SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IIIRD SEMESTER

CATEGORY:-BSC

BE-31 - ENGINEERING MATHEMATICS III

TOTAL:-60 HOURS

COURSE OBJECTIVE:

To develop logical understanding of the subject.

To develop the knowledge, skills & attitudes necessary to solve problem pertaining to Electrical Engineering.

To make aware students about the importance & symbiosis between Mathematics & Engineering.

Unit I

Functions of complex variables: Analytic functions, Harmonic Conjugate, Cauchy-Riemann Equations, Line Integral, Cauchy's Theorem, Cauchy's Integral Formula, Singular Points, Poles & Residues, Residue Theorem, Application of Residues theorem for evaluation of real integrals.

(12 HRS)

Unit II

Errors & Approximations, Solution of Algebraic & Trancedental Equations (Regula Falsi Newton-Raphson, Iterative, Secant Method), Solution of simultaneous linear equations by Gauss Elimination, Gauss Jordan, Crout's methods , Jacobi's and Gauss-Siedel Iterative methods.

(12 HRS)

Unit III

Difference Operators, Interpolation (Newton Forward & Backward Formulae, Central Interpolation Formulae, Lagrange's and divided difference formulae), Numerical Differentiation and Numerical Integration.

(12 HRS)

Unit IV

Solution of Ordinary Differential Equations(Taylor's Series, Picard's Method, Modified Euler's Method, Runge-Kutta Method, Milne's Predictor & Corrector method), Correlation and Regression, Curve Fitting (Method of Least Square).

(12 HRS)

Unit V

Concept of Probability: Probability Mass function, Probability density function. Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution ,Gamma Distribution ,Beta Distribution ,Testing of Hypothesis :Students t-test, Fisher's z-test, Chi-Square Method.

(12 HRS)

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COURSE OUTCOME

Apply basic knowledge of maths to solve real-world problems.

Able to generate sdolutions to unfamiliar problems

Reference:

1. Numerical Methods using Matlab by J.H.Mathews and K.D.Fink, P.H.I.
2. Numerical Methods for Scientific and Engg. Computation by MKJain, Iyengar and RK Jain, New Age International Publication
3. Mathematical Methods by KV Suryanarayan Rao, SCITECH Publications
4. Numerical Methods using Matlab by Yang,Wiley India
5. Pobability and Statistics by Ravichandran ,Wiley India
6. Mathematical Statistics by George R., Springer Grading IVth Semester w.e.f.2011-12

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

IIIRD SEMESTER

CATEGORY:-DC

BE-32- BIOLOGY

TOTAL:-60 HOURS

COURSE OBJECTIVE

To convey that Biology is as important a scientific discipline as Mathematics.
To develop understanding about Biology and its different parts

Unit I

Darwinian evolution, molecular perspective and classification, Phylogenetic trees, study of inter- and intra- species relationships,developmental BiolOQY.
(12 HRS)

Unit II

Cellular structure and function , cellular assembly and central dogma ,of molecular Biology Organismal physiology - Energy and energetic constraints
.**(12 HRS)**

Unit III

3D structure and function of large biological molecules 5 Techniques in biophysics and biochemistry 6 Immunology - Self vs. Non-self, pathogens, human immune system, antigen-antibody reactions, Infectious disease Biologv and vaccines 4.
(12 HRS)

Unit IV

Cancer biology, gene regulation, aging, apoptosis and stem cell BiolOQY 9 Environmental iosafetv, bioresources, biodiversity .
(12 HRS)

Unit V

Drug design ,Engineering designs inspired by examples in biolOQY , Engineering aspects of some Nobel Prizes in Physiology and Medicine & Chemistry *I* recent advances in Biology.
(12 HRS)

COURSE OBJECTIVE

To convey that Biology is as important a scientific discipline as Mathematics.
To develop understanding about Biology and its different parts

Reference Books:

1. Warson JD, Baker, TA, Bell SP, Gann A, Levin M, Losick R, Molecular Biology of the Gene, Pearson Education, 2004.
2. Dawkins, R. The Greatest Show on Earth: The Evidence For Evolution, Bantam Press, Transworld Publishers, Random House Group, London, 2009.
3. Dawkins, R. The Blind Watchmaker, W. W. Norton & Co., NY, 1996.

4. Watson, J. D. The Double Helix: A Personal Account of the Discovery of the Structure of DNA (Copyright © 1968, 1996 by James D. Watson), Simon & Schuster Inc., first Touchstone Edition (2001).

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

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IIIRD SEMESTER

CATEGORY:-DC

EEE-31 - ELECTRICAL & ELECTRONICS MEASUREMENT AND INSTRUMENTATION

TOTAL:-60 HOURS

COURSE OBJECTIVE

To introduce to the students the operation of various electronic Instruments which are used to measure the electronic parameters.

Unit I

Measurement and Error

Accuracy and precision, sensitivity resolution, Error & Error analysis, Effect of temperature, Internal friction, Stray field, Hysteresis and Frequency variation & method of minimizing them, Loading effects, due to shunt connected and series connected instruments, calibration curve, Testing & calibration of instruments.

Galvanometers – Theory & operation of ballistic galvanometer, D'Arsonal galvanometer, galvanometer motion & damping, Sensitivity, Flux meter, Vibration galvanometer, Spot deflection galvanometer. Definition of analog & digital instruments, Classification of analog instruments, their operating principle, Operating force, Types of supports, Damping, Controlling.

(12 HRS)

Unit II

Different types of Ammeter & Voltmeter

PMMC, MI, Electrodynamometer, Hotwire, Electrostatic, Induction, Rectifier, Ferro dynamic & Electro-thermic, Expression for control & deflection torque, their advantages, disadvantages & error, Extension of range of instruments using shunt & multiplier.

(12 HRS)

Unit III

Instrument Transformers

Potential and current transformers, ratio and phase angle errors, testing of instrument transformers, Difference between CT and PT, errors and reduction of errors.

Measurement of power: Power in AC and DC Circuit, Electrodynamometer type of wattmeter, Construction, theory, operation & error, Low power factor & UPF wattmeter, Double element and three element dynamometer wattmeter, Measurement of power in three phase circuit, one, two & three wattmeter method, Measurement of reactive power by single wattmeter, Measurement of power using CTs & PTs.

(12 HRS)

Unit IV

Measurement of Energy

Single phase induction type energy meter – construction & operation – driving and braking torques –errors & compensations – Testing by phantom loading and using R.S.S. meter- Three phase energy meter – Tri-vector meter – Maximum demand meter, Ampere hour meter. Potentiometer – DC potentiometer standardization – Lab type Crompton's potentiometer, application of DC

potentiometer, AC polar type and coordinate type potentiometer, their construction and applications.
(12 HRS)

Unit V
Miscellaneous Instruments & Measurements
Power factor meter, Single phase and three phase Electro-dynamometer type & moving iron type.
Frequency meter – Vibrating reed, Resonance type & Weston type, Synchronoscope, Ohmmeter – series & stunt type, Multi-meter, Megger & Ratio meter.
Resistance Measurement – Classification of low, medium & high resistance – Voltmeter, Ammeter, Wheatstone Bridge, Kelvin's double bridge & loss of charge methods for resistance measurement, Earth resistance measurement.
Magnetic Measurement – B-H Curve, Hysteresis Loop determination, Power loss in sheet metal – Lloyd Fischer square for measurement of power loss.
(12 HRS)

COURSE OUTCOMES:
Students would be able to:
1. understand operation of different instruments.
2. describe different terminology related to measurements.
3. understand the principles of various types of transducers and sensors.

Reference Books:

1. E W Golding & F C Widdis; Electrical Measurement & Measuring Instruments; Wheeler Pub.
2. A.K. Sawhney; Electrical & Electronic Measurements & Instrument; Dhanpat Rai & Sons Pub.
3. Buckingham & Price; Electrical Measurements; Prentice Hall

List of Experiments:

Subject - Electrical & Electronics Measurement And Instrumentation

1. Measurement of low resistance using Kelvin's Double bridge
2. Measurement of medium resistance using Whetstone's bridge
3. Measurement of high resistance by loss of charge method
4. Measurement of Insulation resistance using Megger
5. Measurement of earth resistance by fall of potential method and verification by using earth tester.
6. Measurement of power in a single phase ac circuit by 3 voltmeter/ 3 Ammeter methods.
7. Calibration of a dynamometer type of wattmeter with respect to a standard/Sub Standard wattmeter.
8. Calibration of an induction type single phase energy meter.

9. Calibration of a dynamometer type of wattmeter by Phantom Loading method.

10. Measurements using Instrument Transformers.

11. Study of various types of Indicating Instruments.

12. Measurement of Power in three phase circuit by one, two & three Wattmeter's.

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IIIRD SEMESTER

CATEGORY:-DC

EEE-32 - ANALOG ELECTRONICS

TOTAL:-60 HOURS

COURSE OBJECTIVE The primary objective of this course is to develop an in-depth understanding of the design principles and applications of integrated analogcircuits.

Unit I

Semiconductor device, theory of P-N junction, temperature dependence and break down characteristics, junction capacitances, Zener diode, Varactor diode, PIN diode, LED, Photo diode, Transistors BJT, FET, MOSFET, types, working principal, characteristics, and region of operation, load line biasing methods,. transistor as an amplifier, gain, bandwidth, frequency response, Various applications of diode and special diodes.

(12 HRS)

UNIT II

Small signal analysis of transistor (low frequency) using h-parameters, thermal runaway and thermal stability.

(12 HRS)

Unit III

Feedback amplifier, negative feedback, voltage-series, voltage shunt ,current series and current shunt feedback , Sinusoidal oscillators, L-C (Hartley-Colpitts) oscillators, RC phase shift, Wien bridge, and Crystal oscillators. Power amplifiers, class A, class B , class A B, C amplifiers , their efficiency and power Dissipation, Pushpull and complimentary pushpull amplifier.

(12 HRS)

Unit IV

Switching characteristics of diode and transistor, turn ON, OFF time, reverse recovery time , transistor as switch , Multivibrators, Bistable, Monostable, Astable multivibrators. Cllipers and clampers, Differential amplifier, calculation of differential , common mode gain and CMRR using hparameters,Darlington pair , Boot strapping technique. Cascade and cascade amplifier.

(12 HRS)

Unit V

Operational amplifier characteristics, slew rate , bandwidth, offset voltage ,basic current, application inverting , non inverting amplifier , summer , average, differentiator, integrator, differential amplifier, instrumentation amplifier , log and antilog amplifier , voltage to current and current to voltage converters , comparators Schmitt trigger , active filters, 555 timer and its application.

(12 HRS)

COURSE OUTCOME: After successful completion of course, Students are expected to able in applying theory and realize analog filter circuits, Understand the circuit operation of the 555 timer IC and regulator IC and identifying the faulty components within a circuit.

Reference Books:

1. Nashelsky & Boysted; Electronic Devices and Circuits; PHI
2. Millman Halkias; Electronic Devices and Circuits; McGraw- Hill
3. Achuthan MA and Bhatt KN; Fundamentals of semiconductor devices; TMH
4. Neamen Donald; Semiconductor Physics and devices
5. Millman & Grabel; Micro Electronics; McGraw-Hill
6. Bogart; Electronic Devices and Circuits; Universal Book Stall, NDelhi
7. Millman & Halkias; Integrated Electronics; McGraw- Hill.
8. Tobbey; OP- Amps their design and Application
9. R.A. Gaikward; OP- Amp and linear Integreted circuit; PHI
10. D. Raychowdhary and Shail Jain; Linear Integrated Circuits
11. Botkar; Integrated Circuits; Khanna
12. Clayton; Applications of linear Integrated circuits

List of experiments (Expandable):

Subject - Analog Electronics

1. V-I Characteristics of different types of Diodes.
2. Applications of diodes and Design of various clipping and clamping circuits.
3. Design half & full wave rectifier.
4. Design & Analysis of transistor amplifier in CE, CB & CC configuration.
5. Design & Analysis of JFET Amplifier.
6. Design & Analysis of MOSFET Amplifier.
7. To study and construct power amplifiers of various classes.
8. Study of various oscillators.
9. Char. of Op-Amp (input offset voltage, slew rate CMRR, BW, Input bias current)
10. Linear application of OP-Amp (voltage follower, inviting and non-inverting amplifier and their frequency response adder subtractor differential amplifier, integrator and differential frequency response) .
11. Study of Op-Amp as a comparator.
12. Design of Schmitt trigger.
13. Design of monoastable & astable multivibrator.

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NOTE- All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed/ drafted on paper.

Step 2: Where ever applicable the designed/drafted circuit should be simulated using simulation S/W (TINA-V7/ Labview/ CIRCUIT MAKER etc.).

Step 3 : The designed/drafted circuit should be tested on the bread board & compare the results with the simulated results.

Step 4 : Where ever required the bread board circuit should be fabricated

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IIIRD SEMESTER

CATEGORY:-DC

EEE-33 - NETWORK ANALYSIS

TOTAL:-60 HOURS

COURSE OBJECTIVE

1. To analyze the Circuits in time and frequency domain
2. To study network Topology, network Functions, two port network.
3. To synthesize passive network by various methods.

Unit I

Introduction to circuit elements R,L,C and their characteristics in terms of linearity & time dependant nature, voltage & current sources controlled & uncontrolled sources KCL and KVL analysis, Nodal & mesh analysis, analysis of magnetically coupled circuits, Transient analysis :- Transients in RL, RC&RLC Circuits, initial conditions, time constants. Steady state analysis- Concept of phasor & vector, impedance & admittance, Network topology, concept of Network graph, Tree, Tree branch & link, Incidence matrix, cut set and tie set matrices, dual networks, and Dot convention, coupling coefficient, tuned circuits, Series & parallel resonance.

(12 HRS)

Unit II

Network Theorems for AC & DC circuits- Thevenin's & Norton's, Superposition's, Reciprocity, Compensation, Substitution, Maximum power transfer, and Millman's theorem, Tellegen's theorem, problems with dependent & independent sources.

(12 HRS)

Unit III

Frequency domain analysis – Laplace transform solution of Integro-differential equations, transform of waveform synthesized with step ramp, Gate and sinusoidal functions, Initial & final value theorem, Network Theorems in transform domain.

(12 HRS)

Unit IV

Concept of signal spectra, Fourier series co-efficient of a periodic waveform, symmetries as related to Fourier coefficients, Trigonometric & Exponential form of Fourier series.

(12 HRS)

Unit V

Network function & Two port networks – concept of complex frequency, Network & Transfer functions for one port & two ports, poles and zeros, Necessary condition for driving point & transfer function. Two port parameters – Z, Y, ABCD, Hybrid parameters, their inverse & image parameters, relationship between parameters, Interconnection of two ports networks, terminated two port networks.

(12 HRS)

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COURSE OUTCOME

After successful completion of the course student will be able to:

1. Apply their knowledge in analyzing Circuits by using network theorems.
2. Apply the time and frequency method of analysis.
3. Find the various parameters of two port network.
4. Apply network topology for analyzing the circuit.
5. Synthesize the network using passive elements

Reference Books:

1. M.E. Van Valkenburg, Network Analysis, (PHI)
2. F.F.Kuo, Network Analysis.
3. Mittal GK; Network Analysis; Khanna Publisher
4. Mesereau and Jackson; Circuit Analysis- A system Approach; Pearson.
5. Sudhakar & Pillai; Circuit & Networks- Analysis and Synthesis; TMH
6. Hayt W.H. & J.E. Kemmerly; Engineering Circuit Analysis; TMH
7. Decarlo lin; Linear circuit Analysis; Oxford
8. William D Stanley : Network Analysis with Applications, Pearson Education
9. Roy Choudhary D; Network and systems; New Age Pub
10. Charles K. Alexander & Matthew N.O. Sadiku: Electrical Circuits :TMH
11. Chakraborti :Circuit theory: Dhanpat Rai
12. B.Chattopadhyay & P.C.Rakshit; Fundamental of Electrical circuit theory; S Chand

List of Experiments:

Subject - Network Analysis

1. To Verify Thevenin's Theorem.
2. To Verify Superposition Theorem.
3. To Verify Reciprocity Theorem.
4. To Verify Maximum Power Transfer Theorem.
5. To Verify Millman's Theorem.
6. To Determine Open Circuit parameters of a Two Port Network.
7. To Determine Short Circuit parameters of a Two Port Network.
8. To Determine A,B, C, D parameters of a Two Port Network
9. To Determine h parameters of a Two Port Network
10. To Find Frequency Response of RLC Series Circuit.
11. To Find Frequency Response of RLC parallel Circuit.

NOTE - All experiments (wherever applicable) should be performed through the following steps.
Step 1: Circuit should be designed/ drafted on paper.

Step 2: Where ever applicable the designed/drafted circuit should be simulated using Simulation S/W (TINA-V7/ PSPICE/ Lab view/ CIRCUIT MAKER etc.).

Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.

Step 4: Where ever required the bread board circuit should be fabricated on PCB.

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IIIRD SEMESTER

CATEGORY:-DLC

EEE-34 - ELECTRICAL WORKSHOP

COURSE OBJECTIVE

1. To understand the importance of workshop practice in Engineering
2: to acquire proper understanding of various manufacturing processes
3: to identify the significance and application of various tools and equipment used in workshop

Experiment List:

1. To prepare a wiring such that one lamp is controlled by one switch with one independent plug point and to prepare estimate for the same time.
2. To prepare an estimation and wire up a circuit for mercury vapour lamp and CFL.
3. To prepare an estimate and wire up the circuit to control two lamps from two switches such that one lamp is ON at a time.
4. To connect two lamps in series and parallel and to prepare the estimate for the same.
5. To connect two switches in order to control one lamp so that it can be controlled by each one independently. Also prepare the estimate for the same.
6. To prepare an estimate and wire up the circuit to control two lamps with two switches (one way switch and two way switch) so as to get both dim, both bright and only one bright.
7. To prepare wiring of distribution board including power plug using isolator, MCB, ELCB and to prepare the estimation for the same.
8. To measure the resistance of insulation using insulation megger.
9. To measure the resistance of earth using earth megger.
10. (a). Identification of electronic components.
    (b). To practice soldering and prepare the estimation for the same.
    (c). To solder an IC base and wires in a PCB.
    (d). Insert a logic gate in the IC base and verify its function using IC tester.
11. To prepare an estimate and to setup a half wave and full wave rectifier with and without capacitor filter.

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COURSE OUTCOME

After completion of the course, the student will be able to

1: know and understand the types of trades in engineering

2: improve their practical skills to develop new products

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IIIRD SEMESTER

CATEGORY:-PDFS

BE-33 PROFESSIONAL DEVELOPMENT FINISHING SCHOOL

LEVEL-I

TOTAL - 36 HOURS

COURSE OBJECTIVE

The students are to be groomed with respect to personality development. In this regard, an effort is made to improve the knowledge with respect to basic in English, mathematics, aptitude and reasoning.

UNIT-I

Conversational English:

Grammar mainly Tenses, 100 small sentences of daily use tense wise, Letter Writing, Standard Format for CV writing.

(12 HRS)

UNIT-II

Basic Mathematics:

Arithmetic, Algebra, Unit Conversions.

Arithmetic

Number system, Decimals, Fractions, Simplification, HCF and LCM. Ratio and proportion, percentage, partnership, Average, profit and Losses, Simple Interest and Compound Interest, Mensuration, Time and work ,Time and Distance, Data Interpretation , Trigonometry Basics ,etc.

Algebra

Basics Algebraic Formulae, Linear Equations, quadratics Eqations,Logarithms,Functions, Permutation and Combination, Binomial Theorem , Series (AP,GP,HP).Unit conversion SI,FPS,MKS,CGS .

(12 –HOURS)

UNIT-III

Aptitude / Reasoning

Quantitative Aptitude and Logical Reasoning- Level-1

Problem solving on.

Number System, problems on Ages, Number Theory, Algebra, Clocks and Calendars.

Alphabet Test, Series Completion, Coding- Decoding, Logical Sequence, Insert missing figures.

(12 –HOURS)

OUTCOME

The students have gained confidence after improving their English, Math, and Aptitude and reasoning abilities.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

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IVTH SEMESTER

CATEGORY:-DC

EEE-41 - ELECTRICAL MACHINES – I

TOTAL:-60 HOURS

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on

1: the Principle of Converting Electrical energy to Mechanical energy and Vice-versa through Electromagnetic field.

2: understanding the effect of Armature reaction. Commutation and methods of improving commutation in D.C. Machines.

3: understanding the Characteristics and Applications of DC motors.

4: the working principles and applications of 1- □phase and 3-□ Transformers.

Unit I

Transformer-I

Working principle, emf. equation, construction, phasor diagrams, equivalent circuit, voltage regulation, losses, separation of hysteresis and eddy current losses, efficiency, tests: open circuit and short circuit, load, Sumpner’s test, Condition for maximum efficiency and regulation, Power and distribution transformer, all day efficiency, Excitation phenomenon, Autotransformer: working, advantages , its equivalent circuit and phasor diagram.

(12 HRS)

Unit II

Transformer-II

Three phase transformer: its construction, groups and connections, their working and applications; Scott connection; Parallel operation of Transformers: application, advantages, requirement and load sharing; Tap changers, cooling, conservator and breather. Pulse and high frequency transformers.

(12 HRS)

Unit III

Three phase Induction Motor-I

Working principle, construction, comparison of slip ring and squirrel cage motors, steady state analysis, phasor diagram and equivalent circuit, power flow diagram, torque-speed and power-speed characteristics, Losses and efficiency, No load and block rotor test, circle diagram.

(12 HRS)

Unit IV

Three phase Induction Motor-II

Starting of squirrel cage and slip ring motors, power factor control, Cogging & Crawling, Double cage &Deep bar Indication Motor, impact of unbalanced supply and harmonics on performance, speed control, braking, Induction Generator. Applications.

(12 HRS)

Unit V

Single Phase Motors:

Single Phase Induction motor; double revolving field theory, equivalent circuit and its determination, performance calculation, starting methods and types of single phase Induction

motors: their working principle and applications, comparison with three phases Induction Motor. Single phase A.C. series motor, Servo motors, Linear Induction Motor.
(12 HRS)

COURSE OUTCOME
After completion of this course, students will be able to
1: describe the Principles of Electro Mechanical Energy Conversion.
2: explain the effect of Armature reaction , Commutation and methods of improving commutation in D.C. Machines. & Solve Problems
3: enumerate the Characteristics, speed control and Applications of D.C.Motors & Solve problems
4: identify the Applications of 1- and 3- Transformers

Reference Books:

1. M. G. Say, Alternating Current Machines', (5th Ed.) ELBS, 1986.
2. V.Del Toro, "Electrical Machines & Power Systems", 1985, Prentice-Hall, Inc., Englewood Cliffs.
3. V.Del Toro, "Electromechanical Devices for Energy Conversion & Control Systems", PHI Pvt. Ltd.,1975.Text Books:
4. Electrical Machines by Nagrath and Kothari (TMH).
5. A.C. Machines by Langs dorf (McGraw-Hill)
6. Electrical Machines by Dr.P.S.Bimbhra (Khanna).
7. Electrical Machines by Ashfaq Hussain. (Dhanpat Rai).

List of Experiments (expandable)

Subject - Electrical Machines-I

1. Experiments can cover any of the above topics, following is a suggestive list:
2. Perform turn ratio and polarity test on 1-phase transformer
3. Perform load test on a 1-phase transformer and plot its load characteristic
4. Perform OC and SC tests on a 1-phase transformer and determine its equivalent circuit. Also find its efficiency and regulation at different load and power factor.
5. Perform OC and SC tests on a 3-phase transformer and determine its equivalent circuit. Also find its efficiency and regulation at different load and power factor.
6. Perform Sumpner's test on two 1-phase transformer and determine its efficiency at various load.
7. Perform No-load and block rotor test on a 3- phase IM and determine its equivalent circuit.
8. Perform load test on a 3- phase IM and plot its performance characteristics.
9. Study various types of starters used for 3- IMs.
10. Perform No-load and block rotor test on a 1- phase IM and determine its equivalent circuit.

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BHOPAL

IVTH SEMESTER

CATEGORY:-DC

EEE-42 - POWER SYSTEM –I

TOTAL:-60 HOURS

COURSE OBJECTIVE-This course will develop students‘ knowledge in/on

1. Cconventional Energy Sources
2. Economics of Power Generation
3. Different Types of Insulators , Corona, under Ground Cables & parameters of transmission lines

Unit I

General consideration on various sources of energy, energy conversion employing steam, energy conversion using water gas turbine

a) MHD generation
b) Solar generation
c) Wind power station
d) Geothermal power generation.

(12 HRS)

Unit II

Thermal, nuclear and gas power station:

Block diagram of thermal power station, selection of site. Different types of auxiliaries used in thermal power station. Nuclear Power Station: Different types of reactors and fuels, safety methods, waste isposal.

(12 HRS)

Unit III

Gas Power Station:

Block diagram, gas cycles, combined cycle power plants. Comparison between these power stations.

(12 HRS)

Hydro Power Station:

Choice of site, block diagram including surge tank and penstock, Hydrographs, flow duration curve. Types of turbines, base load and peak load power station.

(12 HRS)

Unit IV

Economic aspects of power plant operations:

Definitions load factor, demand factor and Diversity factor. Calculation of cost of generation, fixed charges, interest and depreciations, Methods of Depreciation. Tariffs: Different types of tariffs, power factor improvement.

(12 HRS)

Unit V

Economic Scheduling of Power Stations:

Economic operation of power system, criteria of loading of power plants with and without transmission loss, load dispatching in power system, co-generation and coordination of power plants.

(12 HRS)

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COURSE OUTCOME

1: describe the operation of conventional generating stations
2: determine Different Types of Tariff‟s in power system
3: design Distribution of voltage along the string insulators & Solve Problems
4: discuss underground cables & circuit parameters of transmission lines & Solve Problems

Reference Books:

1. G.R.Nagpal,"Power Plant Engineering", Khanna Publisher
2. S.N. Singh Electric Power Generation. PHI.
3. M.V.Deshpandey,"Modern Design of Power Station"

List of Experiment:

Subject - Power System Engineering-I

1. To study the Thermal Power Station.
2. To study the Hydro Power Station.
3. To study the Nuclear Power Station.
4. To study & draw Towers used in Transmission lines.
5. To study & draw the different types of insulator.
6. To study & design Electrical Power Transmission line.
7. Determination of Transmission Parameters of a transmission line.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

IVTH SEMESTER

CATEGORY:-DC

EEE-43 - DIGITAL ELECTRONICS & LOGIC DESIGN

TOTAL:-60 HOURS

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on

1: switching algebra and various minimization techniques of switching functions.

2: various combinational circuits and their applications.

3 : types of flip flops and their use in the design of sequential circuits.

4: different logic family circuits and their performance.

Unit I

(A) Number System: Various number systems-decimal, Binary, Hex and Octal with mutual conversion, binary arithmetic in computers, addition, subtraction, multiplication and division.

(B) Binary Codes: Weighted, non-weighted codes, error detecting and correcting codes, alphanumeric codes, ASCII codes.

(12 HRS)

Unit II

Boolean Algebra & Logic Hardware

(A) Boolean Algebra: AND, OR, NOT, NAND, NOR, EXOR, operations and gates, laws of Boolean algebra, reduction of Boolean expression, logic diagram, universal building blocks, negative logic

(B) Logic hardware “ Diode as switch, Bipolar transistor as switch FET as switch, MOSFET (Deplection and Enhancement mode) IC Technology, MSI, LSI, VLSI, logic specification, logic families (DTL, TTL, ECL, MOS, CMOS)

(12 HRS)

Unit III

Combinational circuits and system

(A) Combinational logic: Minterms and maxterms, Truth table and Karnaugh mapping, reduction of Boolean expression with SOP, POS and mixed terms, incompletely specified functions multiple output minimization, variable mapping, minimization by labular/ Quine Mc cluskey method.

(B) Encoders, Decoders, Multiplexers, Demultiplexers, code convertors, Binary address Digital comparator, parity checker/ generator, programming logic Array (PLA);

(12 HRS)

Unit IV

Sequential circuits

(A) State tables and diagrams, flip flop and its various types- JK, RS, T, D, pulse and edge

triggered flip flops transition and excitation tables, timing diagrams. (B) Shift registers: Series and parallel data transfer, ripple counters, synchronous counters,Modulo N counter design, Up down counters, Ring
(12 HRS)

Unit V
Memory & A/D Conversion
(A) Semiconductor ROM, Bipolar and MOS RAM, organization of RAM memory subsystem. Timing circuit, clock circuit and IC Timer.
(B) Analog/ Digital conversion: Digital to analog conversion, dualeslope integration successive approximation, parallel and parallel/ series conversion, converter specifications.
(12 HRS)

COURSE OUTCOME
After completion of this course, the students' will be able to
1: apply various minimization techniques to obtain minimal SOP/POS forms of switching functions.
2: design different combinational circuits and implement logic functions.
3: explain the operation of flip flops and their application in the design of sequential circuits like counters, shift registers, sequence detectors etc.
4: analyze the operation of various logic family circuits and compare their performance characteristics

Reference Books:

1. An Introduction to Digital Computer Design by V. rajaraman and T. Radhakrishnan, 3rd Edn. PHI.
2. Digital Principles and Applications by A.P. Malvino and B.P. Leach, 4th Edn. McGraw Hill.
3. Digital computer Fundamentals by T.C. Bratee, 6th Edn. McGraw Hill.
4. Pulse, Digital and switching circuits-Millman

Text Books:

1. Digital Electronics by WH Gothmann, 2nd Edn. PHI.

List of Experiments (Expandable):

Subject- Digital Electronics & Logic Design

1. To Verification of all Gates.
2. Draw of HALF ADDER circuit using EX-OR and AND gate and verification of its operation.

3. Construction of HALF ADDER circuit using EX-OR, AND and OR gate and verification of its operation.
4. Construction of HALF SUBTRACTOR circuit using EX-OR, AND and NOT gate and verification of its operation.
5. Construction of FULL SUBTRACTOR circuit using EX-OR,NOT AND and OR gates and verification of its operation
6. Analysis of operation COUNTER CONVERTER of D/A Converter circuit.
7. To testing the working of a MONOLITHIC CONVERTER of A/D Converter circuit.
8. Functional verification of a WEIGHTED RESISTOR D/A converter The purpose of this experiment is to analyze the operation of weighted resistor D/A converter according to the binary system.
9. Functional verification of D/A converter with ladder network.
10. To Verification of ENCODER circuit.
11. To Verification of DCODER circuit.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

IVTH SEMESTER

CATEGORY:-DC

EEE-44 - ELECTRICAL & ELECTRONICS MATERIAL

TOTAL:-60 HOURS

COURSE OBJECTIVE

This course will develop students' knowledge in/on

1. Critical reasoning to identify fundamental issues and establish directions for investigation
2. Creative processes to define specific plans for problem solution
3. Analytical thought to interpret results and place them within a broader context.
4. Application of materials solutions to enhance or radically improve existing and future technology

Unit I

Conducting Material: Classification and main properties, High resistivity alloy: Constant Mangann, Nichrome, Electrochemical, properties of copper, Aluminum, steel tungsten, Molybdenum, Platinum, Tantalum, Niobium, Mercury, Nickel, Titanium, Carbon, Lead, thermal, Bit metals, thermocouple, materials, specific resistance, conductance, variation of resistance with temperature, super conductors.

(12 HRS)

Unit II

Semi Conductor Materials: General conception, variation of electrical conductivity, Elements having semiconductor properties, general application, hall effect, energy levels, conduction in semiconductors, Intrinsic conduction, impurity conduction, P and N type impurities, electrical change, Neutrality, Drift, Mobility current flow in semi conductors P-N junction formation by alloying, Elasting (forward and reverse) of P-n junction, Reverse separation current, Zener effect, Junction, capacitance, hall defects and hall coefficient.

(12 HRS)

Unit III

Magnetic Materials: Details of magnetic materials, reduction between B.H. and ı, soft and hard magnetic materials. Di-magnetic, Para magnetic and Ferromagnetic materials, electrical sheet steel, cast iron. Permanent magnetic materials. Dynamic and static hysteresis loop. Hysteresis loss, eddy current loss, Magnetization, magnetic susceptibility, coercive force, core temperature, rectangular hysteresis loop, Magnet rest square loop core materials, iron silicon, Iron alloys.

(12 HRS)

Unit IV

Insulating Materials: General electrical mechanical and chemical properties of insulating material, Electrical characteristics volume and surface resistivity complex permittivity loss, and dielectric loss, equivalent circuits of an imperfect dielectric polarization and polarisability classification of dielectric.

(12 HRS)

Unit V

Mechanical Properties: Classification insulating materials on the basis of temperature rise. General properties of transformer oil, commonly used varnishes, solidifying insulating materials, resins, bituminous waxes, drying oils, Fibrous insulating materials, wood, paper and cardboard, insulating textiles, varnished adhesive tapes, inorganic fibrous material and other insulating materials, such as mica, ceramic, Bakelite, ebonite, glass, PVC, rubber, other plastic molded materials.

(12 HRS)

COURSE OUTCOME

After completion of this course, students will be able to

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

Reference Books:

1. TTTI Madras; Electrical Engineering Materials; TMH.
2. Electrical Engineering Material s & Devices; John Allison ;TMH
3. Materials for Electrical Engineering: B.M. Tareev
4. Anderson; Di-Electrics :
5. Kortisky; Electrical Engineering Materials:
6. Indulkar and S. Thruvengadem; Electrical Engineering Materials; S. Chand

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

IVTH SEMESTER

CATEGORY:-DC

EEE 45 - FIELD THEORY

TOTAL:-60 HOURS

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on-

1**:** concepts of electric forces and fields for different configurations.

2: fields in different materials and capacitance calculations.

3:effects of magnetic fields in electrical systems, magnetic potentials and inductance.

4 : Maxwell‟s equations, wave equation and Pointing vector

Unit I

Cartesian, cylindrical & spherical co-ordinate systems, scalar & vector fields, gradient, divergence & curl of a vector field, Divergence theorem & Stokes's theorem, concept of vectors. Electrostatic Fields – Coulomb's law, electric field intensity due to different charge distribution viz. line charge, sheet charge, Field due to continuous volume – electric potential, properties of potential function, potential gradient equipotential surfaces, line of force, Gauss law, applications of Gauss law, Gauss law in point form, method of images.

(12 HRS)

Unit II

Laplace's & Poisson's equations, solution of Laplace's equation, Electric dipole, dipole moment, potential & electric field intensity due to dipole, Behavior of conductors in an electric field. Conductor & insulator, electric field inside a dielectric, polarization, Boundary value conditions for electric Field, Capacitance & Capacitances of various types of capacitors, Energy stored and energy density in static electric field, Current density, conduction & convection current density ohms law in point form, equation of continuity.

(12 HRS)

Unit III

Static Magnetic Field, Biot-Savart's law, Magnetic Field intensity due to straight current carrying filament, circular, square and solenoidal current carrying wire, Relationship between magnetic flux, flux density & magnetic Field intensity; Ampere's circuital law and its applications, magnetic Field intensity due to infinite sheet and various other configurations, Ampere's circuital law in point form, Magnetic force, moving charge in a magnetic field, Lorentz Force on straight and long current carrying conductors in magnetic field, force between two long & parallel current carrying conductors. Magnetic dipole & dipole moment, a differential current loop as dipole, torque on a current carrying loop in magnetic field, Magnetic Boundary conditions.

(12 HRS)

Unit IV

Scalar magnetic potential and its limitations, Vector magnetic potential and its properties, vector magnetic potential due to different simple configurations; Self and Mutual inductances, determination of self & mutual inductances, self inductance of solenoid, toroid coils, mutual inductance between a straight long wire & a square loop. Energy stored in magnetic Field & energy density, Faraday's Law, transformer & motional EMFs, Displacement current, Maxwell's equations

as Generalization of circuit equations, Maxwell's equation in free space, Maxwell's equation for harmonically varying Field, static and steady fields, Maxwell's equations in differential & integral form.
(12 HRS)

Unit V
Electro Magnetic Waves : Uniform plane wave in time domain in free space, Sinusoidally time varying uniform plane wave in free space, Wave equation and solution for material medium, Uniform plane wave in dielectrics and conductors, Pointing Vector theorem, instantaneous, average and complex poynting vector, power loss in a plane conductor, energy storage,
Polarization of waves, Reflection by conductors and dielectric – Normal & Oblique incidence, Reflection at surface of a conducting medium, surface impedance, transmission line analogy.
(12 HRS)

COURSE OUTCOME
After completion of this course, students will be able to
1: realize electric field concepts and solve problems.
2: examine the fields in different materials and capacitance concepts.
3: use the magnetic field concepts and calculate the magnetic potentials and inductance for various cases.
4: contrast Maxwell‟s equations, assess wave equation, Poynting vector and apply the concept of wave propagation.

Reference Books:

1. Mathew N.O Sadiku; Elements of Electromagnetic; Oxford.
2. P.V. Gupta; Electromagnetic Fields; Dhanpat Rai.
3. N.N. Rao; Element of Engineering Electromagnetic; PHI.
4. William H. Hayt; Engineering Electromagnetic; TMH.
5. John D. Kraus; Electromagnetic; TMH.
6. Jordan Balmian; Electromagnetic wave & Radiating System; PHI.
7. David K. Cheng; Fields and Wave Electromagnetic; Addison Wesley.
8. S.P. Seth; Electromagnetic Field ;Dhanpat Rai & Sons

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

IVTH SEMESTER

CATEGORY:-DLC

BE-42 – MATLAB SIMULATION LAB

COURSE OBJECTIVE

This course will develop students' knowledge in/on

1. To familiarize the student in introducing and exploring MATLAB softwares.
2 To enable the student on how to approach for solving Engineering problems using simulation tools.
3 To prepare the students to use MATLAB in their project works.
4 To provide a foundation in use of this software's for real time applications.

LIST OF EXPERIMENT:-

1. To understand MATLAB basic features and built in functions available in MATLAB.
2. Generate various signals and sequences (periodic and a periodic) (Ramp, Impulse, unit step, square, saw tooth, triangular sinusoidal and sin c) using MATLAB software.
3. Perform the operations on signals and sequences such as addition, Multiplication, Scaling, shifting, folding and also compute energy and power.
4. Verify the Linearity of a given Discrete System.
5. Verification of Time Invariance of a Discrete System.
6. Compute the Unit Sample, Unit step and Sinusoidal Response of the given LTI System and Verifying its Stability.
7. Finding the Laplace transform & Inverse Laplace transform of some signals.
8. Compute the Unit Sample, Unit step and Sinusoidal Response of the given LTI System and Verifying its Stability.
9. Finding the Laplace transform & Inverse Laplace transform of some signals.
10. Perform the waveform synthesis using Laplace transform of a given signal.
11. Write the program for locating poles and zeros and plotting pole-zero maps in s-plane and z-plane for the given transfer function.
12. Verify the sampling theorem.

COURSE OUTCOME

After completion of this course, students will be able to

1 Ability to express programming & simulation for engineering problems.
2 Ability to find importance of this software for Lab Experimentation.
3 Articulate importance of software's in research by simulation work.
4 In-depth knowledge of providing virtual instruments on .Environment.
5 Ability to write basic mathematical ,electrical ,electronic problems in Matlab.

REFERNCES :-

1. Shailandra Jain, Modeling and simulation using MATLAB/SIMULINK ,willey
2. I.J.Nagrath,D.P. Kothari, Electrical machine,TMH
3. P.C. Sen ,Power Electronics, TMH

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

IVTH SEMESTER

CATEGORY: - PDFS

BE-44 PROFESSIONAL DEVELOPMENT FINISHING SCHOOL

LEVEL-II

TOTAL - 36 HOURS

OBJECTIVE

The students are to be groomed with respect to personality development. Further improvement in English, Aptitude and reasoning ability is desirable.

UNIT-I

Conversational English:

Grammar mainly Prepositions (550 small sentences of daily use related to day to day life

(18 –HRS)

UNIT-II

Aptitude / Reasoning:

Quantitative Aptitude and Logical Reasoning – Level II

Problem solving on,

Partnerships, Profit Loss and Discounts, Time and Distance.

Logical sequence of Figures, Cubes, Blood Relations, Data Sufficiency, Arrangement Problems.

(18 –HRS)

OUTCOME

Further improvement in English, Aptitude and reasoning ability is achieved.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

VTH SEMESTER

CATEGORY:-DC

EEE-51 - UTILIZATION OF ELECTRICAL ENERGY

TOTAL:-60 HOURS

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on

1 : various electric traction systems with their performance.

2 : selection of motor for different industrial drives.

3 : electric heating and welding techniques.

4 : designing and selection of lamps for proper illumination

Unit I

Illumination Engineering

Nature of light, units, sensitivity of the eye, luminous efficiency, glares. Production of Light; Incandescent lamps, arc lamps gas discharge lamps- fluorescent lamps polar curves, effect of voltage variation on efficiency and life of lamps, Distribution and control of light, lighting calculations, solid angle, inverse square and cosine laws, methods of calculations, factory lighting, flood lighting and street lighting, Direct diffused and mixed reflection & transmission factor, refractors, light fittings.

(12 HRS)

Unit II

Heating, Welding And Electrolysis

Electrical heating-advantages, methods and applications, resistance heating, design of heating elements, efficiency and losses control. Induction heating: core type furnaces, core less furnaces and high frequency eddy current heating, dielectric heating: principle and special applications, arc furnaces: direct arc furnaces, Indirect arc furnaces, electrodes, design of heating elements, power supply and control. Different methods of electrical welding, resistance welding, arc welding, energy storage welding, laser welding, and electron beam welding, and electrical equipment for them. Arc furnaces transformer and welding transformers. Review of electrolytic principles, laws of electrolysis, electroplating, anodizing-electro-cleaning, extraction of refinery metals, power supply for electrolytic process, current and energy efficiency.

(12 HRS)

Unit III

Traction

Special features of Traction motors, selection of Traction Motor, Different system of electric traction and their Advantages and disadvantages, Mechanics of train movement: simplified speed time curves for different services, average and schedule speed, tractive effort, specific energy consumption, factors affecting specific energy consumption, acceleration and braking retardation, adhesive weight and coefficient of adhesion,

(12 HRS)

Unit IV

Electric Drives

Individual and collective drives- electrical braking, plugging, rheostat and regenerative braking load equalization use of fly wheel criteria for selection of motors for various industrial drives, calculation of electrical loads for refrigeration and air-conditioning, intermittent loading and temperature rise curve.

(12 HRS)

Unit V

Introduction to Electric and Hybrid Vehicles

Configuration and performance of electrical vehicles, traction motor characteristics, tractive effort, transmission requirement, vehicle performance and energy consumption.

(12 HRS)

COURSE OUTCOME

After completion of this course, students will be able to

1 : choose the motor for different types of Electric traction systems.
2 : evaluate the selection of a motor for different types of loads.
3 : use various heating and welding techniques for different applications.
4 : select and design the lamps for proper illumination. & Solve Problems

Reference Books:

1. Open Shaw, Taylor, .Utilization of electrical energy., Orient Longmans, 1962.
2. H. Pratap, Art and Science of Utilization of Electrical Energy.
3. Gupta, J.B., Utilization of Elect. Energy ,Katariya and sons, New Delhi.
4. Garg, G.C., Utilization of Elect. Power and Elect. Traction.
5. N V Suryanarayan, Utilization of Elect. Power including Electric Drives and Elect. Traction, New Age International.
6. Hancok N N, Electric Power Utilisation, Wheeler Pub.
7. Mehrdad,Ehsani,Yimin Gao,Sabastien.E. Gay,Ali Emadi, “Modern electric, hybrid electric and fuel cell vehicles”, CRC Press.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

VTH SEMESTER

CATEGORY:-DC

EEE-52 - ELECTRICAL MACHINE-II

TOTAL:-60 HOURS

COURSE OUTCOME

After completion of this course, students will be able to

1 : choose the motor for different types of Electric traction systems.
2 : evaluate the selection of a motor for different types of loads.
3 : use various heating and welding techniques for different applications.
4 : select and design the lamps for proper illumination. & Solve Problems

Unit I

D.C. Machine-I

Basic construction of DC machines; types of DC machines and method of excitation; lap and wave windings; Emf equation; armature reaction and methods of limiting armature reaction; Commutation process and methods for improving commutation; Basic performance of DC generators and their performance characteristics; Metadyne and Amplidyne; permanent magnet DC motors; Brush less dc motors,

(12 HRS)

Unit II

D.C. Machine-II

Basic operation of DC motors; Torque equation; Operating characteristics of DC motors, Starting of DC motors- 2point, 3 point and 4 point starters; speed control of DC motors; losses and efficiency of DC machines; testing of DC machines, direct testing, Swinburne's test and Hopkinson's test. Application of DC machines

(12 HRS)

Unit III

Synchronous Machine-I

Construction; types of prime movers; excitation system including brushless excitation; polyphase distributive winding, integral slot and fractional slot windings; emf equation, generation of harmonics and their elimination; armature reaction; synchronous reactance and impedance, equivalent circuit of alternator, relation between generated voltage and terminal voltage, voltage regulation of alternators using synchronous impedance, mmf, zpf and new A.S.A method.

(12 HRS)

Unit IV

Synchronous Machine-II

Salient pole machines; two reaction theory equivalent circuit model and phasor diagram; determination of Xd and Xq by slip test; SCR and its significance; regulation of salient pole alternator, power angle equation and characteristics; synchronizing of alternator with infinite busbar,; parallel operation and load sharing; synchronizing current, synchronizing power and synchronising torque coefficient; synchroscopes and phase sequence indicator; effect of varying excitation and mechanical torque,.

(12 HRS)

Unit V

Synchronous machine-III

Synchronous motor operation, starting and stopping of synchronous motor, pull in torque, motor under load power and torque, reluctance torque, effect of excitation, effect of armature reaction, power factor adjustment, V curves, inverted V curves, synchronous motors as power factor correcting device, super synchronous and sub synchronous motors, hunting and damper winding efficiency and losses. Analysis of short circuit oscillogram, determination of various transient, sub transient and steady reactances and time constants, expression of transient and sub transient reactances in terms of self and mutual inductances of various winding, short circuit current, equivalent circuit. Single phase synchronous motors- hysteresis motor, reluctance motor. Repulsion motor, stepper motor, switched reluctance.

(12 HRS)

COURSE OUTCOME

After completion of this course, students will be able to

1: describe the Performance Characteristics, starting methods and speed control of 3-Φ Induction motors.

2: evaluate the Performance of 3- Φ Synchronous Generators. & Solve Problems

3: identify Applications of 3- Φ Synchronous Motors & Solve Problems.

4: explain the Various Applications of 1-Φ induction Motors and Special Purpose Machines.

List of Experiments (expandable)

Subject- Electrical Machine-II

Experiments can cover any of the above topics, following is a suggestive list:

1. To plot magnetization characteristic of a separately excited DC generator
2. To perform load test on DC generators.
3. To perform load test on DC series and shunt motor
4. To perform Swinburne's test on a DC machine and find out its efficiency under full load condition.
5. To conduct Hopkinson's test on a pair of DC shunt machine.
6. To perform OCC and SCC test on an alternator and determine its regulation.
7. To determine regulation of alternator using mmf and zpf methods.
8. To synchronise alternator with infinite bus bar.
9. To plot V and inverted V curves for a synchronous motor
10. To find Xd and Xq of salient pole synchronous machine by slip test.
11. To Determine negative sequence and zero sequence reactance of an alternator.
12. To determine subtransient direct axis and quadrature axis synchronous reactances of salient pole machine.

Reference Books:

1. M.G. Say,Performance & design of AC machines, CBS publishers & distributors, Delhi, 3rd edition
2. A.E. Clayton & N.N. Nancock, The Performance & design of DC machines CBS publications & distributors, Delhi, 3rd edition
3. P.S. Bhimbra, Electrical Machinery, Khanna Pub.
4. 4. P.S. Bhimbra, Generalized theory of Electrical Machines, Khanna publishers, Delhi,
5. Ashfaq Husain, Electric Machines, Dhanpat Rai, New Delhi
6. I.J. Nagrath & D.P. Kothari, Electric Machines, Tata McGraw Hill , New Delhi,
7. 6. Syed A. Nasar,Electric Machines & Power Systems, Volume I , Tata McGraw Hill, New Delhi
8. 7. A. E. Fitzerald, C. Kingsley & S.D. Umans , Electric Machinery Tata McGraw Hill ,New Delhi ,5th edition

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

VTH SEMESTER

CATEGORY:-DC

EEE-53 - MICROPROCESSORS & MICROCONTROLLERS
(µP & µC)

TOTAL:-60 HOURS

COURSE OBJECTIVE
This course will develop students' knowledge in/on
1: architecture of 8085 microprocessor.
2: assembly language programming.
3: memory segmentation concept.
4: architecture of 8051 microcontroller and its interfacing

Unit I
Microprocessor 8086: Introduction to 16-bit 8086 microprocessors, architecture of 8086, Pin Configuration, interrupts, minimum mode and maximum mode, timing diagram, Memory interfacing, Comparative study of Salient features of 8086, 80286 and 80386.
(12 HRS)

Unit II
Microprocessor 8086 programming: Instruction set of 8086, Addressing mode, Assembler directives & operations, assembly and machine language programming, subroutine call and returns, Concept of stack, Stack structure of 8086, timings and delays,
(12 HRS)

Unit III
Input-Output interfacing: Memory Mapped I/O and Peripherals I/O. PPI 8255 Architecture and modes of operation, Interfacing to 16-bit microprocessor and programming, DMA controller (8257) Architecture, Programmable interval timer 8254, USART 8251, 8 bit ADC/DAC interfacing and programming.
(12 HRS)

Unit IV
Microcontroller 8051: Intel family of 8 bit microcontrollers, Architecture of 8051, Pin description, I/O configuration, interrupts; Interrupt structure and interrupt priorities, Port structure and operation, Accessing internal & external memories and different mode of operations, Memory organization, Addressing mode, instruction set of 8051 and programming.
(12 HRS)

Unit V
8051 Interfacing, Applications and serial communication: 8051 interfacing to ADC and DAC, Stepper motor interfacing, Timer/ counter functions, 8051 based thyristors firing circuit, 8051 connections to RS-232, 8051 Serial communication , Serial communication modes, Serial communication programming, Serial port programming in C.
(12 HRS)

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

COURSE OUTCOME

After completion of this course, the students' will be able to

1: Explain the architecture of 8085.
2: Write assembly language programs by using 8085 microprocessor.
3: Discuss the various addressing modes of 8086 microprocessor.
4: Explain the architecture of 8051 microcontroller and its interfacing

List of Experiment:

Subject- Microprocessors & Microcontrollers

Introduction

1. Introduction to 8086 & 8051 kit, hardware features & modes of operation.
2. Introduction to 8086 & 8051 kit, hardware features & modes of operation.
3. Technique of programming & basic commands of kit.
4. Instruction set of 8086 & 8051.

Assembly language programming of 8086 & 8051.

1. Write a program to add two 8-bit numbers.
2. Write a program to add two 16-bit numbers.
3. Write a program for 8-bit decimal subtraction.
4. Write a program to find 1's complement and then 2's complement of a 16-bit numbers.
5. Write a program to find larger of two numbers.
6. Write a program to shift an 8-bit number left by 2-bits.
7. Write a program to multiply two 16-bit numbers.
8. Write a program for factorial of given number by recursion.
9. Write a program to square of an 8-bit number.
10. Write a program to generate a square wave of 2 KHz Frequency on input pin.

Reference Books:

1. Hall Douglas V., Microprocessor and interfacing, revised second edition 2006, Macmillan, McGraw Hill.
2. A.K. Ray & K.M.Bhurchandi, Advanced Microprocessors and peripherals- Architecture, Programming and Interfacing, Tata McGraw – Hill, 2009 TMH reprint.
3. Kenneth J. Ayala, The 8086 microprocessor: programming and interfacing the PC, Indian - edition, CENGAGE Learning.
4. Muhammad Ali Mazidi and Janice Gillespie Mazidi, the 8051 Microcontroller and Embedded Systems, Pearson education, 2005.
5. Kenneth J. Ayala, the 8051 Microcontroller Architecture, III edition, CENGAGE Learning.

6. V.Udayashankara and M.S.Mallikarjunaswamy, 8051 Microcontroller: Hardware, Software & Applications, Tata McGraw – Hill, 2009.

7. McKinley, the 8051 Microcontroller and Embedded Systems – using assembly and C, PHI, 2006 / Pearson, 2006.

8. Microprocessor and Interfacing, I edition 2012, oxford press setnil kumar, Saravam Jeevanathan shah.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

VTH SEMESTER

CATEGORY:-DC

EEE 54- FUNDAMENTAL OF POWER ELECTRONICS

TOTAL:-60 HOURS

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on

1: characteristics and applications of basic power semiconductor switches

2 : performance of controlled rectifiers.

3 : performance of chopper, inverter operation

4: A.C voltage controllers & Cyclo converter operation and power electronic applications in industry

Unit-1

Advantages and application of power electronic devices characteristics, Symbol & application of power diodes, power transistors, GTO, Triac, Diac, Power MOSFET, IGBT, LASCR, Fast recovery diode, Scotty diode MCTs. Principle of operation of SCR, Two transistor analogy, brief idea of construction of SCR, Static characteristics of SCR, Condition of turn on & off of SCR Gate characteristics, Method for turning on of SCR, Turnoff methods, different commutation techniques (Class A,B,C,D,E, & F Commutation) firing of SCR, Use of pubic transformer and opto isolator in firing, Resistance firing Ckt, Resistance capacitance firing circuit, UJT firing cut, and ramp triggering, firing for 3-Φ circuit. SCR rating & protection of SCR over voltage, Over current, Suprior firing, Design of snubber circuit and protection of gate of SCR, heating, cooling & mounting of SCR series and parallel operation of SCR, String efficiency & problem associated with series and parallel operation of SCR

(12 HRS)

Unit-2

Operation and analysis of single phase (Half wave & Full Wave) and multiphase (Three Phase) uncontrolled and controlled rectifier circuit with resistive, resistive & inductive load (continuous & non continuous conduction, Fw small & very large inductive loads) and RLE loads. Estimation of average load voltage and load current for above rectifier circuits active and reactive power input. Effect of free wheeling diode and source inductance on performance of these rectifier circuits . Comparison of mid point & Bridge rectifier circuits.

(12 HRS)

Unit-3

Series and parallel inverter, Voltage source & current source inverter, Single phase and three phase bridge inverter, Self cumulated inverters,, Mc- murray & MC murray bed ford inverters, Voltage control of single phase and three phase bridge inverter, Harmonics & their reduction techniques.

(12 HRS)

Unit-4

Principle of chopper operation, Various control strategies in chopper, Step up & step-up/step down choppers, chopper configuration (Type A,B, C,D, & E), Steady state analysis of chopper circuits, Current & voltage commutation of chopper circuits Jones & Morgens chopper

(12 HRS)

Unit-5

Single phase (mid point & bridge configuration) and three phase cyclo convertor configuration and operating principles. AC voltage controllers (using SCRs & Traic) single phase full wave controller with R and RL load, Estimation of RMS load voltage, RMS load current and input power factor, three phase AC voltage controller (Without analysis) Dual converter Switched mode voltage regulator buck, Boost, Buck & Boost, Ck regulators.

(12 HRS)

COURSE OUTCOME

After completion of this course, students will be able to

1: determine the power semiconductor switches characteristics and their applications & design of snubber
circuit

2 : evaluate the performance of rectifiers. & Solve Problems

3 : analyze & describe the operation of inverters and choppers & Solve Problems

4 : evaluate the performance of AC voltage controllers and Cycloconverters

References:

1. M.H. Rashid, Power Electronics Circuits, Devices and Applications, Pearson Education, Singapore, 1993.
2. M Ramsmoorthy, An Introduction to transistor and their application, Affiliated East-West Press.
3. P.C. Sen, Power Electonics, TMH.
4. M.D. Singh, K.B. Khanchandani, Power Electronics, TMH, Delhi, 2001.
5. Chakravarti A., Fundamental of Power Electronics and Drives, Dhanpat Ray & Co.,

LIST OF EXPERIMENTS :-

1. V-I characteristics of SCR
2. V-I characteristics of DIAC
3. V-I characteristics of BJT
4. V-I characteristics of TRIAC
5. VI characteristics of MOSFET
6. Transfer characteristics of MOSFET
7. Output characteristics of IGBT
8. Transfer characteristics of IGBT

9. Single phase SCR half controlled converter with R load
10. 1- Φ SCR fully controlled converter with r-load
11. Study of 3φ SCR Half controlled converter
12. Study of 3φ SCR Fully controlled converter
13. Study of classes of commutation A,B,C,D,E & F.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

VTH SEMESTER

CATEGORY:-DE

EEE-55 - ELECTRICAL ENERGY CONSERVATION AND AUDITING

TOTAL:-60 HOURS

COURSE OBJECTIVE

To impact basic knowledge to the students about current energy scenario, energyconservation, audit & management. To inculcate among the students systematicknowledge & skill about assessing the energy efficiency, energy auditing & energymanagement.

Unit I

General energy problem: Energy use patterns and scope for conservation. Energy audit: Energy monitoring, Energy accounting and analysis, Auditing and targeting. Energy conservation policy, Energy management & audit, Energy audit, Types of energy audit, energy management (audit), qualities and function of energy managers, language of an energy manager, Questionnaire, Check list for top management, Loss of energy in material flow, energy performance, Maximizing system efficiency, Optimizing, input energy requirements, Energy auditing instruments, Material load energy balance diagram.

(12 HRS)

Unit II

Thermodynamics of Energy Conservation. Basic principle. Irreversibility and second law efficiency analysis of systems. Primary energy sources, optimum use of prime-movers, energy efficient house keeping, energy recovery in thermal systems, waste heat recovery techniques, thermal insulation. Thermal energy audit in heating, ventilation and air conditioning. Maintenance and Energy audit – friction, lubrication and tribo-logical innovations. Predictive and preventive maintenance.

(12 HRS)

Unit III

Load curve analysis & load management DSM, Energy storage for power systems (Mechanical, Thermal, Electrical & Magnetic) Restructuring of electric tariff from energy conservation consideration, Economic analysis depreciation method, time value of money, Evaluation method of projects, replacement analysis, special problems inflation risk analysis. Pay back period, Energy economics, Cost Benefit Risk analysis, Pay back period.

(12 HRS)

Unit IV

Energy efficient electric drives, Energy efficient motors V.S.D. power factor improvement in power system. Energy Conservation in transportation system especially in electric vehicle. Energy flow networks, Simulation & modeling, formulation & Objective & constraints, alternative option, Matrix chart.

(12 HRS)

Unit-V

Energy conservation task before industry, Energy conservation equipments, Co-Generation, Energy conservation process, Industry Sugar, Textiles, Cement Industry etc Electrical Energy Conservation in building, heating and lighting. domestic gadgets

(12 HRS)

COURSE OUTCOME

1. Students will be able to apply the knowledge of the subject to calculate the efficiency of various thermal utilities.
2. Students will be able to design suitable energy monitoring system to analyz and optimize the energy consumption in an organization.
3. Students will be able to improve the thermal efficieny by designing suitable systems for heat recovery and co-generation.
4. Students will be able to use the energy audit methods learnt to identify the areas deserving tighter control to save energy expenditure.
5. Students will be able to carry out the cost- benefit analysis of various investment alternatives for meeting the energy needs of the organization.

Reference Books:

1. Energy Management – W.R. Murphy & G. Mckey Butler worths.
2. Energy Management Head Book- W.C. Turner, John Wiley
3. Energy Management Principles- Craig B. Smith, Pergamon Press
4. Energy Conservation- Paul O Callagan- Pergamon Press
5. Design & Management of energy conservation. Callaghan,
6. Elect, Energy Utilization & Conservation. Dr. Tripathi S.C.,

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

VTH SEMESTER

CATEGORY:-DEL

EEE-56 - INDUSTRIAL TRAINING (2 WEEKS)

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on

1. To provide comprehensive learning platform to students where they can enhance their employ ability skills and become job ready along with real corporate exposure.
2. To enhance students’ knowledge in one particular technology.
3. To Increase self-confidence of students and helps in finding their own proficiency
4. To cultivate student’s leadership ability and responsibility to perform or execute the given task.
5. To provide learners hands on practice within a real job situation.

CONCEPT AND GUIDELINE

Student will undertake a small project which will pertain to live problems of Industry\Community. The project may be related to use of technology in industry or transfer of technology to introduce value addition for agriculture, improving health & hygienic, energy management & conservation, optimal use of local resources or in the new product areas. The student can undertake project singly or in a batch (of not more than five students). At the end of project student will submit a project report which will contain details of the problem identified and solution suggest for it.

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on

1. To provide comprehensive learning platform to students where they can enhance their employ ability skills and become job ready along with real corporate exposure.
2. To enhance students’ knowledge in one particular technology.
3. To Increase self-confidence of students and helps in finding their own proficiency
4. To cultivate student’s leadership ability and responsibility to perform or execute the given task.
5. To provide learners hands on practice within a real job situation.

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BHOPAL

VTH SEMESTER

CATEGORY: - PDFS

BE-53 PROFESSIONAL DEVELOPMENT FINISHING SCHOOL

LEVEL-III

TOTAL - 36 HOURS

OBJECTIVE

The students are to be groomed with respect to personality development. Further improvement in English, Aptitude and reasoning ability is desirable.

UNIT-I

Conversational English:

Grammar mainly Active and Passive Voice, 250 sentences of daily use irrespective of any specific tenses**.**

(12 HRS)

UNIT-II

Conversational English:

100 sentences of daily use related to professional and formal environment Report Writing with necessary punctuations and with editor's eye, Thematic Apperception, Expression of Feelings 2-minutes Talk by the students, Smart Etiquettes and Tidiness **.**

(12 HRS)

UNIT-III

Aptitude/Reasoning

Quantitative Aptitude and Logical Reasoning – Level III

Problem solving on,

Average, Time work, percentage, Probability, Permutation and Combination.

Question- Statements, Theme Detection, Statement Assumptions, Statement Argument**.**

(12 HRS)

OUTCOME

Further improvement in reading, writing and vocal English is achieved. Aptitude and reasoning aspect shows improvement.

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VI TH SEMESTER

CATEGORY:-DC

EEE-61 – SIGNAL & SYSTEMS

TOTAL:-60 HOURS

COURSE OBJECTIVE:

This course introduces students about the signals and systems mathematically and understands how to perform mathematical operations on them. COURSE CONTENT

Classificationof signals and systems: Continuous time signals (CT signals), Discrete time signals (DT signals) -Step, ramp, pulse, impulse, sinusoidal and exponential signals, basic operations on signals, classifications of CT and DT signals-Periodic and aperiodic signals, energy and power signals, random signals, CTsystems and DT systems, basic properties of systems, basic properties of systems, linear time invariant systems and properties.

Unit- 1

Analysis of continuous time signals: Time and frequency domain analysis, Fourier series analysis, spectrum of CT signals, Fourier transform and Laplace transform, region of convergence, wavelet transform.

(12 HRS)

Unit- 2

Linear time invariant continuous time systems: Differential equations representation, block diagram representation, state variable representation and matrix representation of systems, impulse response, step response, frequency response, relizability of systems, analog filters.Analysis of discrete time signals: Convolution sum and properties, sampling of CT signals and aliasing, DTFT and properties, Z transform and properties, inverse Z transform.

(12 HRS)

Unit- 3

Linear time invariant discrete time systems: Difference equations, block diagram representation, impulse response, analysis of DT LTI systems using DTFT and Z transform, state variable equations and matrix representation of systems, Digital filters.COURSE OUTCOMEStudent after successful completion of course must possess an Understanding of various signals and systems properties and be able to identify whether a given system exhibits these properties and its implication for practical systems.

(12 HRS)

Unit- 4

Evaluation will be continuous an integral part of the class as well through external assessment.

(12 HRS)

COURSE OUTCOME:

1. Knowledge about basic signal and system modeling concept and definitions Outcomes
2. Student understand continuous-time signals and discrete-time signals
3. Student understand linear time-invariant systems theory and applications
4. Student can perform mathematical and graphical convolution of signals and systems

REFERENCES

1.Alan V. Oppenheim, Alan S. Willsky, S Hamid Nawab, 'Signals and Systems', 2nd edition 2015 Pearson New International Edition

2.A. Anand Kumar, Signals and Systems, PHI, III edition, 2015

3.Mahmood Nahvi, Signalsand Systems, McGraw Hill

4.Simon Haykins and Barry Van Veen,Signalsand Systems, Wiley India

5.A. Nagoor Kani; 'Signals and Systems' McGraw Hill

6.Robert A. Gabel and Richard A.Roberts,Signals& Linear Systems, Wiley.

7.Rodger E. Ziemer, William H. Tranter, D. Ronald Fannin.Signals& systems, Pearson Education

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

VITH SEMESTER

CATEGORY:-DC

EEE-62 - CONTROL SYSTEMS

TOTAL:-60 HOURS

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on

1 : transfer function representation &determination using block diagram Reduction& signal flow graphs of LTI Systems

2 : time domain analysis of LTI Systems and stability studies

3 : develop the concepts on stability analysis using frequency response.

4 : concepts of state space analysis & compensation techniques

Unit I

Modeling of dynamic systems: Electrical, Mechanical and hydraulic systems, Concept of transfer function, Simulation of differential equations in analog computer, State space description of dynamic systems: Open and closed loop systems, Signal flow graph, Mason’s formula, Components of control systems: Error detectors (Synchros & Potentiometer), Servomotors (AC & DC), techo generators, power amplifier, steeper motors.

(12 HRS)

Unit II

Time – domain analysis of closed loop systems: Test signals, time response of first and second order systems, Time domain performance specifications, Steady state error & error constants Feedback control actions: Proportional, derivative and integral control. Solution of state equation: Eigen values & eigenvectors digitalization state transitive matrix, stability Routh-Hurwit stability analysis.

(12 HRS)

Unit III

Characteristics equation of closed loop system root loci, construction of loci, Effect of adding, poles and Zeros on the loci, Stability by root loci.

(12 HRS)

Unit IV

Frequency, Domain analysis, Bode plots, Effect of adding, poles and Zeros, Polar plot, Nyquist stability analysis, Relative stability : Gain and phase margins.

(12 HRS)

Unit V

Frequency- Domain compensation : lead lag, Lag-lead compensation, Design of compensating networks.

(12 HRS)

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COURSE OUTCOME

After completion of this course, students will be able to

1 : determine the TF of a system using block diagram reduction technique & signal flow graphs of LTI system & Solve Problems.

2 : determine Transient and Steady State behavior of systems using standard test signals and stability in time domain & Solve Problems

3 : determine the stability of the LTI systems using frequency domain.

4 : analyze performance of state space analysis of a continuous system

List of Experiments :

Subject- Control Systems

1. Time response of second order system.
2. Characteristics of Synchrons.
3. Effect of feedback on servomotors.
4. Determination of transfer function of A-C servomotor.
5. Determination of transfer function of D-C motor.
6. Formulation of PI & PD controller and study of closed loop responses of 1st and 2^{nd} order dynamic systems.
7. State space model for classical transfer function using MATLAB.
8. Simulation of transfer function using operational amplifier.
9. Design problem: Compensating Networks of lead and lag.
10. Temperature controller using PID.
11. Transfer function of a DC generator.
12. Characteristics of AC servomotor.
13. Use of MATLAB for root loci and Bode plots of type-1, type-2 systems.
14. Study of analog computer and simulation of 1st order and 2nd order dynamic equations.
15. Formulation of proportional control on 1st order and 2nd order dynamic systems.
16. Feed back control of 3rd order dynamic Systems
17. Study of lead and lag compensating networks.
18. Effect of adding poles & zeros on root loci and bode plots of type-1, type-2 systems through MATLAB.

Reference Books:

1. I.J. Nagrath and M. Gopal, "Control system Engineering", New Age International.
2. K. Ogata, Modern Control Engineering, PHI.
3. B.C. Kuo, Automatic Control systems, PHI

4. Gopal M., Control System : Principles & Design, TMH.
5. N.K. Sinha, Control Systems, New Age International
6. Stefani, Shahian, Savant, Hostetter – "Design of feed back control System's", Oxford.

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BHOPAL

VITH SEMESTER

CATEGORY:-DC

EEE-63 - POWER SYSTEM ENGINEERING-II

TOTAL:-60 HOURS

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on

1 : representation of transmission lines

2 : methods of voltage control

3 : symmetrical components and fault calculations

4 : system neutral grounding and insulation co-ordination

Unit I

Introduction: Problems associated with modern interconnected power Systems, deregulation, power systems restructuring, distributed generation, congestion, available transfer capacities, pricing of energy and transmission services.

(12 HRS)

Unit II

Power flow studies: Formulation of static power flow equations and solutions using Gauss- Seidel, Newton Raphson and FDLF methods, comparison of these methods, Economic operation of power system - Economic dispatch, Emission dispatch, line loss, ITL, economic dispatch using lagrangian multiplier method.

(12 HRS)

Unit III

MW Frequency control: Coherency, control area, modeling of speed control mechanism, load damping, block diagrammatic representation of single and two area interconnected system, static and dynamic response, .optimum parameter adjustment.

(12 HRS)

Unit IV

MVAR Voltage control Problem: Difference in control strategy over MW-f control, characteristics of an excitation system, DC AC and static excitation system, General block diagram representation of voltage regulators.

(12 HRS)

Unit V

Power System Stability: Steady state, dynamic and transients stability, Swing equation, equal area criterion, solution of swing equation using step by step method modified Eulers method and Runga -Kutta method, methods of improving transient stability.

(12 HRS)

COURSE OUTCOME

After completion of this course, students will be able to

1 : analyze transmission line performance & Solve Problems

2 : explain the significance of per unit quantities.

3 : determine the fault currents for symmetrical and unbalanced faults

4 : realize the concept of Traveling waves on transmission line

Reference Books:

1. Modern Power System Analysis-by I.J. Nagrath & D.P. Kothari Tata Mc Graw – Hill Publication Company Ltd 2nd edition.
2. A Chakrawarti Power System Analysis:Operation and Control PHI Learning 3rd edition
3. Reactive power Control in Electric Systems-by T.J.E. Miller, John Wiley & Sons.
4. Electrical Power Systems-by C.L. Wadhwa New Age International (P) Limited Publishers, 2nd edition 1998.
5. Elgerd O.I., "Electric Energy Systems Theory", TMH, New Delhi, Second Edition 1983.
6. Prabha Kundur, "Power system stability and control", Mc-Graw Hill Inc, New York, 1993.
7. Taylor C.W., "Power System Voltage Stability", Mc-Graw Hill Inc, New York, 1993.
8. Nagrath IJ, Kothari D.P., "Power System Engineering", Tata Mc-Graw Hills, New Delhi 1994.
9. Weedy B.M. "Electric Power System" John Wiley and Sons, 3rd edition.
10. P.S.R. Murthy, "Power System Operation and Control", B S Publ-ication.
11. Power Generation, Operation and Control by A.J. wood and B.F. Wollenberg John Wiley & Sons Inc. 1984.
12. T.K. Nagsarkar, M.S. Sukhiza, -"Power System Analysis", Oxford University Press.
13. Economic Operation of Power Systems- by L.K. Kirchmayer Wiley Eastern Ltd.

List of Experiments:

Subject- Power System Engineering-II

1. To develop a program in Mat-Lab for information of Y-bus matrix for N bus system.
2. Load flow solution for 3-bus system using Gauss- Seidel, Newton Raphson and FDLF methods up to 3 iteration.
3. Load flow solution for IEEE 6-bus and 30-bus system in Mat-Lab using Newton Raphson method.
4. Assessment of transient stability of a single machine system.
5. Effect of compensation on voltage profile of IEEE 6-bus system.
6. Study of any software tools (PSCAD,EDSA, Mi POWER, ETAP etc)

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VITH SEMESTER

CATEGORY:-DE

EEE-64 (A) POWER SYSTEM PROTECTION

TOTAL:-60 HOURS

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on

1. Understand the different components of a protection system.
2. Evaluate fault current due to different types of fault in a network.
3. Understand the protection schemes for different power system components.
4. Understand the basic principles of digital protection.
5. Understand system protection schemes, & the use of wide-area measurements.

Unit I

Faults in power systems, single line diagram, equivalent impedance diagram, per unit reactances. Analysis (using matrices) of power systems by symmetrical components under:
(a) Three phase short circuit.
(b) Line to line fault.
(c) Line to ground fault.
(d) Double line to ground fault.
Sequence networks and their inter connections for different types of faults, effects of fault mpedance. Current Limiting Reactors: Applications, types, construction and location of current limiting reactors, short circuit calculation using reactors.
(12 HRS)

Unit II Relays

General considerations, sensing of faults, construction of electro-magnetic attraction and induction types relays, Buchholz and negative sequence relay, concept of reset, pick up, inverse time and definite time characteristics, over current , over voltage, directional, differential and distance relays on R-X diagram. Static Relays: Introduction, advantage and limitation of static relays, static over current, directional, distance and differential relays.
(12 HRS)

Unit III Protection

Types & detection of faults and their effects, alternator protection scheme (stator, rotor, reverse power protection etc.). Power transformer protection (external and internal faults protection), generator-transformer unit protection scheme, bus bar protection. Transmission line protection (current/time grading, distance), Pilot relaying schemes, power line carrier protection.
(12 HRS)

Unit IV Switchgear

Theory of current interruption- energy balance and recovery rate theory, arc quenching, recovery and restriking voltages. Types of circuit breakers. bulk oil and minimum oil, air break and air blast, sulphur hexa fluride (SF6) and vacuum circuit breakers. Rating selection and testing of circuit breakers/operating mechanisms. LT switchgear, HRC fuses, types construction and applications.
(12 HRS)

Unit V Modern Trends In Protection

Electronic relays, static relays functional circuits: comparators, level detectors, logic and training circuits, microprocessor and computer based protection schemes, software development for protection, security & reliability.

(12 HRS)

COURSE OUTCOME

1.Student gains knowledge on different Protective Equipments or Power Systems

2. Know about various protective systems- how it works and where it works?

3. Different applications o f the relays, circuit breakers, grounding for different elements of power system is also discussed in the subject.

Reference Books:

1. Van A. R & Warrington C., " Protective Relays : Their Theory and Practice", Vol 1 & 2, Chapman and Hall.
2. Paithankar Y. O.," Transmission Network Protection: Theory and Practice", Marcel Deicker, Inc.
3. GEC Measurements," Protective Relays : Application Guide", GEC Measurements.
4. Masson R.J., Art & Science of Protective Relaying.
5. J & P Switchgear handbook Ravindra Nath B., and Chandar M., Power systems protection and switchgear
6. Rao Sunil S, Switchgear and protection.
7. Crane P.H.C., Switchgear Principle.
8. The Elementary Council, "Power System Protection", Vol.1,2 &3, Peter Peregrinus Ltd.
9. Badriram & Vishwakarma, Power System Protection. Ravindranath & Chander, Power System Protection & Switchgear.

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VITH SEMESTER

CATEGORY:-DE

EEE-64 (B) - ENERGY CONSERVATION & MANAGEMENT

TOTAL:-60 HOURS

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on

To impart knowledge in the domain of energy conservation

To bring out Energy Conservation Potential and Business opportunities across different user segments under innovative business models

To inculcate knowledge and skills about assessing the energy efficiency of an entity/ establishment

Unit I

General energy problem: Energy use patterns and scope for conservation. Energy audit: Energy monitoring, Energy accounting and analysis, Auditing and targeting. Energy conservation policy, Energy management & audit, Energy audit, Types of energy audit, energy management (audit), qualities and function of energy managers, language of an energy manager, Questionnaire, Check list for top management, Loss of energy in material flow, energy performance, Maximizing system efficiency, Optimizing, input energy requirements, Energy auditing instruments, Material load energy balance diagram.

(12 HRS)

Unit II

Thermodynamics of Energy Conservation. Basic principle. Irreversibility and second law efficiency analysis of systems. Primary energy sources, optimum use of prime-movers, energy efficient house keeping, energy recovery in thermal systems, waste heat recovery techniques, thermal insulation. Thermal energy audit in heating, ventilation and air conditioning. Maintenance and Energy audit – friction, lubrication and tribo-logical innovations. Predictive and preventive maintenance.

(12 HRS)

Unit III

Load curve analysis & load management DSM, Energy storage for power systems (Mechanical, Thermal, Electrical & Magnetic) Restructuring of electric tariff from energy conservation consideration, Economic analysis depreciation method, time value of money, Evaluation method of projects, replacement analysis, special problems inflation risk analysis. Pay back period, Energy economics, Cost Benefit Risk analysis, Pay back period.

(12 HRS)

Unit IV

Energy efficient electric drives, Energy efficient motors V.S.D. power factor improvement in power system. Energy Conservation in transportation system especially in electric vehicle. Energy flow networks, Simulation & modeling, formulation & Objective & constraints, alternative option, Matrix chart.

(12 HRS)

Unit V

Energy conservation task before industry, Energy conservation equipments, Co-Generation, Energy conservation process, Industry Sugar, Textiles, Cement Industry etc Electrical Energy Conservation in building, heating and lighting. domestic gadgets .

(12 HRS)

COURSE OUTCOME

Students will able to describe

1. Obtain knowledge about energy conservation policy, regulations and business practices
2. Analyse energy systems from a supply and demand perspective
3. Recognize opportunities for enabling rational use of energy
4. Apply knowledge of Energy Conservation Opportunities in a range of contexts
5. Develop innovative energy efficiency solutions and demand management strategies

Reference Books:

1. Energy Management – W.R. Murphy & G. Mckey Butler worths. E
2. nergy Management Head Book- W.C. Turner, John Wiley
3. Energy Management Principles- Craig B. Smith, Pergamon Press
4. Energy Conservation- Paul O Callagan- Pergamon Press
5. Design & Management of energy conservation. Callaghan,
6. Elect, Energy Utilization & Conservation. Dr. Tripathi S.C.,

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VITH SEMESTER

CATEGORY:-DE

EEE-64 (C) - GENERALISED THEORY OF ELECTRICAL MACHINES

TOTAL:-60 HOURS

COURSE OBJECTIVE

To impart knowledge on

1. The key principles in Analysis of electrical machines
2. The Generalized Representation and steady state analysis of Synchronous Machines
3. The generator and motor operation in steady state and transient conditions
4. The analysis of harmonics in Ac machines
5. The generalized representation of special machines

Unit I

Review : Primitive machine, voltage and torque equation. Concept of transformation change of variables & m/c variables and transform variables. Application to D.C. machine for steady state and transient analysis, and equation of cross field commutator machine.

(12 HRS)

Unit II

Induction Machine : Voltage, torque equation for steady state operation, Equivalent circuit, Dynamic performance during sudden changes in load torque and three phase fault at the machine terminals. Voltage & torque equation for steady state operation of 1-P induction motor & scharge motor.

(12 HRS)

Unit III

Synchronous Machine : Transformation equations for rotating three phase windings, Voltage and power equation for salient and non salient alternator, their phasor diagrams,
Simplified equations of a synchronous machine with two damper coils.

(12 HRS)

Unit IV

Operational Impedances and Time Constants of Synchronous Machines: Park's equations in operational form, operational impedances and G(P) for a synchronous machine with four Rotor Windings, Standard synchronous machine Reactances, time constants, erived synchronous machine time constants, parameters from short circuit
characteristics.

(12 HRS)

Unit V

Approximate Methods for Generator & System Analysis : The problem of power system analysis, Equivalent circuit & vector diagrams for approximate calculations, Analysis of line to line short circuit, Application of approximate method to power system analysis.

(12 HRS)

COURSE OUTCOME

Students will be able to describe

1. The Generalized Representation of machines and their analysis
2. The steady state analysis and transient analysis of various machines
3. The performance of special machines and their representation

Reference Books:

1. P.C.Krause, Analysis of Electric Machinery, Wiley India.,
2. B.Adkins, The General theory of Electrical Machines.
3. B.Adkins & R.G.Harley, The General theory of AC Machines.
4. P.S.Bhimbra, Generalised theory of Electrical m/c
5. White & Woodson, Electro Mechanical Energy Conversion.

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VITH SEMESTER

CATEGORY:-OE

EEE-65(A) - DIGITAL SIGNAL PROCESSING

TOTAL:-60 HOURS

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on

1. continuous-time (CT) and discrete-time (DT) signals
2. discrete fourier transform (DFT), computational complexity of DFT and efficient implementation of DFT using fast fourier transform (FFT)
3. specifying characteristics of frequency selective filters, design of linear-phase FIR filters
4. classical analog butterworth & chebyshev filters, converting analog filter into equivalent digital filter to design digital IIR filters

Unit I

Introduction to Digital Signal Processing: Discrete time signals & systems, linear shift invariant systems, stability and causality, Linear-constant coefficient difference equations, Frequency domain representation of discrete time signals and systems, properties of the Discrete Time Fourier transform (DTFT), Sampling and discrete time processing of continuous-time signals.
(12 HRS)

Unit II

Z-Transform: Applications of z-transforms, solution of difference equations of digital filters, System function, stability criterion, frequency response of stable systems, one-sided Z-transform and its applications.
(12 HRS)

Unit III

Discrete Fourier series: Properties of discrete Fourier series, DFS representation of periodic sequences. Discrete Fourier Transforms: Properties of DFT: Fast Fourier Transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms. Inverse FFT.
(12 HRS)

Unit IV

IIR DIGITAL FILTERS: Analog filter approximations - Butterworth and Chebyshev, Design of IIR Digital filters from analog filters, Bilinear transformation method, step & impulse invariance techniques, Spectral Transformations, Realization of IIR digital filters - direct, canonic, cascade & parallel forms.
(12 HRS)

Unit V

FIR DIGITAL FILTERS: Characteristics of FIR Digital Filters frequency response, Design of FIR Digital Filters using Window Techniques. Comparison of IIR and FIR filters, Realization of FIR digital filters - direct, linear phase, cascade & parallel forms.
(12 HRS)

COURSE OUTCOME

After completion of this course, students will be able to

1: explain Continuous-time (CT) and discrete-time (DT) signals

2: find the DFT of a DT sequence, perform circular convolution using DFT & IDFT and compute 2, 4 & 8point DFT of a sequence using radix-2 DIT & DIF algorithms

3: design a linear-phase FIR filter with a prescribed magnitude response using windowing & frequency- sampling methods

4: design an IIR Butterworth/Chebyshev digital filter meeting the required specifications by performing impulse invariance/bilinear transformation

Reference Books:

1. Oppenheim & Schaffer, Digital Signal Processing, PHI.
2. J Cavacchi Digital Signal Processing Wiley India.
3. John G. Proakis Digital Signal Processing: Principles, Algorithms, and Applications, 4/E.
4. Ludeman Fundamental of Digital Signal Processing, wiley India.
5. A. Antoniou, Digital Filters Analysis & Design, TMH.
6. A. Anand Kumar Digital Signal Processing, PHI.
7. S.K. Mitra, Digital Signal Processing, TMH

List of Experiments :

Subject- Digital Signal Processing

1. To develop elementary signal function modules (m-files) for unit sample, unit step, exponential and unit ramp sequences.
2. To develop program for computing inverse Z-transform.
3. To develop program for computing discrete Fourier Transform (DFT) and inverse discrete Fourier Transform (IDFT).
4. To develop program for computing circular convolution.
5. To develop program for finding the response of the LTI system by difference equation.
6. To study important commands of MATLAB software.

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VITH SEMESTER

CATEGORY:-OE

EEE-65 (B) SCADA SYSTEMS AND APPLICATIONS

TOTAL:-60 HOURS

COURSE OBJECTIVE

There are many objectives of SCADA System.

1.Improved overall System efficiency (capital & energy)
2.Increased penetration energy sources including renewable energy sources.
3.Reduced Energy Requirements in both the Transmission and Generation
4.Increased Relativity of sequence to essential loads.

Unit I

Introduction to SCADA and PLC:SCADA: data acquisition system, evaluation of scada, communication technologies, monitoring and supervisory functions. plc: block diagram, rogramming languages, ladder diagram, functional block diagram, applications, interfacing of plc with scada.

(12 HRS)

Unit II

SCADA system components: Schemes, Remote Terminal Unit, Intelligent Electronic Devices, Communication Network, SCADA server.

(12 HRS)

Unit III

SCADA Architecture-Various SCADA Architectures, advantages and disadvantages of each system, single unified standard architecture IEC 61850 SCADA / HMI Systems.

(12 HRS)

Unit IV

SCADA Communication-Various industrial communication technologies- wired and wireless methods and fiber optics, open standard communication protocols.

(12 HRS)

Unit V

Operation and control of interconnected power system-Automatic substation control, SCADA configuration, Energy management system, system operating states, system security, state estimation, SCADA applications Utility applications, transmission and distribution sector operation, monitoring analysis and improvement. Industries oil gas and water. Case studies, implementation, simulation exercises.

(12 HRS)

COURSE OUTCOME

After completion of this course, students will be able to

1 Ability to express programming for engineering problems.

2 Ability to find importance of this software for Lab Experimentation.

3 Ability to write basic mathematical ,electrical ,electronic problems in SCADA.

Reference Books:

1. Stuart A Boyer: SCADA supervisory control and data acquisition.
2. Gordan Clark, Deem Reynders, Practical Modem SCADA Protocols.
3. Sunil S. Rao, Switchgear and Protections, Khanna Publication.

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VITH SEMESTER

CATEGORY:-OE

EEE-65 (C) – INDUSTRIAL ELECTRONICS

TOTAL:-60 HOURS

COURSE OBJECTIVE

This course will develop students' knowledge in/on

1. Analyze the steady state and small signal AC response of simple electronic circuits containing diodes, transistors, and operational amplifiers
2. Apply performance criteria in the design of basic amplifier circuits and verify that the criteria were met.
3. Design and analyze circuits containing digital components and microprocessors.
4. Analyze and evaluate performance parameters of AC and DC motors.

Unit I

Advantages and application of power electronic devices characteristics, Symbol & application of power diodes, power transistors, GTO, Triac, Diac, Power MOSFET, IGBT, LASCR, Fast recovery diode, Scotty diode MCTs. Principle of operation of SCR, Two transistor analogy, brief idea of construction of SCR, Static characteristics of SCR, Condition of turn on & off of SCR Gate characteristics, Method for turning on of SCR, Turnoff methods, different commutation techniques (Class A,B,C,D,E, & F Commutation) firing of SCR, Use of pubic transformer and opto isolator in firing, Resistance firing Ckt, Resistance capacitance firing circuit, UJT firing cut, and ramp triggering, firing for 3-Φ circuit. SCR rating & protection of SCR over voltage, Over current, Suprior firing, Design of snubber circuit and protection of gate of SCR, heating, cooling & mounting of SCR series and parallel operation of SCR, String efficiency & problem associated with series and parallel operation of SCR

(12 HRS)

Unit II

Operation and analysis of single phase (Half wave & Full Wave) and multiphase (Three Phase) uncontrolled and controlled rectifier circuit with resistive, resistive & inductive load (continuous & non continuous conduction, Fw small & very large inductive loads) and RLE loads. Estimation of average load voltage and load current for above rectifier circuits active and reactive power input. Effect of free wheeling diode and source inductance on performance of these rectifier circuits . Comparison of mid point & Bridge rectifier circuits.

(12 HRS)

Unit III

Series and parallel inverter, Voltage source & current source inverter, Single phase and three phase bridge inverter, Self cumulated inverters,, Mc- murray & MC murray bed ford inverters, Voltage control of single phase and three phase bridge inverter, Harmonics & their reduction techniques.

(12 HRS)

Unit IV

Principle of chopper operation, Various control strategies in chopper, Step up & step-up/step down choppers, chopper configuration (Type A,B, C,D, & E), Steady state analysis of chopper circuits, Current & voltage commutation of chopper circuits Jones & Morgens chopper

(12 HRS)

Unit V

Single phase (mid point & bridge configuration) and three phase cyclo convertor configuration and operating principles. AC voltage controllers (using SCRs & Traic) single phase full wave controller with R and RL load, Estimation of RMS load voltage, RMS load current and input power factor, three phase AC voltage controller (Without analysis) Dual converter Switched mode voltage regulator buck, Boost, Buck & Boost, Ck regulators.

(12 HRS)

COURSE OUTCOME

After completion of this course, the students' will be able to

1. Awareness of general structure of industrial electronics
2. Impart the knowledge of generation of electricity based on conventional and nonconventional energy sources
3. To make students capable of analysis of mechanical and electrical design aspects of transmission system
4. Enable the students to do analysis of different types of distribution systems and its design.
5. Impart the knowledge of protective relays and circuit breakers.

List Of Experiments :-

Subject- Industrial Electronics

14. V-I characteristics of SCR
15. V-I characteristics of DIAC
16. V-I characteristics of BJT
17. V-I characteristics of TRIAC
18. VI characteristics of MOSFET
19. Transfer characteristics of MOSFET
20. Output characteristics of IGBT
21. Transfer characteristics of IGBT
22. Single phase SCR half controlled converter with R load
23. 1- Φ SCR fully controlled converter with r-load
24. Study of 3φ SCR Half controlled converter
25. Study of 3φ SCR Fully controlled converter
26. Study of classes of commutation A,B,C,D,E & F.

References:

6. M.H. Rashid, Power Electronics Circuits, Devices and Applications, Pearson Education, Singapore, 1993.

7. M Ramsmoorthy, An Introduction to transistor and their application, Affiliated East-West Press.

8. P.C. Sen, Power Electonics, TMH.

9. M.D. Singh, K.B. Khanchandani, Power Electronics, TMH, Delhi, 2001.
10. Chakravarti A., Fundamental of Power Electronics and Drives, Dhanpat Ray & Co.,

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

VITH SEMESTER

CATEGORY:-P

EEE-66 - ENGINEERING DESIGN PROJECT

COURSE OBJECTIVE

1. Manufacturing and Design Engineering is an interdisciplinary field.
2. A balanced emphasis on the "design," the "process," and the "systems" view of manufacturing is essential.
3. Hands-on experience is required.

COURSE GUIDELINES

The Engineering Design Project Work provides students an opportunity to do something on their own and under the supervision of a guide. Each student shall work on an approved project, which may involve fabrication, design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work involves sufficient work so that students get acquainted with different aspects of manufacture, design or analysis. The students also have to keep in mind that in final semester they would be required to implement whatever has been planned in the Major Project in this semester. It is possible that a work, which involves greater efforts and time may be taken up at this stage and finally completed in final semester, but partial completion report should be submitted in this semester and evaluated also at the end of the semester. At the end of semester, all students are required to submit a synopsis and be assessed by an external examiner.

COURSE OUTCOME

1. Ability to apply mathematics, science, and engineering principles.
2. Ability to design and conduct experiments, analyze and interpret data.
3. Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
4. Ability to function on multidisciplinary teams.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

VITH SEMESTER

CATEGORY: - PDFS

BE-61 PROFESSIONAL DEVELOPMENT FINISHING SCHOOL

(LEVEL-IV)

TOTAL - 36 HOURS

COURSE OBJECTIVE

The students are to be groomed with respect to personality development. Emphasis to be made in reading, writing and vocal English, quantitative aptitude and logical reasoning to be stressed.

UNIT-I

Final Finishing:

Final Preparation of CV. Final Compilation of Database of Students with Necessary Mapping, Mock Interviews, Group Discussions.

(18 HOURS)

UNIT-II

Aptitude / Reasoning:

Quantitative Aptitude and Logical Reasoning- Level IV

Problem solving on.

Ratio and Proportions, Solutions and Mixtures, Sets, Simple Interest and Compound Interest, Simple and Quadratic Equations.

(18 HOURS)

COURSE OUTCOME

Attainment of confidence the students to be able to face interviews, group discussion and presentation ability. Knowledge on basic mathematical ability attained. Hence forth a student become competent to face the challenges of the world after attainments of knowledge at college level

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

VIITH SEMESTER

CATEGORY:-DC

EEE-71 - COMPUTER AIDED ELECTRICAL MACHINE DESIGN

TOTAL:-60 HOURS

COURSE OBJECTIVE

1. To study mmf calculation & thermal rating of various types of electrical machines.
2. To study armature & field systems of D.C machines.
3. To design core, yoke, windings & cooling system of transformers.
4. To design stator & rotor of induction machines.
5. To design stator & rotor of synchronous machines & study their thermal behavior.

Unit-1

Introduction: Design problem -Mathematical programming methods, computer aided design Mathematical formulation of the problem. Programming techniques (LP & NLP only), Methods of solution,Unconstrained optimization problems, constrained optimization problems.
(12 HRS)

Unit-2

Optimal design of DC machine: Design of armature, Windings and field systems, Selection of variables for optimal design, Formufunctions of design equations, Objective function, Constraint functions ,Algorithms for optimal design.
(12 HRS)

Unit-3

Optimal design of power transformer: Design of magnetic circuit, Design of windings, Selection of variables for optimal design, Formulation of design equations, Objective function,Constraint functions, Algorithms for optimal design.
(12 HRS)

Unit-4

Optimal design for 3-phase alternator: Design of stator, windings, Design of Field systems for salient pole and non-salient pole machines, Selection of vari ables for optimal design.
(12 HRS)

Unit-5

Optimal design of 3-phase induction motor: Design of stator, Windings Design of squirrel cage rotor, Design of slip ring rotor, Selection of variables for optimal design, Formulation of design equations, Objective functions Constraint functions, Algorithms for optimal design.
(12 HRS)

COURSE OUTCOME

Ability to model & analyze electrical apparatus & their application to power system.

References Books:

1. Design and Testing of Electrical Machines, M.V. Deshpandey, PHI Learning

2. Computer- Aided Design of Electrical Equipment by Dr. M. Ramamurthy Affiliated East-West press Pvt. Ltd. New Delhi.

3. Electrical Machine Design by A.K. Sawhney, Dhanpat Rai & Sons.

4. Principles of Electrical Machine Design with Computer Programmes by S.K. Sen, Oxford & IBH Publishing Co.

5. Performance and Design of A.C. Machines -M.G. Say, Affiliated East West Press Pvt. Ltd., New Delhi.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

VIITH SEMESTER

CATEGORY:-DC

EEE-72 – ELECTRICAL DRIVES

TOTAL:-60 HOURS

COURSE OBJECTIVE

1. To learn basics of electric drive analysis
2. To be able to analyze and design systems with electric drives
3. To learn to work in teams while working on engineering problems
4. To be able to write reports on the technical analysis performed
5. To learn to search the literature for more information on electric drives and report back on what was found in writing and orally .

Unit I

Review of electric motors & Solid state converters: Speed control techniques of DC, Induction & synchronous motor, Converters, inverters, chopper and cyclo converter operation, Effects of power electronic equipments on load side & supply side.

(12 HRS)

Unit II

Review of closed loop controllers, sensors & transducers: PI, PID, Variable structure. AC, DC & Pulse tacho- generators.

(12 HRS)

Unit III

DC Drives: Converter & chopper fed DC drive, Reversing, Starting, Regenerative Four quadrant operation, High power application.

(12 HRS)

Unit IV

AC Drive: Inverter & cyclo converter fed drive, Vector control, Sensor less operation, Linear Electrical motor concept, Synchronous motor Drive.

(12 HRS)

Unit V

Special Drives: Switched reluctance & permanent magnet brushless DC Operation, Converters Characteristics &Control, PLC based drives.

(12 HRS)

COURSE OUTCOME

This course will give the students a basic understanding of various methods of controlling electric machines for use in variable speed and positioning applications. The student will learn to analyze the steady state behavior of electric machine and drive systems.

Reference books:

1 Ned Mohan, T.M. Undeland, W.P. Robbins, Power Electronics design", John Wiley & Sons.

2 .J.M.D. Murphy, F.O. Turnbull, "Power Electronic Control of AC motors", Pergamon Press.

3. P.C. Sen, D.C. drive, Pergamon Press.

4. B.K. Bose, Power Electronics & AC drive prentice Hall.

5. Dubey G.K. "Power semi Conductor controller drives, Prentice Hall.

6. Vedam Subramanyam, "Electrical Drives".

7. T.J.E. Miller, Switched Reluctance & P.M. B.L. DC motor, Pergamon Press.

8. P.V. Rao, "Power semiconductor Drives", BS Publications.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

VIITH SEMESTER

CATEGORY:-DC

EEE-73- HIGH VOLTAGE ENGINEERING

TOTAL:-60 HOURS

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on

1 : breakdown mechanisms in solid, liquid and gaseous dielectrics.

2 : high voltage and current generation circuits and the operation of each circuit.

3 : different techniques employed in high voltage and current measurements.

4 : impulse and power frequency tests on the power system components.

Unit I

Introduction:-Introduction to HV technology, advantages of transmitting electrical power at high voltages, need for generating high voltages in laboratory. Important applications of high voltage.
(12 HRS)

Unit II

Breakdown phenomena:-Classification of HV insulating media, Properties of important HV insulating media. Gaseous dielectrics: Ionizations: primary and secondary ionization processes. Criteria for gaseous insulation breakdown based on Townsend’s theory, Limitations of Townsend’ Streamer’s theory breakdown in non uniform fields. Corona discharges. Paschen’s law and its significance. Time lags of Breakdown. Breakdown in solid dielectrics: Intrinsic Breakdown avalanche breakdown, thermal breakdown, and electro mechanic breakdown, Breakdown of liquids dielectric dielectrics: Suspended particle theory, electronic Breakdown, cavity breakdown (bubble’s theory), electro convection breakdown.
(12 HRS)

Unit III

Generation of HV AC DC and Impulse Voltage and current:HV AC-HV transformer; Need for cascade connection and working of transformers units connected in cascade, Series resonant circuit principle of operation and advantages. Tesla coil.HV DC- voltage doubler circuit, cock croft croft-Walton type high voltage DC set, Introduction to standard lightning and switching impulse voltages. Analysis of single stage impulse generator expression for Output impulse voltage, multistage impulse, generator Components of multistage, impulse generator. Triggering of impulse generator by three electrode gap arrangement.Triggering gap and oscillograph time sweep circuits. Generation of switching impulse voltage.Generation of high impulse Current.
(12 HRS)

Unit IV

Measurement of high voltages: Electrostatic voltmeter-principle, construction and limitation. Generating voltmeter- Principle,construction. Series resistance micro ammeter for HV DC measurements. Standard sphere gap measurements of HV AC, HV DC, and impulse voltage. Factors affecting the measurements.Potential dividers-resistance dividers capacitance mixed RC potential dividers. Surge current measurement.
(12 HRS)

Unit V

High voltage tests on electrical apparatus: Definitions of technologies, tests on isolators, circuit breakers, cables insulators and transformers.

(12 HRS)

COURSE OUTCOME

After completion of this course, students will be able to:

1: illustrate the different breakdown mechanisms in solid, liquid and gaseous dielectrics.

2: design and describe the various circuits for generation of high voltages and currents.

3: design and describe the various circuits for measurement of high voltages and currents.

4: illustrate the power frequency and impulse tests on the power system components

Reference books:

1. E. Kuffel and W.S. Zaengl, “High voltage engineering fundamentals”, 2nd edition, Elsevier,

Press, 2005.

2. M.S.Naidu and Kamaraju, “High Voltage Engineering”, 3rd edition, THM, 2007.

3. L. L. Alston, “High Voltage technology”, BSB Publication, 2007..

4. Rakosh Das Begamudre, Extra High voltage AC transmission engineering, Wiley 1987.

5. Transmission and distribution reference book -Westing House.C.L.Wadhwa, High voltage

Engineering, New Age International Private limited, 1995.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

VIITH SEMESTER

CATEGORY:-DE

EEE-74 (A) -EHV A.C. AND D.C. TRANSMISSION

TOTAL:-60 HOURS

COURSE OBJECTIVE

1. To Provide In-depth understanding of different aspects of Extra High Voltage AC transmission system design and Analysis.
2. To Calculate the Value of Line Inductance and Capacitance of EHV transmission Line
3. To understand the concept of Voltage gradients of conductors.
4. To develop the empirical formula to determine the Corona loss occurring in EHV AC transmission Line.
5. To determine the interference caused by Corona and to measure its magnitude

Unit I

Constitution of EHV a.c. and d.c. links, Kind of d.c. links, Limitations and Advantages of a.c.and d.c. transmission, Principal application of a.c. and d.c. transmission, Trends in EHV a.c. and d.c. transmission, Power handling control, Converter analysis garetz circuit, firing angle control overlapping.

(12 HRS)

Unit II

FACTS devices, basic types of controller, series controller, static synchronous series compensator (SSSC), thyristor-controlled series capacitor (TCSC), thyristor-controlled series reactor (TCSR), shunt controller (STATCOM), static VAR controller (SVC), series- series, combined series-shunt controller, unified power flow controller(UPFC), thyristor controlled phase shifting transformer (TCPST).

(12 HRS)

Unit III

Components of EHV d.c. system, converter circuits, rectifier and inverter valves, Reactive power requirements, harmonics generation, Adverse effects, Classification, Remedial measures to suppress,filters, Ground return. Converter faults & protection harmonics misoperation, Commutation failure, Multiterminal D.C. lines.

(12 HRS)

Unit IV

Control of EHV d.c. system desired features of control, control characteristics, Constant current control, Constant extinction angle control. Ignition Angle control. Parallel operation of HVAC & DC system. Problems & advantages.

(12 HRS)

Unit V

Travelling waves on transmission systems, their shape, Attenuation and distortion, effect of junction and termination on propagation of traveling waves. Over voltages in transmission

system. Lightning, switching and temporary over voltages: Control of lighting and switching over voltages
(12 HRS)

COURSE OUTCOME

1.Qualitative comparison of AC and DC transmission system with all aspects
2.Understand the need of EHV AC transmission and various issues related with it
3.Reactive power management, Stability of AC and DC systems
4. In depth converter analysis, faults, protections, harmonic considerations, grounding system

Reference books:

1. S. Rao,- "EHV AC & DC Transmission" Khanna pub.
2. Kimbark,-" HVDC Transmission" john willy & sons pub.
3. Arrillaga,- "HVDC Transmission"2nd Edition ,IEE londan pub.
4. Padiyar, -"HVDC Transmission" 1st Edition ,New age international pub.
5. T.K. Nagsarkar,M.S. Sukhiza, -"Power System Analysis", Oxford University
6. Narain.G. Hingorani, l. Gyugyi-"Undustanding of FACTS concept and technology", John Wiley & sons pub.
7. P.Kundur- "H.V.D.C. Transmission" McGraw Hill Pub.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

VIITH SEMESTER

CATEGORY:-DE

EEE-74 (B)- RENEWABLE ENERGY SOURCE

TOTAL:-60 HOURS

COURSE OBJECTIVE

The course should enable the students to :

1. Understand the various forms of conventional energy resources.
2. Learn the present energy scenario and the need for energy conservation
3. Explain the concept of various forms of renewable energy
4. Outline division aspects and utilization of renewable energy sources for both domestics and industrial application
5. Analyse the environmental aspects of renewable energy resources.

Unit I

Renewable Energy Systems: Energy Sources, Comparison of Conventional and non-conventional, non-renewable sources. Statistics of world resources and data on different sources globally and in Indian context. Significance of renewable sources and their exploitation. Energy planning,Energy efficiency and management.

(12 HRS)

Unit II

Wind Energy System: Wind Energy, Wind Mills, Grid connected systems. System configuration, working principles,limitations. Effects of wind speed and grid conditions. Grid independent systems wind-battery, wind diesel, wind-hydro biomass etc. wind operated pumps, controller for energy balance. Small Hydro System Grid connected system, system configuration, working principles, limitations.Effect of hydro potential and grid condition. Synchronous versus Induction Generator for standalone systems. Use of electronic load controllers and self excited induction generators. Wave Energy System: System configuration: grid connected and hybrid system.

(12 HRS)

Unit III

Solar Radiation: Extraterrestrial solar radiation, terrestrial solar radiation, Solar thermal conversion, Solar Photo tonic System Solar cell, Solar cell materials, efficiency, Characteristics of PV panels under varying insulation. PV operated lighting and water pumps, characteristics of motors and pumps connected to PV panels Energy System, Biomass System configuration, Biomass engine driven stand-alone or hybrid modes, Biomass engine drive generators, feeding loads in stand-alone or hybrid modes, Biomass energy and their characteristics.

(12 HRS)

Unit IV

Energy from oceans: Ocean temperature difference, Principles of OTEC, plant operations, Geothermal Energy, Electric Energy from gaseous cells, Magneto from nuclear wastes, Possibilities of other modern non-conventional energy sources.

(12 HRS)

Unit V

Electric Energy Conservation: Energy efficient motors and other equipment. Energy saving in Power Electronic controlled drives. Electricity saving in pumps, air-conditioning, power plants, process industries, illumination etc. Methods of Energy Audit. **Measurements systems**; efficiency measurements. Energy regulation, typical case studies,various measuring devices analog and digital, use of thyristers.

(12 HRS)

COURSE OUTCOME

Upon completion of the course, the student will be able to:

1: analyze the Renewable Sources of Energy and Distributed Generation (DG) &DSM options, Energy storage and Interconnection technologies

2: explain the concepts of Generation of Electricity by Photovoltaic Effect & its applications.

3: describe the Principle of Generation of Electricity by Wind power plants, Various wind turbines& controller for wind Applications.

4: explain construction &working of Energy Storage Parameters-Lead–Acid Batteries & issues involved in Power Injection & Interconnection Technologies with Grid.

Reference books:

1. John Twidell & Toney Weir, Renewable Energy Resources, E & F N Spon.
2. El-Wiki, Power Plant Technology, McGraw Hill.
3. Rai G D, Non-conventional Energy Resources, Khanna.
4. F Howard E. Jordan, "Energy Efficient Electric Motor & their Application-II", Plenum Press, New York, USA.
5. Anna Mani, "Wind Energy Resource Survey in India-Ill", Allied Publishers Ltd., New Delhi.
6. S.P. Sukhatme: Solar Energy, TMH-4e.
7. Dr. A. Ramachandran, Prof B.V Sreekantan & M F.C. Kohli etc, "TERI Energy Data Directory & Year book 1994-95", Teri Tata Energy Research Institute, New Delhi.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

VIITH SEMESTER

CATEGORY:-DE

EEE-74 (C) -FLEXIBLE AC TRANSMISSION SYSTEM

TOTAL:-60 HOURS

COURSE OBJECTIVE

To impart the students with various flexible ac transmission system devices which are used for proper operation of existing AC system more flexible in normal and abnormal conditions.

Unit I

Basic Issues Involved in Bulk Power Transmission, Review of basics of power transmission networks-control of power flow in AC transmission line- Analysis of uncompensated AC Transmission line- Passive reactive power compensation, Principle of Transmission system compensation, Need for FACTS controllers - types of FACTS controllers and Benefits.

(12 HRS)

Unit II

STATIC VAR COMPENSATOR (SVC) AND PURPOSE: Voltage control by SVC – Advantages of slope in dynamic characteristics- Influence of SVC on system voltage, Design of SVC voltage regulator, Modeling of SVC for power flow and stability studies, Applications- Enhancement of transient stability, Steady state power transfer, Enhancement of Power system damping, Prevention of voltage instability.

(12 HRS)

Unit III

THYRISTOR AND GTO THYRISTOR CONTROLLED SERIES CAPACITORS (TCSC and GCSC): Concepts of Controlled Series Compensation–Analysis of TCSC-GCSC , Different modes of operation, Modeling of TCSC and GCSC for load flow studies- modeling TCSC and GCSC for stability studies- Applications of TCSC and GCSC, SSR mitigation.

(12 HRS)

Unit IV

VOLTAGE SOURCE CONVERTER BASED FACTS CONTROLLERS: Static synchronous compensator(STATCOM)- Static synchronous series compensator (SSSC) -Power flow control with STATCOM and SSSC-Modeling of STATCOM and SSSC for power flow studies- operation of Unified and Interline power flow Controllers (UPFC and IPFC).

(12 HRS)

Unit V

CONTROLLERS AND THEIR –CO-ORDINATION: FACTS Controller interactions – SVC–SVC interaction - co-ordination of multiple controllers using linear control techniques – Quantitative treatment of control coordination.

(12 HRS)

COURSE OBJECTIVE

To impart the students with various flexible ac transmission system devices which are used for proper operation of existing AC system more flexible in normal and abnormal conditions.

Reference books:

1. Mohan Mathur, R., Rajiv. K. Varma, Thyristor– Based FACTS Controllers for Transmission Systems, IEEE press and John Wiley & Sons, Inc, 2002.
2. K.R.Padiyar, FACTS Controllers in Power Transmission and Distribution, New Age International (P) Ltd., Publishers, New Delhi, Reprint, 2008.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

VIITH SEMESTER

CATEGORY:-OE

EEE-75 (A)- COMPUTER APPLICATION TO POWER SYSTEMS

TOTAL:-60 HOURS

COURSE OBJECTIVE

To impart the students with various flexible ac transmission system devices which are used for proper operation of existing AC system more flexible in normal and abnormal conditions.

Unit I

Models of power system components, network model using graph theory, formation of Z bus transmission line models, regulating transformer, line load ability, capability curves of alternator.
(12 HRS)

Unit II

Control of load bus voltage using reactive power control variable, SVC & SVS, Regulated shunt Compensation, series and shunt compensation, Uniform series and shunt compensation and effect on load ability of transmission lines.
(12 HRS)

Unit III

Sensitivity analysis: General sensitivity ,relations, generation shift distribution factors, line outage distribution factors, compensated shift factors, sensitivity associated with voltage VAR sensitivities relating load bus voltage changes in terms of PV bus voltage changes, sensitivity relating changes in reactive power generation for changes in PV Bus Voltage.
(12 HRS)

Unit IV

Power system security : Security functions, Security level, contingency analysis, security Control, economic dispatch using LP formulation,pre-contingency and post-contingency corrective rescheduling.
(12 HRS)

Unit V

Voltage stability : Difference between voltage and angle stability, PV Curve for voltage stability Assessment, proximity and mechanism, modal analysis using reduced Jacobian, participation factor, effect of series and shunt compensation on voltage stability,effect of load models.
(12 HRS)

COURSE OUTCOME

At the end of the course, a student will be able to:

1. Perform basic design and evaluation of SCADA system architectures including local systems, communication infrastructure and central systems.

2. Describe basic power system instrumentation technologies and principles

3. Describe basic power system protection technologies and schemes

4. Analyse and evaluate current processes and technologies employed for control and operation of transmission grids

Reference books:

1. Computer Modeling of Electrical Power Systems, Arrillaga J. Watson N R Wiley India.
2. A Chakrawarti Power System Analysis: Operation and Control PHI Learning 3rd edition
3. Power Generation, Operation and Control by A.J.wood and B.F.Wollenberg John Wiley & Sons Inc. 1984.
4. Computer Techniques in Power Systems Analysis- Pai M.A. Tata Mc Graw Hill.
5. Computer Aided Power Systems Analysis Kusic G.L. 2nd Edition, CRC Press
6. Modern Power Systems Analysis Nagrath I.J. and Kothari D.P. Tata Mc Graw Hill.
7. Power System Analysis Grainger J.J. & Stevnson W.D. Mc Graw Hill.
8. Power System Stability and control-P Kundur, IEEE Press 1994.
9. Advance Power Systems Analysis and Dynamics Singh L.P.John Wiley.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

VIITH SEMESTER

CATEGORY:-OE

EEE-75 (B) – ADVANCED ELECTRICAL DRIVES

TOTAL:-60 HOURS

COURSE OBJECTIVE

This course will develop students' knowledge in/on

1. To impart knowledge on Performance of the fundamental control practices associated with AC and DC machines (starting, reversing, braking, plugging, etc.) using power electronics
2. To impart industry oriented learning
3. To evaluate the use of computer-based analysis tools to review the major classes of machines and their physical basis for operation

Unit I

Review of electric motors & Solid state converters: Speed control techniques of DC, Induction & synchronous motor, Converters, inverters, chopper and cyclo converter operation, Effects of power electronic equipments on load side & supply side.

(12 HRS)

Unit II

Review of closed loop controllers, sensors & transducers: PI, PID, Variable structure. AC, DC & Pulse tacho- generators.

(12 HRS)

Unit III

DC Drives: Converter & chopper fed DC drive, Reversing, Starting, Regenerative breaking, Four quadrant operation, High power application.

(12 HRS)

Unit IV

AC Drive: Inverter & cyclo converter fed drive, Vector control, Sensor less operation, Linear Electrical motor concept, Synchronous motor Drive.

(12 HRS)

Unit V

Special Drives: Switched reluctance & permanent magnet brushless DC Operation, Converters, Characteristics &Control, PLC based drives.

(12 HRS)

COURSE OUTCOME

At the end of the course, a student will be able to:

1. Identify relevant information to supplement to the Electric Drives (EE 701) course. 2. Set up control strategies to synthesize the voltages in dc and ac motor drives.
3. Develop testing and experimental procedures applying basic knowledge in electronics, electrical circuit analysis, electrical machines, microprocessors, and programmable logic controllers.
4. An ability to use standard methods to determine accurate modeling/simulation parameters for various general-purpose electrical machines and power electronics devices required for designing a system and solve drives related problems

Reference books:

1 Ned Mohan, T.M. Undeland, W.P. Robbins, Power Electronics –Converters, Applications anddesign", John Wiley & Sons.
2 .J.M.D.Murphy, F.O.Turnbull, "Power Electronic Control of AC motors", Pergamon Press.
3. P.C. Sen, D.C. drive, Pergamon Press
4. B.K. Bose, Power Electronics & AC drive prentice Hall.
5. Dubey G.K. "Power semi Conductor controller drives, Prentice Hall.
6. Vedam Subramanyam, "Electrical Drives".
7. T.J.E. Miller, Switched Reluctance & P.M. B.L. DC motor, Pergamon Press
8. P.V. Rao, "Power semiconductor Drives", BS Publications.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

VIITH SEMESTER

CATEGORY:-OE

EEE-75 (C)-WIND AND SOLAR ENERGY SYSTEMS

TOTAL:-60 HOURS

COURSE OBJECTIVE

The course should enable the students to :

1. Understand the various forms of conventional energy resources.
2. Learn the present energy scenario and the need for energy conservation
3. Explain the concept of various forms of renewable energy
4. Outline division aspects and utilization of renewable energy sources for bothdomestics and industrial application
5. Analyse the environmental aspects of renewable energy resources

Unit I

Physics of Wind Power: History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power-cumulative distribution functions.

(12 HRS)

Unit II

Wind generator topologies: Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent Magnet Synchronous Generators, Power electronics converters. Generator-Converter configurations, Converter Control.

(12 HRS)

Unit III

The Solar Resource Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability.

(12 HRS)

Unit IV

Solar photovoltaic: Technologies-Amorphous, mono crystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms. Converter Control.

(12 HRS)

Unit V

Network Integration Issues and Solar thermal power generation: Overview of grid code technical requirements. Fault ride-through for wind farms - real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behavior during grid disturbances. Power quality issues. Power system interconnection experiences in the world. Hybrid and isolated operations of solar PV and wind systems. Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis.

(12 HRS)

COURSE OUTCOMES

1. Understand the energy scenario & the consequent growth of the power generation from renewable energy sources.
2. Understand the basic physics of wind & solar power generation.
3. Understand the power electronic interfaces for wind & solar generation.
4. Understand the issues related to the grid-integration of solar & wind energy systems.

Reference books:

1. T. Ackermann, “Wind Power in Power Systems”, John Wiley and Sons Ltd., 2005.
2. G. M. Masters, “Renewable and Efficient Electric Power Systems”, John Wiley and Sons, 2004.
3. S. P. Sukhatme, “Solar Energy: Principles of Thermal Collection and Storage”, McGraw Hill, 1984.
4. H. Siegfried and R. Waddington, “Grid integration of wind energy conversion systems” John Wiley and Sons Ltd., 2006.
5. G. N. Tiwari and M. K. Ghosal, “Renewable Energy Applications”, Narosa Publications, 2004

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

VIITH SEMESTER

CATEGORY:-P

EEE-76-MAJOR PROJECT-I

COURSE OBJECTIVE

This course will develop students' knowledge in/on
1: problem based & project based learning
2: major project design in one of the selected areas of specialization with substantial multi-disciplinary component
3: analytical and research skills
4: team work, leadership and interpersonal skills

COURSE GUIDELINES

The objectives of the course 'Major Project' are to provide students with a comprehensive experience for applying the knowledge gained so far by studying various courses. To develop an inquiring aptitude and build confidence among students by working on solutions of small industrial problems. To give students an opportunity to do something creative and to assimilate real life work situation in institution. To adapt students for latest developments and to handle independently new situations. To develop good expressions power and presentation abilities in students. The focus of the Major Project is on preparing a working system or some design or understanding of a complex system using system analysis tools and submit it the same in the form of a write-up i.e. detail project report. The student should select some real life problems for their project and maintain proper documentation of different stages of project such as need analysis, market analysis, concept evaluation, requirement specification, objectives, work plan, analysis, design, implementation and test plan. Each student is required to prepare a project report and present the same at the final examination with a demonstration. The faculty and student should work according to following schedule: i) Each student undertakes substantial project in an approved area of the subject and supervised by a member of staff. ii) The student must submit outline and action plan for the project execution (time schedule) and the same be approved by the concerned faculty. iii) At all the steps of the project, students must submit a written report of the same.

COURSE OUTCOME

After completion of this course, the students will be able to
1: demonstrate creativity in the design of components, systems or processes of their program of study
2: design an innovative product by applying current knowledge and adopt to emerging applications of engineering & technology
3: work cooperatively with others to achieve shared goal by motivating team-mates with a clear sense of direction, values and ethics
4: write concisely & convey meaning in a manner appropriate to different readers and verbally express ideas easily understood by others who are unfamiliar with the topic

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

VIIITH SEMESTER

CATEGORY:-P

EEE-81-MAJOR PROJECT-II

COURSE OBJECTIVE

This course will develop students‘ knowledge in/on
1: problem based & project based learning
2: major project design in one of the selected areas of specialization with substantial multi-disciplinary component
3: analytical and research skills
4: team work, leadership and interpersonal skills

COURSE GUIDELINES

The objectives of the course ‘Major Project’ are to provide students with a comprehensive experience for applying the knowledge gained so far by studying various courses. To develop an inquiring aptitude and build confidence among students by working on solutions of small industrial problems. To give students an opportunity to do something creative and to assimilate real life work situation in institution. To adapt students for latest developments and to handle independently new situations. To develop good expressions power and presentation abilities in students. The focus of the Major Project is on preparing a working system or some design or understanding of a complex system using system analysis tools and submit it the same in the form of a write-up i.e. detail project report. The student should select some real life problems for their project and maintain proper documentation of different stages of project such as need analysis, market analysis, concept evaluation, requirement specification, objectives, work plan, analysis, design, implementation and test plan. Each student is required to prepare a project report and present the same at the final examination with a demonstration. The faculty and student should work according to following schedule:

i) Each student undertakes substantial project in an approved area of the subject and supervised by a member of staff.

ii) The student must submit outline and action plan for the project execution (time schedule) and the same be approved by the concerned faculty.

iii) At all the steps of the project, students must submit a written report of the same.

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

COURSE OUTCOME

After completion of this course, the students will be able to

1: work cooperatively with others to achieve shared goal by motivating team-mates with a clear sense of direction, values and ethics

2: write concisely & convey meaning in a manner appropriate to different readers and verbally express ideas easily understood by others who are unfamiliar with the topic

3: design an innovative product by applying current knowledge and adopt to emerging applications of engineering & technology

SARVEPALLI RADHAKRISHNAN UNIVERSITY, BHOPAL

VIIITH SEMESTER

CATEGORY:-

EEE-82 COMPREHENSIVE VIVA

Learning Objective:

The objective of comprehensive viva-voce is to assess the overall knowledge of the student in the relevant field of Engineering acquired over 4 years of study in the undergraduate program .

Learning outcome:

Viva voce will be conducted towards the end of the semester which will be covering the complete syllabus ,this will test the doing so, the main objective of this course is prepare the student's to face interview both at the academics and industrial sector student's learning and understanding during. their graduate program.

Viva will be conducted in 8th semester which will be covering the complete syllabus. This will test the student's learning and understanding during the course of their B.Tech programme. In doing so, the main objective of this course is to prepare the students to face interview both in the academic and the industrial sector.

SARVEPALLI RADHAKRISHNAN UNIVERSITY,

BHOPAL

VIIITH SEMESTER

CATEGORY:-

EEE-83-SEMINAR

Objective of GD and seminar is to improve the MASS COMMUNICATION and CONVINCING/
understanding skills of students and it is to give student an opportunity to exercise their rights to express themselves.

Evaluation will be done by assigned faculty based on group discussion and power point presentation.