IV YEAR I SEMESTER **COURSE STRUCTURE**

Code	Subject	L	T/P/D	C
57012	Switchgear and Protection	3	1	3
57013	Utilization of Electrical Energy	3	1	3
57014	Instrumentation	3	1	3
57015	Power System operation and Control	4	-	4
	Elective – I	4	1	4
57016	High Voltage Engineering			
57017	VLSI Design			
57018	Digital Control Systems			
	Elective – II	4	1	4
57019	Optimization Techniques			
57020	Electrical Distribution Systems			
57021	Principles of Digital Signal Processing			
57603	Microprocessors and Microcontrollers Lab	-	3	2
57604	Electrical Measurements Lab	-	3	2
	Total	**21**	**11**	**25**

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IV Year B.Tech EEE I-Sem	L	T/P/D	C
	3	1/-/-	3

(57012) SWITCH GEAR AND PROTECTION

Objective:

This course introduces all varieties of Circuit Breakers and Relays for protection of Generators, Transformers and feeder bus bars from over voltages and other hazards. It emphasis on Neutral grounding for overall protection.

UNIT – I : Circuit Breakers-1

Circuit Breakers: Elementary principles of arc interruption, Recovery, Restriking Voltage and Recovery voltages.- Restriking Phenomenon, Average and Max. RRRV, Numerical Problems - Current Chopping and Resistance Switching - CB ratings and Specifications : Types and Numerical Problems. – Auto reclosures.

UNIT –II : Circuit Breakers-2

Description and Operation of following types of circuit breakers: Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum and SF6 circuit breakers.

UNIT – III : Electromagnetic and Static Relays

Principle of Operation and Construction of Attracted armature, Balanced Beam, induction Disc and Induction Cup relays.

Relays Classification: Instantaneous, DMT and IDMT types.

Application of relays: Over current/ Under voltage relays, Direction relays, Differential Relays and Percentage Differential Relays.

Universal torque equation, Distance relays: Impedance, Reactance and Mho and Off-Set Mho relays, Characteristics of Distance Relays and Comparison.

Static Relays: Static Relays verses Electromagnetic Relays.

UNIT – IV : Generator Protection

Protection of generators against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection. Numerical Problems on % Winding Unprotected.

UNIT –V : Transformer Protection

Protection of transformers: Percentage Differential Protection, Numerical Problem on Design of CT s Ratio, Buchholtz relay Protection.

UNIT –VI : Feeder and Bus-Bar Protection

Protection of Lines: Over Current, Carrier Current and Three-zone distance relay protection using Impedance relays. Translay Relay.

Protection of Bus bars – Differential protection.

UNIT – VII : Neutral Grounding

Grounded and Ungrounded Neutral Systems.- Effects of Ungrounded Neutral on system performance. Methods of Neutral Grounding: Solid, Resistance, Reactance - Arcing Grounds and Grounding Practices.

UNIT – VIII : Protection against over voltages

Generation of Over Voltages in Power Systems.-Protection against Lightning Over Voltages - Valve type and Zinc-Oxide Lighting Arresters - Insulation Coordination -BIL, Impulse Ratio, Standard Impulse Test Wave, Volt-Time Characteristics.

TEXT BOOKS:

1. Switchgear and Protection – by Sunil S Rao, Khanna Publlishers
2. Power System Protection and Switchgear by Badari Ram , D.N Viswakarma, TMH Publications

REFERENCE BOOKS:

1. Transmission network Protection by Y.G. Paithankar ,Taylor and Francis,2009.
2. Power system protection and switch gear by Bhuvanesh Oza, TMH, 2010.
3. Electrical Power Systems – by C.L.Wadhwa, New Age international (P) Limited, Publishers, 3rd editon

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(57013) UTILIZATION OF ELECTRICAL ENERGY

Objective:

This subject deals with the fundamentals of illumination and its classification and the electric heating and welding. It gives the detailed study of all varieties of Electric drives and their application to electrical traction systems.

UNIT – I ELECTRIC DRIVES

Type of electric drives, choice of motor, starting and running characteristics, speed control, temperature rise, particular applications of electric drives, types of industrial loads, continuous, intermittent and variable loads, load qualization.

UNIT – II ELECTRIC HEATING

Advantages and methods of electric heating, resistance heating induction heating and dielectric heating.

UNIT – III ELECTRIC WELDING

Electric welding, resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.

UNIT – IV ILLUMINATION FUNDAMENTALS

Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light.

UNIT – V VARIOUS ILLUMINATION METHODS

Discharge lamps, MV and SV lamps – comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of lighting and flood lighting.

UNIT – VI ELECTRIC TRACTION – I

System of electric traction and track electrification. Review of existing electric traction systems in India. Special features of traction motor, methods of electric braking-plugging rheostatic braking and regenerative braking.

UNIT – VII ELECTRIC TRACTION – II

Mechanics of train movement. Speed-time curves for different services – trapezoidal and quadrilateral speed time curves.

UNIT – VIII ELECTRIC TRACTION-III

Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and braking retardation adhesive weight and coefficient of adhesion.

TEXT BOOK:

1. Utilisation of Electric Energy – by E. Openshaw Taylor, University press.
2. Art & Science of Utilization of electrical Energy – by Partab, Dhanpat Rai & Sons.

REFERENCE BOOKS:

1. Utilization of Electrical Power including Electric drives and Electric traction – by N.V.Suryanarayana, New Age International (P) Limited, Publishers, 1996.
2. Generation, Distribution and Utilization of electrical Energy – by C.L. Wadhwa, New Age International (P) Limited, Publishers, 1997.

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IV Year B.Tech EEE I-Sem	L	T/P/D	C
	3	1/-/-	3

(57014) INSTRUMENTATION

Objective :

Instrumentation is essential in monitoring and analysis of any Physical system and its control. This course deals with different types of transducers, digital voltmeters, oscilloscopes and measurement of non electrical quantities.

UNIT-I Characteristics of Signals

Measuring Systems, Performance Characteristics, - Static characteristics, Dynamic Characteristics; Errors in Measurement – Gross Errors, Systematic Errors, Statistical Analysis of Random Errors.

UNIT-II Signals and their representation

Signal and their representation: Standard Test, periodic, aperiodic, modulated signal, sampled data, pulse modulation and pulse code modulation

UNIT-III Oscilloscope

Cathode ray oscilloscope-Cathode ray tube-time base generator-horizantal and vertical amplifiers-CRO probes-applications of CRO-Measurement of phase and frequency-lissajous patterns-Sampling oscilloscope-analog and digital type

UNIT-IV Digital Voltmeters

Digital voltmeters- Successive approximation, ramp, dual-Slope integration continuos balance type-Micro processor based ramp type DVM digital frequency meter-digital phase angle meter-

UNIT-V Signal Analyzers

Wave Analysers- Frequency selective analyzers, Heterodyne, Application of Wave analyzers- Harmonic Analyzers, Total Harmonic distortion, spectrum analyzers, Basic spectrum analyzers, spectral displays, vector impedance meter, Q meter. Peak reading and RMS voltmeters

UNIT-VI Transducers

Definition of transducers, Classification of transducers, Advantages of Electrical transducers, Characteristics and choice of transducers; Principle operation of resistor, inductor, LVDT and capacitor transducers; LVDT

Applications, Strain gauge and its principle of operation, guage factor, Thermistors, Thermocouples, Synchros, Piezo electric transducers, photovoltaic, photo conductive cells, photo diodes.

UNIT-VII Measurement of Non-Electrical Quantities-I

Measurement of strain, Gauge Sensitivity, Displacement, Velocity, Angular Velocity, Acceleration, Force, Torque.

UNIT-VIII Measurement of Non-Electrical Quantities-II

Measurement of Temperature, Pressure, Vacuum, Flow, Liquid level.

TEXT BOOKS:

1. Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India
2. A course in Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, Dhanpatrai & Co.

REFERENCE BOOKS:

1. Measurements Systems, Applications and Design – by D O Doeblin, TMH Publications
2. Modern Electronic Instrumentation and Measurement techniques – by A.D Helfrick and W.D.Cooper, Pearson/Prentice Hall of India.
3. Principles of Measurement and Instrumentation – by A.S Morris, Pearson /Prentice Hall of India
4. Electronic Instrumentation-by H.S.Kalsi Tata MCGraw-Hill Edition, 1995.

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IV Year B.Tech EEE I-Sem	L	T/P/D	C
	4	-/-/-	4

(57015) POWER SYSTEM OPERATION AND CONTROL

Objective : This subject deals with Economic operation of Power Systems, Hydrothermal schedulings and modeling of turbines, generators and automatic controllers. It emphasizes on single area and two area load frequency control and reactive power control.

UNIT – I : Economic Operation of Power Systems-1

Optimal operation of Generators in Thermal Power Stations, - heat rate Curve – Cost Curve – Incremental fuel and Production costs, input-output characteristics, Optimum generation allocation with line losses neglected.

UNIT – II : Economic Operation of Power Systems-2

Optimum generation allocation including the effect of transmission line losses – Loss Coefficients, General transmission line loss formula.

UNIT – III : Hydrothermal Scheduling

Optimal scheduling of Hydrothermal System: Hydroelectric power plant models, Scheduling problems-Short term Hydrothermal scheduling problem.

UNIT –IV : Modeling of Turbine,. and Automatic Controllers

Modelling of Turbine: First order Turbine model, Block Diagram representation of Steam Turbines and Approximate Linear Models.

Modelling of Governor: Mathematical Modelling of Speed Governing System – Derivation of small signal transfer function.

Modeling of Excitation System: Fundamental Characteristics of an Excitation system, Transfer function, Block Diagram Representation of IEEE Type-1 Model

UNIT – V : Single Area Load Frequency Control

Necessity of keeping frequency constant.

Definitions of Control area – Single area control – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response – Uncontrolled case.

UNIT – VI : Two-Area Load Frequency Control

Load frequency control of 2-area system – uncontrolled case and controlled case, tie-line bias control

UNIT-VII : Load Frequency Controllers

Proportional plus Integral control of single area and its block diagram representation, steady state response – Load Frequency Control and Economic dispatch control.

UNIT – VIII : Reactive Power Control

Overview of Reactive Power control – Reactive Power compensation in transmission systems – advantages and disadvantages of different types of compensating equipment for transmission systems; load compensation – Specifications of load compensator, Uncompensated and compensated transmission lines: shunt and Series Compensation.(qualitative treatment)

TEXT BOOKS:

1. Power Systems Analysis, operation and control by Abhijit Chakrabarti, Sunitha Halder, PHI 3/e , 2010
2. Modern Power System Analysis – by I.J.Nagrath & D.P.Kothari Tata M Graw – Hill Publishing Company Ltd, 2nd edition.

REFERENCE BOOKS:

1. Power System Analysis and Design by J.Duncan Glover and M.S.Sarma., cengage 3rd Edition.
2. Electric Energy systems Theory – by O.I.Elgerd, Tata Mc Graw-hill Publishing Company Ltd., Second edition.
3. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
4. Power System Analysis by C.L.Wadhwa, Newage International-3rd Edition

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	4	1/-/-	4

(57016) HIGH VOLTAGE ENGINEERING (ELECTIVE-I)

Objective : This subject deals with the detailed analysis of Breakdown occuring in gaseous, liquids and solid dielectrics. Information about generation and measurement of High voltage and current. In addition High voltage testing methods are also discussed.

UNIT I : INTRODUCTION TO HIGH VOLTAGE TECHNOLOGY AND APPLICATIONS

Electric Field Stresses, Gas / Vaccum as Insulator, Liquid Dielectrics, Solids and Composites, Estimation and Control of Electric Stress, Numerical methods for electric field computation, Surge voltages, their distribution and control, Applications of insulating materials in transformers, rotating machines, circuit breakers, cable power capacitors and bushings.

UNIT II : BREAK DOWN IN GASEOUS AND LIQUID DIELECTRICS

Gases as insulating media, collision process, Ionization process, Townsend's criteria of breakdown in gases, Paschen's law. Liquid as Insulator, pure and commercial liquids, breakdown in pure and commercial liquids.

UNIT III : BREAK DOWN IN SOLID DIELECTRICS

Intrinsic breakdown, electromechanical breakdown, thermal breakdown, breakdown of solid dielectrics in practice, Breakdown in composite dielectrics, solid dielectrics used in practice.

UNIT IV : GENERATION OF HIGH VOLTAGES AND CURRENTS

Generation of High Direct Current Voltages, Generation of High alternating voltages, Generation of Impulse Voltages, Generation of Impulse currents, Tripping and control of impulse generators.

UNIT V : MEASUREMENT OF HIGH VOLTAGES AND CURRENTS

Measurement of High Direct Current voltages, Measurement of High Voltages alternating and impulse, Measurement of High Currents-direct, alternating and Impulse, Oscilloscope for impulse voltage and current measurements.

UNIT VI : OVER VOLTAGE PHENOMENON AND INSULATION CO-ORDINATION

Natural causes for over voltages – Lightning phenomenon, Overvoltage due to switching surges, system faults and other abnormal conditions, Principles of Insulation Coordination on High voltage and Extra High Voltage power systems.

UNIT VII : NON-DISTRUCTIVE TESTING OF MATERIAL AND ELECTRICAL APPARATUS

Measurement of D.C Resistivity, Measurement of Dielectric Constant and loss factor, Partial discharge measurements.

UNIT VIII : HIGH VOLTAGE TESTING OF ELECTRICAL APPARATUS

Testing of Insulators and bushings, Testing of Isolators and circuit breakers, Testing of cables, Testing of Transformers, Testing of Surge Arresters, Radio Interference measurements.

TEXT BOOKS:

1. High Voltage Engineering by M.S.Naidu and V. Kamaraju – TMH Publications, 3rd Edition
2. High Voltage Engineering: Fundamentals by E.Kuffel, W.S.Zaengl, J.Kuffel by Elsevier, 2nd Edition.

REFERENCE BOOKS:

1. High Voltage Engineering by C.L.Wadhwa, New Age Internationals (P) Limited, 1997.
2. High Voltage Insulation Engineering by Ravindra Arora, Wolfgang Mosch, New Age International (P) Limited, 1995.
3. High Voltage Engineering, Theory and Practice by Mazen Abdel Salam, Hussein Anis, Ahdan El-Morshedy, Roshdy Radwan , Marcel Dekker

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IV Year B.Tech EEE I-Sem

L	T/P/D	C
4	1/-/-	4

(57017) VLSI DESIGN (ELECTIVE –I)

UNIT I

INTRODUCTION : Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS technologies- Oxidation, Lithography, Diffusion, Ion implantation, Metallisation, Encapsulation, Probe testing, Integrated Resistors and Capacitors.

UNIT II

BASIC ELECTRICAL PROPERTIES : Basic Electrical Properties of MOS and BiCMOS Circuits: Ids-Vds relationships, MOS transistor threshold Voltage, gm, gds, figure of merit "wo"; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT III

VLSI CIRCUIT DESIGN PROCESSES : VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2 microm CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

UNIT IV

GATE LEVEL DESIGN : Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads, Wiring Capacitances, Fan-in and fan-out, Choice of layers

UNIT V

DATA PATH SUBSYSTEMS : Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters.

UNIT VI

ARRAY SUBSYSTEMS: SRAM, DRAM, ROM Serial access memories, content addressable memory .

UNIT VII

SEMICONDUCTOR INTEGRATED CIRCUIT DESIGN : VHDL SYNTHESIS : PLAs FPGAs, CPLDs, standard cells, programmable array logic, design approach parameters influencing low power design.

UNIT VIII

CMOS TESTING : CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chip level Test Techniques, System-level Test Techniques, Layout Design for improved Testability.

TEXTBOOKS:

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, PHI, 2005 Edition.
2. VLSI Designing K. Lal kishore VSV prabhakar IK international 2009
3. CMOS VLSI Design - A circuits system perspective Neil H E Weste David Harris Ayan banergye pearson 2009.

REFERENCES:

1. CMOS Logic circuit design, - John P. Uyemura, springer 2007.
2.. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997
3. Principles of CMOS VLSI Design West and Eshraghian pearson .
4. Introduction to VLSI Mead & Convey BS publications 2010.
5. VLSI Design M. Micheal Vai CRC press 2009 .

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IV Year B.Tech EEE I-Sem	L	T/P/D	C
	4	1/-/-	4

(57018) DIGITAL CONTROL SYSTEMS (ELECTIVE-I)

UNIT – I SAMPLING AND RECONSTRUCTION

Introduction, Examples of Data control systems – Digital to Analog conversion and Analog to Digital conversion, sample and hold operations.

UNIT-II THE Z – TRANSFORMS

Introduction, Linear difference equations, pulse response, Z – transforms, Theorems of Z – Transforms, the inverse Z – transforms, Modified Z-Transforms

UNIT-III Z-PLANE ANALYSIS OF DISCRETE-TIME CONTROL SYSTEM

Z-Transform method for solving difference equations; Pulse transforms function, block diagram analysis of sampled – data systems, mapping between s-plane and z-plane.

UNIT – IV STATE SPACE ANALYSIS

State Space Representation of discrete time systems, Pulse Transfer Function Matrix solving discrete time state space equations, State transition matrix and it's Properties, Methods for Computation of State Transition Matrix, Discretization of continuous time state – space equations

UNIT – V CONTROLLABILITY AND OBSERVABILITY

Concepts of Controllability and Observability, Tests for controllability and Observability. Duality between Controllability and Observability, Controllability and Observability conditions for Pulse Transfer Function

UNIT – VI STABILITY ANALYSIS

Mapping between the S-Plane and the Z-Plane – Primary strips and Complementary Strips – Constant frequency loci, Constant damping ratio loci, Stability Analysis of closed loop systems in the Z-Plane. Jury stablility test – Stability Analysis by use of the Bilinear Transformation and Routh Stability criterion.

UNIT – VII

DESIGN OF DISCRETE TIME CONTROL SYSTEM BY CONVENTIONAL METHODS

Transient and steady – State response Analysis – Design based on the frequency response method – Bilinear Transformation and Design procedure in the w-plane, Lead, Lag and Lead-Lag compensators and digital PID controllers.

UNIT – VIII STATE FEEDBACK CONTROLLERS AND OBSERVERS

Design of state feedback controller through pole placement – Necessary and sufficient conditions, Ackerman's formula.

State Observers – Full order and Reduced order observers.

TEXT BOOK:

1. Discrete-Time Control systems - K. Ogata, Pearson Education/PHI, 2nd Edition

REFERENCE BOOKS:

1. Digital Control Systems, Kuo, Oxford University Press, 2nd Edition, 2003.
2. Digital Control and State Variable Methods by M.Gopal, TMH

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L	T/P/D	C
4	1/-/-	4

(57019) OPTIMIZATION TECHNIQUES (ELECTIVE-II)

UNIT – I Introduction and Classical Optimization Techniques:

Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems.

UNIT – II Classical Optimization Techniques

Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints.

Solution by method of Lagrange multipliers – multivariable Optimization with inequality constraints – Kuhn – Tucker conditions.

UNIT – III Linear Programming

Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm.

UNIT – IV Transportation Problem

Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems.

UNIT – V Unconstrained Nonlinear Programming:

One – dimensional minimization methods: Classification, Fibonacci method and Quadratic interpolation method

UNIT – VI Unconstrained Optimization Techniques

Univariate method, Powell's method and steepest descent method.

UNIT – VII Constrained Nonlinear Programming:

Characteristics of a constrained problem, Classification, Basic approach of Penalty Function method; Basic approaches of Interior and Exterior penalty function methods. Introduction to convex Programming Problem.

UNIT – VIII Dynamic Programming:

Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.

TEXT BOOKS:

1. "Engineering optimization: Theory and practice"-by S. S.Rao, New Age International (P) Limited, 3rd edition, 1998.
2. "Introductory Operations Research" by H.S. Kasene & K.D. Kumar, Springer (India), Pvt .LTd.

REFERENCE BOOKS:

1 "Optimization Methods in Operations Research and systems Analysis" – by K.V. Mittal and C. Mohan, New Age International (P) Limited, Publishers, 3rd edition, 1996.
2. Operations Research – by Dr. S.D.Sharma.
3. "Operations Research : An Introduction" – by H.A. Taha, Pearson Pvt. Ltd.
4. Linear Programming – by G. Hadley

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L	T/P/D	C
4	1/-/-	4

(57020) ELECTRICAL DISTRIBUTION SYSTEMS (ELECTIVE-II)

UNIT – 1 GENERAL CONCEPTS

Introduction to distribution systems, Load modelling and characteristics. Coincidence factor, contribution factor loss factor - Relationship between the load factor and loss factor. Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.

UNIT – II DISTRIBUTION FEEDERS

Design Considerations of Distribution Feeders: Radial and loop types of primary feeders, voltage levels, feeder loading; basic design practice of the secondary distribution system.

UNIT – III SUBSTATIONS

Location of Substations: Rating of distribution substation, service area within primary feeders. Benefits derived through optimal location of substations.

UNIT – IV SYSTEM ANALYSIS

Voltage drop and power-loss calculations: Derivation for voltage drop and power loss in lines, manual methods of solution for radial networks, three phase balanced primary lines.

UNIT – V PROTECTION

Objectives of distribution system protection, types of common faults and procedure for fault calculations. Protective Devices: Principle of operation of Fuses, Circuit Reclosures, line sectionalizes, and circuit breakers

UNIT – VI COORDINATION

Coordination of Protective Devices: General coordination procedure.

UNIT – VII COMPENSATION FOR POWER FACTOR IMPROVEMENT

Capacitive compensation for power-factor control.

Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched), Power factor correction, capacitor allocation - Economic justification - Procedure to determine the best capacitor location.

UNIT – VIII VOLTAGE CONTROL

Voltage Control: Equipment for voltage control, effect of series capacitors, effect of AVB/AVR, line drop compensation.

TEXT BOOK:

1. Electric Power Distribution system, Engineering" – by Turan Gonen, CRC Press.
2. Electrical Power Distribution Systems by V.Kamaraju , TMH, 2/e, 2010

REFERENCE BOOK:

1. Electrical Power Distribution hand book by g.Ram murthy, 2ed, University press
2. Electric Power Distribution – by A.S. Pabla, Tata Mc Graw-hill Publishing company, 5th edition, 1997.

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IV Year B.Tech EEE I-Sem	L	T/P/D	C
	4	1/-/-	4

(57021) PRINCIPLES OF DIGITAL SIGNAL PROCESSING (ELECTIVE-II)

UNIT I : Signal Analysis:

Anology between vectors and signals, Classification of signals with examples, classification of systems with examples

Fourier series: Trigonometric Fourier series, Exponential Fourier series, Line spectrum, Properties of Fourier series, Dirchlet's conditions, Problems.

Fourier Transform: Fourier transform and relation between Fourier series and Fourier transform (F.T), Properties of Fourier Transform, Conditions for existence of F.T, Inverse Fourier Transform, Significance of energy density and power density spectrums, Evalution of convolution Integral, Problems.

UNIT II : SIGNAL TRANSMISSION THROUGH LINEAR SYSTEM:

Linear system, Impulse response, Response of a linear system, Linear time invariant (LTI), Transfer function of a LTI system, Filter characteristics of linear systems, Distortion less transmission through a system, Physical Realizability of LTI systems, Ideal LPF, HPF and BPF characteristics, Relation between rise time and band width of a system, Relation between input and output Power Spectral Densities, Sampling Theorem and Signal Reconstruction, Aliasing, Problems

UNIT III : LAPLACE AND Z- TRANSFORMS:

Laplace Transform (L.T): Concept of L.T, properties of Laplace Transform, Region of Convergence, Solution to differential equations, Inverse Laplace Transform, Problems.

Z- TRANSFORMS (Z.T): Concept of Z.T, properties of Z- Transform, Region of convergence, Inverse Z-Transform, Solution to difference equations, Relation between F.T,L.T and Z.T, Problems.

UNIT IV : INTRODUCTION TO DSP:

Discrete Time (DT) signals and sequences, Properties of DT LTI system –

Linearity, Time invariance, Stability, Causality, memoryless, linear Constant Coefficient Difference Equations and its solution, Concept of Discrete Time Fourier Transform (DTFT), Frequency domain representation of discrete time signals and systems, Properties of DTFT, Problems.

UNIT V : DISCRETE FOURIER REPRESENTATION

Discrete Fourier series (DFS): DFS representation of periodic sequences, Properties, Problems

Discrete Fourier Transform (DFT): Discrete Fourier Transform, Properties of DFT, Linear convolution of sequence using DFT, Computation of DFT, Relation between DTFT,DFS,Z.T and DFT, Problems

UNIT VI : Fast Fourier Transforms:

Fast fourier transforms(FFT) – Radix -2 Decimation – in- time (DIT) and Decimation – in- frequency (DIF) FFT Algorithms, Comparison of DIT FFT , Inverse FFT , and FFT for composite N, problems

UNIT VII : IIR Digital Filters:

Anlog filter approximations – Butterworth and Chebyshev, Design of IIR Digital filter from Analog filter- Step Invarience , impulse invariance and bilinear transformation techniques, design examples, realization of IIR filters direct, canaonic, cascade, and parallel forms.

UNIT VIII : FIR digital filters :

Characteristics of FIR digital filters, frequency response, design of FIR digital filters-fourier method, window techniques, frequency sampling technique, comparison of IIR and FIR filters, realization of FIR filters direct, canaonic, cascade, and parallel forms.

TEXT BOOKS:

1. Signals, systems and communications B.P. lathi B.S. publications 2009
2. Digital Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, and JR Buck pearson education 2009.
3. Fundamentals of Digital Signal Processing – Loney ludeman, John wiley 2010

REFERENCE BOOKS:

1. Signal & systems – A.V.Oppenheim and A S Wilsky and SH Nawab PHI 2/e 2008
2. Digital Signal Processing: S Salivahanan, A Vallava raj and C.gnanapriya TMH. 2008
3. Digital Signal Processing , principles, algorithms, and applications – John G proakis, Dimitris G. manolakis pearson education /phi 2007.
4. Digital Signal Processing - fundamentals applications LiTan Elsevier 2008
5. Digital Signal Processing A practical approach, Emmanuel C . IFEACHOR and Barie Jervis 2/e pearson 2009

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	0	-/3/-	2

(57603) MICROPROCESSORS AND MICROCONTROLLERS LAB

The following programs are to be written for assembler and execute the same with 8086 and 8051 kits

1. Programs for 16 bit arithmetic operations for 8086 (using various addressing modes)
2. Program for sorting an array for 8086.
3. Program for searching for a number or character in a string for 8086.
4. Program for string manipulations for 8086.
5. Program for digital clock design using 8086.
6. Interfacing ADC and DAC to 8086.
7. Parallel communication between two microprocessor kits using 8255.
8. Serial communication between two microprocessor kits using 8251.
9. Interfacing to 8086 and programming to control stepper motor.
10. Programming using arithmetic, logical and bit manipulation instructions of 8051.
11. Program and verify timer/counter in 8051.
12. Program and verify interrupt handling in 8051.
13. UART operation in 8051.
14. Communication between 8051 kit and PC.
15. Interfacing LCD to 8051.
16. Interfacing Matrix/keyboard to 8051..
17. Data Transfer from peripheral to memory through DMA controller 8237/8257.

Note: Minimum of 12 experiments to be conducted.

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	0	-/3/-	2

(57604) ELECTRICAL MEASUREMENTS LAB

The following experiments are required to be conducted as compulsory experiments:

1. Calibration and Testing of single phase energy Meter
2. Calibration of dynamometer power factor meter
3. Crompton D.C. Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter
4. Kelvin's double Bridge – Measurement of resistance – Determination of Tolerance.
5. Dielectric oil testing using H.T. testing Kit
6. Schering bridge & Anderson bridge.
7. Measurement of 3 phase reactive power with single-phase wattmeter.
8. Measurement of parameters of a choke coil using 3 voltmeter and 3 ammeter methods. In addition to the above eight experiments, atleast any two of the experiments from the following list are required to be conducted:
9. Calibration LPF wattmeter – by Phantom testing
10. Measurement of 3 phase power with single watt meter and 2 No's of C.T.
11. C.T. testing using mutual Inductor – Measurement of % ratio error and phase angle of given C.T. by Null method.
12. P.T. testing by comparison – V.G. as Null detector – Measurement of % ratio error and phase angle of the given P.T.
13. LVDT and capacitance pickup – characteristics and Calibration
14. Resistance strain gauge – strain measurements and Calibration
15. Transformer turns ratio measurement using a.c. bridge
16. Measurement of % ratio error and phase angle of given C.T. by comparison.