

## **JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech IV-I Sem. (E.E.E)**

### **(9A02701) DISTRIBUTION OF ELECTRIC POWER**

#### **UNIT – I 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 GENERAL ASPECTS OF D.C. DISTRIBUTION SYSTEMS**

Classification of Distribution Systems - Comparison of DC vs AC and Under-Ground vs Over - Head Distribution Systems- Requirements and Design features of Distribution Systems- Voltage Drop Calculations (Numerical Problems) in D.C Distributors for the following cases: Radial D.C Distributor fed one end and at the both the ends (equal/unequal Voltages) and Ring Main Distributor.

#### **UNIT III A.C. DISTRIBUTION SYSTEMS.**

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

Voltage Drop Calculations (Numerical Problems) in A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages.

#### **UNIT – IV SUBSTATIONS**

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

Classification of substations: **Air insulated substations** - Indoor & Outdoor substations: Substations layout showing the location of all the substation equipment.

Bus bar arrangements in the Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, main and transfer bus bar Double breaker – One and half breaker system with relevant diagrams.

#### **UNIT – V POWER FACTOR AND VOLTAGE CONTROL**

Causes of low p.f -Methods of Improving p.f -Phase advancing and generation of reactive KVAR using static Capacitors-Most economical p.f. for constant KW load and constant KVA type loads, Numerical Problems.

Dependency of Voltage on Reactive Power flow.- Methods of Voltage Control: Shunt Capacitors, Series Capacitors, Synchronous Capacitors, Tap changing and Booster Transformers

#### **UNIT – VI 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 – VII COMPENSATION FOR POWER FACTOR IMPROVEMENT**

Capacitive compensation for power-factor control - effect of shunt capacitors (Fixed and switched), Power factor correction- Economic justification - Procedure to determine the best capacitor location.

#### **UNIT – VIII PROTECTION AND COORDINATION OF DISTRIBUTION SYSTEMS**

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 Coordination of Protective Devices: General coordination procedure.

## **TEXT BOOK:**

1. “Electric Power Distribution system, Engineering” – by Turan Gonen, Mc Graw-hill Book Company.
2. Electric Power Distribution – by A.S. Pabla, Tata Mc Graw-hill Publishing Company, 4<sup>th</sup> edition, 1997.

## **REFERENCE BOOK:**

1. Electric Power Distribution Automation by Dr. M. K. Khedkar and Dr. G. M. Dhole, University Science Press.
2. Electrical Power Distribution Systems by V. Kamaraju, Right Publishers.
3. Electrical Power Systems for Industrial Plants by Kamalesh Das, JAICO Publishing House.
4. Hand Book of Electric Power Distribution by G. Ramamurthy, 2<sup>nd</sup> Edition, Universities Press.

## **JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

### **B.Tech IV-I Sem. (E.E.E)**

### **(9A04603) DIGITAL SIGNAL PROCESSING**

#### **UNIT-I**

##### **INTRODUCTION**

Introduction to digital signal processing: discrete time signals and sequences, linear shift invariant systems, stability and causality, linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems.

#### **UNIT-II**

##### **DISCRETE FOURIER SERIES**

Properties of discrete Fourier series, DFS representation of periodic sequences, discrete Fourier transforms: properties of DFT, linear convolution of sequences using DFT, computation of DFT. Relation between Z-Transform and DFS.

#### **UNIT-III**

##### **FAST FOURIER TRANSFORMS**

Fast Fourier transforms (FFT)-Radix2 decimation in time and decimation in frequency FFT algorithms, inverse FFT and FFT for composite N.

#### **UNIT-IV**

##### **REALIZATION OF DIGITAL FILTERS**

Review of Z-transforms, applications of Z-Transforms, solution of difference equations of digital filters, block diagram representation of linear constant-coefficient difference equations, basic structures of IIR systems, transposed forms, basic structures of FIR systems, system function.

#### **UNIT-V**

##### **IIR DIGITAL FILTERS**

Analog filter approximations-Butterworth and chebyshev, design of IIR digital filters from analog filters, design examples: analog-digital transformations, Illustrative Problems.

#### **UNIT-VI**

##### **FIR DIGITAL FILTERS**

Characteristics of FIR digital filters, frequency response. Design of FIR digital filters using window techniques, frequency sampling technique, comparison of IIR and FIR filters, , Illustrative Problems.

#### **UNIT-VII**

##### **MULTIRATE DIGITAL SIGNAL PROCESSING FUNDAMENTALS:**

Basic sample rate alteration devices, Multirate Structures for sampling rate Converters, Multistage design of decimator and Interpolator, Polyphase Decomposition, Nyquist filters.

## **UNIT-VIII**

### **APPLICATIONS OF DIGITAL SIGNAL PROCESSING**

Spectral analysis of nonstationary Signals, Musical Sound processing, signal Compression, Transmultiplexers, Discrete Multitone Transmission of digital data.

#### **TEXT BOOKS:**

1. Digital signal processing, principles, Algorithms and applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education/PHI, 2007.
2. Digital signal processing , A computer base approach- Sanjit K Mitra, Tata McGraw Hill, 3rd edition, 2009.
3. Discrete Time Signal Processing-A.V. Oppenheim and R.W. Schaffer, PHI.

#### **REFERENCES:**

1. Digital signal processing: Andreas Antoniou, TATA McGraw Hill, 2006.
2. A Text book on Digital Signal processing – R S Kaler, M Kulkarni, Umesh Gupta, I K International Publishing House Pvt. Ltd.
3. Digital signal processing: M H Hayes, Schaum's outlines, TATA Mc-Graw Hill, 2007.

## **JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

### **B.Tech IV-I Sem. (E.E.E)**

#### **(9A02702) FUNDAMENTALS OF HVDC & FACTS DEVICES**

##### **UNIT-I INTRODUCTION**

comparison of AC and DC Transmission systems, Application of D.C. Transmission, Types or DC links, Typical layout of a HVDC converter station. HVDC converters, pulse number, Analysis of & phase Bridge circuit with and without overlap, converter Bridge characteristics, equivalent circuits or Rectifier and inverter configurations Twelve pulse converters.

##### **UNIT -II CONVERTER AND HVDC SYSTEM CONTROL**

Principles of DC links control, converter control characteristics, system control Hierarchy, Firing angle control, current and extinction Angle control starting and stopping of DC link.

##### **UNIT -III HARMONICS, FILTERS AND REACTIVE POWER CONTROL**

Introduction, generation of Harmonics, AC and DC Filters, Reactive power requirements at steady state, sources of Reactive power static Var systems.

##### **UNIT -IV POWER FLOW ANALYSIS IN AC/DC SYSTEMS**

Introduction, Modeling of DC/AC converters, controller equations, solutions of AD/DC load flow-simultaneous approach and sequential approach.

##### **UNIT – V FACTS CONCEPTS**

Flow of power in AC parallel paths and Meshed systems, Basic types of FACTS controllers, Brief description and Definitions of FACTS controllers.

##### **UNIT - VI STATIC SHUNT COMPENSATORS**

Objectives of shunt compensation, Methods of controllable VAR generation, Static VAR compensators, SVC and STATCOM, comparison.

## **UNIT - VII STATIC SERIES COMPENSATORS**

Objectives of series compensation, variable impedance type-thyristor switched series capacitors (TCSC), switching converter type series compensators – static series synchronous compensator (SSSC) – power angle characteristics – Basic operating control Schemes.

## **UNIT - VIII COMBINED COMPENSATORS**

Introduction, unified power flow controller (UPFC), Basic operating principle, Independent real and reactive power flow controller, control structure.

### **TEXT BOOKS:**

1. HVDC power Transmission systems by K.R. Padiyar, Wiley Eastern Limited
2. Understanding of FACTS by N.G. Hingorani & L. Gyugyi, IEEE Press.
3. Flexible AC Transmission Systems (FACTS) Young Huasong & Alan T. Hons, The Institution of Electrical Engineers, IEE Power and Energy Series 30.
4. An Introduction to: Reactive Power Control and Voltage Stability in Power Transmission Systems by Abhijit Chakrabarti, D. P. Kothari, A. K. Mukhopadhyay and Abhinandan De, Eastern Economy Edition, 2010.

### **REFERENCE BOOKS:**

1. **EHV - AC, HYDC Transmission & Distribution Engineering**, S.Rao, Khanna publishers, 3<sup>rd</sup> edition 2003.
2. **Power Electronic Control in Electrical Systems-** E Acha. VG Agelidis & O Anaya-Lara. THE Miller – Elsevier, 2009.

## **JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

### **B.Tech IV-I Sem. (E.E.E)**

#### **(9A02703) 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 emphasizes 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 SF<sub>6</sub> circuit breakers.

#### **UNIT – III ELECTROMAGNETIC RELAYS**

Basic Requirements of Relays – Primary and Backup protection - Construction details of – Attracted armature, balanced beam, inductor type and differential relays – Universal Torque equation – Characteristics of over current, Direction and distance relays.

#### **UNIT – IV STATIC AND MICROPROCESSOR BASED RELAYS**

Static Relays – Advantages and Disadvantages – Definite time, Inverse and IDMT static relays – Comparators – Amplitude and Phase comparators. Microprocessor based relays – Advantages and

Disadvantages – Block diagram for over current (Definite, Inverse and IDMT) and Distance Relays and their Flow Charts.

#### **UNIT – V 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 –VI TRANSFORMER PROTECTION**

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

#### **UNIT –VII PROTECTION OF FEEDERS AND TRANSMISSION LINES**

Protection of Feeder (Radial & Ring main) using over current Relays. Protection of Transmission line – 3 Zone protection using Distance Relays. Carrier current protection. Protection of Bus bars.

#### **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.

#### **TEXT BOOKS:**

1. Switchgear and Protection – by Sunil S Rao, Khanna Publishers
2. Power System Protection and Switchgear by Badari Ram , D.N Viswakarma, TMH Publications.
3. Fundamentals of Power System Protection by Y. G. Paithankar and S. R. Bhide, 2<sup>nd</sup> Edition, PHI.

#### **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, 3<sup>rd</sup> editon
4. Electrical power System Protection by C. Christopoulos and A. Wright, 2<sup>nd</sup> Edition, Springer International Edition.

### **JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

#### **B.Tech IV-I Sem. (E.E.E)**

#### **(9A02704) INSTRUMENTATION**

#### **(Elective – I)**

#### **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 DATA TRANSMISSION AND TELEMETRY**

Methods of Data Transmission – General Telemetry System – Land line Telemetry System – Voltage, Current and position. Land line with feedback system. Frequency Modulation System (FM), Pulse Modulation (PM), Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM) Telemetry. Comparison of FM, PM, PAM and PCM.

#### **UNIT-IV DATA ACQUISITION SYSTEM (DAS)**

Analog and Digital Acquisition systems – Components of Analog DAS – Types of Multiplexing Systems: Time division and Frequency division multiplexing – Digital DAS – Block Diagram – Use of Recorders in Digital DAS – Digital Recording using Analog Recorder – Complete data logging System - Block diagram and its working – Modern Digital DAS (Block Diagram)

#### **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, gauge 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, Dhanpat Rai & Co.

#### **REFERENCE BOOKS:**

1. Measurements Systems, Applications and Design – by D O Doebelin, Mc Graw Hill Edition.
2. Principles of Measurement and Instrumentation – by A.S Morris, Pearson /Prentice Hall of India
3. Electronic Instrumentation-by H.S.Kalsi Tata MCGraw-Hill Edition, 3/e.
4. Modern Electronic Instrumentation and Measurement techniques – by A.D Helfrick and W.D.Cooper, Pearson/Prentice Hall of India.
5. Industrial Instrumentation – Principles and Design by T. R. Padmanabhan, Springer.

### **JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

#### **B.Tech IV-I Sem. (E.E.E)**

#### **(9A02705) HIGH VOLTAGE ENGINEERING (ELECTIVE-I)**

#### **Objective ;**

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

#### **UNIT - I INTRODUCTION**

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

## **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 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, Cockroft- Walton type high voltage DC set - Calculation of high voltage regulation, ripple and optimum number of stages for minimum voltage drop.

## **UNIT - V 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 generator, 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.

## **UNIT – VI 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 HVAC, HVDC and impulse voltages - Factors affecting the measurements - Potential dividers-resistance dividers capacitance dividers mixed RC potential dividers. Measurement of high impulse currents-Rogowsky coil.

## **UNIT – VII 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 - Factors affecting the discharge detection, Discharge detection methods-straight and balanced methods.

## **UNIT – VIII HIGH VOLTAGE TESTS ON ELECTRICAL APPARATUS**

Definitions and terminology, tests on isolators, circuit breakers, cables, insulators and transformers.

### **TEXT BOOKS:**

1. High Voltage Engineering by M.S.Naidu and V. Kamaraju – TMH Publications, 4<sup>th</sup> Edition
2. High Voltage Engineering by C.L.Wadhwa, New Age International (P) Limited, 1997.
3. High Voltage Engineering Problems & Solutions, R. D. Begamudre, New Age International Publishers, First Edt., 2010.

### **REFERENCE BOOKS:**

1. High Voltage Engineering: Fundamentals by E.Kuffel, W.S.Zaengl, J.Kuffel by Elsevier, 2<sup>nd</sup> Edition.
2. High Voltage Insulation Engineering by Ravindra Arora, Wolfgang Mosch, New Age International (P) Limited, 1995.
3. High Voltage Technology by L. L. Alston, OXFORD University Press, Second Edition, 2009.

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

**B.Tech IV-I Sem. (E.E.E)**

**(9A02706) RENEWABLE ENERGY SOURCES**

**(Elective – I)**

**Objective :**

It introduces solar energy its radiation, collection, storage and application. It also introduces the Wind energy, Biomass energy, Geothermal energy and ocean energy as alternative energy sources.

**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 tilted surface, instruments for measuring solar radiation and sun shine, solar radiation data.

**UNIT-II**

**SOLAR ENERGY COLLECTION:** Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

**UNIT-III**

**SOLAR ENERGY STORAGE AND APPLICATIONS:** Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

**UNIT-IV**

**WIND ENERGY:** Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

**UNIT-V**

**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-VI**

**GEOTHERMAL ENERGY:** Resources, types of wells, methods of harnessing the energy, potential in India.

**UNIT-VII**

**OCEAN ENERGY:** OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

**UNIT-VIII**

**DIRECT ENERGY CONVERSION:** Need for DEC, Carnot cycle, limitations, principles of DEC.

**TEXT BOOKS:**

1. Non-Conventional Energy Sources by G.D. Rai, Khanna Publishers
2. Renewable Energy Resources – Twidell & Wier, CRC Press( Taylor & Francis)

**REFERENCE BOOKS:**

1. Renewable energy resources by Tiwari and Ghosal, Narosa.
2. Renewable Energy Technologies by Ramesh & Kumar, Narosa.
3. Non-Conventional Energy Systems by K Mittal, Wheeler
4. Renewable energy sources and emerging technologies by D.P.Kothari,K.C.Singhal, PHI.



## **JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech IV-I Sem. (E.E.E)**

### **(9A02707) SOFT COMPUTING TECHNIQUES (ELECTIVE-II)**

#### **Objective :**

This course introduces the basics of Neural Networks and essentials of Artificial Neural Networks with Single Layer and Multilayer Feed Forward Networks. Also deals with Associate Memories and introduces Fuzzy sets and Fuzzy Logic system components along with Genetic Algorithms. The Application of Soft Computing Techniques to Electrical Engineering is also presented.

#### **UNIT – I ARTIFICIAL NEURAL NETWORKS**

Introduction, Biological Neuron, Artificial Neuron, Basic concepts of Neural Networks, Basic Models of ANN Connections, McCulloch-Pitts Model, Characteristics of ANN, Applications of ANN.

#### **UNIT- II ESSENTIALS OF ARTIFICIAL NEURAL NETWORKS**

Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application

#### **UNIT–III SUPERVISED LEARNING NETWORKS**

Perceptron Network, Perceptron Learning Rule, Architecture, Perceptron Training Algorithm, ADALINE, MADALINE, Back Propagation Network, BP Learning Rule, Input Layer Computation, Hidden Layer Computation, Output Layer Computation, Radial Basis Function.

#### **UNIT IV ASSOCIATIVE MEMORY NETWORK**

Training Algorithms for Pattern Association, Auto Associative Memory Network, Hetero Associative Memory Network, BAM, Hopfield Networks.

#### **UNIT – V CLASSICAL & FUZZY SETS**

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

#### **UNIT VI FUZZY LOGIC SYSTEM COMPONENTS**

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

#### **UNIT VII GENETIC ALGORITHMS**

Introduction, Basic Operators and Terminologies in GA, Traditional Vs Genetic Algorithm, Encoding, Fitness Function, Reproduction, Crossover, Mutation Operator.

#### **UNIT VIII APPLICATIONS TO ELECTRICAL SYSTEMS**

ANN based Short term Load Forecasting, Load flow Studies, Fuzzy logic based Unit Commitment and Genetic Algorithm based Economic Dispatch.

#### **TEXT BOOKS**

1. Principles of – Soft Computing by S. N. Sivanandam and S. N. Deepa, Wiley India Edition.
2. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Pai – PHI Publications.
3. Nureal networks by Satish Kumar , TMH, 2004.
4. Neuro Fuzzy and Soft Computing by J. S. R. Jang, C. T. Sun and E. Mizutani, Pearson Education.

**REFERENCE BOOKS:**

1. Neural Networks – James A Freeman and Davis Skapura, Pearson Education, 2002.
2. Neural Networks – Simon Hakens , Pearson Education
3. Fuzzy Logic with Engineering Applications by T. J. Ross, 2<sup>nd</sup> Edition , Wiley India Edition.
4. Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.
5. Genetic Algorithms by D. E. Goldberg, Addison – Wisley, 1999.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B.Tech IV-I Sem. (E.E.E)****(9A02708) RELIABILITY ENGINEERING AND APPLICATIONS TO POWER SYSTEMS****(ELECTIVE-II)****UNIT – I BASICS OF PROBABILITY THEORY & DISTRIBUTION**

Basic probability theory – rules for combining probabilities of events – Bernoulli's trials – probability density and distribution functions – binomial distribution – expected value and standard deviation of binomial distribution.

**UNIT – II NETWORK MODELLING AND RELIABILITY ANALYSIS**

Analysis of Series, Parallel, Series-Parallel networks – complex networks – decomposition method.

**UNIT – III 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 – IV MARKOV MODELLING**

Markov chains – concept of stochastic transitional probability Matrix, Evaluation of limiting state Probabilities. – Markov processes one component repairable system – time dependent probability evaluation using Laplace transform approach – evaluation of limiting state probabilities using STPM – two component repairable models.

**UNIT – V FREQUENCY & DURATION TECHNIQUES**

Frequency and duration concept – Evaluation of frequency of encountering state, mean cycletime, for one , two component repairable models – evaluation of cumulative probability and cumulative frequency of encountering of merged states.

**UNIT – VI GENERATION SYSTEM RELIABILITY ANALYSIS**

Reliability model of a generation system– recursive relation for unit addition and removal – load modeling - Merging of generation load model – evaluation of transition rates for merged state model – cumulative Probability, cumulative frequency of failure evaluation – LOLP, LOLE, LOEE.

**UNIT – VII COMPOSITE SYSTEM RELIABILITY ANALYSIS**

System and Load Point Reliability Indices – Weather Effects on Transmission Lines, Weighted Average rate and Markov Model.

**UNIT – VIII DISTRIBUTION SYSTEM AND RELIABILITY ANALYSIS**

Basic Techniques - Radial Networks – Evaluation of Basic Reliability Indices, Performance Indices – Load Point and System Reliability Indices – Customer oriented, Loss and Energy oriented indices - Examples.

**TEXT BOOKS:**

1. Reliability Evaluation of Engg. System – R. Billinton, R.N.Allan, Plenum Press, New York, reprinted in India by B.S.Publications, 2007.

2. Reliability Evaluation of Power systems – R. Billinton, R.N.Allan, Pitman Advance Publishing Program, New York, reprinted in India by B.S.Publications, 2007.

## **JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

### **B.Tech IV-I Sem. (E.E.E)**

### **(9A02709) 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, 3<sup>rd</sup> 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. Mital and C. Mohan, New Age International (P) Limited, Publishers, 3<sup>rd</sup> edition, 1996.
2. Operations Research – by Dr. S.D.Sharma, Kedarnath Ramnath and company, eleventh edition, Reprint 1997.
3. “Operations Research : An Introduction” – by H.A. Taha, PHI Pvt. Ltd., 6<sup>th</sup> edition
4. Linear Programming – by G. Hadley, Narosa Publishing House, 2002

## **JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech IV-I Sem. (E.E.E)**

### **(9A02710) MICROPROCESSORS AND MICROCONTROLLERS LAB**

#### **I . Microprocessor 8086:**

Introduction to MASM/TASM.

Arithmetic operation – Multi byte addition and subtraction, Multiplication and Division – Signed and unsigned Arithmetic operation, ASCII – arithmetic operation.

Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD, BCD to ASCII conversion.

By using string operation and Instruction prefix: Move Block, Reverse string, Sorting, Inserting, Deleting, Length of the string, String comparison.

Modular Program: Procedure, Near and Far implementation, Recursion.

Dos/BIOS programming: Reading keyboard (Buffered with and without echo) – Display characters, Strings.

#### **II. Interfacing**

8259 – Interrupt Controller.

8279 – Keyboard Display.

8255 – PPI.

8251 – USART.

#### **III. Microcontroller 8051:**

1. Reading and Writing on a parallel port.
2. Timer in different modes.
3. Serial communication implementation.
4. Understanding three memory areas of 00 – FF (Programs using above areas).
5. Using external interrupts
6. Programs using special instructions like swap, bit/byte, set/reset etc.
7. Programs based on short, page, absolute addressing.

## **JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**B.Tech IV-I Sem. (E.E.E)**

### **(9A02711) POWER ELECTRONICS AND SIMULATION LAB**

#### **Any Eight of the Experiments in Power Electronics Lab**

1. Study of Characteristics of SCR, MOSFET & IGBT
2. Gate firing circuits for SCR's
3. Single Phase AC Voltage Controller with R and RL Loads
4. Single Phase fully controlled bridge converter with R and RL loads
5. Forced Commutation circuits (Class A, Class B, Class C, and Class D & Class E)
6. DC Jones chopper with R and RL Loads
7. Single Phase Parallel, inverter with R and RL loads

8. Single Phase Cycloconverter with R and RL loads
9. Single Phase Half controlled converter with R load
10. Three Phase half controlled bridge converter with R-load
11. Single Phase series inverter with R and RL loads
12. Single Phase Bridge converter with R and RL loads
13. Single Phase dual converter with RL loads

**Any two simulation experiments with PSPICE/PSIM**

PSPICE simulation of single-phase full converter using RLE loads and single-phase AC voltage controller using RLE loads.

PSPICE simulation of resonant pulse commutation circuit and Buck chopper.

PSPICE simulation of single phase Inverter with PWM control.

**REFERENCE BOOKS:**

1. Simulation of Electric and Electronic circuits using PSPICE – by M.H.Rashid, PHI.
2. PSPICE A/D user's manual – Microsim, USA.
3. PSPICE reference guide – Microsim, USA.
4. MATLAB and its Tool Books user's manual and – Mathworks, USA.