of protective components.

TEXT BOOKS:

1. Sunil S.Rao, Switchgear and Protection, Khanna publishers, New Delhi, 2008.
2. Y.G.Paithankar and S.R.Bhide, Fundamentals of power system protection, Second Edition, Prentice Hall of India Pvt. Ltd., New Delhi – 2010

REFERENCES:

1. Badri Ram , B.H.Vishwakarma, Power System Protection and Switchgear, New Age International Pvt Ltd Publishers, Second Edition 2011.

2. B.Rabindranath and N.Chander, Power System Protection and Switchgear, New Age International (P) Ltd., First Edition 2011.
3. M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarti, A Text Book on Power System Engineering, Dhanpat Rai & Co., 1998.
4. C.L.Wadhwa, Electrical Power Systems, 6th Edition, New Age International (P) Ltd., 2010
5. Ravindra P.Singh, " Switchgear and Power System Protection " PHI Learning Private Ltd., New Delhi 2009.

PTEE8603 UTILIZATION AND CONSERVATION OF ELECTRICAL ENERGY L T P C
3 0 0 3

OBJECTIVES

- To analyze the various concepts behind Renewable energy resources.
- To introduce the energy saving concept by different ways of illumination.
- To understand the different methods of electric heating and electric welding.

UNIT I ELECTRIC DRIVES AND TRACTION 9

Fundamentals of electric drive - choice of an electric motor - application of motors for particular services - traction motors - characteristic features of traction motor - systems of railway electrification - electric braking - train movement and energy consumption - traction motor control - track equipment and collection gear.

UNIT II ILLUMINATION 9

Introduction - definition and meaning of terms used in illumination engineering - classification of light sources - incandescent lamps, sodium vapour lamps, mercury vapour lamps, fluorescent lamps – design of illumination systems - indoor lighting schemes - factory lighting halls - outdoor lighting schemes - flood lighting - street lighting - energy saving lamps, LED.

UNIT III HEATING AND WELDING 9

Introduction - advantages of electric heating – modes of heat transfer - methods of electric heating -resistance heating - arc furnaces - induction heating - dielectric heating - electric welding – types -resistance welding - arc welding - power supply for arc welding - radiation welding.

UNIT IV SOLAR RADIATION AND SOLAR ENERGY COLLECTORS 9

Introduction - solar constant - solar radiation at the Earth's surface - solar radiation geometry – estimation of average solar radiation - physical principles of the conversion of solar radiation into heat – flat-plate collectors - transmissivity of cover system - energy balance equation and collector efficiency - concentrating collector - advantages and disadvantages of concentrating collectors - performance analysis of a cylindrical parabolic concentrating collector.

UNIT V WIND ENERGY 9

Introduction - basic principles of wind energy conversion - site selection considerations - basic components of a WECS (Wind Energy Conversion System) - Classification of WECS - types of wind machines - analysis of aerodynamic forces acting on the blade - performances of wind.

TOTAL : 45 PERIODS

OUTCOMES:

- Awareness on electrical energy utilization and need for conservation
- Awareness on Renewable energy sources.

TEXT BOOKS

1. N.V. Suryanarayana, “Utilisation of Electric Power”, Wiley Eastern Limited, New Age International Limited,1993.
2. J.B.Gupta, “Utilisation Electric power and Electric Traction”, S.K.Kataria and sons, 2000.
3. G.D.Rai,”Non-Conventional Energy sources”,Khanna publications Ltd.,New Delhi 1997

REFERENCES:

1. R.K.Rajput, Utilisation of Electric Power, Laxmi publications private Limited.,2007
2. H.Partab, Art and Science of Utilisation of Electrical Energy”, Dhanpat Rai and Co., New Delhi-2004.
3. C.L.Wadhwa, “Generation, Distribution and Utilisation of Electrical Energy”, New Age international Pvt.Ltd.,2003

PTEE8611	MICROPROCESSORS AND POWER ELECTRONICS LABORATORY	L	T	P	C
		0	0	3	2

AIM

- To experimentally understand the operation of Intel 8085 microprocessor
- To realize the digital & linear integrated circuits used in simple system
- To study the applications of switching devices in rectifier, inverter, chopper configuration.

OBJECTIVES

- To perform simple arithmetic operations using assembly language program.
- To write an assembly language program using the control instructions
- To write an assembly language program to convert Analog input to Digital output and Digital input to Analog output.
- To study various digital & linear integrated circuits used in simple system configuration.
- To realize the rectifier, inverter, chopper using switching devices.

LIST OF EXPERIMENTS

1. Simple arithmetic operations with 8085: Multi precision addition / subtraction / multiplication / division.
2. Programming with control instructions: Increment / Decrement, Ascending / Descending order, Maximum / Minimum of numbers, Rotate instructions, Hex / ASCII / BCD code conversions.
3. Interface Experiments:

   A/D Interfacing.

   D/A Interfacing.

   Traffic light controller

4. Study of Basic Digital IC's.

   (Verification of truth table for AND, OR, EXOR, NOT, NOR, NAND, JK FF, RS

   FF, D FF)

5. Implementation of Boolean Functions, Adder/ Subtractor circuits
6. Op-Amp Linear Application: Comparator, Differentiator, Integrator, Adder, Subtractor.
7. AC to DC half-controlled converter
8. AC to DC fully controlled converter
9. Step down and step up MOSFET based choppers
10. IGBT based single-phase PWM inverter
11. AC Voltage Controller
12. Cyclo-converter

TOTAL : 45 PERIODS

OUTCOMES

- Ability to write assembly language programmes, control instructions for conversion of Analog inputs to Digital output and Digital input to Analog outputs
- Ability to write control instructions of linear and digital integrated circuits so as to functionalize switching devices in power converters.

PTCS8351 OPERATING SYSTEMS LT P C
3 0 0 3

OBJECTIVES

- To impart knowledge about process synchronization, inter-process communication, scheduling, deadlock handling, and memory management.

UNIT I OPERATING SYSTEMS OVERVIEW 9

Introduction to operating systems – Computer system organization, architecture – Operating system structure, operations – Process, memory, storage management – Protection and security – Distributed systems – Computing Environments – Open-source operating systems – OS services – User operating-system interface – System calls – Types – System programs – OS structure – OS generation – System Boot – Process concept, scheduling – Operations on processes – Cooperating processes – Inter-process communication – Examples – Multithreading models – Thread Libraries – Threading issues – OS examples

UNIT II PROCESS MANAGEMENT 9

Basic concepts – Scheduling criteria – Scheduling algorithms – Thread scheduling – Multiple-processor scheduling – Operating system examples – Algorithm Evaluation – The critical-section problem – Peterson's solution – Synchronization hardware – Semaphores – Classic problems of synchronization – Critical regions – Monitors – Synchronization examples – Deadlocks – System model – Deadlock characterization – Methods for handling

deadlocks – Deadlock Prevention – Deadlock Avoidance – Deadlock detection – Recovery from deadlock

UNIT III STORAGE MANAGEMENT 9

Memory Management – Swapping – Contiguous memory allocation – Paging – Segmentation – Example: The Intel Pentium - Virtual Memory: Background – Demand paging – Copy on write – Page replacement – Allocation of frames – Thrashing**.**

UNIT IV I/O SYSTEMS 9

File concept – Access methods – Directory structure – File-system mounting – Protection – Directory implementation – Allocation methods – Free-space management – Disk scheduling – Disk management – Swap-space management – Protection

UNIT V CASE STUDY 9

The Linux System – History – Design Principles – Kernel Modules – Process Management – Scheduling – Memory management – File systems – Input and Output – Inter-process Communication – Network Structure – Security – Windows 7 – History – Design Principles – System Components – Terminal Services and Fast User – File system – Networking.

TOTAL: 45 PERIODS

OUTCOMES

- Aspects of operating systems are studied.
- Features of process and storage management are studied.
- Concepts of disk scheduling protection and protection are studied.

TEXT BOOKS:

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, “Operating System Concepts Essentials”, John Wiley & Sons Inc., 2010.

REFERENCES:

1. Andrew S. Tanenbaum, “Modern Operating Systems”, Second Edition, Addison Wesley, 2001.
2. Charles Crowley, “Operating Systems: A Design-Oriented Approach”, Tata McGraw Hill Education”, 1996.
3. D M Dhamdhere, “ Operating Systems: A Concept-based Approach”, Second Edition, Tata McGraw-Hill Education, 2007.
4. William Stallings, “Operating Systems: Internals and Design Principles”, Seventh Edition, Prentice Hall, 2011.

PTEC8030 **COMMUNICATION ENGINEERING** **L T P C**

3 0 0 3

OBJECTIVES

To introduce the concepts of communication systems engineering using wire and wireless medium

- To introduce different methods of analog communication and their significance
- To introduce Digital Communication methods for high bit rate transmission
- To introduce the concepts of source and line coding techniques for enhancing rating of transmission of minimizing the errors in transmission.
- To introduce optical and cellular communication concepts

UNIT I ANALOG COMMUNICATION 9

AM - Frequency spectrum - vector representation - power relations - generation of AM - DSB, DSB/SC, SSB, VSB, AM Transmitter & Receiver; FM and PM - frequency spectrum - power relations : NBFM & WBFM, Generation of FM and PM - Amstrong method & Reactance modulators

UNIT II DIGITAL COMMUNICATION 9

Pulse modulations - concepts of sampling and sampling theorem, quantization and coding : PCM, DM, slope overload error. ADM. DPCM, PAM, Digital modulation techniques - ASK, FSK, PSK, BPSK, QPSK

UNIT III SOURCE CODES, LINE CODES & ERROR CONTROL 9

Binary communication -entropy, properties, BSC, BEC, noiseless coding theorem, BW- SNR trade off, source coding : Shannon-Fano, Huffman coding -, Line codes: NRZ, RZ, AMI, HDBP, ARQ, mBnB codes, PSD - error control codes and applications: block, cyclic and convolution codes

UNIT IV MULTIPLE ACCESS TECHNIQUES 9

Spread Spectrum & Multiple Access techniques : FDMA, TDMA, CDMA concepts, advantages and applications

UNIT V OPTICAL AND CELLULAR COMMUNICATIONS 9

Fibers - types: sources, detectors, optical link, Cellular concept - Frequency reuse - channel assignment strategies - handoff strategies - Interference and system capacity - Coverage and capacity expansion techniques

TOTAL:45 PERIODS

OUTCOMES

- Basic theories behind the various communication systems are studied.
- Features of the various communication systems are studied.

TEXT BOOKS

1. Taub & Schiling "Principles of communication systems" Tata McGraw hill 2007
2. J.Das "Principles of digital communication" New Age International, 1986
3. Theodore S. Rappaport, " Wireless Communications - Principles and Practice", Pearson, 2nd Edition, 2003

REFERENCES
1. Kennedy and Davis "Electronic communication systems" Tata McGraw hill, 4th edition, 1993.
2. Bernard Sklar "Digital communication fundamentals and applications" Pearson Education, 2001
3. Bary le, Memuschmidt, digital Communication, Kluwer Publication, 2004.
4. B.P.Lathi "Modern digital and analog communication systems" Oxford University Press, 2010

PTEE8001 ADAPTIVE CONTROL L T P C
3 0 0 3

OBJECTIVES
- To illustrate the concept of system identification and adaptive control
- To give an introductory knowledge about black-box approach based system identification
- To give adequate knowledge on batch and recursive identification
- To give basic knowledge on Computer Controlled Systems
- To introduce the design concept for adaptive control schemes

UNIT I NON-PARAMETRIC METHODS 9
Non-parametric methods - Transient analysis - frequency analysis - Correlation analysis - Spectral analysis - Input signal design for identification

UNIT II PARAMETRIC METHODS 9
Least squares estimation – Analysis of the least squares estimate - Best linear unbiased estimate – Model parameterizations - Prediction error methods

UNIT III RECURSIVE IDENTIFICATION METHODS 9
The recursive least square method - Model validation –Model structure determination - Introduction to closed loop system identification

UNIT IV ADAPTIVE CONTROL SCHEMES 9
Introduction – Auto-tuning of PID controller using relay feedback approach – Types of adaptive control, Gain scheduling, Model reference adaptive control, Self–tuning controller – Design of gain scheduled adaptive controller – Applications of gain scheduling

UNIT V MRAC & STR 9
STR – Pole placement design – Indirect STR and direct STR – MRAC - MIT rule – Lyapunov theory – Relationship between MRAC and STR

TOTAL: 45 PERIODS

OUTCOMES:
- Various system identification techniques are studied.
- Features of adaptive control and other control techniques viz., STR, MRAC are studied.

TEXTBOOKS
1. T. Soderstrom and Petre Stoica, System Identification, Prentice Hall International (UK) Ltd. 1989
2. Karl J. Astrom and Bjorn Wittenmark, Adaptive Control, Pearson Education, Second edition, Fifth impression, 2009

REFERENCES

1. L. Ljung, System Identification - Theory for the User, 2nd edition, PTR Prentice Hall, Upper Saddle River, N.J., 1999
2. Narendra and Annasamy, " Stable Adaptive Control Systems", Prentice Hall, 1989.

PTEE8002 ADVANCED DIGITAL SIGNAL PROCESSING L T P C
3 0 0 3

OBJECTIVES:

- To introduce the concept of analyzing discrete time signals & systems in the time and frequency domain.
- To classify signals and systems & their mathematical representation.
- To analyse the discrete time systems.
- To study various transformation techniques & their computation.
- To study about filters and their design for digital implementation.
- To study about a programmable digital signal processor & quantization effects.

UNIT I INTRODUCTION 9

Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect. Digital signal representation.

UNIT II DISCRETE TIME SYSTEM ANALYSIS 9

Z-transform and its properties, inverse z-transforms; difference equation – Solution by z-transform, application to discrete systems - Stability analysis, frequency response – Convolution – Introduction to Fourier Transform– Discrete time Fourier transform.

UNIT III DISCRETE FOURIER TRANSFORM & COMPUTATION 9

DFT properties, magnitude and phase representation - Computation of DFT using FFT algorithm – DIT & DIF - FFT using radix 2 – Butterfly structure.

UNIT IV DESIGN OF DIGITAL FILTERS 9

FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics. IIR design: Analog filter design - Butterworth and Chebyshev approximations; digital design using impulse invariant and bilinear transformation - Warping, prewarping -Frequency transformation.

UNIT V DIGITAL SIGNAL PROCESSORS 9

Introduction – Architecture of one DSP processor– Features – Addressing Formats – Functional modes - Introduction to Commercial Processors

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand and apply Fourier transforms for processing of signals
- Ability to design and develop digital filters algorithms in digital signal processor platforms.

TEXT BOOKS:

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, 2009.
2. S.K. Mitra, 'Digital Signal Processing – A Computer Based Approach', Tata McGraw Hill, New Delhi, 2001.

REFERENCES:

1. Alan V. Oppenheim, Ronald W. Schafer and John R. Buck, 'Discrete – Time Signal Processing', Pearson Education, New Delhi, 2003.
2. Emmanuel C Ifeachor and Barrie W Jervis ,"Digital Signal Processing – A Practical approach" Pearson Education, Second edition, 2002.
3. B. Venkataramani, M. Bhaskar, 'Digital Signal Processors, Architecture, Programming and Applications', Tata McGraw Hill, New Delhi, 2003.

PTEE8003 ADVANCED CONTROL SYSTEMS L T P C
3 0 0 3

OBJECTIVES

To gain knowledge in design of state variable systems, analysis of non-linear systems and introduction of optimal control

- To study the state variable design
- To provide adequate knowledge in the phase plane analysis
- To study describing function analysis
- To analyze the stability of the systems using different techniques
- To introduce the concepts on design of optimal controller

UNIT I STATE VARIABLE DESIGN 9

Control law design – State feedback and pole placement - Estimator design – Regulator design - Combined control law and estimator – Introduction of the reference input – Integral control and disturbance estimation – Effect of delays

UNIT II PHASE PLANE ANALYSIS 9

Features of linear and non-linear systems - Common physical non-linearities – Methods of linearising non-linear systems - Concept of phase portraits – Singular points – Limit cycles – Construction of phase portraits – Phase plane analysis of linear and non-linear systems – Isocline method

UNIT III DESCRIBING FUNCTION ANALYSIS 9

Basic concepts - Derivation of describing functions for common non-linearities – Analysis of non-linear systems – Limit cycle - Stability

UNIT IV STABILITY ANALYSIS 9

Introduction – Concept of stability – Equilibrium points- Lyapunov's stability theorems - Lyapunov's direct method for LTI systems – Lyapunov's method for non-linear systems - Krasovski's theorem on Lyapunov function

UNIT V OPTIMAL CONTROL 9

Problem formulation - Linear quadratic regulator - Finite and infinite time - Variational approach to optimal control problem - Solution of Ricatti equation - Differential and Algebraic

TOTAL: 45 PERIODS

OUTCOMES

- Features of tools used for studying the nature of non-linear systems are studied.
- Basics of stability and the assessment of stability are studied.
- Basics of optimal control and its features are studied.

TEXT BOOKS

1. I.J. Nagrath and M. Gopal, Control Systems Engineering, New Age International Publishers, Fourth Edition, 2012.
2. K P Mohandas, Modern Control Engineering, Sanguine Technical Publishers, 2008

REFERENCES

1. George J. Thaler, Automatic Control Systems, Jaico Publishers, 1993
2. Ashish Tewari, Modern Control Design with Matlab and Simulink, John Wiley, New Delhi, 2002
3. M. Gopal, Modern Control System Theory, New Age International Publishers, 2005.
4. Gene F. Franklin, J. David Powell and Abbasemami-Naeini, Feedback Control of Dynamic Systems, Fourth edition, Pearson Education, 2002
5. William A. Wolovich, Automatic Control Systems, Oxford University Press, First Indian Edition 2010

PTEE8004 ANALYSIS OF ELECTRICAL MACHINES L T P C
3 0 0 3

OBJECTIVES

- To study the fundamentals of electromechanical energy conversion process in electrical equipments.
- To study the theory of transformation of multi-phase circuits and systems and its application to multi-phase induction and synchronous machines.
- To develop the time domain mathematical model of DC and AC machines and analyse their steady state and dynamic state performance

UNIT I PRINCIPLES OF ELECTROMAGNETIC ENERGY CONVERSION 9

General expression of stored magnetic energy, co-energy and force/ torque – example using single and doubly excited system – Calculation of air gap mmf and per phase machine inductance using physical machine data.

UNIT II DC MACHINES 9

Voltage and torque equations – dynamic characteristics of permanent magnet and shunt DC machines – state equations - solution of dynamic characteristic by Laplace transformation.

UNIT III REFERENCE FRAME THEORY 9

Static and rotating reference frames – transformation of variables – reference frames – transformation between reference frames – transformation of a balanced set –balanced steady state phasor and voltage equations.

UNIT IV INDUCTION MACHINES 9

Voltage and torque equations – transformation for rotor circuits – voltage and toque equations in reference frame variables – analysis of steady state operation – free acceleration characteristics – dynamic performance for load and torque variations – dynamic performance of single phasing operation.

UNIT V SYNCHRONOUS MACHINES 9

Voltage and Torque Equation – voltage Equation in arbitrary reference frame and rotor reference frame – Park equations - steady state analysis – dynamic performances for torque variations- dynamic performance during three phase fault – transient stability limit – critical clearing time – computer simulation.

TOTAL : 45 PERIODS

OUTCOMES:

- Development of generalised force/torque equations of electro-mechanical systems from energy and coenergy equations are studied and analysed.
- Transformation theory is studied and applied to three-phase induction and synchronous machines.
- Dynamic state models of DC and AC machines are developed and their complete time domain performance is analysed.

TEXT BOOKS

1. Paul C.Krause, OlegWasyzczuk, Scott S, Sudhoff, "Analysis of Electric Machinery and Drive Systems", IEEE Press, Second Edition**,** 2002.
2. R.Krishnan, "Electric Motor Drives, Modeling, Analysis and Control" , Prentice Hall of India, 2002

REFERENCES

1. Samuel Seely, "Electromechanical Energy Conversion", McGraw Hill Publishing Company**,** 1962.
2. A.E, Fitzgerald, Charles Kingsley, Jr, and Stephan D, Umans, " Electric Machinery", Tata McGraw Hill, Sixth Edition, 2003.

PTEE8006 COMPUTER AIDED DESIGN OF ELECTRICAL APPARATUS L T P C
3 0 0 3

OBJECTIVES

To impart knowledge on

- Problem formulation for field computation
- Finite Element analysis
- Computer aided design of practical problems

UNIT I INTRODUCTION 9

Review on electromagnetic theory – Basic field equations, calculation of field distribution, inductance, capacitance, force and torque, Review on conventional electrical machine design methodology – computer aided design aspects - advantages.

UNIT II CAD PACKAGES 9

Numerical methods for solving field problems, recent developments, problem formulation – governing equations – modeling – boundary conditions and material charactieristics.

UNIT III FINITE ELEMENT ANALYSIS 9

Mathematical formulation for 2-D planar and axial symmetry problems – discretization – shape functions – element and global matrices/vectors – solution – post processing.

UNIT IV FILED ANALYSIS USING FEA(PRACTICALS 9

Electrostatics, Magnetostatics – linear and non-linear problems, permanent magnet, eddy current analysis, calculation of force/torque.

UNIT V DESIGN EXAMPLES (PRACTICALS) 9

Design of cylindrical magnetic devices, transformer, Rotating machines.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to design electrical apparatus using finite element package.

TEXT BOOKS

1. Sheppard.J.Salon " Finite Element Analysis of Electrical Machines", Springer International Edition, First Indian Reprint, 2007
2. Nicola Bianchi " Electrical Machine Analysis using Finite Elements", Taylor & Francis, 2005.

REFERENCES

1. K.J.Binns, P.J. Lawrenson, C.W. Trowbridge, " The analytical and numerical solution of electrical and magnetic fields", John Wiley & Sons, 1993.
2. Nathan Ida, Joao P A Bastos, "Electromagnetics and calculation of fields", Springer Verlag, Second Edition, 1997.
3. P P. Silvester, Ferrari, "Finite Elements for Electrical Engineers", Cambrige University Press, Third Edition, 1996.
4. M V K Chari, P P Silvester, " Finite Elements in Electrical and Magnetic Field problems", John Wiley, 1980.
5. S.S.Rao, "The Finite Element Method in Engineering", Elsevier, 2011.
6. J.N.Reddy, "An Introduction to the Finite Element Method", McGraw Hill International Editions, Third illustrated edition, 2006.

PTEE8007 DATA STRUCTURES AND ALGORITHMS **L T P C 3 0 0 3**

OBJECTIVES

- To provide an introduction to computer algorithms and data structures, with an emphasis on foundational material.
- To have a good understanding of the fundamental data structures used in computer science
- To have a good understanding of how several fundamental algorithms work, particularly those concerned with sorting, searching and graph manipulation
- To analyze the space and time efficiency of most algorithms
- To design new algorithms or modify existing ones for new applications and reason about the efficiency of the result

UNIT I INTRODUCTION AND BASIC DATA STRUCTURES **9**

Problem solving techniques and examples-Abstract Data Type (ADT)-The list ADT Arrays-Stacks and Queues: Implementation and Application

UNIT II ADVANCED DATA STRUCTURES **9**

Trees: Preliminaries-Binary Tree- Tree traversals-Binary search Trees-AVL Trees

UNIT III SORTING AND HASHING **9**

Sorting by Selection- Sorting by Insertion- Sorting by Exchange- Sorting by Diminishing Increment- Heap Sort- Heaps Maintaining the Heap Property-Building a Heap- Heap sort Algorithm-Quick sort- Description-Performance of quick sort-Analysis of Quick Sort. Hashing - General idea-Hash functions-Separate Chaining-Open Addressing-Rehashing-Extendible Hashing

UNIT IV ALGORITHM DESIGN TECHNIQUES 9

The role of algorithms in computing-Getting Started-Growth of functions. Divide and conquer-dynamic programming-Greedy Algorithm – Backtracking.

UNIT V GRAPHS ALGORITHMS 9

Elementary Graph Algorithms-Minimum Spanning Trees-Single-source shortest paths-All pairs shortest paths

TOTAL:45 PERIODS

OUTCOMES:

- Fundamentals of data structures and algorithms are studied.
- Features of various algorithms for different applications are studied.

TEXT BOOKS

1. M A Weiss," Data Structures and Algorithm Analysis in C++",3rd Edition, Pearson Education,2007.
2. Thomas H Cormen, Charles E Leiserson and Ronald L Rivest," Introduction to Algorithms", 2nd Edition, prentice Hall of India, 2002

REFERENCES

1. R G Dromey,"How to solve it by computers", Pearson Education Asia, 2005.
2. Robert L Kruse, Clovis L Tando and Bruce P Leung,"Data structures and Program Design in C",2nd Edition, Prentice Hall of India.
3. Jean Paul Trembley, Paul G Sorenson, "An Introduction to Data Structures with Applications", 2nd Edition, Tata McGraw Hill, 2007.

PTEE8008 EHV POWER TRANSMISSION L T P C
3 0 0 3

OBJECTIVES

- To impart knowledge on EHV AC, HVDC and FACTS transmission trends with parameter calculations and study on the effect of EHV lines on living organisms

UNIT I TRANSMISSION LINE TRENDS 9

Standard transmission voltages, average values of line parameters – Power handling capacity and line losses - number of lines.

UNIT II LINE AND GROUND PARAMETERS 9

Resistance, Temperature rise and current carrying capacity of conductors. Properties of Bundle conductors – Calculation of L and C parameters – Modes of propagation – Effect of Earth.

UNIT III HIGH VOLTAGE DIRECT CURRENT (HVDC) 9

HVDC system – Principle of operation, control and design consideration, HVDC circuit breaking.

UNIT IV FACTS 9

Basic concepts – Reactive power control, uncompensated transmission line, series compensation, SVC, thyristor control, series capacitor, static synchronous compensator, unified power flow controller and applications.

UNIT V ELECTROSTATIC AND MAGNETIC FIELDS OF EHV LINES 9

Electric shock – threshold currents – Calculation of electrostatic fields and magnetic fields of AC and DC lines – Effect of fields on living organism – Electrical field measurement.

TOTAL : 45 PERIODS

OUTCOMES:

- Expose to the components of electrostatic and magnetic field effects of EHV lines.

TEXT BOOKS

1. S Kamakshaiah & V Kamaraju "HVDC Transmission", Tata Mcgraw Hilll Publishers, 2011
2. Rakosh Das Begamudre " Extra high voltage AC transmission Engineering", New Age International Publishers, Third Edition, 2006.
3. Narain G Hingorani " Understanding FACTS" Standard Publishers, 1994.
4. P.Kundur " Power System stability and control", Tata Mcgraw Hilll Publishers, 1994.

REFERENCES

1. C.L. Wadhwa " Electrical Power Systems", New Age International Publishers, Fourth Edition, 2005.
2. K.R. Padiyar, " HVDC Power Transmission System". New Age International Publishers, First Edition, Reprint 2005.
3. M.L. Soni, P.V. Gupta, U.S. Bhatnagar, A.Chakrabarti, " A Text Book on Power System Engineering", Dhanpat Rai & Co., 1998.
4. Mafen Abdel – Salam, Hussein Anis, Ahdab E-Moshedy, Roshdy Padwan " High Voltage Engienering – Theory & Practice", Marcel Dekker Inc., 2000.

PTEE8009 EMBEDDED AUTOMATION SYSTEMS L T P C

3 0 0 3

OBJECTIVES

- To introduce different types of sensors used extensively in industrial and home, vehicle automation
- To understand the basic scheme for interfacing sensing and actuating component
- To focus on scope for embedded based secured environment for industrial and home automation

UNIT I INTRODUCTION TO SENSORS AND ACTUATORS 9

Sensor electronics and techniques - Overview of sensor measurements - Sensor linearization and characterization - Sensor classification - Pressure, position, temperature, humidity, speed, acceleration, oxygen, torque, light, distance and level- Different fire sensors, smoke detectors and their types. CO and CO2 sensors - Principles of stepper motors, Relays , solenoids , Hydraulic and pneumatic devices. Sensor and actuator circuit interface for microcontrollers and their programming

UNIT II AUTOMOTIVE SYSTEM AND CONTROL 9

Basics of engine control system – Electronic Fuel Control System – Electronic ignition system – sensors and actuators for automotive systems - .Air flow rate sensor – angular position sensor – engine speed sensor – Hall Effect position sensor – optical crank shaft sensor – throttle angle sensor – sensor for feedback control – automotive engine control actuators

UNIT III AUTOMOTIVE INSTRUMENTATION 9

Microcomputer based instrumentation system – advantages – signal conversion – multiplexing - sampling – Measurement of fuel, coolant temperature, oil pressure, speed – Display devices – onboard diagnostics

UNIT IV BUILDING AUTOMATION 9

RFID enabled access control with components like active, passive cards, Controllers, Antennas - Design considerations for the Fire and Alarm system. Concept of IP enabled Fire& Alarm system-Concept of energy management system, occupancy sensors, fans & lighting controller

UNIT V ADVANCED INSTRUMENTS AND STANDARDS 9

Basic concepts of waveform measuring instruments- analyzing recorders –advanced digital oscilloscope –Basics of virtual instrumentation-Digital field testers - test and calibration standards –traceability-EMI/EMC

TOTAL: 45 PERIODS

OUTCOMES:

- Able to design an efficient embedded automation system.

TEXT BOOKS

1. E Q Doebelin, Measurement Systems, Application and Design, 4th edition, McGraw-Hill, 2011
2. William B. Ribbens, Understanding Automotive Electronics, 6th edition, YES DEE Publishing Private Limited, 2011

REFERENCES

1. Ronald k. Jurgen, Automotive Electronics Handbook, 2nd edition, McGraw-Hill, 2007
2. Anto Budiardjo,'Building Automation Beyond the Simple Web Server',Clasma Events, Inc.
3. Barney Capehart,'WebBased Enterprise Energy and Building Automation Systems'C.E.M, Editor
4. Jim Sinopoli,' Smart Buildings', Fairmont Press (March 8, 2007)
5. Uwe Kiencke, Lars Nielsen, "Automotive Control Systems: For Engine, Driveline, and Vehicle", Springer; First edition, 2000.
6. Ting – pat so, Albert, Wail ok chan, "Intelligent Building Systems", Springer, 1999.
7. James Sinopoli, "Smart Building Systems for architected, owners and Builders", Elsevier, 2010.

PTEE8010 EMBEDDED SYSTEM DESIGN

L T P C
3 0 0 3

OBJECTIVES

To provide a clear understanding on the basic concepts of embedded system design and its applications to various fields :

- Building Blocks of Embedded System
- Introduction to Embedded software Tools
- Bus Communication protocol, Input/output interfacing.
- Various scheduling algorithms for process.
- Basics of Real time operating system.
- Demo with example tutorials to discuss on one real-time operating system tool

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS 9

Introduction to Embedded Systems – The build process for embedded systems- Structural units for a Embedded microcontroller , selection of processor & memory devices- DMA – Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock-- IDE, assembler, compiler, linker, simulator, debugger, Incircuit emulator,Target Hardware Debugging, Boundary Scan

UNIT II EMBEDDED NETWORKING 9

Embedded Networking: Introduction,I/O Device Ports & Buses– Serial Bus communication protocols -RS232 standard – RS485 – CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I^2C) – PC Parallel port communication- ISA, PCI

UNIT III INTERRUPTS SERVICE MECHANISM AND DEVICE DRIVERS 9

Programmed-I/O busy-wait approach without interrupt service mechanism-ISR concept-interrupt sources – multiple interrupts – context and periods for context switching, interrupt latency and deadline – Introduction to Device Drivers

UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN 9

Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task communication-shared memory, message passing-, Interprocess Communication – synchronization between processes-semaphores, Mailbox,pipes, priority inversion, priority inheritance, comparison of Real time Operating systems: VxWorks, чC/OS-II, RT Linux

UNIT V EMBEDDED SYSTEM APPLICATION WITH DEVELOPMENT 9

Case Study : Washing Machine- Automotive Application- RFID- System, Application, RFIDTag, Reader-Embedded Product Development Life Cycle, Objective, Need, and different Phases & Modelling of the EDLC

TOTAL:45 PERIODS

OUTCOMES:

- Able to understand the hardware and software required to design the embedded system

TEXT BOOKS

1. Rajkamal, ‘Embedded system-Architecture, Programming, Design’, TMH,2011.
2. Peckol, “Embedded system Design”,JohnWiley&Sons,2010

REFERENCES

1. Shibu.K.V, “Introduction to Embedded Systems”, TataMcgraw Hill,2009
2. Tammy Noergaard, “Embedded Systems Architecture”, Elsevier, 2006

3. Rajib Mall “Real-Time systems Theory and Practice” Pearson Education, 2007
4. Han-Way Huang, ”Embedded system Design using C8051”, Cengage Learning,2009

PTEE8011 FLEXIBLE AC TRANSMISSION SYSTEMS LT P C
3 0 0 3

OBJECTIVES

- To expose the students to the start-of-art of the power system
- To analyze the performance of power systems with FACTS controllers.
- To model FACTS controllers for load flow and dynamic analysis

UNIT I INTRODUCTION 9

Reactive power control in electrical power transmission lines -Uncompensated transmission line - series compensation – Basic concepts of Static Var Compensator (SVC) – Thyristor Controlled Series capacitor (TCSC) – Unified power flow controller (UPFC).

UNIT II STATIC VAR COMPENSATOR (SVC) AND APPLICATIONS 9

Voltage control by SVC – Advantages of slope in dynamic characteristics – Influence of SVC on system voltage – Design of SVC voltage regulator –Modelling of svc for power flow and transient stability – Applications: Enhancement of transient stability – Steady state power transfer – Enhancement of power system damping.

UNIT III THYRISTOR CONTROLLED SERIES CAPACITOR (TCSC) AND APPLICATIONS 9

Operation of the TCSC – Different modes of operation – Modelling of TCSC – Variable reactance model – Modelling for Power Flow and stability studies. Applications: Improvement of the system stability limit – Enhancement of system damping.

UNIT IV VOLTAGE SOURCE CONVERTER BASED FACTS CONTROLLERS 9

Static Synchronous Compensator (STATCOM) – Principle of operation – V-I Characteristics. Applications: Steady state power transfer-Enhancement of transient stability - Prevention of voltage instability. SSSC-operation of SSSC and the control of power flow –Modelling of SSSC in load flow and transient stability studies.

UNIT V CO-ORDINATION OF FACTS CONTROLLERS 9

Controller interactions – SVC – SVC interaction – Co-ordination of multiple controllers using linear control techniques – Control coordination using genetic algorithms.

TOTAL : 45 PERIODS

OUTCOMES:

- Able to understand, analyse and develop analytical model of FACTS controller for power system application.

TEXT BOOKS

1. R.Mohan Mathur, Rajiv K.Varma, “Thyristor – Based Facts Controllers for Electrical Transmission Systems”, IEEE press and John Wiley & Sons, Inc, 2002.
2. Narain G. Hingorani, “Understanding FACTS -Concepts and Technology of Flexible AC Transmission Systems”, Standard Publishers Distributors, Delhi- 110 006, 2011.

REFERENCES

1. K.R.Padiyar,” FACTS Controllers in Power Transmission and Distribution”, New Age International(P) Limited, Publishers, New Delhi, 2008
2. A.T.John, “Flexible A.C. Transmission Systems”, Institution of Electrical and Electronic Engineers (IEEE), 1999.
3. V.K.Sood,HVDC and FACTS controllers – Applications of Static Converters in Power System, APRIL 2004 , Kluwer Academic Publishers, 2004.

PTEE8012 **FUNDAMENTALS OF COMPUTER ARCHITECTURE** **L T P C**

3 0 0 3

OBJECTIVES

To understand the basic concepts and organization of Computers

- To understand the basic concepts and organization of Computers.
- Introduce the CPU architecture and micro programming
- Concepts and importance of parallelism
- Significances of Memory management and Mapping.

UNIT I BASIC STRUCTURE OF COMPUTERS **9**

Functional units – Basic operational concepts – Bus structures – Performance and Metrics – Instruction and instruction sequencing – hardware – software interface – addressing modes – instruction set – RISC – CISC – ALU design – fixed point and floating point operation

UNIT II CONTROL AND CENTRAL PROCESSING UNIT **9**

Micro programmed control – Control memory, address sequencing, micro program example, and design of control unit. Central processing unit – general register organization, stack organization, instruction formats, addressing modes, data transfer and manipulation, program control, reduced instruction set computer

UNIT III COMPUTER ARITHMETIC, PIPELINE AND VECTOR PROCESSING **9**

Computer arithmetic – addition and subtraction, multiplication algorithms, division algorithms, floating point arithmetic operations decimal arithmetic unit, decimal arithmetic operations. Pipeline and vector processing – Parallel processing, pipelining, arithmetic pipeline, instruction pipeline, vector processing array processors

UNIT IV INPUT OUTPUT ORGANIZATION **9**

Input output organization: peripheral devices, input output interface, asynchronous data transfer ,modes of transfer, priority interrupt, direct memory access, input output interface, serial communication

UNIT V MEMORY ORGANIZATION **9**

Memory organization – memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory, memory management hardware

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand the architecture and various components of computer hardware system.

TEXT BOOKS

1. Morris Mano, ‘Computer system architecture’, 3rd edition, Pearson education 2007
2. William Stallings ,’ Computer Organization and architecture’, 7th edition Pearson Education 2011

REFERENCES

1. Behrooz Parhami, ‘Computer Architecture’, Oxford University Press, 2005.
2. Vincent P. Heuring and Harry F. Jordan, ‘ Computer systems design and architecture’, Pearson Education Asia Publications, 2004.

PTEE8013 FUNDAMENTALS OF OBJECT ORIENTED PROGRAMMING **L T P C**

3 0 0 3

OBJECTIVES

To Introduce the concept of Object Oriented Programming and C++.

- Familiar with the concepts of Object Oriented Programming.
- Able to appreciate the features of C++ programming Language.
- Having a thorough understanding about Classes and Objects.
- Able to develop programs in C++

UNIT I INTRODUCTION TO OBJECT-ORIENTED PROGRAMMING AND C++ **10**

Procedure-Oriented Programming System – Object-Oriented Programming System – Comparison of C++ with C – Object-Oriented Terms and Concepts – Object-Oriented Languages – Differences between Procedural and Object-Oriented Programming – Merits and Demerits of Object-Oriented Methodology. Structure of a C++ Program – Data Types – Operators in C++ - Control Structures – Functions in C++

UNIT II CLASSES AND OBJECTS **8**

Introduction to Classes and objects – Member Functions and Member Data – Objects and Functions – Objects and Arrays – Name Spaces – Nested Classes – Dynamic Memory Allocation and Deallocation – Constructors and Destructors

UNIT III INHERITANCE AND POLYMORPHISM **9**

Introduction – Base Class and Derived Class Pointers – Function Overriding – Base Class Initialization – Protected Access Specifier – Deriving by Different Accessing specifiers – Different Kinds of Inheritance – Order of Invocation of Constructors and Destructors – Virtual Functions – Mechanism of Virtual Functions – Pure Virtual Functions – Virtual Destructors and Constructors

UNIT IV OPERATOR OVERLOADING, TEMPLATES **9**

Operator Overloading – Overloading various Operators – Type Conversion – New Style Casts and the typed Operator – Function Templates – Class Templates – The Standard Template Library (STL)

UNIT V EXCEPTION HANDLING AND CASE STUDIES **9**

Introduction – C-Style Handling of Error-generating Code – C++-Style Solution-the try/throw/catch Construct – Limitations of Exception Handling. Case Studies: String Manipulations – Building classes for matrix operations

TOTAL:45 PERIODS

OUTCOMES:

- Ability to develop the object oriented programs for simple projects

TEXT BOOKS

1. Sourav Sahay, “Object Oriented Programming with C++”, Oxford University Press, 2006.
2. Deittel and Deittel, “C++ - How to Program”, 2nd Edition, Prentice Hall of India.
3. Balagurusamy E., “Object Oriented Programming with C++”, 3rd Edition, Tata McGraw Hill, 2007

REFERENCES

1. K U Subhash, “ Object Oriented Programming with C++”, Pearson, 2010.
2. Bhushan Trivedi, “Programming with ANSI C++”, Oxford University Press, 2007.

3. Ira Pohl, “Object Oriented Programming using C++”, Pearson Education, 2nd Edition, 2003
4. John P. Hayes , ‘ Computer Architecture and Organization’, Tata McGraw-Hill, 1988.
5. Andrew S Tannenbaum ‘ Structured Computer Organization ‘, 5th edition Pearson Education 2007

PTEE8014	HIGH VOLTAGE DIRECT CURRENT TRANSMISSION	L T P C 3 0 0 3

OBJECTIVES

To understand the concept, planning of DC power transmission and comparison with AC power transmission.

- To analyze HVDC converters.
- To study about the HVDC system control.
- To analyze harmonics and design of filters.
- To model and analysis the DC system under study state.

UNIT I INTRODUCTION 9

DC Power transmission technology – Comparison of AC and DC transmission – Application of DC transmission – Description of DC transmission system – Planning for HVDC transmission – Modern trends in HVDC technology – DC breakers – Operating problems – HVDC transmission based on VSC – Types and applications of MTDC systems

UNIT II ANALYSIS OF HVDC CONVERTERS 9

Line commutated converter - Analysis of Graetz circuit with and without overlap - Pulse number – Choice of converter configuration – Converter bridge characteristics – Analysis of a 12 pulse converters – Analysis of VSC topologies and firing schemes

UNIT III CONVERTER AND HVDC SYSTEM CONTROL 9

Principles of DC link control – Converter control characteristics – System control hierarchy – Firing angle control – Current and extinction angle control – Starting and stopping of DC link – Power control – Higher level controllers – Control of VSC based HVDC link

UNIT IV REACTIVE POWER AND HARMONICS CONTROL 9

Reactive power requirements in steady state – Sources of reactive power – SVC and STATCOM – Generation of harmonics – Design of AC and DC filters – Active filters

UNIT V POWER FLOW ANALYSIS IN AC/DC SYSTEMS 9

Per unit system for DC quantities – DC system model – Inclusion of constraints – power flow analysis – case study

TOTAL: 45 PERIODS

OUTCOMES:

- Basic principles and types of HVDC system are studied.
- Features of converters used in HVDC system are studied.
- Concepts and reactive power management, harmonics and power flow analysis are studied.

TEXT BOOKS

1. Padiyar, K. R., “HVDC power transmission system”, New Age International (P) Ltd., New Delhi, Second Edition, 2010.
2. Edward Wilson Kimbark, “Direct Current Transmission”, Vol. I, Wiley interscience, New York, London, Sydney, 1971.

REFERENCES
1. Kundur P., “Power System Stability and Control”, McGraw-Hill, 1993.
2. Colin Adamson and Hingorani N G, “High Voltage Direct Current Power Transmission”, Garraway Limited, London, 1960.
3. Arrillaga, J., “High Voltage Direct Current Transmission”, Peter Pregrinus, London, 1983.

PTEE8015 INDUSTRIAL POWER SYSTEM ANALYSIS AND DESIGN L T P C
3 0 0 3

OBJECTIVES
- To know the Industrial power quality standards
- To know mitigation techniques for harmonics and flicker problem

UNIT I MOTOR STARTING STUDIES 9
Introduction-Evaluation Criteria-Starting Methods-System Data-Voltage Drop Calculations-Calculation of Acceleration time-Motor Starting with LimitedCapacity Generators-Computer-Aided Analysis.

UNIT II POWER FACTOR CORRECTION STUDIES 9
Introduction-System Description and Modeling-Acceptance Criteria-Frequency Scan Analysis-Voltage Magnification Analysis-Sustained Overvoltages-Switching Surge Analysis-Back-to-Back Switching.

UNIT III HARMONIC ANALYSIS 9
Harmonic Sources-System Response to Harmonics-System Model for Computer-Aided Analysis-Acceptance Criteria-Harmonic Filters-Harmonic Evaluation-Case Study.

UNIT IV FLICKER ANALYSIS 9
Sources of Flicker-Flicker Analysis-Flicker Criteria-Data for Flicker analysis- Case Study-Arc Furnace Load-Minimizing the Flicker Effects.

UNIT V GROUND GRID ANALYSIS 9
Introduction-Acceptance Criteria-Ground Grid Calculations-Computer-Aided Analysis - Improving the Performance of the Grounding Grids-Conclusions.

TOTAL : 45 PERIODS

OUTCOMES:
- Different standards of power quality are studied.
- Features of different PF correction studies, harmonic analysis and flicker analysis and grid analysis are studied.

TEXT BOOKS
1. Ramasamy Natarajan, ”Computer-Aided Power System Analysis”, Marcel Dekker Inc., 2002.
2. Sen, S.K. “ Principles of Electrical machine Designs with Computer Programmes.” Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1987

REFERENCES
1. A.Shanmugasundara, G. Gangadharan, R. Palani “ Electrical machine Design Date Book’” New Age International Pvt. Ltd., Reprint 2007.
2. Balbir Singh “Electrical Machine Design” Brite Publications, Pune, 1981.

PTEE8017 MEDICAL INSTRUMENTATION L T P C
3 0 0 3

OBJECTIVES:

- To Introduce Fundamentals of Biomedical Engineering
- To study the communication mechanics in a biomedical system with few examples
- To study measurement of certain important electrical and non-electrical parameters
- To understand the basic principles in imaging techniques
- To have a basic knowledge in life assisting and therapeutic devices

UNIT I FUNDAMENTALS OF BIOMEDICAL ENGINEERING 9

Cell and its structure – Resting and Action Potential – Nervous system and its fundamentals - Basic components of a biomedical system- Cardiovascular systems- Respiratory systems - Kidney and blood flow - Biomechanics of bone - Biomechanics of soft tissues - Basic mechanics of spinal column and limbs - Physiological signals and transducers - Transducers – selection criteria – Piezo electric, ultrasonic transducers - Temperature measurements - Fibre optic temperature sensors.

UNIT II NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES 9

Measurement of blood pressure - Cardiac output - Heart rate - Heart sound - Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas analysers, pH of blood –measurement of blood pCO2, pO2, finger-tip oxymeter - ESR, GSR measurements .

UNIT III ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS 9

Electrodes – Limb electrodes –floating electrodes – pregelled disposable electrodes - Micro, needle and surface electrodes – Amplifiers, Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier - ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms - Electrical safety in medical environment, shock hazards – leakage current-Instruments for checking safety parameters of biomedical equipments.

UNIT IV IMAGING MODALITIES AND ANALYSIS 9

Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography –Different types of biotelemetry systems - Retinal Imaging - Imaging application in Biometric systems - Analysis of digital images

UNIT V LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES 9

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dialysers – Lithotripsy - ICCU patient monitoring system - Nano Robots - Robotic surgery – Advanced 3D surgical techniques- Orthopedic prostheses fixation

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand and analyze instrumentation systems and their applications to various industries.

TEXT BOOKS:

1. Leslie Cromwell, Biomedical Instrumentation and Measurement, Prentice hall of India, New Delhi, 2007.
2. Ed. Joseph D. Bronzino, The Biomedical Engineering HandBook, Second Edition, Boca Raton, CRC Press LLC, 2000

REFERENCES

1. John G. Webster, Medical Instrumentation Application and Design, John Wiley and sons, New York, 1998.
2. Khandpur R.S, Handbook of Biomedical Instrumentation, Tata McGraw-Hill, New Delhi, 1997.
3. Joseph J.carr and John M. Brown, Introduction to Biomedical Equipment Technology, John Wiley and sons, New York, 1997.
4. Khandpur R S, Handbook of Medical Instrumentation, Tata Mc Graw Hill.
5. Duane Knudson, Fundamentals of Biomechanics, Springer, 2003.
6. Suh, Sang, Gurupur, Varadraj P., Tanik, Murat M., Health Care Systems, Technology and Techniques, Springer, 1st Edition, 2011.

PTEE8018 MICRO ELECTRO MECHANICAL SYSTEMS L T P C
3 0 0 3

OBJECTIVES

- To provide the introduction to the MEMS technology
- To study the different MEMS materials and their properties
- To study the different fabrication process used in MEMS technology.
- To introduce the fundamental working principles of different sensors and actuators.

UNIT I INTRODUCTION 9

Intrinsic Characteristics of MEMS – Energy Domains and Transducers- Sensors and Actuators – Introduction to Micro fabrication - Silicon based MEMS processes – MEMS Materials – Review of Electrical and Mechanical concepts in MEMS – Stress and strain analysis – Flexural beam bending- Torsional deflection.

UNIT II SENSORS AND ACTUATORS - I 9

Electrostatic sensors – Parallel plate capacitors – Applications – Micro motors -Interdigitated Finger capacitor – Comb drive devices – Thermal Sensing and Actuation – Thermal expansion – Thermal couples – Thermal resistors – Applications – Magnetic Actuators – Micromagnetic components – Case studies of MEMS in magnetic actuators.

UNIT III SENSORS AND ACTUATORS - II 9

Piezoresistive sensors – Piezoresistive sensor materials - Stress analysis of mechanical elements – Applications to Inertia, Pressure, Tactile and Flow sensors – Piezoelectric

sensors and actuators – piezoelectric effects – piezoelectric materials – Applications to Inertia , Acoustic, Tactile and Flow sensors.

UNIT IV MICROMACHINING 9

Bulk Micromachining, Surface micromachining and LIGA processes.

UNIT V APPLICATIONS 9

Application to Acceleration, Pressure, Flow, Chemical, Inertial sensors - Optical MEMS – Bio MEMS – RF MEMS – Energy Harvesting.

TOTAL : 45 PERIODS

OUTCOMES:

- Able to design and analyse the performance of MEMS devices.
- Able to identify the right MEMS device against the applications.

TEXT BOOKS.

1. Chang Liu, “Foundations of MEMS”, Pearson Education Inc., 2006.
2. Stephen D Senturia, “Microsystem Design”, Springer International Edition, 2006.
3. Tai Ran Hsu, “MEMS and Micro systems Design and Manufacture” Tata McGraw Hill, New Delhi, 2006.

REFERENCES

1. Marc Madou, “Fundamentals of Microfabrication”, CRC press, **2002**.
2. Gregory T. Kovacs “Micromachined Transducers Source Book”, McGraw-Hill High Education, 1998.
3. M.H.Bao, “Micromechanical Transducers: Pressure sensors, Accelerometers and Gyroscopes”, Elsevier, Newyork, 2000.

PTEE8019 NANO TECHNOLOGY L T P C
3 0 0 3

OBJECTIVES

- To provide the concept and knowledge of Nanoscience and Nanotechnology.
- To know about preparation methods and nanofabrication techniques.
- To create awareness of clean room environment & societal implications of Nanotechnology
- To know about the different characterization techniques used for nano systems

UNIT I INTRODUCTION 10

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of bulk nanostructured materials- nano particles- quantum dots, nanowires-ultra-thin films-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties

UNIT II PREPARARTION ROUTES AND LITHOGRAPHY FOR NANOSCALE DEVICES 10

Preparation of nanoscale materials:precipitation,mechanical milling, colloidal routes, self assembly;vapour phase deposition, CVD,sputtering,evaporation,molecular beam epitaxy,atomic layer epitaxy, lithography:optical/UV,electron beam and x-ray lithography, systems and processes, wet etching, dry etching

UNIT III PREPARATION ENVIRONMENTS 5

Clean rooms: specifications and design, air and water purity, requirements for particular Processes, Vibration free environments: Services and facilities required. Working practices, sample cleaning, Chemical purification, chemical and biological Contamination, Safety issues, flammable and toxic hazards, biohazards, implication of Nanoscience and Nanotechnology on society.

UNIT IV CHARECTERISATION TECHNIQUES 10

X-ray and Neutron diffraction technique, Scanning Electron Microscopy plus environemental techniques,Transmission Electron Microscopy including high-resolution imaging, analytical electron microscopy. EDX and EELS. Surface Analysis techniques. XPS,SIMS,Auger

UNIT V EVOLVING INTERFACES OF NANO 10

Applications of nanotechnology: NEMS-nanosensor-nanomedicines-nanotechnology Applications to electrical engineering-nanoelectronics:quantum transport devices, molecular electronics devices, quantum computing ,memory, CNT and its applications, nanomotor, nanorobot,energy efficient battery technology, lighting system, solar cell.

TOTAL:45 PERIODS

OUTCOMES:

- To understand unique properties of nano material structure and apply them for Electrical and Electronics Engineering.

TEXT BOOKS

1. Chattopadhyay K.K and A.N Banerjee, Introduction to Nanoscience and nanotechnology, PHI, 2009
2. T.Pradeep Nano the Essentials Tata-McGraw hill education,2007

REFERENCES

1. G Timp (Editor), Nanotechnology, AIP press/Springer, 1999.
2. Charles P.poole&frank J.owens,Introduction to nanotechnology ,willey india.
3. Jan korwink and andreas greiner, semiconductors for micro and nanotechnology:an introduction for engineers,weinheim Cambridge: wiley-VCH,2001.
4. Rainer wager(ed),nanoelectronics and information technology,second edition,wiley-VCH
5. N john Dinardo, nanoscale characterization of surfaces and interfaces,second edition, weinheim Cambridge: wiley-VCH,2000

PTEE8020 OPERATIONS RESEARCH L T P C
3 0 0 3

OBJECTIVE

- To learn the basics of optimization techniques and their applications to Electrical Engineering

UNIT I LINEAR PROGRAMMING 9

Introduction - formulation of linear programming model - Graphical solution – solving LPP using simplex algorithm – Revised Simplex Method

UNIT II ADVANCES IN LPP 9

Duality theory - Dual simplex method - Sensitivity analysis –- Transportation problems – Assignment problems- Traveling sales man problem -Data Envelopment Analysis

UNIT III NON LINEAR PROGRAMMING 9

Classification of Non Linear programming – Lagrange multiplier method – Karush – Kuhn Tucker conditions – Reduced gradient algorithms – Quadratic programming method – Penalty and Barrier method.

UNIT IV INTERIOR POINT METHODS 9

Karmarkar's algorithm – Projection Scaling method –Dual affine algorithm – Primal affine algorithm Barrier algorithm.

UNIT V DYNAMIC PROGRAMMING 9

Formulation of Multistage decision problem – Characteristics – Concept of sub-optimization and the principle of optimality – Formulation of Dynamic programming – Backward and Forward recursion – Computational procedure – Conversion of final value problem into Initial value problem.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand and apply the optimization technique for electrical engineering applications.

TEXT BOOKS

1. Hillier and Lieberman "Introduction to Operations Research", TMH, 2000
2. R.Panneerselvam, "Operations Research", PHI, 2006

REFERENCES

1. Philips, Ravindran and Solberg, "Operations Research", John Wiley, 2002.
2. Hamdy A Taha, "Operations Research – An Introduction", Prentice Hall India, 2003.
3. Ronald L.Rardin, "Optimization in Operation Research" Pearson Education Pvt. Ltd. New Delhi, 2005.

PTEE8021 POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS LT P C
3 0 0 3

OBJECTIVES

- To study the features of different elements used in renewable energy conversion.
- To study the hybrid operation of wind and PV systems.
- To study the features of MPPT tracking.

UNIT I INTRODUCTION 9

Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems.

UNIT II ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION 9

Review of reference theory fundamentals-principle of operation and analysis: IG, PMSG, SCIG and DFIG.

UNIT III POWER CONVERTERS 9

Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection of inverter, battery sizing, array sizing

Wind: Three phase AC voltage controllers- AC-DC-AC converters: uncontrolled rectifiers, PWM Inverters, Grid Interactive Inverters-matrix converters.

UNIT IV ANALYSIS OF WIND AND PV SYSTEMS 9

Stand alone operation of fixed and variable speed wind energy conversion systems and solar system-Grid connection Issues -Grid integrated PMSG and SCIG Based WECS grid Integrated solar system

UNIT V HYBRID RENEWABLE ENERGY SYSTEMS 9

Need for Hybrid Systems- Range and type of Hybrid systems- Case studies of Wind-PV Maximum Power Point Tracking (MPPT).

TOTAL : 45 PERIODS

OUTCOMES:

- Features of renewable energy sources are studied.
- Features of electrical machines and converters used in renewable energy conversion are studied.
- Wind and PV systems are analysed and its hybrid operation is successfully studied.

TEXT BOOK:

1. S. N. Bhadra, D.Kastha, S.Banerjee, “Wind Electrical Systems”, Oxford University Press 2005.

REFERENCES:

1. Rashid .M. H “power electronics Hand book”, Academic press, 2001.
2. Ion Boldea, “Variable speed generators”, Taylor & Francis group, 2006.
3. Rai. G.D, “Non conventional energy sources”, Khanna publishes, 1993.
4. Gray, L. Johnson, “Wind energy system”, prentice hall linc, 1995.
5. Non-conventional Energy sources B.H.Khan Tata McGraw-hill Publishing Company, New Delhi.

PTEE8022 **POWER QUALITY** **L T P C**
3 0 0 3

OBJECTIVES

- To study the production of voltages sags, over voltages and harmonics and methods of control.
- To study various methods of power quality monitoring.

UNIT I INTRODUCTION TO POWER QUALITY 9

Terms and definitions – Overloading, under voltage, over voltage - Concepts of transients - Short duration variations such as interruption - Long duration variation such as sustained interruption - Sags and swells - Voltage sag - Voltage swell - Voltage imbalance - Voltage fluctuation - Power frequency variations - International standards of power quality - Computer Business Equipment Manufacturers Associations (CBEMA) curve

UNIT II VOLTAGE SAGS AND INTERRUPTIONS 9

Sources of sags and interruptions - Estimating voltage sag performance - Thevenin's equivalent source - Analysis and calculation of various faulted condition - Voltage sag due to induction motor starting - Estimation of the sag severity - Mitigation of voltage sags, active series compensators - Static transfer switches and fast transfer switches

UNIT III OVERVOLTAGES 9

Sources of over voltages - Capacitor switching – Lightning - Ferro resonance - Mitigation of voltage swells - Surge arresters - Low pass filters - Power conditioners - Lightning protection – Shielding - Line arresters - Protection of transformers and cables - An introduction to computer analysis tools for transients, PSCAD and EMTP

UNIT IV HARMONICS 9

Harmonic sources from commercial and industrial loads - Locating harmonic sources - Power system response characteristics - Harmonics Vs transients. Effect of harmonics - Harmonic distortion - Voltage and current distortion - Harmonic indices - Inter harmonics – Resonance - Harmonic distortion evaluation - Devices for controlling harmonic distortion - Passive and active filters - IEEE and IEC standards

UNIT V POWER QUALITY MONITORING 9

Monitoring considerations - Monitoring and diagnostic techniques for various power quality problems - Modeling of power quality (harmonics and voltage sag) problems by mathematical simulation tools - Power line disturbance analyzer – Quality measurement equipment - Harmonic / spectrum analyzer - Flicker meters - Disturbance analyzer - Applications of expert systems for power quality monitoring

TOTAL: 45PERIODS

OUTCOMES:

- Basics of power quality are studied.
- Concepts of sag and swell and harmonics are studied.
- Monitoring parameters of power quality using simulation and hardware are obtained.

TEXT BOOKS

1. Roger. C. Dugan, Mark. F. McGranagham, Surya Santoso, H.Wayne Beaty, "Electrical Power Systems Quality", McGraw Hill,2003.(Chapters1,2,3, 4 and 5)
2. J. Arrillaga, N.R. Watson, S. Chen, "Power System Quality Assessment", (New York: Wiley, 1999). (For Chapters 1, 2, 3, 4 and 5)

REFERENCES

1. G.T. Heydt, “Electric Power Quality”, 2nd Edition. (West Lafayette, IN, Stars in a Circle Publications, 1994). (Chapter 1, 2, 3 and 5)
2. M.H.J Bollen, “Understanding Power Quality Problems: Voltage Sags and Interruptions”, (New York: IEEE Press, 1999). (For Chapters 1, 2, 3 and 5)
3. PSCAD User Manual.

PTEE8023 RESTRUCTURED POWER SYSTEMS L T P C
3 0 0 3

OBJECTIVES

- To expose the students to the start-of-art of the power system
- To model and analyze the power system in restructured environment
- To familiarize the methods of energy trading

UNIT I OVERVIEW OF KEY ISSUES IN ELECTRIC UTILITIES RESTRUCTURING 9

Restructuring Models: PoolCo Model, Bilateral Contracts Model, Hybrid Model - Independent System Operator (ISO): The Role of ISO - Power Exchange(PX): Market Clearing Price(MCP) - Market operations: Day-ahead and Hour-Ahead Markets, Elastic and Inelastic Markets - Market Power - Stranded costs - Transmission Pricing: Contract Path Method, The MW-Mile Method - Congestion Pricing: Congestion Pricing Methods, Transmission Rights - Management of Inter -Zonal/Intra Zonal Congestion: Solution procedure, Formulation of Inter - Zonal Congestion Sub problem, Formulation of Intra - Zonal Congestion Sub problem.

UNIT II ELECTRIC UTILITY MARKETS IN THE UNITED STATES 9

California Markets: ISO, Generation, Power Exchange, Scheduling Co-coordinator, UDCs, Retailers and Customers, Day-ahead and Hour-Ahead Markets, Block forwards Market, Transmission Congestion Contracts (TCCs) - New York Market: Market operations - PJM interconnection - ERCOT ISO - New England ISO – Midwest ISO: MISO’s Functions, Transmission Management, Transmission System Security, Congestion Management, Ancillary Services Coordination, Maintenance Schedule Coordination - Summary of functions of U.S. ISOs.

UNIT III OASIS: OPEN ACCESS SAME-TIME INFORMATION SYSTEM 9

FERC order 889 - Structure of OASIS: Functionality and Architecture of OASIS - Implementation of OASIS Phases: Phase 1, Phase 1-A, Phase 2 - Posting of information: Types of information available on OASIS, Information requirement of OASIS, Users of OASIS – Transfer Capability on OASIS: Definitions, Transfer Capability Issues, ATC Calculation, TTC Calculation, TRM Calculation, CBM Calculation - Transmission Services - Methodologies to Calculate ATC – Experiences with OASIS in some Restructuring Models: PJM OASIS, ERCOT OASIS.

UNIT IV ELECTRIC ENERGY TRADING 9

Essence of Electric Energy Trading - Energy Trading Framework: The Qualifying factors - Derivative Instruments of Energy Trading: Forward Contracts, Futures Contracts, Options, Swaps, Applications of Derivatives in Electric Energy Trading - Portfolio Management: Effect of Positions on Risk Management - Energy Trading Hubs - Brokers in Electricity Trading - Green Power Trading.

UNIT V ELECTRICITY PRICING - VOLATILITY, RISK AND FORECASTING 9

Electricity Price Volatility: Factors in Volatility, Measuring Volatility - Electricity Price Indexes: Case Study for Volatility of Prices in California, Basis Risk - Challenges to Electricity Pricing: Pricing Models, Reliable Forward Curves - Construction of Forward Price Curves: Time frame for Price Curves, Types of Forward Price Curves – Shortterm Price Forecasting:

Factors Impacting Electricity Price, Forecasting Methods, Analyzing Forecasting Errors, Practical Data Study.

TOTAL = **45 PERIODS**

OUTCOMES

- Key issues in utilities and utility markets are studied.
- Concepts of OASIS, electricity pricing and energy marketing are studied.

TEXT BOOKS

1. K.Bhattacharaya, M.H.J.Bollen and J.E.Daader, "Operation of Restructured Power Systems", Kluwer Academic Publishers, 2001.

REFERENCES

1. Mohammad Shahidehpour and Muwaffaq Almoush, "Restructured Electrical Power Systems Operation, Trading and Volatility," Marcel Dekkar, Inc, 2001.
2. G.Zaccour, "Deregulation of Electric Utilities", Kluwer Academic Publishers 1998.
3. M.Illic, F.Galiana and L.Fink, "Power Systems Restructuring : Engineering and Economics", Kluwer Academic Publishers, 2000.
4. Editor, Loi Lei Lai, "Power System Restructuring and Deregulation: Trading, Performance and Information Technology", John Wiley and sons Ltd, 2001.

PTEE8024 SOFT COMPUTING TECHNIQUES L T P C
3 0 0 3

OBJECTIVES

- To study the basics of artificial neural network.
- To study the concepts of modeling and control of neural and fuzzy control schemes.
- To study the features of hybrid control schemes.

UNIT I ARTIFICIAL NEURAL NETWORK 9

Review of fundamentals – Biological neuron, artificial neuron, activation function, single layer perceptron – Limitation – Multi layer perceptron – Back propagation algorithm (BPA) – Recurrent neural network (RNN) – Adaptive resonance theory (ART) based network – Radial basis function network – online learning algorithms, BP through time – RTRL algorithms – Reinforcement learning.

UNIT II NEURAL NETWORKS FOR MODELING AND CONTROL 9

Modeling of non-linear systems using ANN – Generation of training data – Optimal architecture – Model validation – Control of non-linear systems using ANN – Direct and indirect neuro control schemes – Adaptive neuro controller – Familiarization with neural network toolbox

UNIT III FUZZY SET THEORY 9

Fuzzy set theory – Fuzzy sets – Operation on fuzzy sets – Scalar cardinality, fuzzy cardinality, union and intersection, complement (Yager and Sugeno), equilibrium points, aggregation, projection, composition, cylindrical extension, fuzzy relation – Fuzzy membership functions

UNIT IV FUZZY LOGIC FOR MODELING AND CONTROL 9

Modeling of non-linear systems using fuzzy models – TSK model – Fuzzy logic controller – Fuzzification – Knowledge base – Decision making logic – Defuzzification – Adaptive fuzzy systems – Familiarization with fuzzy logic toolbox

UNIT V HYBRID CONTROL SCHEMES 9

Fuzzification and rule base using ANN – Neuro fuzzy systems – ANFIS – Fuzzy neuron – Introduction to GA – Optimization of membership function and rule base using Genetic Algorithm – Introduction to support vector machine – Particle swarm optimization – Case study – Familiarization with ANFIS toolbox

TOTAL: 45 PERIODS

OUTCOMES:

- Basic concepts of ANN and its modeling and control aspects are studied.
- Different features of fuzzy logic and its control implementation are studied.
- Features of different hybrid control schemes are studied.

TEXTBOOKS

1. Laurence Fausett, “Fundamentals of Neural Networks”, Prentice Hall, Englewood Cliffs, N.J., 1992
2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, McGraw Hill Inc., 2000.

REFERENCE BOOKS

1. Goldberg, “Genetic Algorithm in Search, Optimization and Machine learning”, Addison Wesley Publishing Company Inc. 1989
2. Millon W.T., Sutton R.S. and Webrose P.J., “Neural Networks for Control”, MIT press, 1992
3. Ethem Alpaydin, “Introduction to Machine learning (Adaptive Computation and Machine Learning series)’, MIT Press, Second Edition, 2010.
4. Zhang Huaguang and Liu Derong, “Fuzzy Modeling and Fuzzy Control Series: Control Engineering”, 2006

PTEE8025 SOLID STATE DRIVES L T P C
3 0 0 3

OBJECTIVES:

- To understand steady state operation and transient dynamics of a motor load system.
- To study and analyze the operation of the converter / chopper fed dc drive, both qualitatively and quantitatively.
- To study and understand the operation and performance of AC motor drives.
- To analyze and design the current and speed controllers for a closed loop solid state DC motor drive.

UNIT I DRIVE CHARACTERISTICS 9

Electric drive – Equations governing motor load dynamics – steady state stability – multi quadrant Dynamics: acceleration, deceleration, starting & stopping – typical load torque characteristics – Selection of motor

UNIT II CONVERTER / CHOPPER FED DC MOTOR DRIVE 9

Steady state analysis of the single and three phase converter fed separately excited DC motor drive – continuous and discontinuous conduction – Time ratio and current limit control – 4 quadrant operation of converter / chopper fed drive.

UNIT III INDUCTION MOTOR DRIVES 9

Stator voltage control – energy efficient drive – v/f control – constant air gap flux – field weakening mode – voltage / current fed inverter – closed loop control.

UNIT IV SYNCHRONOUS MOTOR DRIVES 9

V/f control and self control of synchronous motor: Margin angle control and power factor control – permanent magnet synchronous motor.

UNIT V DESIGN OF CONTROLLERS FOR DRIVES 9

Transfer function for DC motor / load and converter – closed loop control with current and speed feedback – armature voltage control and field weakening mode – design of controllers; current controller and speed controller-converter selection and characteristics.

TOTAL : 45 PERIODS

OUTCOMES:

- Basic requirement of motor selection for different load profiles are studied.
- Stability aspects of drive systems are studied.
- Important features of DC and AC drives are studied.
- Controller design for DC drives is studied.

TEXT BOOKS:

1. Gopal K.Dubey, Fundamentals of Electrical Drives, Narosa Publishing House, 1992.
2. Bimal K.Bose. Modern Power Electronics and AC Drives, Pearson Education, 2002.

REFERENCES:

1. S.K.Pillai, A First course on Electrical Drives, Wiley Eastern Limited, 1993.
2. Murphy J.M.D and Turnbull, Thyristor Control of AC Motor, Pergamon Press, Oxford 1988.
3. Gopal K.Dubey, Power semiconductor controlled Drives, Prentice Hall Inc., New Jersey, 1989.
4. R.Krishnan, Electric Motor & Drives: Modeling, Analysis and Control, Prentice hall of India, 2001.

PTEE8026 SPECIAL ELECTRICAL MACHINES L T P C
3 0 0 3

OBJECTIVES:

To explore the theory and applications of special electrical machines.

- To review the fundamental concepts of permanent magnets and the operation of
- permanent magnet brushless DC motors.
- To introduce the concepts of permanent magnet brushless synchronous motors and synchronous reluctance motors.
- To develop the control methods and operating principles of switched reluctance motors.
- To introduce the concepts of stepper motors and its applications.
- To understand the basic concepts of other special machines.

UNIT I PERMANENT MAGNET BRUSHLESS DC MOTORS 9

Fundamentals of Permanent Magnets- Types- Principle of operation- Magnetic circuit analysis-EMF and Torque equations- Characteristics and control

UNIT II PERMANENT MAGNET SYNCHRONOUS MOTORS 9

Principle of operation – EMF and torque equations - Phasor diagram - Power controllers – Torque speed characteristics – Digital controllers – Constructional features, operating principle and characteristics of synch**ronous reluctance motor.**

UNIT III SWITCHED RELUCTANCE MOTORS 9

Constructional features –Principle of operation- Torque prediction –Characteristics-Power controllers – Control of SRM drive- Sensorless operation of SRM – Applications.

UNIT IV STEPPER MOTORS 9

Constructional features –Principle of operation –Types – Torque predictions – Linear and Non-linear analysis – Characteristics – Drive circuits – Closed loop control – Applications.

UNIT V OTHER SPECIAL MACHINES 9

Principle of operation and characteristics of Hysteresis motor – AC series motors – Linear motor – Applications.

TOTAL : 45 PERIODS

OUTCOMES:

- Need for special electrical machines are studied.
- Different features of special machines and converter circuits for special machines are obtained

TEXT BOOKS:

1. T.J.E. Miller, Brushless magnet and Reluctance motor drives, Claredon press, London, 1989.
2. R.Krishnan, Switched Reluctance motor drives, CRC press, 2001.
3. T.Kenjo, Stepping motors and their microprocessor controls, Oxford University press, New Delhi, 2000.

REFERENCES:

1. T.Kenjo and S.Nagamori, Permanent magnet and Brushless DC motors, Clarendon press, London, 1988.
2. R.Krishnan, Electric motor drives, Prentice hall of India, 2002.
3. D.P.Kothari and I.J.Nagrath, Electric machines, Tata Mc Graw hill publishing company, New Delhi, Third Edition, 2004.
4. Irving L.Kosow, Electric Machinery and Transformers, Pearson Education, Second Edition, 2007.

PTEE8027 VLSI DESIGN AND ARCHITECTURE L T P C

3 0 0 3

OBJECTIVES

To understand the basic concepts of VLSI and CMOS design.

- Introduce the basics of VLSI design and its importance.
- Analyse the switching Characteristics of MOS transistor.
- Study the construction of NMOS, CMOS and Bi-CMOS based logic circuits.
- To learn about the programming of Programmable device using Hardware description Language.

UNIT I BASIC MOS TRANSISTOR 9

Enhancement mode & Depletion mode – Fabrication (NMOS, PMOS, CMOS, BiCMOS) Technology – NMOS transistor current equation – second order effects – MOS Transistor Model.

UNIT II NMOS & CMOS INVERTER AND GATES 9

NMOS & CMOS inverter – Determination of pull up / pull down ratios – stick diagram – lambda based rules – super buffers – BiCMOS & steering logic

UNIT III SUB SYSTEM DESIGN & LAYOUT 9

Structured design of combinational circuits – Dynamic CMOS & clocking – Tally circuits – (NAND-NAND, NOR-NOR and AOI logic) – EXOR structure – Multiplexer structures – Barrel shifter.

UNIT IV DESIGN OF COMBINATIONAL ELEMENTS & REGULAR ARRAYLOGIC 9

Programmable Logic Devices- PLA,PAL,GAL, CPLD , FPGA–- Implementation of Finite State Machine with PLDs

UNIT V VHDL PROGRAMMING 9

RTL Design – Structural level Design -combinational logic – Types – Operators – Packages – Sequential circuit – Sub programs – Test benches. (Examples: adder, counters, flipflops, FSM, Multiplexers / Demultiplexers).

TOTAL:45 PERIODS

OUTCOMES

- Expose to HDL language and ability to design PLD devices and simple application.

TEXT BOOKS

1. D.A.Pucknell, K.Eshraghian, 'Basic VLSI Design', 3rd Edition, Prentice Hall of India, New Delhi, 2003.
2. Debprasad Das, VLSI Design, Oxford University Press, 2010.
3. Eugene D.Fabricius, 'Introduction to VLSI Design', Tata McGraw Hill, 1990.

REFERENCES

1. N.H.Weste, 'Principles of CMOS VLSI Design', Pearson Education, India, 2002.
2. Charles H.Roth, 'Fundamentals of Logic Design', Jaico Publishing House, 1992.
3. Zainalatsedin Navabi, 'VHDL Analysis and Modelling of Digital Systems', 2n Edition, Tata McGraw Hill, 1998.
4. Douglas Perry, 'VHDL Programming By Example', Tata McGraw Hill, 3rdEdition.2007.
5. Parag K.Lala, 'Digitl System Design using PLD', BS Publications, 2003

PTEI8751 INDUSTRIAL DATA NETWORKS L T P C
(EEE, E&I) 3 0 0 3

OBJECTIVES

To impart knowledge

- on the serial interface standards.
- on the principle of network architecture and protocol stack.
- about the characteristics and functions of the individual layers of the protocol stack
- about the wired and wireless communication protocols used in industrial networks.

UNIT I RS – 232 AND RS – 485 9

ISO-OSI model – EIA 232 Interface standard – EIA 422 interface standard – 20mA current loop – Serial interface converters.

UNIT II MODBUS DATA HIGHWAY (PLUS) AND HART PROTOCOLS 9

MODBUS protocol structure – Function codes – Troubleshooting – Data highway (plus) protocols – Review of HART Protocol.

UNIT III AS – INTREFACE (AS-I) AND DEVICENET 9

AS interfaces:- Introduction, Physical layer, Data link layer and Operating characteristics. Devicenet:- Introduction Physical layer, Data link layer and Application layer.

UNIT IV PROFIBUS PA/DP/FMS AND FF 9

Profibus:- Introduction, Profibus protocol stack, Profibus communication model, Communication objects, System operations and Troubleshooting – Foundation fieldbus versus Profibus.

UNIT V INDUSTRIAL ETHERNET AND WIRELESS COMMUNICATION 9

Industrial Ethernet:- Introduction, 10Mbps Ethernet and 100Mbps Ethernet – Radio and wireless communication:- Introduction, Components of radio link, the radio spectrum and frequency allocation and radio modems – Comparison between various industrial networks.

TOTAL: 45 PERIODS

OUTCOMES

- Able to gain knowledge on the serial interface standards, network architecture and protocol stack
- Able to get familiarized with the wired and wireless communication protocols used in industrial networks.

TEXT BOOKS:

1. Mackay, S., Wrijut, E., Reynders, D. and Park, J., “practical Industrial Data Networks Design, installation and Troubleshooting”, Newnes Publications, Elsevier, 1st Edition, 2004.
2. Buchanan, W., “Computer Buses”, CRC Press, 2000,

REFREENCES:

1. Tanenbaum, A.S., “Modern Operating Systems”, Prentice Hall of India Pvt. Ltd.,2003.
2. Rappaport,T.S., “Wireless Communication: principles and Practice” 2nd Edition, Prentice Hall of India, 2001
3. Stallings,W., “wireless Communication and networks”, 2nd Edition, Prentice Hall of India, 2005

PTGE8551 **ENGINEERING ETHICS AND HUMAN VALUES** **L T P C**
(Industrial, Mechanical Printing,Automobile, EEE CSE, ECE, Civil, Textile) **3 0 0 3**

OBJECTIVES:

- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I HUMAN VALUES **10**

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality.

UNIT II ENGINEERING ETHICS **9**

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION **9**

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law – The Challenger Case Study

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS **9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – The Three Mile Island and Chernobyl Case Studies Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination

UNIT V GLOBAL ISSUES **8**

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Sample Code of Conduct

TOTAL: 45 PERIODS

OUTCOMES:

- Able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

TEXTBOOK

1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.

REFERENCES:

1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Thompson Wadsworth, A Division of Thomson Learning Inc., United States, 2000
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, "Fundametals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001

WEB SOURCES:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

PTMA8251 **NUMERICAL METHODS (EEE, IT, Printing, Automobile, Industrial, Manufacturing)** **L T P C 3 0 0 3**

OBJECTIVES

- To provide the mathematical foundations of numerical techniques for solving linear system, eigenvalue problems, interpolation, numerical differentiation and integration and the errors associated with them;
- To demonstrate the utility of numerical techniques of ordinary and partial differential equations in solving engineering problems where analytical solutions are not readily available.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9

Solution of algebraic and transcendental equations – Fixed point iteration method - Newton-Raphson method- Solution of linear system of equations – Gauss Elimination method – Pivoting – Gauss-Jordan methods – Iterative methods of Gauss-Jacobi and Gauss-Seidel – Matrix Inversion by Gauss-Jordan method – Eigenvalues of a matrix by Power method and by Jacobi's method

UNIT II INTERPOLATION AND APPROXIMATION 9

Interpolation with unequal intervals- Lagrange interpolation - Newton's divided difference interpolation – Cubic Splines – Interpolation with equal intervals – Newton's forward and backward difference formulae – Least square method – Linear curve fitting.

UNIT III NUMERICAL DIFFERENTATION AND INTEGRATION 9

Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal, Simpson's 1/3 and Simpson's 3/8 rules – Romberg's method – Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's rules

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9

Single step-methods – Taylor's series method – Euler's method – Modified Euler's method – Fourth order Runge-Kutta method for solving first and second order equations – Multi-step methods – Milne's and Adams-Bashforth predictor-corrector methods for solving first order equations

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9

Finite difference methods for solving two-point linear boundary value problems. Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method

TOTAL:45 PERIODS

OUTCOMES:

- Able to have a clear perception of the power of numerical techniques, ideas and to demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields.

TEXT BOOKS

1. Grewal, B.S. and Grewal,J.S., "Numerical methods in Engineering and Science", Khanna Publishers, New Delhi, 9th Edition, 2007.
2. Sankara Rao, K. "Numerical methods for Scientists and Engineers', Prentice Hall of India Private Ltd., New Delhi, 3rd Edition,2007

REFERENCES:

1. Brian Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education Asia, New Delhi, 1st Edition, 2007.
2. Gerald, C.F. and Wheatley, P.O., "Applied Numerical Analysis", Pearson Education Asia, New Delhi, 6th Edition, 2006.
3. Laurene V. Fausett, "Applied Numerical Analysis using MATLAB", Pearson Education, New Delhi, 1st print, 2nd Edition, 2009.

PTMA8252 PROBABILITY AND STATISTICS L T P C
(Industrial, Mechanical Printing, Manufacturing EEE, Textile) 3 0 0 3

OBJECTIVES

- To make the students acquire a sound knowledge in statistical techniques that model engineering problems.
- The Students will have a fundamental knowledge of the concepts of probability

UNIT I RANDOM VARIABLES 9

Discrete and Continuous random variables - Moments - Moment generating functions - Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions - Functions of a random variable

UNIT II TWO-DIMENSIONAL RANDOM VARIABLES 9

Joint distributions - Marginal and Conditional distributions - Covariance - Correlation and Linear regression - Transformation of random variables - Central limit theorem (for independent and identically distributed random variables).

UNIT III TESTS OF SIGNIFICANCE 9

Sampling distributions - Tests for single mean, proportion, Difference of means (large and small samples) - Tests for single variance and equality of variances - $\chi 2$-test for goodness of fit - Independence of attributes - Non-parametric tests: Test for Randomness and Rank-sum test (Wilcoxon test).

UNIT IV DESIGN OF EXPERIMENTS 9

Completely randomized design - Randomized block design - Latin square design - 2^2 - factorial design - Taguchi's robust parameter design.

UNIT V STATISTICAL QUALITY CONTROL 9

Control charts for measurements (X and R charts) - Control charts for attributes (p, c and np charts) - Tolerance limits - Acceptance sampling.

TOTAL:45 PERIODS

OUTCOMES:

- Able to understand, analyse and solve problems on random variables and statistics.

TEXT BOOKS

1. Milton, J. S. and Arnold, J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, New Delhi, 4th Edition, 3rd Reprint, 2008.
2. Johnson, R.A. and Gupta, C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2011

REFERENCES

1. Devore, J.L., “Probability and Statistics for Engineering and the Sciences”, Thomson Brooks/Cole, International Student Edition, New Delhi, 7th Edition, 2008.
2. Walpole, R.E., Myers, R.H., Myers, S.L. and Ye, K., “Probability and Statistics for Engineers and Scientists”, Pearson Education, Asia, 8th Edition, 2007.
3. Ross, S.M., “Introduction to Probability and Statistics for Engineers and Scientists”, Elsevier, New Delhi, 3rd Edition, 2004.
4. Spiegel, M.R., Schiller, J. and Srinivasan, R.A., “Schaum’s Outline of Theory and Problems of Probability and Statistics”, Tata McGraw Hill, New Delhi, 2004.

PTMA8351 **DISCRETE MATHEMATICS** **L T P C**
(EEE & IT) **3 0 0 3**

OBJECTIVES

At the end of the course, students would

- Have knowledge of the concepts needed to test the logic of a program.
- Have an understanding in identifying structures on many levels.
- Be aware of a class of functions which transform a finite set into another finite set which relates to input output functions in computer science.
- Be aware of the counting principles.
- Be exposed to concepts and properties of algebraic structures such as semi groups, monoids and groups

UNIT I LOGIC AND PROOFS 9

Propositional Logic – Propositional equivalences – Predicates and Quantifiers – Nested Quantifiers – Rules of inference – Introduction to proofs – Proof methods and strategy

UNIT II COMBINATORICS 9

Mathematical induction – Strong induction and well ordering – The basics of counting - The pigeonhole principle – Permutations and Combinations – Recurrence relations - Solving linear recurrence relations using generating functions – Inclusion – Exclusion Principle and its applications

UNIT III GRAPHS 9

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths

UNIT IV ALGEBRAIC STRUCTURES 9

Algebraic systems - Semi groups and monoids - Groups - Subgroups Homomorphisms – Normal subgroup and coset – Lagrange's theorem – Definitions and examples of Rings and Fields

UNIT V LATTICES AND BOOLEAN ALGEBRA 9

Partial ordering – Posets – Lattices as Posets – Properties of lattices – Lattices as algebraic systems – Sub lattices – Direct product and Homomorphism – Some special lattices – Boolean algebra

TOTAL: 45 PERIODS

OUTCOMES:

- Have knowledge of the concepts needed to test the logic of a program.
- Have an understanding in identifying structures on many levels.
- Aware of a class of functions which transform a finite set into another finite set which relates to input output functions in computer science.
- Aware of the counting principles.
- Exposed to concepts and properties of algebraic structures such as semi groups, monoids and groups.

TEXT BOOKS

1. Kenneth H.Rosen, “Discrete Mathematics and its Applications”, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 7th Edition, Special Indian edition, 2011.
2. Tremblay J.P. and Manohar R, “Discrete Mathematical Structures with Applications to Computer Science”, Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011

REFERENCES

1. Ralph. P. Grimaldi, “Discrete and Combinatorial Mathematics: An Applied Introduction”, Pearson Education Asia, Delhi, 4th Edition, 2007.
2. Thomas Koshy,” Discrete Mathematics with Applications”, Elsevier Publications, 2006.
3. Seymour Lipschutz and Mark Lipson, ”Discrete Mathematics”, Schaum’s Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010

PTMG8001 MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTING **L T P C 3 0 0 3**

OBJECTIVES

- To study the features of demand supply analysis.
- To study the pricing objectives and its methods.
- To study the basics of accounting and its types.
- To study the procedures for capital budgeting and investments.

UNIT I DEMAND & SUPPLY ANALYSIS 9

Firm: Types & objectives - Managerial decisions - Fundamental economic concepts Demand - Types of demand - Determinants of demand - demand function - demand elasticity - demand forecasting - supply - Determinants of supply - supply function - supply elasticity

UNIT II PRODUCTION AND COST ANALYSIS 9

Production function - returns to scale - Managerial uses of production function. Cost concepts - cost function - Determinants of cost - Short run and long run cost curves

UNIT III PRICING 9

Pricing Objectives - Determinants of price - Pricing under different market structures – price discrimination - pricing methods in practice

UNIT IV FINANCIAL ACCOUNTING (ELEMENTARY TREATMENT) 9

Basics of accounting - Journal, Ledger trial balance - Final accounts with Adjustment - Financial Ratio Analysis - Cash flow analysis - Fund flow analysis - Analysis and interpretation of financial statements - Comparative financial statements

UNIT V CAPITAL BUDGETING 9

Investments - Methods of capital budgeting and accounting for risk in capital budgeting

TOTAL:45 PERIODS

OUTCOMES:

- Basics of demand, supply and cost analysis are studied.
- Different methods of financial accounting and capital budgeting are studied.

TEXT BOOKS

1. Samuelson, Paul A and Nordhaus W.D., "Economics", Tata Mcgraw Hill Publishing Company Limited, New Delhi, 2004.
2. Salvatore Dominick, "Managerial Economics in a global economy", Thomson South Western, 4th edition, 2001.
3. S.N. Maheshwari, "Financial Accounting", Fourth Edn., Vikas Publishers House, New Delhi.
4. Khan and Jain, "Management Accounting" Tata McGraw Hill Education, 2006

REFERENCES

1. Paresh Shah, "Basic Financial Accounting for Management" Oxford University Press, New Delhi, 2007.
2. James C. Van home and John M. Wachowics Jr. "Fundamentals of financial Management" Prentice Hall of India, New Delhi, 11th Edition, 2004.
3. VL. Mote, Samuel Paul, G.S. Gupta, "Managerial Economics Concepts & Cases, "Tata McGraw Hiil Publishing Company Limited, 38th Reprint, 2005

PTMG8651 TOTAL QUALITY MANAGEMENT L T P C
(EEE, Mechanical, Automobile, Printing, Industrial, Manufacturing, 3 0 0 3
CSE, ECE, IT, Leather, Production)

OBJECTIVES

- To understand the various principles, practices of TQM to achieve quality.
- To learn the various statistical approaches for Quality control.
- To understand the TQM tools for continuous process improvement.
- To learn the importance of ISO and Quality systems

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality - Basic concepts of TQM – TQM Framework - Contributions of Quality Gurus – Barriers to TQM – Cost of Quality.

UNIT II TQM PRINCIPLES 9

Quality statements - Customer focus –Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Continuous process improvement – PDCA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I 9

The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT IV TQM TOOLS & TECHNIQUES II 9

Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Performance measures - BPR.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits –Quality Council – Leadership, Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward.

TOTAL : 45 PERIODS

OUTCOMES:

- Able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXT BOOK:

1. Dale H.Besterfiled, et al., “Total Quality Management”, Pearson Education Asia, Third Edition, Indian Reprint , 2006.

REFERENCE BOOKS:

1. James R. Evans and William M. Lindsay, “The Management and Control of Quality”, (6th Edition), South-Western (Thomson Learning), 2005.
2. Oakland, J.S. “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford, Third Edition , 2003.
3. Suganthi,L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd., 2006 .
4. Janakiraman,B and Gopal, R.K, “Total Quality Management – Text and Cases”,Prentice Hall (India) Pvt. Ltd., 2006.

PTGE8071 **DISASTER MANAGEMENT** **L T P C**
3 0 0 3

OBJECTIVES:

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS 9

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) 9

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of-community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processess and Framework at State and Central Level-State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 9

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS 9

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

OUTCOMES:

The students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society

- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarious in the Indian context, Disaster damage assessment and management.

TEXTBOOKS:

1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

REFERENCES

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

PTGE8072 HUMAN RIGHTS LT P C
3 0 0 3

OBJECTIVES :

- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I **9**

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT II **9**

Evolution of the concept of Human Rights Magana carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

UNIT III **9**

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV **9**

Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V **9**

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabled persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

TOTAL : 45 PERIODS

OUTCOMES :

- Engineering students will acquire the basic knowledge of human rights.

REFERENCES:

1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.