COURSE STRUCTURE
AND
DETAILED SYLLABUS

ELECTRICAL AND ELECTRONICS ENGINEERING

FOR
B.TECH FOUR YEAR DEGREE COURSE
(Applicable for the batches admitted from 2012-2013)

B.Tech. Programs:
Chemical Engineering
Civil Engineering
Computer Science and Engineering
Electrical and Electronics Engineering
Electronics and Communication Engineering
Information Technology
Mechanical Engineering

Pharmacy Programs:
B.Pharmacy
Pharma-D
Pharma-D (Post Baccalaureate)
M.Pharm (Pharmaceutics)
M.Pharm (Pharmacology)
M.Pharm (Pharmaceutical Analysis & Quality Assurance)
M.Pharm (Industrial Pharmacy)

M.Tech. Programs:
M.Tech (Computer Science and Engineering)
M.Tech (Software Engineering)
M.Tech (Computer Science)
M.Tech (Computer Networks & Information Security)
M.Tech (Power Electronics & Electrical Drives)
M.Tech (Electrical Power Systems)
M.Tech (CAD/CAM)
M.Tech (Machine Design)
M.Tech (VLSI System Design)
M.Tech (Embedded Systems)
M.Tech (Electronics & Communications Engineering)
M.Tech (Wireless & Mobile Communication)
M.Tech (Structural Engineering)
M.Tech (Construction Management)

Master of Business Administration
Master of Computer Application

ANURAG GROUP OF INSTITUTIONS
(AUTONOMOUS)
(Formerly CVSR College of Engineering)
Venkatapur, Ghatkesar, Hyderabad – 501 301
www.cvsr.ac.in
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## COURSE STRUCTURE AND SYLLABUS

### III YEAR I SEMESTER

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject Name</th>
<th>Lectures</th>
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<td>A57011</td>
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### COURSE STRUCTURE
## COURSE STRUCTURE AND SYLLABUS

### III YEAR I SEMESTER

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Note: All End Examinations (Theory and Practical) are of three hours duration.

T – Tutorial  P – Practical  D – Drawing
Utilization of Electrical Energy

COURSE OBJECTIVES:
1. To understand concepts of drives, heating, welding, illumination and traction.
2. To identifying and troubleshooting the various applications of electrical equipments.
3. To design suitable schemes for welding, heating, drives, illumination and traction.
4. To identify the job/higher education / research opportunities in Electric Utilization.

UNIT – I
Electric Drives
Type of electric drives, choice of motor, starting and running characteristics, speed control, temperature rise, types of industrial loads, continuous, intermittent and variable loads, load equalization, applications of electric drives.

UNIT – II
Electric Heating & Welding
Advantages and methods of electric heating, Resistance heating ,Induction heating and Dielectric heating.
Electric welding, Resistance and Arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.

UNIT – III
Illumination Fundamentals & Various Illumination Methods
Introduction, terms used in illumination, laws of illumination, polar curves, Discharge lamps, MV , SV and LED lamps – comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of interior lighting and flood lighting.
UNIT – IV
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.
Mechanics of train movement. Speed-time curves for different services – trapezoidal and quadrilateral speed time curves.

UNIT – V
Electric Traction-II
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 BOOKS:

REFERENCE BOOKS:

COURSE OUTCOMES:
After going through this course the student gets a thorough knowledge on
1. Various types of electric drives and various types of lamps.
2. Various methods of electric heating and welding.
3. Illumination fundamentals and basic principles of light control.
4. Electric traction and methods of electric braking.

With which he/ she can able to apply the above conceptual things to real time electrical drives, domestic and commercial applications and electric traction system.
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B.Tech EEE IV Year I-Semester

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Instrumentation

COURSE OBJECTIVES:
1. Deals with instrumentation systems having conversion from Non-electrical quantities to electrical quantities
2. Can able to analyze and implement instrumentation systems concerned with pressure, force, temp & flow etc.

UNIT-I
Characteristics of Signals

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

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

UNIT-III
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

Signal Analyzers
Wave Analyzers- 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-IV
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, gauge factor, Thermistors, Thermocouples, Synchros, Piezo electric transducers, photovoltaic, photo conductive cells, photo diodes.

UNIT-V
Measurement of Non-Electrical Quantities

TEXT BOOKS:

REFERENCE BOOKS:

COURSE OUTCOMES:
After going through this course the student gets a thorough knowledge on
1. Characteristics of measuring systems and different types of signals.
2. Working and performance of CRO, analog and digital oscilloscopes, digital voltmeters, signal analyzers, transducers and LVDT transducers.

With which he/ she can able to apply the above conceptual things to real time electrical and electronic measurements and applications.
ANURAG GROUP OF INSTITUTIONS  
(Autonomous) 

B.Tech EEE IV Year I-Semester  

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Computer Methods in Power Systems

COURSE OBJECTIVES:
1. Ability to understand formation of Power System matrices & Power flow studies by various computer methods.
2. Ability to apply the mathematical concepts to solve power flow analysis.
3. Analyze the power system behavior under normal & fault conditions.
4. It deals with short circuit analysis of power system for steady state and transient stability.

UNIT-I
Power System Network Matrices

Graph theory: Definitions, Bus incidence Matrix, Ybus formation by direct and singular transformation methods, Numerical Problems.

Formation of Zbus: Partial network, algorithm for the modification of Zbus for addition element for the following cases: addition of element from a new bus to reference, addition of element from a new bus to an old bus, Addition of element between an old bus to reference and Addition of element between two old busses. Modification of Zbus for the changes in network (problems).

Unit –II
Power Flow Studies

Necessity of power flow studies- data for power flow studies- derivation of static load flow equations- load flow solution using Gauss seidel Method: Acceleration Factor, load flow solution with and without P-V buses, Algorithm and Flowchart, Numerical load flow Solution for Simple Power systems (Max 3- buses): Determination of Bus Voltages, Injected Active and Reactive Powers (Sample one iteration only) and finding line flows and losses for the given Bus Voltages.

Newton Raphson Method in Rectangular and Polar Co-Ordinates form: Load flow solution with or without PV busses- Derivation of Jacobian Elements, Algorithm and Flowchart.

Decoupled and Fast Decoupled Methods.- Comparison of Different Methods
Unit-III
Short Circuit Analysis
Per unit system representation. Per unit equivalent reactance network of three phase Power System, Numerical Problems.
Sequence Networks: Positive, Negative and Zero sequence Networks, Numerical Problems.

Unit-IV
Power System Steady State Stability Analysis
Elementary concepts of Steady State, Dynamic and Transient Stabilities.
Description of Steady State Stability Power limit, Transfer Reactance, Synchronizing Power Coefficient, Power angle curve and determination of steady state stability and methods to improve steady state stability.

Unit-V
Power System Transient State Stability Analysis

TEXT BOOKS:

REFERENCE BOOKS:

**COURSE OUTCOMES:**

After going through this course the student gets a thorough knowledge on
1. Ybus and Zbus formations.
2. Necessity of power flow studies, load flow solutions by using different iterative methods.
3. Per unit (PU) system representation.
4. Symmetrical and unsymmetrical fault analysis.
5. Power system steady state stability and transient stability analysis.

With which he/she can able to apply the above conceptual things to real time power system and its applications.
ANURAG GROUP OF INSTITUTIONS  
(Autonomous)

B.Tech EEE IV Year I-Semester  

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Power Semiconductor Drives

COURSE OBJECTIVES

1. This course deals with control of DC drives.
2. This course provides knowledge about four quadrant operations of DC drives.
3. This course deals with control of AC drives.

UNIT – I
Control of DC motors by Single phase Converters
Introduction to Thyristor controlled Drives, Single Phase semi and fully controlled converters connected to separately excited d.c motors – continuous current operation, output voltage and current waveforms, Speed and Torque expressions and speed - torque Characteristics - numerical Problems.

UNIT – II
Control of DC motors by Three phase Converters
Three phase semi and fully controlled converters connected to separately excited d.c motors – output voltage and current waveforms, Speed and Torque expressions, Speed - Torque characteristics – numerical Problems.

UNIT – III
Four Quadrant operation of DC Drives & Control of DC motors by Choppers
Introduction to phase controlled four quadrant operations – Four quadrant operation of D.C motors by dual converters – Closed loop operation of DC motor in motoring mode (Block Diagram Only).
Single quadrant, two quadrant and four quadrant chopper fed separately excited dc motors – Continuous current operation, Output voltage and current wave forms, Speed and torque expressions, speed - torque characteristics – numerical Problems.

UNIT – IV
Control of Induction motors
From stator side:
Variable voltage Control of Induction Motor by Ac Voltage Controllers,
Waveforms, speed - torque characteristics – V/f control of Induction motors by Voltage source inverter, current source inverter. Speed - torque characteristics and their comparison – PWM control technique used for various converters – numerical problems.

From rotor side: Rotor resistance control – Slip power recovery control – Static Scherbius drive performance, speed - torque characteristics – Static Kramer Drive performance, speed vs torque characteristics, advantages and applications – numerical problems.

UNIT – V

Control of synchronous motors


TEXT BOOKS:

REFERENCE BOOKS:

COURSE OUTCOMES:
After going through this course the student gets a thorough knowledge on
1. Speed control of DC motors by 1-ph and 3- ph controlled rectifiers.
2. Four quadrant operation of DC drives.
3. Control of Induction motors and Synchronous motors using AC Voltage controllers and Voltage source and current source inverters.
With which he/she can able to apply the above conceptual things to real time electrical drives and its applications.
ANURAG GROUP OF INSTITUTIONS
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B.Tech EEE IV Year I-Semester

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High Voltage Engineering
(Elective-I)

COURSE OBJECTIVES:
1. To know Various Dielectric Materials, Numerical methods for electric field computation and Applications.
2. To learn about high voltage testing of materials and electrical apparatus.

UNIT I
Introduction to High Voltage Technology and Applications
Electric Field Stresses, Gas / Vacumm 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, Solid 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.
Intrinsic breakdown, electromechanical breakdown, thermal breakdown, breakdown of solid dielectrics in practice, Breakdown in composite dielectrics, solid dielectrics used in practice.

UNIT III
Generation and Measurements 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 IV
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 V
Non-Destructive and High Voltage Testing Of Material And Electrical Apparatus
Measurement of D.C Resistivity, Measurement of Dielectric Constant and loss factor, Partial discharge measurements.

TEXT BOOKS:

REFERENCE BOOKS:

COURSE OUTCOMES:
After going through this course the student gets a thorough knowledge on
1. High Voltage Technology and Applications
2. Break Down in Gaseous, Solid and Liquid Dielectrics in high voltage apparatus used in practice
3. Generation and Measurements of High Voltages And Currents
4. Over Voltage Phenomenon And Insulation Co-Ordination
5. Non-Destructive and High Voltage Testing Of Material And Electrical Apparatus
With which he/ she can able to apply the above conceptual things to real time high voltage systems and its applications.
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B.Tech EEE IV Year I-Semester

VLSI DESIGN
(Elective-I)

COURSE OBJECTIVES:

• Give exposure to different steps involved in the fabrication of ICs using MOS transistor, CMOS/BICMOS transistors and passive components.
• Explain electrical properties of MOS and BiCMOS devices to analyze the behavior of inverters designed with various loads.
• Give exposure to the design rules to be followed to draw the layout of any logic circuit.
• Provide concept to design different types of logic gates using CMOS inverter and analyze their transfer characteristics.
• Provide design concepts to design building blocks of data path of any system using gates.
• Understand basic programmable logic devices and testing of CMOS circuits.

UNIT I
Introduction: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS
Technologies- Oxidation, Lithography, Diffusion, Ion implantation, Metallization, Encapsulation, Probe testing, Integrated Resistors and Capacitors, CMOS Nanotechnology.
Basic Electrical Properties: Basic Electrical Properties of MOS and BiCMOS Circuits: Ids-Vds relationships, MOS transistor threshold Voltage, gm, gds, figure of merit ωo; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, BiCMOS Inverters.

UNIT II
UNIT III
Data Path Subsystems: Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters.

UNIT IV
Array Subsystems: SRAM, DRAM, ROM, Serial Access Memory, Content addressable memory
Semiconductor Integrated Circuit Design: PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach, Parameters influencing low power design.

UNIT V

TEXTBOOKS:

REFERENCES:

COURSE OUTCOMES:
Upon successfully completing the course, the student should be able to:
• Acquire qualitative knowledge about the fabrication process of integrated circuit using MOS transistors.
• Choose an appropriate inverter depending on specifications required for a circuit.
• Draw the layout of any logic circuit which helps to understand and estimate parasitic of any logic circuit.
• Design different types of logic gates using CMOS inverter and analyze their transfer characteristics.
• Provide design concepts required to design building blocks of data path using gates.
• Design simple memories using MOS transistors and can understand design of large memories.
• Design simple logic circuit using PLA, PAL, FPGA and CPLD.
• Understand different types of faults that can occur in a system and learn the concept of testing and adding extra hardware to improve testability of system.
ANURAG GROUP OF INSTITUTIONS
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B.Tech EEE IV Year I-Semester

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Neural Networks and Fuzzy Logic
(Elective-I)

COURSE OBJECTIVES:

1. This course introduces the basics of Neural Networks and essentials of Artificial Neural Networks with Single Layer and Multilayer Feed Forward Networks.
2. It also deals with Associate Memories and introduces Fuzzy sets and Fuzzy Logic system components. The Neural Network and Fuzzy Network system application to Electrical Engineering is also presented.

Unit – I

Introduction to Neural Networks & Essentials of Artificial Neural Networks

Types of Neuron Activation Function, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Applications

Unit – II

Single Layer and Multilayer Feed Forward Neural Networks
Single layer: Introduction, Perceptron Models- Discrete, Continuous, Training Algorithms- Discrete and Continuous Perceptron Networks,

Unit – III

Associative Memories
Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning,
General Concepts of Associative Memory (Associative Matrix, Association Rules, Hamming Distance, The Linear Associator, Matrix Memories, Content Addressable Memory), Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm Architecture of Hopfield Network: Discrete and Continuous versions

**Unit – IV**

Classical & Fuzzy Sets

Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

Fuzzy Logic System Components

Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

**UNIT-V**

Applications

Neural network applications: Process identification, control, fault diagnosis and load forecasting.

Fuzzy logic applications: Fuzzy logic control and Fuzzy classification.

**TEXT BOOKS:**

2. Introduction to Artificial Neural Systems – Jacek M Zurada, Jaico publishing house 1997

**REFERENCE BOOKS:**

1. Neural and fuzzy systems : Foundations, Architectures and applications – N Yadaiah and S.BapiRaju, Pearson Education
COURSE OUTCOMES:
After going through this course the student gets a thorough knowledge on
1. ANN architectures and types of neuron models.
2. Single layer and multi layer feed forward networks.
3. Different types of Associative memories.
4. Fuzzy logic components.
5. Neural network and fuzzy logic applications.
With which he/ she can able to apply the above conceptual things to real time applications of electrical and electronics engineering.
ANURAG GROUP OF INSTITUTIONS
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B.Tech EEE IV Year I-Semester

Optimization Techniques
(Elective-II)

COURSE OBJECTIVES:
1. Deals with Classical Optimization Techniques and Linear Programming.
2. Deals with optimization techniques and dynamic programming.

UNIT – I
Introduction and Classical Optimization Techniques:

UNIT – II
Linear Programming and Transportation Problem
Linear Programming:
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 – III
Unconstrained Nonlinear Programming and Optimization Techniques

Unconstrained Nonlinear Programming:
One – dimensional minimization methods: Classification, Fibonacci method and Quadratic interpolation method
Unconstrained Optimization Techniques
Univariate method, Powell’s method and steepest descent method.

UNIT – IV
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 – V
Dynamic Programming:

TEXT BOOKS:

REFERENCE BOOKS:

COURSE OBJECTIVES:
After going through this course the student gets a thorough knowledge on
2. Linear and Nonlinear Programming.
3. Dynamic programming.

With which he/ she can able to apply the above conceptual things in real time to get the optimal solution in electrical and electronics engineering.
B.Tech EEE IV Year I-Semester

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Electrical Distribution System
(Elective-II)

COURSE OBJECTIVES:
1. Ability to apply the knowledge on distribution systems, Load Modeling and Characteristics.
2. Ability to analyze substations and benefits derived through optimal location of substations.

UNIT – I General Concepts:
Introduction to distribution systems, Load modeling 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.

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

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 – III Protection:

Coordination:
Coordination of Protective Devices: General coordination procedure.

UNIT – IV 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 – V 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 – Turan Gonen, Mc Graw-

REFERENCE BOOK:
1. Electrical Power Distribution and Automation - S.Sivanagaraju, V.Sankar,
Dhanpat Rai & Co, 2006

COURSE OUTCOMES:
After going through this course the student gets a thorough knowledge on
1. Location and ratings of distribution substations.
2. Operation of fuses.
3. Capacitive compensation and voltage and power factor control.
With which he/ she can able to apply the above conceptual things in real time
power systems and applications.
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B.Tech EEE IV Year I-Semester  

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Linear System Analysis  
(Elective-II)

COURSE OBJECTIVES:
1. Ability to find the Fourier transforms of some common signals using Laplace Transform and Perseval’s theorem.
2. Ability to test the polynomials using Sturm’s theorem and reliability of elements.

UNIT-I:
State Variable Analysis

UNIT-II
Fourier series And Fourier Transform Representation And Applications
Introduction, Trigonometric form of Fourier series, Exponential form of Fourier series, Wave symmetry, Fourier integrals and transforms, Fourier transform of a periodic function, Properties of Fourier Transform, Parseval’s theorem, Fourier transform of some common signals, Fourier transform relationship with Laplace Transform.

Introduction, Effective value and average values of non sinusoidal periodic waves, currents, Power Factor, Effects of harmonics, Application in Circuit Analysis, Circuit Analysis using Fourier Series.

UNIT – III
Laplace Transform Applications
Application of Laplace transform Methods of Analysis – Response of RL, RC, RLC Networks to Step, Ramp, and impulse functions, Shifting Theorem – Convolution Integral – Applications
Testing of Polynomials & Network Synthesis
Elements of reliability-Hurwitz polynomials-positive real functions-Properties-Testing-Sturm’s Test, examples.
Synthesis of one port LC networks-Foster and Cauer methods-Synthesis of RL and RC one port networks-Foster and Causer methods

UNIT-IV
Sampling
Sampling theorem – Graphical and Analytical proof for Band Limited Signal impulse sampling, natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, introduction to Band Pass sampling, Cross correlation and auto correlation of functions, properties of correlation function, Energy density spectrum, Power density spectrum, Relation between auto correlation function and Energy / Power spectral density function.

UNIT-V
Z-Transforms
Fundamental difference between continuous and discrete time signals, discrete time complex, exponential and sinusoidal signals, periodicity of discrete time complex exponential, concept of Z-Transform of a discrete sequence. Distinction between Laplace, Fourier and Z-Transforms. Region of convergence in Z-Transforms, constraints on ROC for various classes of signals, Inverse Z-Transform properties of Z-Transforms.

TEXT BOOKS:

REFERENCE BOOKS:

**COURSE OBJECTIVES:**
After going through this course the student gets a thorough knowledge on
1. State Variable Analysis
2. Fourier series and Fourier Transform Representation and Applications
3. Laplace Transform Applications
4. Testing of Polynomials & Network Synthesis
5. Sampling and Z-Transforms
With which he/she can able to apply the above conceptual things in real time electrical and electronics engineering applications.
Micro processors & Micro Controllers lab

Note: Minimum of 12 experiments to be conducted.

List of Experiments:
The Following programs/experiments are to be written for assembler and execute the same with 8086 and 8051 kits.
1. Programs for 16 bits 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. Programs 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 microprocessors using 8255.
8. Serial communication between two microprocessor kits using 8251.
9. Interfacing to 8086 and programming to control stepper motor using 8255.
10. Programming using arithmetic, logic and bit manipulation instructions of 8051/AVR.
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.
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
5. Measurement of % ratio error and phase angle of given C.T. by comparison.
7. Measurement of 3 phase reactive power with single-phase wattmeter.

In addition to the above eight experiments, at least 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. Dielectric oil testing using H.T. testing Kit
12. LVDT and capacitance pickup – characteristics and Calibration
13. Solid Insulation testing using Megger.
HVDC Transmission

**COURSE OBJECTIVES:**
1. To the importance of HVDC transmission.
2. To study the analysis of HVDC converters, faults and protections.
3. To understand Reactive power control and power factor improvement in real time problems.

**UNIT – I**
Basic Concepts

**UNIT – II**
Analysis of HVDC Converters, Converter Control
Principal of DC Link Control – Converters Control Characteristics – Firing angle control – Current and extinction angle control

**UNIT-III**
Reactive Power Control In HVDC, Power Flow Analysis
UNIT-IV
Converter Fault & Protection
Converter faults – protection against over current and over voltage in converter station – surge arresters – smoothing reactors – DC breakers – Audible noise-space charge field-corona effects on DC lines-Radio interference.

UNIT-V
Harmonics & Filters
Generation of Harmonics – Characteristics harmonics, calculation of AC Harmonics, Non- Characteristics harmonics, adverse effects of harmonics – Calculation of voltage & Current harmonics – Effect of Pulse number on harmonics
Types of AC filters ,Design of Single tuned filters –Design of High pass filters.

TEXT BOOKS:

REFERENCE BOOKS:

COURSE OUTCOMES:
After going through this course the student gets a thorough knowledge on
1. AC and DC transmission, types of HVDC links
2. Analysis of HVDC converters and converter control
3. Power flow analysis and Reactive Power control in HVDC.
4. Converter fault and protection against over current and over voltage in converter stations.
5. Harmonics and filters in HVDC system.
With which he/ she can able to apply the above conceptual things in real time HVDC system.
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B.Tech EEE IV Year II-Semester  

Renewable Energy Sources  
(Elective-III)

COURSE OBJECTIVES:
1. Ability to understand about wind turbines, Geothermal energy sources, ocean energy and Bio conversion process.
2. Ability to learn Renewable energy sources, generating systems, its performance characteristics and potential in India
3. Ability to design solar panels such as flat plate collectors, dish collectors, fuel cells and etc.,

UNIT – I
Principles of Solar Radiation: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.
Solar Energy Collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT-II

UNIT-III
Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria
Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types
of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

UNIT-IV
Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.
Tidal and Wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT-V
Direct Energy Conversion: Need for DEC, Carnot cycle, limitations, principles of DEC. Seebeck effect, MHD generators,

TEXT BOOKS:

REFERENCE BOOKS:

COURSE OUTCOMES:
After going through this course the student gets a thorough knowledge on
1. Role of new and renewable sources.
4. Need for direct energy conversion.
With which he/ she can able to apply the above conceptual things in real time developments in renewable energy sources and their applications.
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B.Tech EEE IV Year II-Semester  

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Digital Control Systems  
(Elective-III)

COURSE OBJECTIVES:

- To acquire knowledge on basics of Z transforms and z plane analysis of discrete control system.
- To learn about State space analysis and controllability Observability of digital control systems, stability analysis, design of discrete time control systems by conventional methods.

UNIT – I

Sampling & Reconstruction

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

The Z – Transforms

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

UNIT-II

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.

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 –III
Controllability & Observability
Concepts of Controllability and Observability, Tests for controllability and Observability. Duality between Controllability and Observability, Controllability and Observability conditions for Pulse Transfer Function
Stability Analysis

UNIT – IV
Design of Discrete Time Control System by Conventional Methods

UNIT-V
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:

REFERENCE BOOKS:
COURSE OUTCOMES:
After going through this course the student gets a thorough knowledge on
1. Digital to analog and analog to digital conversions
2. Z-plane analysis of discrete time control systems.
3. Controllability and Observability.
4. Stability analysis
5. State feedback controllers and state observers.
With which he/ she can able to apply the above conceptual things in controlling of electrical and electronics applications in real time.
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Power System Reliability  
(Elective-III) 

COURSE OBJECTIVES: 
1. To know the main principles and objectives of power system reliability analysis. 
2. To deal with overview of methodologies for reliability analysis of transmission and distribution systems, analysis of time dependencies and interruption costs, impact from protection systems, and life time modeling for maintenance optimization. 

UNIT – I  
Basics of Probability theory & Distribution  

UNIT – II  
Network Modeling and Reliability Analysis  
Reliability functions  
Reliability functions \( f(t), F(t), R(t), h(t) \) and their relationships – exponential distribution – Expected value and standard deviation of exponential distribution – Bath tub curve – reliability analysis of series parallel networks using exponential distribution – reliability measures MTTF, MTTR, MTBF. 

UNIT – III  
Markov Modeling  
Markov chains – concept of stochastic transitional probability Matrix, Evaluation of limiting state Probabilities. – Markov processes one component

UNIT – IV
Frequency & Duration Techniques
Frequency and duration concept – Evaluation of frequency of encountering state, mean cycle-time, for one , two component repairable models – evaluation of cumulative probability and cumulative frequency of encountering of merged states.
Generation System Reliability Analysis

UNIT – V
Composite Systems Reliability Analysis
Distribution System and Reliability Analysis

TEXT BOOKS:

COURSE OUTCOMES:
After going through this course the student gets a thorough knowledge on
4. Frequency and duration techniques.
5. Composite and distribution systems reliability analysis.
With which he/ she can able to apply the above conceptual things in real time power system applications.
B.Tech EEE IV Year II-Semester

Advanced Control Systems
(Elective-IV)

COURSE OBJECTIVES:
1. To learn about State Space Representation and find solution of State Equation, State Transition Matrix.
2. To apply Controllability and Observability for controlling the systems.
3. To analyze Describing functions, Phase Plane and Stability Analysis.

Unit – I
State Space Analysis, Controllability And Observability
State Space Representation, Solution of State Equation, State Transition Matrix, Canonical Forms – Controllable Canonical Form, Observable canonical Form, Jordan Canonical Form.
Test for controllability and Observability for continuous time systems – Time varying case, minimum energy control, time invariant case, Principle of Duality, Controllability and Observability from Jordan canonical form and other canonical forms.

Unit – II
Stability Analysis
Stability: Stability in the sense of Lyapunov. Lyapunov’s stability and Lyapunov’s instability theorems, Direct method of Lyapunov for the linear and nonlinear continuous time autonomous systems.

Unit – III
Phase-Plane Analysis
Introduction to phase-plane analysis, Method of Isoclines for Constructing Trajectories, singular points, phase-plane analysis of nonlinear control systems.
Describing Function Analysis
Introduction to nonlinear systems, Types of nonlinearities, describing functions, describing function analysis of nonlinear control systems.

Unit – IV
Modal Control
Modal Control: Effect of state feedback on controllability and observability. Pole placement by state feedback, Full order observer and reduced order observer.
Calculus Of Variations

Unit – V
Optimal Control

Text Books
2. Distributed computer control systems – S.S.Lamba and V.P.Singh.

Reference Books
COURSE OUTCOMES:
After going through this course the student gets a thorough knowledge on
1. State space analysis, controllability and Observability.
2. Lyapunov’s stability.
3. Phase plane and describing function analysis of non linear control system.
4. Model control and calculus of variations approach.
5. Optimal control problem.
With which he/ she can able to apply the above conceptual things in controlling
of electrical and electronics engineering applications.
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B.Tech EEE IV Year II-Semester

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EHVAC Transmission
(Elective-IV)

COURSE OBJECTIVES:
1. To know the necessity of EHVAC transmission system.
2. To learn about calculation of voltage gradient of conductors corona effects in EHV lines and also calculation of electro static field of EHVAC lines and studying voltage control along with power circle diagram

Unit – I:
Preliminaries:
Necessity of EHV AC transmission – advantages and problems–power handling capacity and line losses- mechanical considerations — bundle conductor systems.
Line inductance and capacitances – sequence inductances and capacitances – modes of propagation.

Unit – II:
Voltage gradients of conductors:

Unit – III:
Corona Effects :
Corona in E.H.V. lines – Corona loss formulae- attention of traveling waves due to Corona – Audio noise due to Corona, its generation, characteristic and limits. Measurements of audio noise radio interference due to Corona - properties of radio noise – frequency spectrum of RI fields –Measurements of RI and RIV.
Unit – IV:
Electro Static Field:

Unit – V:
Voltage control:

TEXT BOOKS:
2. HVAC and DC Transmission - S. Rao.

REFERENCE BOOKS:
2. EHV Transmission line - Electric Institution -Edison (GEC 1968).

COURSE OUTCOMES:
After going through this course the student gets a thorough knowledge on
1. Necessity of EHVAC transmission and its advantages.
2. Voltage gradients of conductors and Corona in EHV lines.
3. Calculation of electrostatic field in EHVAC lines.
4. Voltage control using synchronous condensers.
With which he/ she can able to apply the above conceptual things in real time developments in renewable energy sources and their applications.
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B.Tech EEE IV Year II-Semester

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Computer Organization
(Elective-IV)

COURSE OBJECTIVES:
1. To deal with the basic principles of organization, operation and performance of modern-day computer systems.
2. To learn about all aspects of computer technology, from the underlying integrated circuit technology used to construct computer components, to the use of parallel organization concepts in combining those components.

UNIT-I:

UNIT-II:

UNIT-III:

Micro Programmed Control: Control memory, Address sequencing, micro-program example, design of control unit Hard wired control. Micro-programmed control
UNIT-IV:
The Memory System: Basic concepts semiconductor RAM memories. Read-only memories Cache memories performance considerations, Virtual memories secondary storage.

UNIT-V:
Pipeline And Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Processing, Array Processors.
Multi Processors: Characteristics or Multiprocessors, Interconnection Structures, Inter-processor Arbitration. Inter Processor Communication and Synchronization Cache Coherence. Shared Memory Multiprocessors.

TEXT BOOKS:

REFERENCES:

COURSE OBJECTIVES:
After going through this course the student gets a thorough knowledge on
8. The Memory System and Input-Output Organization.