REVISED **SCHEME OF TEACHING & EXAMINATION-Dated 19th and 20th Mar 2010**

VII SEMESTER
ELECTRICAL AND ELECTRONICS ENGINEERING

Sl. No.	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration (Hrs)	Marks		
							IA	Theory / Practical	Total
1	10EE71	Computer Techniques in Power System Analysis	E&EE	4	-	3	25	100	125
2	10EE72	Electrical Power Utilization	E&EE	4	-	3	25	100	125
3	10EE73	High Voltage Engineering	E&EE	4	-	3	25	100	125
4	10EE74	Industrial Drives and Applications	E&EE	4	-	3	25	100	125
5	10EE75X	Elective-II (Group B)	E&EE	4	-	3	25	100	125
6	10EE76X	Elective-III (Group C)	E&EE	4	-	3	25	100	125
7	10EEL77	Relay and High Voltage Laboratory	E&EE	-	3	3	25	50	75
8	10EEL78	Power System Simulation Laboratory	E&EE	-	3	3	25	50	75
Total				24	06	24	200	700	900

Elective-II (Group B)
10EE751 - HVDC Transmission
10EE752 - Programmable Logic Controllers
10EE753 - Artificial Neural Network
10EE754 - Operating System
10EE755 - Digital System with VHDL
10EE756 -Testing and Commissioning of Electrical Equipment

Elective-III (Group C)
10EE761 - Power System Planning
10EE762 - Computer Control of Electrical Drives
10EE763 - Data Structure
10EE764 - VLSI Circuits and Design
10EE765 - Micro & Smart System Technology
10EE766 - Electromagnetic Compatibility

10EE71 COMPUTER TECHNIQUES IN POWER SYSTEM ANALYSIS

Subject Code	:	**10EE71**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

NETWORK TOPOLOGY: Introduction, Elementary graph theory – oriented graph, tree, co-tree, basic cut-sets, basic loops; Incidence matrices – Element-node, Bus incidence, Tree-branch path, Basic cut-set, Augmented cut-set, Basic loop and Augmented loop, Primitive network – impedance form and admittance form. **6 Hours**

UNIT - 2

NETWORK MATRICES: Introduction, Formation of Y_{BUS} by method of inspection (including transformer off-nominal tap setting) and method of singular transformation ($Y_{BUS} = A^T yA$), Formation of Bus Impedance matrix by step by step building algorithm (without mutual coupling elements).

6 Hours

UNIT - 3 & 4

LOAD FLOW STUDIES: Introduction, Power flow equations, Classification of buses, Operating constraints, Data for load flow, Gauss-Seidal Method – Algorithm and flow chart for PQ and PV buses (numerical problem for one iteration only), Acceleration of convergence; Newton Raphson's Method – Algorithm and flow chart for NR method in polar coordinates (numerical problem for one iteration only). Algorithm for Fast Decoupled load flow method, Comparison of Load Flow Methods.

14 Hours

PART - B

UNIT - 5 & 6

ECONOMIC OPERATION OF POWER SYSTEM: Introduction, Performance curves, Economic generation scheduling neglecting losses and generator limits, Economic generation scheduling including generator limits and neglecting losses; Iterative techniques; Economic Dispatch including transmission losses – approximate penalty factor, iterative technique for solution of economic dispatch with losses; Derivation of transmission loss formula; Optimal scheduling for Hydrothermal plants – problem formulation, solution procedure and algorithm. **12 Hours**

UNIT - 7 & 8

TRANSIENT STABILITY STUDIES: Numerical solution of Swing Equation – Point-by-point method, Modified Euler's method, Runge-Kutta method, Milne's predictor corrector method. Representation of power system for transient stability studies – load representation, network performance equations. Solution techniques with flow charts.

14 Hours

TEXT BOOKS:

1. **Computer Methods in Power System Analysis,** Stag, G. W., and EI-Abiad, A. H.- McGraw Hill International Student Edition. 1968
2. **Computer Techniques in Power System Analysis**, Pai, M. A- TMH, 2nd edition, 2006.

REFERENCE BOOKS:

1. **Modern Power System Analysis,** Nagrath, I. J., and Kothari, D. P, TMH,3rd Edition, 2003.
2. **Advanced Power System Analysis and Dynamics**, Singh, L. P, New Age International (P) Ltd, New Delhi, 2001.
3. **Computer Aided Power System Operations and Analysis**"- Dhar, R. N, TMH, 1984.
4. **Power System Analysis,** Haadi Sadat, TMH, 2nd Edition, 12th reprint, 2007

10EE72 ELECTRICAL POWER UTILIZATION

Subject Code	:	**10EE72**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

HEATING AND WELDING: Advantages and methods of electric of heating, resistance ovens, induction heating, dielectric heating, the arc furnace, heating of building. Electric welding, resistance and arc welding, control devices and welding equipment

10 Hours

UNIT - 2

ELECTROLYTIC PROCESS: Fundamental principles, extraction, refining of metals and electroplating. Factors affecting electro deposition process, power supply for electrolytic process.

6 Hours

UNIT - 3 & 4

ILLUMINATION: Laws of illumination, lighting calculation, factory lighting, flood lighting, street lighting, different types of lamps-incandescent, fluorescent, vapor, CFL and LED lamps and their working, comparision, Glare and its remedy

10 Hours

PART - B

UNIT - 5, 6 & 7

ELECTRIC TRACTION: Introduction, requirements of an ideal traction,systems of traction, speed time curve, tractive effort,co-efficient of adhesion, selection of traction motors, method of speed control, energy saving by series parallel control, ac traction equipment. AC series motor, characteristics, regenerative braking, linear induction motor and their use. AC traction, diesel electric equipment, trains lighting system, specific energy, factors affecting specific energy consumption.

20 Hours

UNIT - 8

INTRODUCTION TO ELECTRIC AND HYBRID VEHICLES: Configuration and performance of electrical vehicles, traction motor characteristics, tractive effort, transmission requirement, vehicle performance and energy consumption

6 Hours

TEXT BOOKS:

1. **Utilization Of Electric Energy,**E Openshaw Taylor, 12th Impression,2009,Universities Press.
2. **Modern Electric, Hybrid Electric and Fuel Cell Vehicles**, Mehrdad, Ehsani, Yimin Gao, Sabastien. E. Gay, Ali Emadi- CRC Press.

REFERENCE BOOKS:

1. **A Course in Electrical Power**, Soni Gupta and Bhatnager-Dhanapat Rai & sons.
3. **Electrical Power,** Dr. S.L.Uppal, Khanna Publications

10EE73 HIGH VOLTAGE ENGINEERING

Subject Code	:	**10EE73**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Introduction to HV technology, need for generating high voltages in laboratory. Industrial applications of high voltage, Electrostatic precipitation, separation, painting and printing.

6Hours

UNIT - 2 & 3

BREAKDOWN PHENOMENA: Classification of HV insulating media. Properties of important HV insulating media under each category. Gaseous dielectrics,Ionization: primary and secondary ionization processes. Criteria for gaseous insulation breakdown based on Townsend's theory. Limitations of Townsend's theory. Streamer's theory breakdown in non uniform fields. Corona discharges. Breakdown in electro negative gases. Paschen's law and its significance. Time lags of Breakdown. Breakdown in solid dielectrics: Intrinsic Breakdown, avalanche breakdown, thermal breakdown, and electro mechanic breakdown. Breakdown of liquid dielectrics: Suspended particle theory, electronic Breakdown, cavity breakdown (bubble's theory), electro convection breakdown.

12 Hours

UNIT - 4

GENERATION OF HV AC AND DC VOLTAGE: HV AC-HV transformer; Need for cascade connection and working of transformers units connected in cascade. Series resonant circuit- principle of operation and advantages. Tesla coil. HV DC- voltage doubler circuit, cock croft- Walton type high voltage DC set. Calculation of high voltage regulation, ripple and optimum number of stages for minimum voltage drop

8 Hours

Part - B

UNIT - 5

GENERATION OF IMPULSE VOLTAGE AND CURRENT: Introduction to standard lightning and switching impulse voltages. Analysis of single stage impulse generator-expression for Output impulse voltage. Multistage impulse generator working of Marx impulse. Rating of impulse generator. Components of multistage impulse generator. Triggering of impulse generator by three electrode gap arrangement. Trigatron gap and oscillograph time sweep circuits. Generation of switching impulse voltage. Generation of high impulse current.

6 Hours

UNIT - 6

MEASUREMENT OF HIGH VOLTAGES: Electrostatic voltmeter-principle, construction and limitation. Chubb and Fortescue method for HV AC measurement. Generating voltmeter- Principle, construction. Series resistance micro ammeter for HV DC measurements. Standard sphere gap measurements of HV AC, HV DC, and impulse voltages; Factors affecting the measurements. Potential

dividers-resistance dividers capacitance dividers mixed RC potential dividers. Measurement of high impulse currents-Rogogowsky coil and Magnetic Links.

10 Hours

UNIT - 7

NON-DESTRUCTIVE INSULATION TESTING TECHNIQUES: Dielectric loss and loss angle measurements using Schering Bridge, Transformer ratio Arms Bridge. Need for discharge detection and PD measurements aspects. Factor affecting the discharge detection. Discharge detection methods-straight and balanced methods.

6 Hours

UNIT - 8

HIGH VOLTAGE TESTS ON ELECTRICAL APPARATUS: Definitions of terminologies, tests on isolators, circuit breakers, cables insulators and transformers

4 Hours

TEXT BOOKS:

1. **High Voltage Engineering**, M.S.Naidu and Kamaraju- 4th Edition, THM, 2008.
2. **High Voltage Engineering Fundamentals**, E.Kuffel and W.S. Zaengl, 2nd Edition, Elsevier Press, 2005.
3. **High Voltage Engineering** ,C.L.Wadhwa, New Age International Private limited, 1995.

REFERENCE BOOKS:

1.**High Voltage Engineering Theory and Practice,** Mazen Abdel-Salam, Hussein Anis, Ahdab El-Morshedy, Roshdy Radwan, 2nd Edn(Revised & Expanded) Marcel-Dekker Publishers(Special Indian Edn.).

10EE74 INDUSTRIAL DRIVES & APPLICATIONS

Subject Code	:	**10EE74**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

AN INTRODUCTION TO ELECTRICAL DRIVES & ITS DYNAMICS: Electrical drives. Advantages of electrical drives. Parts of electrical drives, choice of electrical drives, status of dc and ac drives, Dynamics of electrical drives, Fundamental torque equation, speed torque conventions and multiquadrant operation. Equivalent values of drive parameters, components of low torques, nature and classification of load torques, calculation of time and energy loss in transient operations, steady state stability, load equalization. **9 Hours**

UNIT - 2

SELECTION OF MOTOR POWER RATING: Thermal model of motor for heating and cooling, Classes of motor duty, determination of motor rating.

5 Hours

UNIT - 3 & 4

D C MOTOR DRIVES:

(a) Starting braking, transient analysis, single phase fully controlled rectifier, control of dc separately excited motor, Single-phase half controlled rectifier control of dc separately excited motor.

(b) Three phase fully controlled rectifier control of dc separately excited motor, three phase half controlled controlled rectifier control of dc separately excited motor, multiquadrant operation of dc separately excited motor fed from fully controlled rectifier. Rectifier control of dc series motor, chopper controlled dc drives, chopper control of separately excited dc motor. Chopper control of series motor. **12 Hours**

PART - B

UNIT - 5 & 6

INDUCTION MOTOR DRIVES:

(a) Operation with unbalanced source voltage and single phasing, operation with unbalanced rotor impedances, analysis of induction motor fed from non-sinusoidal voltage supply, starting braking, transient analysis.

(b) Stator voltage control variable voltage frequency control from voltage sources, voltage source inverter control, closed loop control, current source inverter control, current regulated voltage source inverter control, rotor resistance control, slip power recovery, speed control of single phase induction motors.

12 Hours

UNIT - 7

SYNCHRONOUS MOTOR DRIVES: Operation from fixed frequency supply, synchronous motor variable speed drives, variable frequency control of multiple synchronous motors. Self-controlled synchronous motor drive employing load commutated thruster inverter.

10 Hours

UNIT - 8

INDUSTRIAL DRIVES: Rolling mill drives, cement mill drives, paper mill drives and textile mill drives.

4 Hours

TEXT BOOK:

1. **Fundamentals of Electrical Drives**, G.K Dubey , Narosa publishing house, 2nd Edition,2002.

REFERENCE BOOKS:

1. **Electrical Drives**, N.K De and P.K. Sen- PHI, 2009.
2. **A First Course On Electric Drives**, S.K Pillai-Wiley Eastern Ltd 1990.
3. **Power Electronics, Devices, Circuits and Industrial Applications**, V.R. Moorthi, "Oxford University Press, 2005.
4. **Electric Motor Drives,Modeling,Analysis and Control,** R.Krishnan,PHI,2008.

ELECTIVES-II(GROUP **B)**

10EE751 HVDC TRANSMISSION

Subject Code	:	**10EE751**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1 & 2

GENERAL ASPECTS OF DC TRANSMISSION AND COMPARISON OF IT WITH AC TRANSMISSION: Historical sketch, constitution of EHV AC and DC links, Limitations and Advantages of AC and DC Transmission**.**

12 Hours

UNIT - 3 & 4

CONVERTER CIRCUITS: Valve Characteristics, Properties of converter circuits, assumptions, single phase, three phase converters, choice of best circuits for HV DC circuits

12 Hours

PART - B

UNIT - 5

ANALYSIS OF THE BRIDGE CONVERTER: Analysis with grid control but no over lap, Analysis with grid control and with over lap less than 60 deg, Analysis with overlap greater than 60 deg, complete characteristics of rectifier, Inversion

10 Hours

UNIT - 6 & 7

CONTROL OF HVDC CONVERTERS AND SYSTEMS: grid control, basic means of control, power reversal, limitations of manual control, constant current versus constant voltage, desired feature of control, actual control characteristics, constant -minimum -Ignition –angle control, constant –current control, constant –extinction –angle control, stability of control

10 Hours

UNIT - 8

PROTECTION: General, DC reactor, voltage oscillations and valve dampers, current oscillations and anode dampers, DC line oscillations and line dampers, clear line faults and reenergizing the line.

8 Hours

TEXT BOOKS:

1. **Direct current Transmission,** EW Kimbark,
2. **Power system stability and control,** Prabha Kundur, TMH, 9th reprint, 2007.

10EE752 PROGRAMMABLE LOGIC CONTROLLERS

Subject Code	:	10EE752	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUTION: Introduction to Programmable logic controller (PLC), role in automation (SCADA), advantages and disadvantages, hardware, internal architecture, sourcing and sinking, characteristics of I/O devices, list of input and output devices, examples of applications. I/O processing, input/output units, signal conditioning, remote connections, networks, processing inputs I/O addresses.

7 Hours

UNIT - 2

ROGRAMMING: Ladder programming- ladder diagrams, logic functions, latching, multiple outputs, entering programs, functional blocks, programme examples like location of stop and emergency switches

8 Hours

UNIT - 3 & 4

PROGRAMMING LANGUAGES: Instruction list, sequential functions charts & structured text, jump and call subroutines**.**

10 Hours

PART - B

UNIT - 5

INTERNAL RELAYS: ladder programmes, battery- backed relays, one - shot operation, set and reset, master control relay.

5 Hours

UNIT - 6 & 7

Timers and counters: Types of timers, programming timers, ON and OFF- delay timers, pulse timers, forms of counter, programming, up and down counting, timers with counters, sequencer.

12 Hours

UNIT - 8

Shift register and data handling: shift registers, ladder programs, registers and bits, data handling, arithmetic functions, temperature control and bottle packing applications.

10 Hours

Note: Discussing the programming should be restricted to only one type of PLC (Mitsubhishi)

TEXT BOOKS:

1. **Programmable Logic controllers**-W Bolton, 5th edition, Elsevier- newness, 2009.
2. **Programmable logic controllers - principles and applications"-**John W Webb, Ronald A Reis, Pearson education, 5th edition, 2nd impression, 2007.

REFERENCE BOOKS:

1. **Programmable Controller Theory and Applications**,L. A Bryan, E. A Bryan, An industrial text company publication, 2nd edition, 1997.
2. **Programmable Controllers, An Engineers Guide**-E. A Paar, newness, 3rd edition, 2003.

10EE753 ARTIFICIAL NEURAL NETWORK

Subject Code	:	**10EE753**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

Introduction, history, structure and function of single neuron, neural net architectures, neural learning, use of neural networks.

7 Hours

UNIT - 2

Supervised learning, single layer networks, perceptrons, linear separability, perceptron training algorithm, guarantees of success, modifications.

6 Hours

UNIT - 3

Multiclass networks-I, multilevel discrimination, back propagation, setting parameter values, theoretical results

6 Hours

UNIT - 4

Accelerating learning process, application, Madaline adaptive multilayer networks.

7 Hours

PART - B

UNIT - 5

Prediction networks, radial basis functions, polynomial networks, regularization, unsupervised learning, winner-take-all networks

7 Hours

UNIT - 6

Learning vector quantizing, counter propagation networks, adaptive resonance theorem, toplogically organized networks, distance based learning, recognition.

6 Hours

UNIT - 7

Associative models, Hop Field networks, brain state networks, Boltzmann machines, hetero associations.

7 Hours

UNIT - 8

Optimization using Hopfiled networks, simulated annealing, random search, evolutionary computation.

6 Hours

TEXT BOOKS:

1. **Elements Of Artificial Neural Networks** -Kishan Mehrotra, C. K. Mohan, Sanjay Ranka, , Penram, 1997
2. **Artificial Neural Networks**- R, Schalkoff, McGraw Hill, 1997.

REFERENCE BOOKS:

1.Neural Network Design- Hagan, Demuth and Beale Cengage,2nd Edition

2.Introduction To Artificial Neural Systems- J. Zurada, Jaico, 2003

3.Neural Networks -Haykins, PHI, 1999.

4. Artificial Neural Networks, B. Yegnanarayana ,PHI,2009 Edition.

10EE754 OPERATING SYSTEM

Subject Code	:	10EE754	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART- A

UNIT – 1

INTRODUCTION TO OPERATING SYSTEM, SYSTEM STRUCTURES: What operating system do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and security; Distributed system; Special purpose systems; Computing environments. Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating System design and implementation; Operating System structure; Virtual machines; Operating System generation; System boot. **6 Hours**

UNIT - 2

Process Management: Process concept; Process scheduling; Operations on processes; Inter-process communication. Multi-Threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms; Multiple-Processor scheduling; Thread scheduling. **7 Hours**

UNIT - 3

PROCESS SYNCHRONIZATION: Synchronization: The Critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors. **7 Hours**

UNIT - 4

DEADLOCKS: Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. **6 Hours**

PART – B

UNIT - 5

MEMORY MANAGEMENT: Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation. Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing. **7 Hours**

UNIT - 6

FILE SYSTEM, IMPLEMENTATION OF FILE SYSTEM: File System: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection. Implementing File System: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management. **7 Hours**

UNIT - 7

SECONDARY STORAGE STRUCTURES, PROTECTION: Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights, Capability-Based systems. **6 Hours**

UNIT - 8

CASE STUDY: THE LINUX OPERATING SYSTEM: Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory management; File systems, Input and output; Inter-process communication. **6 Hours**

TEXT BOOK:

1. **Operating System Principles –** Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Wiley, 8th Edition, 2009.

REFERENCE BOOKS:

1. **Operating Systems: A Concept Based Approach** – D.M Dhamdhere, TMH, 2nd Edition,2006.
2. **Operating Systems,** P.C.P. Bhatt, PHI, 2nd Edition, 2008.
3. **Operating Systems,**Harvey M Deital,Pearson Education, 3rd Edition.

10EE755 DIGITAL SYSTEM DESIGN WITH VHDL

Subject Code	:	**10EE755**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: VHDL description of combinational networks, Modeling flip-flops using VHDL, VHDL models for a multiplexer, Compilation and simulation of VHDL code, Modeling a sequential machine, Variables, Signals and constants, Arrays, VHDL operators, VHDL functions, VHDL procedures, Packages and libraries, VHDL model for a counter.

10 Hours

UNIT - 2

DESIGNING WITH PROGRAMMABLE LOGIC DEVICES: Read-only memories, Programmable logic arrays (PLAs), Programmable array logic (PALs), Other sequential programmable logic devices (PLDs), Design of a keypad scanner.

5 Hours

UNIT - 3

DESIGN OF NETWORKS FOR ARITHMETIC OPERATIONS: Design of a serial adder with accumulator, State graphs for control networks, Design of a binary multiplier, Multiplication of signed binary numbers, Design of a binary divider.

5 Hours

UNIT - 4

DIGITAL DESIGN WITH SM CHARTS: State machine charts, Derivation of SM charts, Realization of SM charts. Implementation of the dice game, Alternative realization for SM charts using microprogramming, Linked state machines.

6 Hours

PART - B

UNIT - 5

DESIGNING WITH PROGRAMMABLE GATE ARRAYS AND COMPLEX PROGRAMMABLE LOGIC DEVICES: Xilinx 3000 series FPGAs, Designing with FPGAs, Xilinx 4000 series FPGAs, using a one-hot state assignment, Altera complex programmable logic devices (CPLDs), Altera FELX 10K series COLDs.

6 Hours

UNIT - 6

FLOATING-POINT ARITHMETIC: Representation of floating-point numbers, Floating-point multiplication, Other floating-point operations.

6 Hours

UNIT - 7

ADDITIONAL TOPICS IN VHDL: Attributes, Transport and Inertial delays, Operator overloading, Multivalued logic and signal resolution, IEEE-1164 standard logic, Generics, Generate statements, Synthesis of VHDL code, Synthesis examples, Files and TEXTIO.

7 Hours

UNIT - 8

VHDL MODELS FOR MEMORIES AND BUSES: Static RAM, A simplified 486 bus model, interfacing memory to a microprocessor bus.

7 Hours

TEXT BOOKS:

1. **Digital Systems Design Using VHDL**Charles H. Roth. Jr Cengage, 2008.
2. **Digital Electronics And Design With VHDL,** A. Pedroni, Volnet, Elsevier, 1st edition, 2008

REFERENCE BOOKS:

1. **Fundamentals of Digital Logic with VHDL Design,**Stephen Brwon & Zvonko Vranesic, TMH,2nd Edition 2006
2. **Digital Fundamentals using VHDL,**Floyd, Pearson Education, 2003,
3. **VHDL Primer**, J. Bhaskar , PHI, 2009.

10EE756 TESTING AND COMMISSIONING OF ELECTRICAL EQUIPMENT

Subject Code	:	**10EE756**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1 & 2

TRANSFORMERS:

a. Specifications: Power and distribution transformers as per BIS standards.

b. Installation: Location, site, selection, foundation details (like bolts size, their number, etc), code of practice for terminal plates, polarity & phase sequence, oil tanks, drying of windings and general inspection.

5 Hours

c. Commissioning tests: Following tests as per national & International Standards, volt ratio test, earth resistance, oil strength, Bucholz & other relays, tap changing gear, fans & pumps, insulation test, impulse test, polarizing index, load & temperature rise test.

7 Hours

d. Specific Tests: Determination of performance curves like efficiency, regulation etc, and determination of mechanical stress under normal &abnormal conditions.

3 Hours

UNIT - 3 & 4
SYNCHRONOUS MACHINES:
a. Specifications: As per BIS standards.

b. Installation: Physical inspection, foundation details, alignments, excitation systems, cooling and control gear, drying out.

c. Commissioning Tests: Insulation, Resistance measurement of armature & field windings, waveform & telephone interference tests, line charging capacitance.

4 Hours

d. Performance tests: Various tests to estimate the performance of generator operations, slip test, maximum lagging current, maximum reluctance power tests, sudden short circuit tests, transient & sub transient parameters, measurements of sequence impedances, capacitive reactance, and separation of losses, temperature rise test, and retardation tests.

6 Hours

e. Factory tests: Gap length, magnetic eccentricity, balancing vibrations, bearing performance

2 Hours

PART - B

UNIT - 5, 6 & 7
INDUCTION MOTORS:
a. **Specifications** for different types of motors, Duty, I.P. protection.

2 Hours

b. Installation: Location of the motors (including the foundation details) & its control apparatus, shaft & alignment for various coupling, fitting of pulleys & coupling, drying of windings.

4 Hours

c. Commissioning Test: Mechanical tests for alignment, air gap symmetry, tests for bearings, vibrations & balancing.

5 Hours

Electrical Tests: Insulation test, earth resistance, high voltage test, starting up, failure to speed up to take the load, type of test, routine test, factory test and site test (in accordance with ISI code

4 Hours

d. Specific Tests: Performance & temperature raise tests, stray load losses, shaft alignment, and re-rating & special duty capability.

4 Hours

UNIT - 8
SWITCH GEAR & PROTECTIVE DEVICES: Standards, types, specification, installation, commissioning tests, maintenance schedule, type & routine tests.

6 Hours

TEXT BOOKS:

1. **Testing & Commissioning Of Electrical Equipment** -S. Rao,
2. **Testing & Commissioning Of Electrical Equipment** -B .V. S. Rao,

REFERENCE BOOKS:

1. **Relevant Bureau of Indian Standards**
2. **A Handbook on Operation and Maintenance of Transformers-** H. N. S. Gowda, Published by H. N. S. Gowda,2006
3. Handbook of **SwitchGears,**BHEL, TMH,2005.
4. J and P Transformer Book,Elsevier Publication.

ELECTIVES-II (GROUP **C)**

10EE761 POWER SYSTEMPLANNING

Subject Code	:	**10EE761**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION OF POWER PLANNING, National and regional planning, structure of power system, planning tools, electricity regulation, Load forecasting, forecasting techniques, modeling

8 Hours

UNIT - 2 & 3

GENERATION PLANNING, Integrated power generation, co-generation / captive power, power pooling and power trading, transmission & distribution planning, power system economics, power sector finance, financial planning, private participation, rural electrification investment, concept of rational tariffs

10 Hours

UNIT - 4

COMPUTER AIDED PLANNING: Wheeling, environmental effects, green house effect, technological impacts, insulation co-ordination, reactive compensation

8 Hours

PART - B

UNIT - 5 & 6

POWER SUPPLY RELIABILITY, reliability planning, system operation planning, load management, load prediction, reactive power balance, online power flow studies, test estimation, computerized management. Power system simulator**.**

10 Hours

UNIT - 7 & 8

Optimal Power system expansion planning, formulation of least cost optimization problem incorporating the capital, operating and maintenance cost of candidate plants of different types (thermal hydro nuclear non conventional etc), Optimization techniques for solution by programming

16 Hours

TEXT BOOK:

1. **Electrical Power System Planning,** A.S.Pabla, Macmillan India Ltd, 1998

10EE762 COMPUTER CONTROL OF ELECTRICAL DRIVES

Subject Code	:	10EE762	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

REVIEW OF MICRO CONTROLLERS IN INDUSTRIAL DRIVES SYSTEM: Typical Micro controller's 8 bit 16 bit (only block diagram) Digital Data Acquisition system, voltage sensors, current sensors, frequency sensors and speed sensors. **4 Hours**

UNIT - 2

EVOLUTION OF POWER ELECTRONICS IN DRIVES: Power semiconductors devices used for drives control, GTO, BJT, power MOSFET, IGBT, MCT and IGCT structures, Ratings, comparison and their applications. Block diagram of power integrated circuit for D C motor drives. **4Hours**

UNIT - 3

A C MACHINE DRIVES: general classification and National Electrical Manufacturer Association (NEMA) classification, Speed control of Induction motors with variable voltage constant frequency, constant voltage variable frequency, (v/f) constant operation, drive operating regions. Variable stator current operation. Effect of Harmonics.

9 Hours

UNIT - 4

SYNCHRONOUS MACHINE DRIVES: Wound field machine, comparison of Induction and wound field synchronous machines, Torque angle characteristics of salient pole synchronous machines, synchronous reluctance permanent magnet synchronous machines (SPM), variable reluctance machines (VRM).

8 Hours

PART - B

UNIT - 5

PHASE CONTROLLED CONVERTERS: Converter controls, Linear firing angle control, cosine wave crossing control, phase locked Oscillator principle, Electrro magnetic Interference (EMI) and line power quality problems, cyclo converters, voltage fed converters, Rectifiers, Current fed converters. **7 Hours**

UNIT - 6

PRINCIPLES OF SLIP POWER RECOVERY SCHEMES: Static Kramer's drive system, block schematic diagram, phasor diagram and limitations, Static Scherbins scheme system using D.C link converters with cyclo converter modes of operation, modified Scherbins Drive for variable source, constant frequency (VSCF) generation.

6 Hours

UNIT - 7

PRINCIPLE OF VECTOR CONTROL OF A C DRIVES: Phasor diagram, digital Implementation block diagram, Flux vector estimation, indirect vector control block diagram with open loop flux control, synchronous motor control with compensation.

6 Hours

UNIT - 8

EXPERT SYSTEM APPLICATION TO DRIVES (ONLY BLOCK DIAGRAM): Expert system shell, Design methodology, ES based P-I tuning of vector controlled drives system, Fuzzy logic control for speed controller in vector control drives,, structure of fuzzy control in feedback system. **8 Hours**

TEXT BOOKS:

1. **Power Electronics & Motor Drives,**Bimal Bose, Elsevier 2006
2. **Modern Power Electronics & Drives,**Bimal K. Bose, Pearson Education 2003.

REFERENCE BOOK:

1. **Advanced Microprocessor and Interfacing,** Badri Ram, TMH, 1st Edition.

10EE763 DATA STRUCTURES

Subject Code	:	**10EE763**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART A

1. Design and Analysis of Algorithms: From problems of programs, Abstract Data Types Data Types, Data Structures and Abstract Data Types. **04 Hours**

2. Basic Data Type and Trees: Data types List, Implementation of lists, stacks Queues, Mappings, Stacks and recursive procedures. Basic terminology, ADT Tree, / Implementation of trees, Binary trees. **10 Hours**

3. Basic Operation on Sets: Introduction to sets an ADT with union intersection and difference, A Bit-vector implantation sets, A linked list implementation sets, The dictionary, simple dictionary implementation, the Hash table data structures, Estimating the efficiency of functions, Implementation of the mapping ADT, Priority Queues, Implementation of priority queues. **06 Hours**.

4. Directed Graphs: Basic Definitions, Representation for directed graphs, the single source short path problems, Traversals of Directed Graphs, Directed A cyclic graphs, strong components. **06 Hours**.

PART B

5. Sorting: The internal sorting model, simple sorting schemes, Quick sort Heapsort, Binsorting. **06 Hours**.

6.Algorithm analysis Techniques: Efficiency of algorithms, analysis of receive programs solving Recurrence Equations, A general solution for a large class of Recurrences. **06 Hours**

7. Algorithm Design Techniques: Divide and conquer algorithms, Dynamic programming, Greedy Algorithms, Back tracking, local search algorithms. **08 Hours**.

8. Data structures and Algorithm for external storage: A model of external computation, External sorting, sorting information in files, external search Trees. **08 Hours**

Text Book:

1.Data Structures and Algorithms, Alfred Aho, John E. Hopcroft and Jeffery D Ullaman, Pearson Education.

Reference Books:

1. **Introduction to Data structures and Algorithms with C+** by Gleen. W.Rowe, PHI Publications.
2. **Data structures using C & C++,** Langsam, Angenstein, Tenenbaum ,Pearson, 2nd edition,.
3. **Data Structures and Algorithm Analysis in C,** Weiss Mark Allen, Pearson Education,2nd Edition.

10EE764 VLSI CIRCUITS AND DESIGN

Subject Code	:	**10EE764**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

A REVIEW OF MICROELECTRONIC 3 AND AN INTRODUCTION TO MOS TECHNOLOGY: Introduction to integrated circuit technology, Production of E-beam masks. Introduction, VLSI technologies, MOS transistors, fabrication, thermal aspects, production of E-beam masks.

6 Hours

UNIT - 2

BASIC ELECTRICAL PROPERTIES OF MOS AN BICMOS CIRCUIT: Rain to source current Ids versus Vds relationships-BICMOS latch up susceptibility. MOS transistor characteristics, figure of merit, pass transistor NMOS and COMS inverters, circuit model, latch up.

8 Hours

UNIT - 3

MOS AND BICMOS CIRCUIT DESIGN PROCESSES: Mass layers, stick diagrams, design, symbolic diagrams

8 Hours

UNIT - 4

BASIC CIRCUIT CONCEPTS: Sheet resistance, capacitance layer inverter delays, wiring capacitance, choice of layers.

6 Hours

PART - B

UNIT - 5

SCALING OF MOS CIRCUITS: Scaling model and scaling factors- Limit due to current density.

8 Hours

UNIT - 6

SUBSYSTEM DESIGN AND LAYOUT: Some architecture issues- other systems considerations. Examples of structural design, clocked sequential circuits

8 Hours

UNIT - 7

SUBSYSTEM DESIGN PROCESSES: Some general considerations, an Illustration of design process, observations

4 Hours

UNIT - 8

ILLUSTRATION OF THE DESIGN PROCESS: Observation on the design process, Regularity Design of an ALU subsystem. Design of 4-bit adder, implementing ALU functions.

4 Hours

TEXT BOOKS:

1. **Basic VLSI Design,** Douglas Pucknell &Eshragian**,** PHI, 3rd Edition, 2009.
2. **Fundamentals of Modern VLSI Devices,**Yuan Taun Tak H Ning Cambridge Press, South Asia Edition 2003,
3. **ModernVLSI Design,** Wayne wolf, Pearson Education Inc. 3rd edition, 2003.

10EE765 MICRO AND SMART SYSTEM TECHNOLOGY

Subject Code	:	**10EE765**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION TO MICRO AND SMART SYSTEMS:

a) What are smart-material systems? Evolution of smart materials, structures and systems. Components of a smart system. Application areas. Commercial products.

b) What are microsystems? Feynman's vision. Micromachined transducers. Evolution of micro-manufacturing. Multi-disciplinary aspects. Applications areas. Commercial products.**5 Hours**

UNIT - 2

MICRO AND SMART DEVICES AND SYSTEMS: PRINCIPLES AND MATERIALS:

a) Definitions and salient features of sensors, actuators, and systems.

b) Sensors: silicon capacitive accelerometer, piezo-resistive pressure sensor, blood analyzer, conductometric gas sensor, fiber-optic gyroscope and surface-acoustic-wave based wireless strain sensor.

c) Actuators: silicon micro-mirror arrays, piezo-electric based inkjet print-head, electrostatic comb-drive and micromotor, magnetic micro relay, shape-memory-alloy based actuator, electro-thermal actuator

d) Systems: micro gas turbine, portable clinical analyzer, active noise control in a helicopter ca **8 Hours**

UNIT - 3

MICROMANUFACTURING AND MATERIAL PROCESSING:

a) Silicon wafer processing, lithography, thin-film deposition, etching (wet and dry), wafer-bonding, and metallization.

b) Silicon micromachining: surface, bulk, moulding, bonding based process flows.

c) Thick-film processing:

d) Smart material processing:

e) Processing of other materials: ceramics, polymers and metals

f) Emerging trends **7 Hours**

UNIT - 4

MODELING:

a) Scaling issues.

b) Elastic deformation and stress analysis of beams and plates. Residual stresses and stress gradients. Thermal loading. Heat transfer issues. Basic fluids issues.

c) Electrostatics. Coupled electromechanics. Electromagnetic actuation. Capillary electro-phoresis. Piezoresistive modeling. Piezoelectric modeling. Magnetostrictive actuators. **6 Hours**

PART - B

UNIT - 5

COMPUTER-AIDED SIMULATION AND DESIGN:

Background to the finite element element method. Coupled-domain simulations using Matlab. Commercial software. **8 Hours**

UNIT - 6

ELECTRONICS, CIRCUITS AND CONTROL:

Carrier concentrations, semiconductor diodes, transistors, MOSFET amplifiers, operational amplifiers. Basic Op-Amp circuits. Charge-measuring circuits. Examples from microsystems. Transfer function, state-space modeling, stability, PID controllers, and model order reduction. Examples from smart systems and micromachined accelerometer or a thermal cycler. **8 Hours**

UNIT - 7

INTEGRATION AND PACKAGING OF MICROELECTRO MECHANICAL SYSTEMS:

Integration of microelectronics and micro devices at wafer and chip levels. Microelectronic packaging: wire and ball bonding, flip-chip. Low-temperature-cofired-ceramic (LTCC) multi-chip-module technology. Microsystem packaging examples. **6 Hours**

UNIT - 8

CASE STUDIES: BEL pressure sensor, thermal cycler for DNA amplification, and active vibration control of a beam.

4 Hours

PART - C

UNIT - 9

Mini-projects and class-demonstrations (not for Examination)

9 Hours

a) CAD lab (coupled field simulation of electrostatic-elastic actuation with fluid effect)
b) BEL pressure sensor
c) Thermal-cycler for PCR
d) Active control of a cantilever beam

TEXT BOOKS AND A CD-SUPPLEMENT:

1. **MEMS & Microsystems: Design and Manufacture,** Tai-Ran Hsu, TMH, 1st Edition.

REFERENCE BOOKS:

1. Animations of working principles, process flows and processing techniques, A CD-supplement with Matlab codes, photographs and movie clips of processing machinery and working devices.
2. **Laboratory hardware kits for** (i) BEL pressure sensor, (ii) thermal-cycler and (iii) active control of a cantilever beam.

3 Microsystems Design, S. D. Senturia, 2001, Kluwer Academic Publishers, Boston, USA. ISBN 0-7923-7246-8.

4 Analysis and Design Principles of MEMS Devices, Minhang Bao, Elsevier, Amsterdam, The Netherlands, ISBN 0-444-51616-6.

5. Design and Development Methodologies, Smart Material Systems and MEMS, V. Varadan, K. J. Vinoy, S. Gopalakrishnan, Wiley.

6. MEMS- Nitaigour Premchand Mahalik, TMH 2007

10EE766 ELECTROMAGNETIC COMPATIBILITY

Subject Code	:	**10EE766**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Designing of electromagnetic compatibility, EMC regulation, typical noise path, and use of network theory, method of noise coupling, miscellaneous noise sources, and method of eliminating interference.

8 Hours

UNIT - 2 & 3

CABLING: Capacitive coupling, effect of shield on magnetic coupling, mutual inductance calculations, magnetic coupling between shield and inner conductor, shielding to prevent magnetic radiation, shielding a receptor against magnetic fields, shield transfer impedance, experimental data, example of selective shielding, co-axial cable versus shielded twisted pair braided shields, effect of pig tails, ribbon cable, electrically long cables.

10 Hours

UNIT - 4

GROUNDING: Safety grounds, signal grounds, single point ground systems, hybrid grounds, multipoint ground systems, functional ground layout, practical low frequency grounding, hardware grounds, single ground reference for a circuit amplifier shields, grounding of cable shields, ground loops, low frequency analysis of common mode choke, high frequency analysis of common mode choke, differential amplifiers, shields grounding at high frequencies, guard shields guarded meters.

10 Hours

PART - B

UNIT - 5

BALANCING AND FILTERING: Balancing, power supply decoupling, decoupling filters, amplifier decoupling driving capacitive loads, high frequency filtering, system bandwidth, and modulation and coding.

8 Hours

UNIT - 6 & 7

SHIELDING: Near field and far fields, characteristic and wave impedance's shielding effectiveness, absorption loss, reflection loss, composite absorption and reflection loss, summary of shielding equation, shielding with magnetic material, experimental data, apertures, wave guide below cutoff, conductive gaskets, conductive windows, conductive coatings, cavity resonance, brooding of shields.

10 Hours

UNIT - 8

ELECTROSTATIC DISCHARGE: State generation, human body model, static discharge, and ESD protection in equipment design, software and ESD protection, ESD versus EMC.

6 Hours

TEXT BOOK:

1. **Noise reduction techniques in electronic systems**, Henry W. Ott, John Wiley, 2nd edition, 1988

10EEL77 Relay and High Voltage Laboratory

Subject Code	:	**10EEL77**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Lecture Hrs.	:	42	Exam Marks	:	50

(Total 12 experiments are to be conducted by choosing at least 03 experiments from part A, 02 each from part-B and C and 05 from part-D)

PART - A

1. Over current relay **:**
   (a) IDMT non-directional characteristics
   (b) Directional features
   (c) IDMT directional
2. IDMT characteristics of over voltage or under voltage relay. .(solid stare or electromechanical type
3. (a) To determine 50% probability flashover voltage for air insulation subjected to impulse voltage.
   (b) Generation of standard lightning impulse voltage and to determine efficiency and energy of impulse generator.
   Operating characteristics of over voltage or under voltage relay. (Solid state or electromechanical type).
4. Operation of negative sequence relay.
5. Bias characteristics of differential relay.
6. Current-time characteristics of fuse.

PART - B

1. Operating characteristics of microprocessor based (numeric) over –current relay.
2. Operating characteristics of microprocessor based (numeric) distance relay.
3 Operating characteristics of microprocessor based (numeric) over/under voltage relay.

PART - C

1. Generator protection –Merz-Price- protection scheme.
2. Feeder protection scheme-fault studies.
3. Motor protection scheme-fault studies.

PART - D

1. Spark over characteristics of air insulation subjected to high voltage AC with spark over voltage corrected to STP.
2 Spark over characteristics of air insulation subjected to high voltage AC, with spark over voltage corrected to STP for uniform and non-uniform field configuration.
3 Spark over characteristics of air insulation subjected to high voltage dc –
4 Measurement of HVAC and HVDC using standard spheres.
5 Breakdown strength of transformer oil using oil-testing unit.
6 Field mapping using electrolytic tank for any one-model cable/capacitor/transmission line/ Sphere gap models.

10EEL78 Power System Simulation Laboratory

Subject Code	:	**10EEL78**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Lecture Hrs.	:	42	Exam Marks	:	50

Power system simulation using MATLAB/ C or C ++ Sie lab /octave

1. a) Y Bus formation for p systems with and without mutual coupling, by singular transformation and inspection method.
   b) Determination of bus currents, bus power and line flow for a specified system voltage (Bus) Profile
2. Formation of 2-bus, using 2-bus build Algorithm without mutual.
3. ABCD parameters: Formation for symmetric II/I configuration. Verification of AD-BC=1 Determination of coefficient and regulation
   (a)Determination of power angle diagrams for salient and non-salient pole synchronous m/c s, reluctance
   power, excitation, emf and regulation.
   (b)To determine I) Swing curve II) critical clearing time for a single m/c for connected to infinity bus through a pair of identical transmission lines, 3-phase fault on one of the lines for variation of inertia
   constant/line parameters /fault location/clearing time/pre-fault electrical output.
6. Formation of Jacobian for a system not exceeding 4 buses (no PV buses) in polar coordinates
7. Write a program to perform load using Gauss- Seidel method (only p q bus)
8. To determine fault currents and voltages in a single transmission line systems with star-delta transformers at a specified location for SLGF, DLGF.
9. Load flow analysis using Gauss Siedel method, NR method, Fast decoupled flow method for both pq and pv buses.
10. Optimal Generator Scheduling for Thermal power plants.

Note: Questions 1-7: Simulation Experiments using MATLAB/C or C++/Scilab/Octave
Questions 8-10: Use suitable standard software package.

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REVISED **SCHEME OF TEACHING & EXAMINATION-DATED 19TH AND 20TH MAR 2010**

VIII SEMESTER

ELECTRICAL AND ELECTRONICS ENGINEERING

Sl. No.	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hrs / Week		Examination			
				Theory	Practical	Duration (Hrs)	Marks		
							IA	Theory / Practical	Total
1	10EE81	Electrical Power Quality	E&EE	4	-	3	25	100	125
2	10EE82	Power System Operation and Control	E&EE	4	-	3	25	100	125
3	10EE83X	Elective-IV (Group D)	E&EE	4	-	3	25	100	125
4	10EE84X	Elective-V (Group E)	E&EE	4	-	3	25	100	125
5	10EEP85	Project Work	E&EE	-	6	3	100	100	200
6	10EES86	Seminar (on a latest topic relevant to the branch and independent of the project work)	E&EE	-	3	-	50	-	50
Total				16	09	15	250	500	750

Elective-IV (Group-D)

10EE831 - Reactive Power Management
10EE832 - Flexible A.C. Transmission Systems (FACTS)
10EE833- Advanced Instrumentation System
10EE834 - AI Applications to Power Systems
10EE835 - Data Base Management Systems (DBMS)
10EE836 - Operation Research

Elective-V (Group-E)

10EE841 - Power Systems Dynamics and Stability
10EE842 - Energy Auditing & Demand Side management
10EE843 - Data communications and Networking
10EE844 - Electrical Distribution Systems
10EE845 - Insulation Engineering
10EE846 - Intellectual Property Rights

10EE81 ELECTRICAL POWER QUALITY

Subject Code	:	**10EE81**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
Introduction, Power quality-voltage quality, power quality evaluation procedures term and definitions: general classes of power quality problems, transients, long duration voltage variation, short duration voltage variations, voltage imbalance, waveform distortion, power quality terms.
8 Hours

UNIT - 2
VOLTAGE SAGS AND INTERRUPTIONS: Sources of sags and interruptions, estimating voltage sag performance, fundamental principles of protection, monitoring sags.
6 Hours

UNIT - 3 & 4
TRANSIENTS OVER VOLTAGES: Sources of transient over voltages, principles of over voltages protection, utility capacitor switching transients, Fundamentals of harmonics: Harmonic distortion, voltage versus transients, harmonic indexes, harmonic sources from commercial loads, harmonic sources from Industrial loads, effects of harmonic distortion, intraharmonics
10 Hours

PART - B

UNIT - 5
APPLIED HARMONICS: Harmonic distortion evaluations, principles for controlling harmonics, harmonic studies, devices for controlling harmonic distortion, harmonic filters, standards of harmonics
10 Hours

UNIT - 6
POWER QUALITY BENCHMARK: introduction, benchmark process, power quality contract, power quality state estimation, including power quality in distribution planning, Interface to utility system, power quality issues, interconnection standards
10 Hours

UNIT - 7 & 8
POWER QUALITY MONITORING: Monitoring considerations, power quality measurement equipments, assement of power quality measurement data, application of intelligent systems, power quality monitoring standards.
8 Hours

TEXT BOOK:
1. **Electric Power Quality,**Dugan, Roger C, Santoso, Surya, McGranaghan, Mark F/ Beaty, H. Wayne McGraw-Hill professional publication 2003.

REFERENCE BOOKS:

1. **Electric Power Quality,** G.T.Heydt, stars in a circle publications 1991.
2. **Modern Power Electronics,** M.H.Rashid TATA McGraw Hill 2002.
3. **Understanding power quality problems voltage sags and interruptions-** Math H. J. Bollen. IEEE Press, 2000
4. **Power quality in power systems and electrical machines,** Ewald F Fuchs ,Mohammad A.S., Masoum,Academic Press,Elsevier,2009.

10EE82 POWER SYSTEM OPERATION AND CONTROL

Subject Code	:	**10EE82**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

CONTROL CENTER OPERATION OF POWER SYSTEMS: Introduction to SCADA, control center, digital computer configuration, automatic generation control, area control error, operation without central computers, expression for tie-line flow and frequency deviation, parallel operation of generators, area lumped dynamic model.

8 Hours

UNIT - 2 & 3

AUTOMATIC GENERATION CONTROL: Automatic voltage regulator, automatic load frequency control, AVR control loops of generators, performance of AVR, ALFC of single area systems- Speed Governor, Turbine, Generator and Load models, steady state response, concept of control area, multi-area systems, POOL operation-two area systems, modeling the tie line, tie-line bias control.

10 Hours

UNIT - 4

CONTROL OF VOLTAGE AND REACTIVE POWER: Introduction, generation and absorption of reactive power, relation between voltage, power and reactive power at a node, single machine infinite bus systems, methods of voltage control, sub synchronous resonance, voltage stability, voltage collapse.

8 Hours

PART - B

UNIT - 5

UNIT COMMITMENT: Review of Economic Operation of Power Systems. Statement of the Unit Commitment problem, need and importance of unit commitment, methods-priority lists method, dynamic programming method, constraints, spinning reserve, and examples.

8 Hours

UNIT - 6 & 7

POWER SYSTEM SECURITY: Introduction, factors affecting power system security, power system contingency analysis, detection of network problems, network sensitivity methods, calculation of network sensitivity factor, contingency ranking.

10 Hours

UNIT 8

STATE ESTIMATION: Introduction, Least Square Estimation (LSE), Weighted LSE, Static State Estimation of Power Systems, tracking state estimation of power systems. Application of Power System State Estimation.

8 Hours

TEXT BOOKS:

1. **Computer Aided Power System Analysis-** G.L.Kusic, PHI,2010.
2. **Modern Power System Analysis-** I J Nagarath and D P Kothari, TMH, 3rd Edition, 2003
3. **Power generation, operation and control**- Allen J Wood & Woollenberg. John Wiley and Sons, Second Edition, 2009.
4. **Electrical Energy Systems Theory**, O.J Elgerd, TMH,2008.
5. **Power System Operation,** Robert H Miller, James H Malinowski, TMH, 3rd Edition, 2009.

REFERENCE:

1. **Power System Analysis, Operation and Control,** Abhijit Chakrabarti and Sunita Halder, PHI, Second Edition, 2009
2. **Power System Analysis, Operation and Control,** S. Sivaganaraju & G. Sreenivasan, Pearson, 2010

ELECTIVE – IV (GROUP - D)

10EE831 REACTIVE POWER MANAGEMENT

Subject Code	:	**10EE831**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT – 1

Introduction, Importance of reactive power control in EPS, Reactive power devices.
4 Hours

UNIT – 2

Theory of Load Compensation: Introduction- Requirement for compensation, Objectives in load compensation, Specifications of a load compensator, Power factor correction and voltage regulations in single phase system, Phase balancing and p. f. correction of unsymmetrical loads, Compensation in term of symmetrical components. **8 Hours**

UNIT – 3

Reactive Power Control: Fundamental requirement in AC Power transmission, Fundamental transmission line equation, Surge impedance and natural loading, Voltage and current profiles of uncompensated radial and symmetrical line on open circuit, Uncompensated line under load, Effect of line length, Load power and p. f on voltage and reactive power. **8 Hours**

UNIT – 4

Passive and active compensators, Uniformly distributed fixed compensation, Passive shunt compensation, Control of open circuit voltage by shunt reactance, Reactance of shunt reactors, multiple shunt reactors along the line. **6 Hours**

PART – B

UNIT - 5

Series compensation: Objectives and practical limitations, Symmetrical line with mid-point series capacitor and shunt reactor, Power transfer characteristics and maximum transmissible power for a general case, Fundamental concepts of compensation by sectioning. **6 Hours**

UNIT - 6
Principles of Static Compensation: Principle of operation of thyristor controlled reactor, Thyristors switched capacitor. Series Capacitors: Introduction, protective gear, reinsertion schemes, Varistor protective gear. **6 Hours**

UNIT – 7
Synchronous Condenser: Introduction, Power system Voltage control, Emergency reactive power supply, Starting methods, starting motor, reduced voltage starting, static starting. **6 Hours**

UNIT – 8
Harmonics effects, resonance, shunt capacitors and filters, telephone interferences, Reactive Power Co-ordination, Reactive power management, transmission benefits, reactive power dispatch & equipment impact. **8Hours**

TEXT BOOKS:
1. **Reactive power control in electric power systems**, T. J. E. Miller, John Wiley & Sons NY 2009
2. **Reactive Power Management**, D. Tagare, TMH, 1st Edition,2004.

REFERENCE BOOKS:
1. **Power System Stability and Control**,P. Kundur, TMH, 9th reprint, 2007.
2. **Power System Voltage Stability**, Carson. W. Taylor, McGraw-Hill, Inc.

10EE832 FLEXIBLE A.C. TRANSMISSION SYSTEMS (FACTS)

Subject Code	:	**10EE832**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT-1 & 2
Facts, Concepts and general system configuration: Transmission, interconnection, flow of power in AC system, power flow and dynamic stability consideration, of a transmission interconnection, relative importance of controllable parameters, basic types of FACTs controllers, shunt, series, combined shunt and series connected controllers. **10 Hours**

UNIT -3
POWER SEMICONDUCTOR DEVICES: types of high power devices, principle of high power device characteristics and requirements, power device material, diode, MOSFET, MOS turn OFF thyristor, emitter turn OFF thyristor, integrated gate commuted thyristor (GCT & IGCT). **10 Hours**

UNIT -4
VOLTAGE SOURCED CONVERTERS: Basic concepts, single-phase full wave bridge converter operation, square wave voltage harmonics for a single-phase bridge 3-phase full wave converter. **6 Hours**

PART – B

UNIT -5
SELF AND LINE COMMUTATED CURRENT SOURCE CONVERTER: Basic concepts, 3 phase full wave rectifier, thyristor based converter, current sourced converter with turnoff devices, current sourced versus voltage source converter. **6 Hours**

UNIT -6

STATIC SHUNT COMPENSATORS SVC AND STATCOM: Objective of shunt compensation, methods of controllable Var generation, static Var compensator, SVC and STA TCOM, comparison between, SVC and STA TCOM. **10 Hours**

UNIT -7& 8

STATIC SERIES COMPENSATORS: GCSC, TSSC, TCSC and SSSC, objectives of series compensation, variables impedance type of series compensation, switching converter type series compensation, external control for series reactive compensators. **10 Hours**

TEXT BOOKS:

1. **Understanding Facts - Concepts and technology of flexible AC Transmission system,** Arayan Hungorian & Laszlo gyugyi IEEE Press, standard publisher, 2001.

REFERENCE BOOKS:

1. **EHV - AC, HYDC Transmission & Distribution Engineering,** S.Rao,Khanna publishers, 3rd edition 2003.
2. **FACTS - Controllers in Power Transmission distribution** - K.R. Padiyar - New age publishers - 2007.

10EE833 ADVANCED INSTRUMENTATION SYSTEM

Subject Code	:	**10EE833**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

Part - A

UNIT - 1

Instrumentation: Frequency meter, measurement of time and frequency (mains), tachometer, phase meter, capacitance meter. Automation in digital Instrumentation. **6 Hours**

UNIT – 2

Analyzer: Wave analyzers and Harmonic distortion, Basic wave analyzer, Frequency selective wave analyzer, Harmonic distortion analyzer and Spectrum analyzer**.** **8 Hours**

UNIT – 3

Measuring Instruments: Output power meters, Field strength meter Vector impedance meter, Q meter applications-Z, Z_0 and Q. Basic LCR bridge, RX meters**.** **6 Hours**

UNIT – 4

Recorders: Strip chart recorder- applications of Strip chart recorder, Magnetic recorders, Frequency modulation (FM) recording, Digital data recording, Digital memory waveform recorder. **6 Hours**

Part – B

UNIT – 5

Transducers: Synchro's, Capacitance Transducers, Load cells, Piezo electrical Transducers, IC type temperature sensors, Pyrometers, Ultrasonic temperature Transducer, Reluctance pulse pick-ups, Flow measurement-mechanical Transducers; Magnetic flow meters, turbine flow meters. β-gauge. **8 Hours**

UNIT – 6

Data acquisition and conversion: Generalized data acquisition system (DAS), Signal conditioning of inputs, single channel DAS, multi channel DAS, data loggers, compact data logger. **6 Hours**

UNIT – 7

Measurement of power: Measurement of large amount of RF power (calorimetric method),measurement of power on a transmission line, standing wave ratio measurements, measurement of standing wave ratio using directional couplers. **6 Hours**

UNIT – 8

Data transmission: Serial, asynchronous interfacing, data line monitors, RS-232 standard, universal serial bus,IEEE-1394.Long distance data transmission(modems).IEEE 488 bus. Electrical interface. **6 Hours**

TEXT BOOKS:

1.Electronic Instrumentation,H S Kalsi,TMH,3rd Edition,2010**.**

2.Modern Electronic Instrumentation and Measuring Techniques, Cooper D and A D Helfrick,PHI,2009

3. Stuent Reference Manual for Electronic Instrumentation Laboratories, Stanly Wolf,Richard F H,Smith,PHI,2nd Edition,2010.

10EE834 AI APPLICATIONS TO POWER SYSTEMS

Subject Code	:	**10EE834**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

Part - A

UNIT - 1

Sparsity oriented Programming: Introduction, physical structure and sparsity, pivoting, conservation of sparsity by optimal ordering of buses, schemes for ordering, UD table storage scheme.

6 Hours

UNIT - 2

Artificial Intelligence: What is AI? Definitions, history and evolution, essential abilities of intelligence, AI applications; Problem solving: problem characteristics, problem search strategies, forward and backward reasoning, AND-OR graphs, game trees, search methods- informed and uninformed search, breadth first search and depth first search methods. **8 Hours**

UNIT – 3 and 4

Knowledge representation: logical formalisms: propositional and predicate logic: syntax and semantics, wffs, clause form expressions, resolution- use of RRTs for proofs and answers, examples from electric power systems, Non-monotonic logic: TMS, modal, temporal and fuzzy logic. **12 Hours**

Part – B

UNIT – 5

Structured representation of knowledge: ISA/ISPART trees, semantic nets, frames and scripts, examples from electric systems. **07 Hours**

UNIT – 6

Expert systems: Basic components, forward and backward chaining, ES features, ES development, ES categories, ES tools and examples from electric drive systems. **07 Hours**

UNIT –7 and 8

AI languages: LisP and ProLog - Introduction, sample segments, LisP primitives, list manipulation functions, function predicates, variables, iteration and recursion, property lists, sample programs for examples from electric power systems. **12 Hours**

REFERENCE BOOKS:

1. **Introduction to Artificial Intelligence and Expert Systems,** D.W.Patterson,PHI, 2009.
2. **Computer Methods for Circuit Analysis and Design,** J.Vlach and Singhal, CBS Publishers, 1986.
3. **Artificial Intelligence,** Rich, Elaine, Kevin Knight, TMH, 3rd Edition, 2008.
4. **Introduction to AI,** Charniak E. and Mcdermott D ,Pearson Education.
5. **Problem Solving Methods in AI,** Nils J.Nilson ,McGraw-Hill, 1971.
6. **Principles of AI,** Nils J.Nilson, Berlin Springer-Verlag, 1980

10EE835 DATA BASE MANAGEMENT SYSTEMS (DBMS)

Subject Code	:	**10EE835**	**IA Marks**	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT- 1

INTRODUCTION TO DATA BASE SYSTEMS : Managing data, a historical perspective, File systems versus DBMS, Advantages of DBMS, Describing and Storing Data in DBMS, Queries in DBMS, Transaction management, Structure of DBMS, People who work with databases. **4 Hours**

UNIT -2

ENITTY – RELATIONSHIP MODEL : Using high- Level Conceptual Data Models for Database Design, An example of Database Application, Entity types, Entity Sets, Attributes and Keys, Relationship types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design for the COMPANY database, ER Diagrams, Naming Conventions and Design Issues. **6 Hours**

Electronic Instrumentation

RELATIONAL MODEL AND RELATIONAL ALGEBRA: Relational model concepts, relational model constraints and relational database schemes, update operations and dealing with Constraint Violations, Unary relational Operations, SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations, JOIN and DIVISION, Additional Relational Operations, examples of Queries in Relational algebra, relational database design using ER-to-Relational mapping. **6 Hours**

UNIT- 4

SQL –THE RELATIONAL DATABASE STANDARD: SQL Data definition and data types, specifying basic constraints in SQL, Schemes, Change statements in SQL, basic Queries in SQL, more complex SQL queries, Insert, Delete and update statements in SQL, additional features SQL, specifying general constraints as assertion, views (virtual tables) in SQL, database Programming, issues and Techniques, Embedded SQL, Dynamic SQL, more examples; PL/SQL **10 Hours**

PART- B

UNIT- 5

DATABASE DESIGN: Informal Design Guidelines for Relation Schemes, Functional Dependencies, Normal Forms based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Properties of Relational Decompositions. **6 Hours**

UNIT- 6

b: Introduction Security, Access control, Discretionary Access, Mandatory Access Control **6 Hours**

UNIT – 7 & 8

TRANSACTION MANAGEMENT:The ACID properties, Transactions and Schedules, Concurrent Execution of transactions, Lock-based Concurrency control, performance of locking, Transaction support In SQL, Introduction to crash recovery; 2PL, for serializability and recoverability, Introduction to lock management, Lock Conversions, Dealing with Deadlocks, Specialized locking Techniques, Concurrency control without locking, Introduction to ARIES, The log, Other Recovery related Data Structures, The write-ahead log Protocol, Check pointing, Recovering from a System Crash, Media Recovery, Other Algorithms and Interaction with Concurrency control. **14 Hours**

TEXT BOOKS:

1. **Database Management Systems,** Raghu Ramakrishnan and Johannes Gehrke, McGraw Hill, 3rd Edition, 2003.

.

2**. Fundamentals of Database Systems,** Elmasri and Navathe, Pearson Education, 5th Edition, 2003.

REFERENCE:

1**. Database System concepts,** Silberschatz Kortts Sudharshan , McGraw Hill, 5th edition,2006.

10EE836 OPERATION RESEARCH

Subject Code	:	**10EE836**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART – A

Unit – 1: Linear Programming, Introduction, formulation of linear programming problem, Standard and matrix from, graphical solution, simplex method, computational procedure, Big-M method, Two-phase simplex method. **8 Hours**

Unit – 2: Special cases, Degeneracy, alternative optimal solutions, unbounded solutions, Non-existing optimal solutions. Duality in LPP, primal-dual relation, Formulation of dual problem, primal-dual optimal solution, limitations of LPP. 8 **Hours**

Unit – 3: Brief discussion on post-optimality or sensitivity analysis. (Numerical problems to be covered in all the cases except sensitivity analysis) **5 Hours**

Unit – 4: Assignment problems, Introduction, Formulation, Hungarian method of solving assignment problem, special cases, Traveling salesman problem. **5 Hours**

PART – B

Unit – 5: Transportation problems, Introduction, Tabular representation, Initial solution by different methods, Optimal solution, Special cases Games Theory, Introduction, Optimal strategies, solution of 2 X 2, 2 X n, m X 2 games. **7 Hours**

Unit – 6: Concept of dominance, Graphical method of solving. Sequencing problems, n-jobs and one machine. **7 Hours**

Unit – 7: Heuristic problem solving (Continued) n-jobs and two machines, n-jobs and three machines, Two jobs and m machines. N-jobs and m-machines. 6 **Hours**

Unit – 8: Replacement theory, Introduction, Economic life of equipments, Replacement considering both the cases with and without tie value of money, group replacement policy. **6 Hours**

TEXT BOOK:

1.**Fundamentals of operations research** – Ackoff, R.L. and Sasieni, M.W. Wiley eastern limited, New Delhi.
2.**Opretions Research Applications and Algorithms,** Wayne L. Winston,Cengage Learning,4th Edition,2009.
3.**Operations Research** – Bronson, R- Schaum's outline series, Mc Graw Hill International, 2nd Edition.
4.**Introduction to operations Research**,Gillet, B.e., TMH,1979.
5. **Introduction to operations Research** – Hillier, F.S. and Lieberman, G.J, TMH, 8th Edition, 2009

ELECTIVE –V (GROUP - E)

10EE841 POWER SYSTEMS DYNAMICS AND STABILITY

Subject Code	:	**10EE841**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION: Basic concepts, Review of classical methods.

2 Hours

UNIT - 2 & 3
SYSTEM MODELING AND DYNAMICS OF SYNCHRONOUS GENERATOR: Modeling of synchronous machine, Swing equation, Park's transformation – Park's voltage equation, Park's mechanical equation (torque). Applications – (a) Voltage build up in synchronous machine, and (b) Symmetrical short circuit of generator. Solution for transient analysis, Operational impedance, Relationship between Tdo/ and Tdo//, Algebraic constraints.

14 Hours

UNIT - 4
EXCITATION AND PRIME MOVER CONTROLLERS: Introduction, Types of excitation, AVR with and without ESS, TGR, Amplifier PSS, Static exciters.

8 Hours

PART - B

UNIT - 5

MODELING OF PRIME MOVERS: Introduction, Three major components, Block diagram, Hydraulic turbine, Steam turbine.

8 Hours

UNIT - 6

LOAD MODELING: Introduction, Two approaches – Polynomial model and Exponential model. Small Signal Angle Stability: Small signal angle stability with SMIB system, detailed model of SMIB.

10 Hours

UNIT - 7 & 8

TRANSIENT STABILITY ANALYSIS: Simulation for Transient stability Evaluation, Transient stability controllers.

10 Hours

TEXT BOOKS:

1. **Power System Dynamics, Stability and Control**,Padiyar K.R., Interline Publications.
2. **Power System Stability and Control,** Prabha Kundur. TMH, 9th Reprint.

REFERENCE BOOKS:

1. **Dynamics and Control of Large Electric Power Systems,** Marija Ilic; John Zaborszky, , IEEE Press and John Wiley & Sons, Inc, 2007
2. **Power System Control and Stability Revised Printing,** Paul M. Anderson and A. A. Fouad, IEEE Press and John Wiley & Sons, Inc, 2002.
3. **Selected topics from IEEE Transaction and Conference Proceedings**

10EE842 ENERGY AUDITING & DEMAND SIDE MANAGEMENT

Subject Code	:	**10EE842**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Energy situation – world and India, energy consumption, conservation, Codes, standards and Legislation.

6 Hours

UNIT - 2

ENERGY ECONOMIC ANALYSIS: The time value of money concept, developing cash flow models, payback analysis, depreciation, taxes and tax credit – numerical problems.

7 Hours

UNIT - 3

ENERGY AUDITING: Introduction, Elements of energy audits, energy use profiles, measurements in energy audits, presentation of energy audit results.

8 Hours

UNIT - 4

ELECTRICAL SYSTEM OPTIMIZATION: The power triangle, motor horsepower, power flow concept.

4 Hours

PART - B

UNIT - 5 & 6

ELECTRICAL EQUIPMENT AND POWER FACTOR –correction & location of capacitors, energy efficient motors, lighting basics, electrical tariff, Concept of ABT.

10 Hours

UNIT - 7 & 8

DEMAND SIDE MANAGEMENT: Introduction to DSM, concept of DSM, benefits of DSM, different techniques of DSM – time of day pricing, multi-utility power exchange model, time of day models for planning, load management, load priority technique, peak clipping, peak shifting, valley filling, strategic conservation, energy efficient equipment. Management and Organization of Energy Conservation awareness Programs.

16 Hours

TEXT BOOKS:

1. **Industrial Energy Management Systems,** Arry C. White, Philip S. Schmidt, David R. Brown, Hemisphere Publishing Corporation, New York.
2. **Fundamentals of Energy Engineering -** Albert Thumann, Prentice Hall Inc, Englewood Cliffs, New Jersey.
3. **Electrical Power distribution**, A S. Pabla, TMH, 5th edition, 2004

REFERENCE BOOKS:

1. **Recent Advances in Control and Management of Energy Systems**, D.P.Sen, K.R.Padiyar, Indrane Sen, M.A.Pai, Interline Publisher, Bangalore, 1993.
2. **Energy Demand – Analysis, Management and Conservation,** Ashok V. Desai, Wiley Eastern, 2005.
3. **Demand Side Managementm,** Jyothi Prakash, TMH Publishers.
4. **Hand book on energy auditing** - TERI (Tata Energy Research Institute)

10EE843 DATA COMMUNICATIONS AND NETWORKING

Subject Code	:	**10EE843**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

I**NTRODUCTION**: Data Communications; Networks; the Internet; Protocols and Standards; Layered tasks; The OSI Model and the layers in the OSI model; TCP / IP Protocol Suite**. 6 Hours**

UNIT - 2

DATA, SIGNALS, AND DIGITAL TRANSMISSION : Analog and digital signals; Transmission impairment; Data rate limits; Performance; Digital-to-Digital conversion; Analog-to-Digital conversion; Transmission modes. **8 Hours**

UNIT - 3

ANALOG TRANSMISSION AND MULTIPLEXING: Digital - to - Analog conversion; Analog - to - Analog conversion; Multiplexing; Spread spectrum. **6 Hours**

UNIT - 4

TRANSMISSION MEDIA, ERROR DETECTION AND CORRECTION: Twisted pair cable, Coaxial cable, Fibre-Optic cable, Radio waves, Microwaves, Infrared. Introduction to error detection / correction; Block coding; Linear block codes; Cyclic codes, Checksum.

6 Hours

PART - B

UNIT - 5

DATA LINK CONTROL: Framing; Flow and Error control; Protocols; Noiseless channels; Noisy channels; HDLC; Point-to-point Protocol - framing, transition phases. **7 Hours**

UNIT - 6

MULTIPLE ACCESS, ETHERNET: Random Access; Controlled Access; Channelization. Ethernet: IEEE standards; Standard Ethernet and changes in the standard; Fast Ethernet; Gigabit Ethernet.

7 Hours

UNIT - 7

WIRELESS LANS AND CONNECTION OF LANS: IEE 802.11; Bluetooth. Connecting devices; Backbone Networks; Virtual LANs. **6 Hours**

UNIT - 8

OTHER TECHNOLOGIES: Cellular telephony; SONET / SDH: Architecture, Layers, Frames; STS multiplexing. ATM: Design goals, problems, architecture, switching, layers.

6 Hours

TEXT BOOK:

1. **Data Communications and Networking** – Behrouz A. Forouzan, Tata McGraw-Hill, 4th Edition, , 2006.

REFERENCE BOOKS:

1. **Communication Networks: Fundamental Concepts and Key Architectures** - Alberto Leon, Garcia and Indra Widjaja, , Tata McGraw- Hill ,2nd Edition, 2004.
2. **Data and Computer Communication**, William Stallings, Pearson Education, 8th Edition, 2007.
3. **Computer Networks: A Systems Approach** - Larry L. Peterson and Bruce S. David, 4th Edition, Elsevier, 2007.
4. **Introduction to Data Communications and Networking** – Wayne Tomasi, Pearson Education, 2005.
5. **Computer and Communication Networks** – Nader F. Mir, Pearson Education, 2007.

10EE844 ELECTRICAL DISTRIBUTION SYSTEMS

Subject Code	:	**10EE844**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

POWER SYSTEM PLANNING AND AUTOMATION: Introduction, Factors affecting system planning, present planning techniques, planning models, future trends in planning, systems approach, distribution automation. **8 Hours**

UNIT - 2

LOAD CHARACTERISTIC: Basic definition, relation between load and load factor, load growth.

6 Hours

UNIT - 3 & 4

3. SYSTEM PLANNING: Planning process, planning criteria, system developers, dispersed generation, distribution systems, economics and finance, mapping. **12 Hours**

PART - B

UNIT - 5 & 6

DESIGN AND OPERATION: Engineering design, operation criteria, substation and feeder, voltage control, harmonics, load variations, system losses, energy management. **10 Hours**

UNIT - 7
DISTRIBUTION AUTOMATION: Definitions, communication, sensors, SCADA. **8 Hours**

UNIT - 8
OPTIMIZATION: Introduction, costing of schemes, typical network configurations, planning terms, network cost modeling, synthesis of optimum line network. **8 Hours**

TEXT BOOKS:

1. **Electric power distribution system engineering,** Turan Gonen, Mc GrawHill.
2. **Electric power distribution**-A S. Pabla, TMH, 5th edition, 2004
3. **Hand Book of Electrical Power Distribution,** Gorti Ramamurthy,University Press,2nd Edition,2009.

10EE845 INSULATION ENGINEERING

Subject Code	:	**10EE845**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
ELECTROSTATIC FIELD, THEIR CONTROL AND ESTIMATIONS: Electric Field Intensity, Electric Strength, Classification of Electric Fields, Degree of Uniformity of Electric Fields, control of Electric field Intensity (stress control), Estimation of Electric Field Intensity, Basic Equations for potential and Field Intensity in Electrostatic Fields, Analysis of Electric Field Intensity in Homogeneous Isotropic single dielectric only direct solution of Laplace equation, Analysis of Electric field Intensity in Isotropic Multi dielectric system. **7 Hours**

UNIT - 2
INSULATION SYSTEM IN POWER SYSTEM APPARATUS: Insulation system in capacitors, bushings, and transformers modes of failure of insulation systems. Insulations used in rotating machines. **6 Hour**

UNIT - 3
DIELECTRIC PHENOMENA: Dielectric phenomena in in solid insulation. Macroscopic approach for describing the Dielectric phenomena microscopic treatment for Dielectric phenomena. **7 Hours**

UNIT - 4
PROPERTIES OF INSULATION MATERIALS: Introduction to properties of solid insulating materials (both of natural origin and synthetic types) Properties of liquid insulating materials. **6 Hours**

PART - B

UNIT - 5
GASEOUS INSULATION: Requirement of gaseous insulation. Breakdown process: types of collision, Elastic and inelastic, collision cross-section, Mobility of ions, Diffusion of charges, Emission of radiation and excitation, various secondary process and recombination, Mobility controlled and diffusion controlled breakdown. Gas insulated substations. **9 Hours**

UNIT - 6

AGEING PHENOMENA: Failure of electric insulation due to ageing. Ageing mechanisms- Thermal ageing, Electrical ageing, combined thermal and electrical ageing. **9 Hours**

UNIT - 7

Analysis of insulation failure data, Power law model, Graphical estimation of power law constants, ageing date, plotting position and cumulative probability. **8 Hours**

TEXT BOOKS:

1. **Fundamentals of gaseous ionization and plasma electronics,** Nasser E. John Wiley Interscience, New York, 1971.
2. **Methods of statistical analysis and life data,** Hann N.R. Schafer R.E. and Singapore wall N.D. John Wiley and sons, New York, 2002.
3. **Theory of electric polarization**, Bother C.J.F. Elsevier Publications.
4. **High Voltage Insulation Engineering,** Ravindra Arora, Wolfgang Mosch, New age International Publishers Ltd.

REFERENCE BOOKS:

1. Electrical insulation, Bradwell A. Peter Peregrinus Ltd, London, 1993.
2. Electrical breakdown of gases, J.M. Meek and J.D. Craggs, "Oxford university press, 11953
3. High voltage Engineering fundamentals, E. Kufell and W.S. Zaengl, and J. Kufell, 2nd edition, Elsevier 2005
4. High voltage Engineering, M.S. Naidu and V Kamaraju, TMH, 4th edition, 2008.
5. **Gas Insulated Substations**, M.S. Naidu,I K International Publishing House,2008 Edition.

10EE846 INTELLECTUAL PROPERTY RIGHTS

Subject Code	:	**10EE846**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

Introduction, Protection of Knowledge in general, International Treaties-Paries Convention, TRIPS-treaty. **4 Hour**

UNIT – 2

Intellectual Property Rights with exception of Patents – Copyright and neighboring rights, Auteurswet 1912, Neighboring rights, Database law, unified Benelux law relating to Trademarks, Trade Name law. **8 Hour**

UNIT – 3 and 4

Utility model,Unified Benelux law relating to Industrial Designs, Protection of Plant Varities, Topographies and Semiconductor Products, Countering inadmissible competition. **12 Hour**

PART – B

UNIT – 5

Legal Regulations relating to Patents – Strasbourg Treaty, European Patent convention, Patent Cooperation Treaty, Patent Law Treaty. **6 Hour**

UNIT – 6

Obtaining a European Patent-official procedure in Europe, Rights conferred by a European Patent Application or a European Patent, International Patent Application-Official International procedure, Rights conferred by an International Patent Application. **10 Hour**

UNIT – 7

Patent Systems in Germany and United Kingdom, Patent System in USA, Patent System in Japan, Patent System in India. **6Hour**

UNIT – 8

Selected Topics – Novelty and Incentive Step, Industrial Application, Supplementary Protection Certificates**,** What does a Patent Attorney do with patents? **6 Hour**

TEXT BOOKS:

1**. Intellectual Proper Law,** Narayan P, Eastern Law House(P)Ltd.
2**. Law of Patent,** Elizabeth Berti, Eastern Book Company,India,First Edition, 2005.
3. **Managing Intellectual Property-The Strategic Imperative**, Vonod V Sople,PHI,2008

REFERENCE BOOKS:

1. **Intellectual Property,** David Brainbridge, Pearson Education,5th Edition, Indian Reprint,2003**.**

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