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SRI SATYA SAI UNIVERSITY
OF TECHNOLOGY AND MEDICAL SCIENCES

SYLLABUS REVISION

Name of School-School of Engineering

Department-Electrical and Electronics Engineering

2017-18 TO 2021-22

www.sssutms.co.in

Opp.Oilfed Plant, Bhopal-Indore Road,Sehore (M.P), Pin - 466001

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SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES

[Established Under Act. 06 of 2014 by Govt. of Madhya Pradesh]
Approved by Madhya Pradesh Private University Regulatory Commission
Bhopal Indore Road, Opposite Pachama Oilfed Plant, Pachama, Sehore, Phone: (07562) - 222482
Corp. Office: 102, Zone-I, Ganga Jamuna Complex (Basement), M.P. Nagar, Bhopal (M.P.) Ph: (0755) 5270060, Fax (0755) 4270016

(Minutes of the Board of Studies Committee Meeting)

School Of Engineering

Department of Electrical and Electronics Engineering

Minutes of Board of Studies Committee Meeting Dated : 03.05.2017

The Board of Studies Committee Meeting was held in the room of HOD (EX) at 10:30 AM on 03.05.2017. Following members were present.

1. Mr. Mukesh Tiwari
2. Mr. Vijay Prakash Singh
3. Mr. Prabodh Khampariya
4. Ms. Alka Thakur
5. Mr. Devendra Patle
6. Ms. Jyotsna Sagar
7. Mr. Sandesh Pradhan (external)
8. Dr. N.P. Patidar (External)

EMPLOYABILITY

ENTREPRENEURSHIP

SKILL DEVELOPMENT

The Chairman of Board of Studies Committee welcomes and appreciated the efforts put up by the faculty for progress of the departmental activities. The following Agenda points were discussed and resolved.

Agenda 1. Approval of EX-3 & 4 semester Scheme and Syllabus (CBCS)

Discussion (If any) : Scheme and Syllabus should be prepared as per current demand in industry.

Resolution of the Discussion : Scheme and Syllabus was prepared as per current demand in industries and was approved for forthcoming 3 & 4 semester

The Chairman thanks the members for peaceful conduction of meeting.

Signature of All members (Including chairman)

1. Dr. Mukesh Tiwari
2. Mr. Vijay Prakash Singh
3. Dr. Prabodh Khampariya
4. Ms. Alka Thakur
5. Mr. Devendra Patle
6. Ms. Jyotsna Sagar
7. Mr. Sandesh Pradhan (External)
8. Dr. N.P. Patidar (External)

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Sri Satya Sai University of Technology & Medical Sciences Sehore (M.P.)

Sri Satya Sai University of Technology & Medical Sciences, Sehore (M.P)

Scheme of Examination - CBCS Pattern

Academic Year 2017– 2018

Branch :Electrical and Electronics Engineering Semester - III

S.No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Periods/ hour/ week			Credits	Total Marks
			End Sem. Exam.	Mid Tests	Assign-ments/Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation	L	T	P		
1	EXC- 301	Computational Techniques	60	30	10	-	-	2	1	-	3	100
2	EXC- 302	Electronics Devices & Circuits	60	30	10	30	20	2	1	2	4	150
3	EXC- 303	Digital Circuits	60	30	10	30	20	2	1	2	4	150
4	EXC- 304	Network Analysis and Synthesis	60	30	10	30	20	2	1	2	4	150
5	EXC- 305	Signals & Systems	60	30	10	30	20	2	1	2	4	150
6	EXC- 306	Instrumentation and Control	60	30	10	30	20	2	1	2	4	150
TOTAL			360	180	**60**	**150**	100	**12**	6	10	**23**	**850**

w.e.f July 2017

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Scheme of Examination - CBCS Pattern

Academic Year 2017- 2018

Branch :Electrical and Electronics Engineering — Semester - IV

S.No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Periods/ hour/ week			Credits
			End Sem. Exam.	Mid Tests	Assign-ments/Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation	L	T	P	
1	EXC-401	Electromagnetic Theory	60	30	10	-	-	2	1		3
2	EXC-402	Microprocessors and Microcontrollers	60	30	10	30	20	2	1	2	4
3	EXC-403	Power System	60	30	10	30	20	2	1	2	4
4	EXC-404	Analog Communication	60	30	10	30	20	2	1	2	4
5	EXC-405	Electrical Machine-I	60	30	10	30	20	2	1	2	4
6	EXC-406	Electronic Instrumentation	60	30	10	30	20	2	1	2	4
TOTAL			360	180	60	150	100	12	6	10	23

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MTH – 301

COMPUTATIONAL TECHNIQUES

UNIT I MATRICES

Eigenvalues and Eigenvectors of a real matrix , Characteristic equation , Properties of Eigenvalues and eigenvectors , Cayley-Hamilton Theorem , Diagonalization of matrices , Reduction of a quadratic form to canonical form by orthogonal transformation

UNIT II INFINITE SERIES

Sequences , Convergence of series , General properties , Series of positive terms , Tests of convergence (Comparison test, Integral test, Comparison of ratios and D'Alembert's ratio test) , Alternating series , Series of positive and negative terms , Absolute and conditional convergence , Power Series , Convergence of exponential, logarithmic and Binomial Series.

UNIT III FUNCTIONS OF SEVERAL VARIABLES

Limits and Continuity , Partial derivatives , Homogeneous functions and Euler's theorem ,Total derivative ,Differentiation of implicit functions , Change of variables , Partial differemiation of implicit functions , Taylor's series for functions of two variables ,
Errors and approximations , Maxima and minima of functions of two variables

UNIT IV IMPROPER INTEGRALS

Improper integrals of the first and second kind and their convergence , Evaluation of integrals involving a parameter by Leibnitz rule – Beta and Gamma functions , Properties , Evaluation of integrals using Beta and Gamma functions , Error functions.

UNIT V MULTIPLE INTEGRALS

Double integrals , Change of order of integration ,Area enclosed by plane curves , Triple integrals , Volume of Solids , Change of variables in double and triple integrals , Area of a curved surface.

TEXT BOOKS :

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 40th Edition, 2007.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd.,

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EXC-302
Electronic Devices And Circuits

Unit I : Types of Semiconductors :-Intrinsic and Extrinsic, n-type and p-type, energy band diagrams, majority and minority carriers, charge density in semiconductor, generation and recombination of charges, process of diffusion ,diffusion and drift currents, Hall effects and its applications, p-n junction, depletion layer, potential barrier ,electric field, forward and reverse biased junction, current components in p-n diode.

Unit II : Types of Semiconductor Diode Ideal & Practical diode equivalent circuit & frequency response, graphical analysis of diode circuits, Signal diodes, Power Diode, Zener diode, Varactor diode, Schottky diode, PIN diode,Tunnel diode, Photo diode, Direct tunneling equivalent circuit, Tunnel diode

Unit III: Applications of Diode : P-N junction diode as rectifier, clipper and clamper .The Load line concept, The Pieces wise linear diode modal, Clipping circuits, Clipping at two independent levels, Comparators, Sampling Gate, Rectifiers, Other full wave circuits, Capacitor filter additional diode circuits.

Unit IV : Bipolar Junction Transistor - Construction, basic operation, current components and equations, CB,CE and CC-configuration, input and output characteristics, Early effect, region of operation, active, cutoff and saturation region Ebers-Moll model, , power dissipation in transistor , Photo transistor, Uni junctionTransistor (UJT) : Principle of operation, characteristics.

Unit V : FET construction- Construction, n channel and p channel, characteristics, parameters, Equivalent model and voltage gain, Enhancement and depletion MOSFET and its Characteristics, analysis of FET in various configuration.

References:

1. Boylestad and Nashelsky: Electronic Devices and Circuit Theory, Pearson Education
2. Millman and Halkias: Integrated electronics, TMH
3. Graham Bell: Electronic Devices and Circuits, PHI
4. Sendra and Smith: Microelectronics, Oxford Press.
5. Donald A Neamen: Electronic Circuits Analysis and Design, TMH

List of Experiment's:

1. V-I characteristics of various Diodes (p-n, Zener, Varactor, Schottky, Tunnel, Photodiode etc)
2. Characteristics of Transistors (BJT and FET)
3. Applications of diodes and Design of various clipping and clamping circuits
4. Design half & full wave rectifier
5. Design & Analysis of transistor amplifier in CE, CB & CC configuration.
6. Design & Analysis of JFET Amplifier
7. Design & Analysis of MOSFET Amplifier.

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EXC-303
Digital Circuits

Unit-I :Number Systems and codes: Decimal, binary, octal, Hexadecimal, Excess 3, Gray ASCII, decimal number system and conversion , binary weighted codes, signed numbers, 1s and 2s complement codes, Binary arithmetic, Boolean Algebra: Binary logic functions , Boolean laws, truth tables, associative and distributive properties, DeMorgans theorems, realization of switching functions using logic gates.

Unit-II : Combinational Logic:: AND, OR, NOT, XOR, XNOR, NAND, NOR, realization of Boolean function using universal gates. Half and full adder, half and full subtractor, Series and parallel adder, BCD adders, Decoders, Encoders, multiplexers and de-multiplexer

Unit-III : Flip-Flops: R-S, Clocked R-S, T, D, J-K, race around problem, Master-slave J-K , State and Excitation Tables ,Shift registers and counters :synchronous and asynchronous counters, Binary ripple counter, up-down counter, Johnson and ring counter. Analysis and Design of Sequential Circuits

Unit-IV : Semiconductor memories: Organization and construction of RAM, SRAM, DRAM, RAM,ROM, PROM, EPROM, EEPROM, PAL and PLAs etc

Unit-V : Logic families: RTL, DTL, TTL, ECL, IIL, PMOS, NMOS and CMOS logic etc. Interfacing between TTL and MOS, vice-versa.

References:

1. M. Mano : Digital Logic and Computer Design, Pearson Education
2. W.H. Gothman : Digital Electronics, PHI.
3. Millman and Taub : Pulse, Digital and Switching Waveforms, MGH
4. Salivahanan and Arivazhagan : Digital Circuits and Design, Vikas Publishing House
5. Leach and Malvino : Digital Principles and Applications, TMH

List of Experiments:

1. To test and study of operation of all logic Gates for various IC's.
2. Implementation of AND, OR, NOT, NOR, X-OR and X-NOR Gates by NAND and NOR Universal gates.
3. Binary Addition by Half Adder and Full Adder circuit.
4. Binary Subtraction by Half Subtractor and Full Subtractor circuit.
5. Design a BCD to Excess-3 code converter.
6. Verification of the Demorgan's Theorem.
7. Multiplexers/Demultiplexer based Boolean function realization.

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EXC-304
Network Analysis and Synthesis

Unit I : Network Theory : Circuit Theory Concepts – Mesh and Node Analysis; Network Star – Delta Transformation. Steady State Analysis of AC Circuits- Sinusoidal and Phasor Representation of Voltage and Current, Single Phase AC circuit behavior of R, L & C, Combination of R, L & C in series and parallel. Network Topology : Graph of a Network, definitions, tree, co tree, link, basic loop and basic cut set.

Unit II : Network Theorems (Applications to ac networks): Super-position theorem, Thevenin's theorem,Norton's theorem, maximum power transfer theorem, Reciprocity theorem, Millman's theorem, compensation theorem, Tellegen's theorem.

Unit III: Circuit Analysis : Natural response and forced response, Transient response and steady state response for arbitrary inputs (DC and AC), Evaluation of time response both through classical and Laplace methods.

Unit IV : 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 network.

Unit V : Network Synthesis: Positive real function, definition and properties, Properties of LC, RC and RL driving point functions, synthesis of LC, RC and RL driving point admittance functions using Cauer first and second forms.

References:

1 M.E. Van Valkenburg, "Network Analysis", Prentice Hall of India
2 A.Chakrabarti, "Circuit Theory" DhanpatRai& Co.
3 C.L Wadhwa, "Network Analysis and Synthesis" New Age International Publishers, 2007
4 D.RoyChoudhary, "Networks and Systems" Wiley Eastern Ltd.
5 Donald E. Scott: "An Introduction to Circuit analysis: A System Approach" McGraw Hill

List of Experiments:

1. To determine node voltages and branch currents in a resistive network.
2. To obtain Thevenin's equivalent circuit of a resistive network.
3. To obtain transient response of a series R-L-C circuit for step voltage input.
4. To Verify Thevenin Theorem.
5. To Verify Superposition Theorem.
6. To Verify Reciprocity Theorem.
7. To Verify Maximum Power Transfer Theorem.
8. To Verify Millman's Theorem.
9. To Determine Open Circuit parameters of a Two Port Network.

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EXC-305

Signals and System

Unit I- Introduction to Signal & Systems: Signals, classification of signals, basic continuous time and discrete time signals, continuous LTI, discrete LTI systems , impulse and step functions, impulse response stability, linearity, stability, time invariance, Eigen values and Eigen functions, discrete convolution, properties of discrete and continuous LTI systems ,systems described by difference and differential equations.

Unit II- Fourier Analysis of Continuous Time Signals and Systems: Fourier series, Fourier series representation of continuous periodic signal & its properties, Fourier transform and its properties,parseval's theorem, frequency response of LTI systems.

Unit III- Fourier Analysis of Discrete Time Signals & Systems: Discrete-time Fourier series, discrete time Fourier transform (including DFT) and properties, frequency response of discrete time LTI systems, continuous time Fourier transform for periodic and non-periodic signals, properties of CTFT.

Unit IV- Laplace & Z-Transform Transform: Laplace transform and its inverse: definition, existence conditions, region of convergence and properties, application of Laplace transform for the analysis of continuous time LTI system, Z-Transform, properties of Z-transform inversion of Z-transform, two dimensional Z- transform, convergence of Z-transform, region of convergence and properties, application of Z-transform for the analysis of discrete time LTI systems, solving eq. using Z transform.

Unit V- State Space Analysis: Concept of state, state space representation discrete time LTI systems,state space representation of continuous time LTI systems ,solutions of state equation for discrete time LTI systems , solutions of state equation for continuous time LTI systems ,FFT Sampling: Sampling theorem, ideal & real sampling, reconstruction of signal from its samples.

References:

1. Alan V. Oppenheim, Alan S. Willsky and H. Nawab, Signals and Systems, Prentice Hall, 1997
2. Simon Haykin, Communication Systems, 3rd Edition, John Wiley, 1995
3. Signals & Systems, 2nd Edition, by Alan Oppenheim, Alan Wilsky, S. Nawab, Prentice Hall, 1997

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EXC-306
Instrumentation and Control

Unit I : Philosophy of Measurement- Methods of measurement, Measurement system, Classification of instrument systems, Characteristics of instruments & measurement systems, Errors in measurement & its analysis, Standards. Analog Measurement of Electrical Quantities- Electrodynamics, Thermocouple.

Unit II Instrument Transformers: CT and PT; their errors, Applications of CT and PT in the extension ofinstrument range, Introduction to measurement of speed, frequency and power factor.

Unit III Measurement of Parameters- Different methods of measuring low, medium and high resistances,measurement of inductance & capacitance with the help of AC Bridges, Q meter.

Unit IV Introduction to Control System and Their Classification : Differential equations of systems,linear approximation, laplace transform and transfer function of linear system, model of physical system(electrical, mechanical and electromechanical), block diagram, signal flow graph, mason's gain formula.

Unit V Time Domain Analysis: Representation of deterministic signals, first order system response, s - plane root location and transient response, impulse and step response of second order systems, performance characteristics in the time domain, effects of derivative and integral control, steady state response, error constant, generalized definition of error coefficients, concepts of stability, Routh Hurtwitz criterion.

References:

1. E. W. Golding & F. C. Widdis, "Electrical Measuremem &Measuring Instrument", A. W. Wheeler & Co. Pvt. Ltd. India
2. A. K. Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons, India
3. Purkait, "Electrical & Electronics Measurement & Instrumentation", TMH
4. Ogata K, "Modern Control Engineering ", Prentice Hall
5. KUO B.C, "Automatic Control System", Prentice Hall
6. Nagarath & Gopal," Control System Engineering," Wiley Eastern
7. Dakshi & Goyal, Feedback control system, Technical publication.

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EXC 401 Electromagnetic Theory

Unit I : Co-ordinate systems

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

Unit II : Laplace's & Poisson's equations

Laplace's & Poisson's equations, Electric dipole, dipole moment, potential & electric field intensity due to dipole, Behavior of conductors in an electric field. Conductor & insulator, 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.

Unit III : Magnetic Fields

Magnetic Fields, Biot-Savart's law, Magnetic Field intensity due to straight current carrying filament, circular, square and solenoid current carrying wire, Relationship between magnetic flux, flux density & magnetic Field intensity;Magnetic Boundary conditions, Ampere's circuital law and its applications, magnetic Field intensity due to infinite sheet, 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, torque on a current carrying loop in magnetic field.

Unit IV : Magnetic Potential

Scalar magnetic potential and its limitations, Vector magnetic potential and its properties, vector magnetic potential due to different simple configurations; Self and 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, Displacement current, Maxwell's equations for different types- free space, harmonically varying Field, static and steady fields, differential & integral form.

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Unit V : Electro Magnetic Waves :

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, , Polarization of waves. Reflection by conductors and dielectric – Normal & Oblique incidence, Reflection at surface of a conducting medium, transmission line analogy.

References:

1. P.V. Gupta; Electromagnetic Fields; Dhanpat Rai
2. Mathew N.O Sadiku; Elements of Electromagnetic; Oxford
3. S.P. Seth; Electromagnetic Field ;Dhanpa Rai & Sons
4. Sandeep wali : Elements of Electromagnetic; Oxford
5. N.N. Rao; Element of Engineering Electromagnetic; PHI.
6. John D. Kraus; Electromagnetic; TMH.

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EXC 402- Microprocessor and Microcontrollers

Unit-I History of computers: Timing and control, memory devices: semiconductor memory organization, 8-bit microprocessor (8085): Architecture, types of instructions, instruction set, addressing modes, flag register of 8085, and memory segmentation.

Unit-II 16-bit Microprocessors (8086/8088): Architecture, physical address, flag register, memory organization, bus cycle, addressing modes, instruction set difference between 8086 and 8088, introduction to 80186 and 80286, assembly language programming of 8086/8088

Unit –III Data Transfer Schemes: Introduction, types of transmission, 8257 (DMA), 8255 (PPI), serial data transfer (USART 8251), keyboard-display controller (8279), Programmable Priority Controller (8259)

Unit-IV Programmable Interval Timer/ Counter (8253/8254): Introduction, modes, interfacing of 8253, applications, ADC and DAC: Introduction, DAC converters, ADC converters, DAC and ADC interfacing and applications.

Unit -V Microcontroller (8051): Introduction, architecture, instruction set, addressing modes, registers, memory organization, timers/counters, interrupts, addressing modes, 8051 instruction set , applications of microcontrollers.

References:

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. Microprocessor Architecture, Programming and Applications with the 8085 6/e October 2013, Ramesh Gaonkar

List of Experiment:

1. To study 8085 based microprocessor system.
2. To study 8086 based microprocessor system.
3. Write an Assembly Language Program to add two 16 bit numbers.
4. Write an Assembly Language Program to subtract two 16 bit numbers.
5. To develop and run a program for finding out the largest/smallest number from a given set of numbers.
6. To perform multiplication/division of given numbers.
7. To perform computation of square root of a given number.

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EXC 403 Power System

Unit I : Introduction: Typical Layout of an Electrical Power System–Present Power Scenario in India.
Generation of Electric Power: Conventional Sources (Qualitative):Hydro station, Steam Power Plant, Nuclear Power Plant and Gas Turbine Plant.
Non Conventional Sources (Qualitative): Ocean Energy, Tidal Energy, Wave Energy, wind Energy, Fuel Cells, and Solar Energy, Cogeneration and energy conservation and storage.

Unit II : Economics of Generation:
Introduction, definitions of connected load, maximum demand, demand factor, load factor, diversity factor, Load duration curve, number and size of generator units. Base load and peak load plants. Cost of electrical energy-fixed cost, running cost, Tariff on charge to customer.

Unit III : Transmission Systems:
Various system of transmission & their comparison, HVDC transmission Converter, inverter, filters & substation layout. Voltage and Reactive Power control.

Unit IV : Distribution Systems:
Primary and secondary distribution systems, concentrated & uniformly distributed loads on distributors fed at one and both ends, ring distribution, sub mains and tapered mains, voltage drop and power loss calculations, voltage regulators, Feeders Kelvin's law and modified Kelvin's law for feeder conductor size and its limitations.

Unit V : Overhead Transmission Lines: Types of Conductors, Line Parameters: calculation of inductance and capacitance of single and double circuit transmission lines, three phase lines withstranded and bundle conductors, Generalized ABCD constants and equivalent circuits of short ,medium & long lines. Line Performance: circle diagram, regulation and efficiency of short, medium and long lines.

References:-

1. Ashfaque hussain , CBS Publication
2. C.L. Wadhwa –Generation, Distribution and Utilization of Electrical Energy, Second Edition, New Age International, 2009
3. C.L. Wadhwa –Electrical Power Systems, Fifth Edition, New Age International, 2009
4. M.V. Deshpande –Elements of Electrical Power Station Design, Third Edition, WheelerPub. 1995
5. V.K. Mehta principal of electrical power system, S Chand Publication
6. J.B. Gupta electrical power system,kataria and sons publication

List of Experiments:

1. To study of Typical Layout of an Electrical Power System
2. Simulation of three phase bridge rectifier using Pspice
3. To study of AC distribution, Single phase, 3-phase, 3 phase 4 wire system
4. To study of different type of electrical cable
5. To study of different type of insulator
6. To study of lay out of substation
7. To study of different types of towers

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EXC - 404 Analog Communication

Unit-I

Different types of Signals (Continuous, Discrete, Periodic), Time Domain and Frequency Domain Representation, Introduction to basic Transform Techniques applicable to these Signals.

Spectral Analysis: Fourier Technique, Fourier Transform and their Properties, Transform of Gate Signal, Impulse Function and Unit Step Function, Fourier Transform Technique for Periodic Signal, Transform of Train of Pulses and Impulses, Sine and Cosine wave.

Signal Energy and Power, Spectral Density of various types of signals, Spectra (Parseval's Theorem), Density Spectra of Periodic Gate and Impulse train.

Linear Time Invariant (LTI) Systems, Impulse Response, Convolution, Convolution with Impulse Function, Casual and Non Causal System, Distortion less System, Impulse Response of Distortion less System, Ideal Filter and Practical Filter.

Unit-II

Modulation Techniques: Need and types of modulation techniques, Amplitude Modulation, Frequency Spectrum, Power Distribution, Modulation by Complex Signal, Low Level and High Level AM Modulators, Linear Integrated Circuit AM Modulators, Suppressed Carrier Generation (Balance/Chopper and Square Law Modulation), SSB Generator (Phase and Frequency Discrimination Method), VSB Transmission and Application, Detection of AM signals: Envelope Detector Circuit, RC Time Constant, Synchronous Detection Technique, Error in Synchronous Detection, SSB signal detection, PLL and its use in demodulation.

Unit-III

Angle Modulation: Frequency and Phase Modulation Frequency spectrum, bandwidth requirement, Frequency and Phase Deviation, Modulation Index, NBFM and WBFM, Multiple frequencies FM. FM Modulators: Direct (Parameter Variation Method) and Indirect (Armstrong) Method of frequency modulation. FM Detector: Slope Detector, Foster Seely Discriminator, Ratio Detector and PLL detectors.

Unit-IV

Radio Transmitters: AM transmitter, block diagram and working of Low Level and High Level Transmitters, Trapezoidal Pattern and Carrier Shift, SSB Transmitters, FM transmitters Frequency Multiplication Applied to FM Signals, FM transmitters.

Radio Receivers: Block Diagram of Radio Receiver, Receiver Characteristics (Selectivity, Fidelity and Sensitivity), AM Receiver, RF Receiver, Super-heterodyne Receiver, RF Amplifier, Frequency Mixer, AVC and AFC, Image Signal, Intermediate Frequency Selection, Diversity Reception, FM Receiver.

Unit-V Noise :

Sources and types of noise and their power density, White Noise, Noise from Single and Multiple noise source for Linear Systems, Super Position of Power Spectrum, Equivalent Noise Bandwidth, Noise Figure, and Equivalent Noise Temperature, their Relationship, Calculation of Noise Figure and Noise Temperature for Cascade Systems, Noise Performance of Communication System, Band Pass Noise Representation in Terms of Low Pass, In-phase and Quadrature Phase Component and their Power Spectral Density, Figure of Merit, Calculation for AM, AM-SC and SSB System, Noise in Angle Modulated System, Figure of Merit for FM, Noise Density of Output of FM Detector, Pre-Emphasis and De-Emphasis, Phasor Representation of Noise, Capture Effect, Comparison of Noise Performance of AM and FM.

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References:

1. B.P. Lathi : Modern Analog and Digital Communication System, Wiley Eastern limited
2. Taub and Schilling : Principles of communication Systems, TMH
3. Singh and Sapre : Communication Systems, TMH
4. S Haykin : Communication Systems, John Wiley and Sons Inc
5. S Ghose: Signals and Systems, Pearson Education
6. A Bruce Carlson : Communication System, TMH
7. Steven : Communication Systems – Analysis and Design, Pearson Education

List of Experiments (Expandable):

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

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

Step 2: The designed/drafted circuit should be simulated using simulation Software (TINAPRO/ PSPICE/ LABVIEW/ CIRCUIT MAKER).

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

Step 4: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1. Analysis of AM Modulation and Demodulation Techniques (Transmitter and Receiver), Calculation of Parameters
2. Analysis of FM Modulation and Demodulation (Transmitter and Receiver) and Calculation of Parameters
3. To Construct and Verify Pre-emphasis and De-emphasis and Plot the Waveforms.
4. Study of Super-heterodyne Receiver and Characteristics of Radio Receiver.
5. To Construct Frequency Multiplier Circuit and to Observe the Waveform
6. Study of AVC and AFC.
7. Study of PLL chip (566) and its use in various systems

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EXC 405 Electrical Machines-I

Unit I : Transformer:
3-ϕ transformer construction, working principal, connections & applications, Scott connection, polarity test, parallel operation of 1-ϕ & 3-ϕ transformer, condition for maximum efficiency & regulation, cooling methods, harmonics in 3-ϕ transformers, dry type transformer, Auto-transformers.

Unit II : DC Machines:
Construction & working principle of dc machine, classification of dc machine, characteristics of dc machines, emf eq. of dc machine, lap & wave windings, torque eq. of dc motor, starting of dc motor, speed control of dc motor, losses & efficiency of dc machines, applications.

Unit III : Induction motor-I:
Construction, working principle & classification of 3-ϕ induction motor, phasor diagram ,equivalent circuit, developed torque, power flow diagram, speed /torque & torque/slip characteristics, rotational losses & applications.

Unit IV : Induction motor-II:
Starting of 3-ϕ induction motor, no load and blocked rotor test, cogging & crawling, circle diagram, speed control of induction motor, power factor control, Induction generator.

Unit V : Single phase motors:
1-ϕ induction motor, double revolving field theory, equivalent circuit & determination, performance calculation, starting methods & types of 1-ϕ induction motor, their construction, working principle & applications, 1-ϕ series motor, servomotors.

References:

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.
4. Electrical Machines by Nagrath and Kothari (TMH).
5. A.C. Machines by Langs dorf (megraw-Hill).
6. Electrical Machines by Dr.P.S.Bimbhra (Khanna).
7. Electrical Machines by Ashfaq Hussain (Dhanpat Rai).

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

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EXC 406 - Electronics Instrumentation

Unit I - Cathode Ray Oscilloscope: CRO, electrostatic focusing, electrostatic deflection, post deflection acceleration, screen for CRTs, graticule, vertical & horizontal deflection system, time base circuit, oscilloscope probes attenuators, application of CRO, lissajous patterns, dual trace, dual beam, sampling, storage (analog & digital) oscilloscopes.

Unit II - A.C. Bridges: Measurement, sources and detectors, measurement of inductance, capacitance & Q factor, Maxwell's bridge, Maxwell's inductance & capacitance bridge, Hays bridge, Anderson's bridge, Owen's bridge, De-sauty's bridge, Schering bridge, Heaviside Campbell's bridge, Weins bridge, Universal bridge, errors in bridge circuit, Wagner's earthing device, Q meter .

Unit III - Transducers: Classification, characteristic & choice of transducers, resistive, inductive and capacitive transducers, strain gauge, gauge factor, thermistor, thermo couples, LVDT, RVDT, piezo-electric transducers, magneto elastic and magnetostrictive, hall effect transducers, opto-electronic transducers.

Analog & Digital Data Acquisition Systems: Instrumentation systems used, interfacing transducers to electronic control & measuring systems, d/a multiplexing, a/d multiplexing, special encoders.

Unit IV - Signal Generators: Fixed & variable frequency AF oscillators, sine wave generators, AF sine and square wave generator, function generator, square & pulse generator, random noise generator, sweep generator, TV sweep generator, sweep- marker generator, video pattern generator vectroscope, beat frequency oscillator, frequency selective wave analyzer, heterodyne wave analyzer, harmonic distortion analyzer, spectrum analyzer, digital fourier analyzer.

Unit V - Digital Instruments: Advantages of digital instruments over analog instruments, resolution , sensitivity, digital voltmeter - ramp type, dual slope integration type, integrating type, successive approximation VM, digital multimeter, digital frequency meter, electronic counter, digital tachometer, digital ph meter, digital phase meter, digital capacitance meter, LED, LCD, nixies, electro luminescent, incandescent, liquid vapour display, dot-matrix display, analog recorders, X-Y recorders, RS 232C, IEEE 488, GPIB electric interface.

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References:

1. Albert. D. Helfrick, W.D. Cooper. Modern Electronic Instrumentation and measurement techniques, PHI.
2. Kalsi H.S., Electronic Instrumentation, TMH.
3. A.K. Sawhney, Electrical and Electronic measurements and Instrumentation, Dhanpat Rai and Co.
4. E.W. Golding, Electrical Measurement and Measuring Instruments Sir Isaac Pitman and Sons, Ltd. London 1940
5. C.S. Rangan, G.R. Sarma, V.S.V. Mani, Instrumentation Devices

List of Experiments:-

1. Measurement of inductance of a coil using Anderson Bridge.
2. Measurement of capacitance of a capacitor using Schering Bridge.
3. LVDT and capacitance transducers characteristics and calibration.
4. Resistance strain gauge- Strain Measurement and calibration.
5. Measurement of R, L, C & Q using LCR-Q meter.
6. Study & measurement of frequency using Lissajous patterns.
7. Measurement of pressure using pressure sensor.
8. Study of piezo-electric transducer and measurement of impact using piezo-electric transducer.
9. Measurement of displacement using LVDT.
10. Measurement of speed of a motor using photoelectric transducer.
11. Study & measurement using ph meter.
12. Temperature measurement & control using thermo couple & using thermistor.

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[Established Under Act. 06 of 2014 by Govt. of Madhya Pradesh]
Approved by Madhya Pradesh Private University Regulatory Commission
Bhopal Indore Road, Opposite Pachama Oilfed Plant, Pachama, Sehore, Phone: (07562) - 222482

Corp. Office: 202, Zone-I, Ganga Jamuna Complex (Basement), M.P. Nagar, Bhopal (M.P.) Ph: (0755) 3270916, Fax (0755) 3270518

(Minutes of the Board of Studies Committee Meeting)

School Of Engineering

Department of Electrical and Electronics Engineering

Minutes of Board of Studies Committee Meeting Dated : 03.6.2017

The Board of Studies Committee Meeting was held in the room of HOD (EX) at 1:30 PM on 03.6.2017. Following members were present.

1. Mr. Mukesh Tiwari
2. Mr. Vijay Prakash Singh
3. Mr. Prabodh Khampariya
4. Ms. Alka Thakur
5. Mr. Devendra Patle
6. Ms. Jyotsna Sagar
7. Mr. Sandesh Pradhan (external)
8. Dr. N.P. Patidar (External)

The Chairman of Board of Studies Committee welcomes and appreciated the efforts put up by the faculty for progress of the departmental activities. The following Agenda points were discussed and resolved.

Agenda 1. Approval of EX-7th & 8th semester Scheme and Syllabus (NON-CBCS)

Discussion (If any) : Scheme and Syllabus should be prepared as per current demand in industry.

Resolution of the Discussion : Scheme and Syllabus was prepared as per current demand in industries and was approved for forthcoming 7th & 8th semester

The Chairman thanks the members for peaceful conduction of meeting.

Signature of All members (Including chairman)

1. Mr. Mukesh Tiwari
2. Mr. Vijay Prakash Singh
3. Mr. Prabodh Khampariya
4. Ms. Alka Thakur
5. Mr. Devendra Patle
6. Ms. Jyotsna Sagar
7. Mr. Sandesh Pradhan (External)
8. Dr. N.P. Patidar (External)

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Scheme of Examination

Seventh Semester –BE (EX)

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted						Total Marks	Credits Allotted Subject wise			Total Credits
			Theory Slot			Practical Slot							
			End Sem.	Mid Sem MST (Two tests average)	Quiz, Assignment	End Sem	Term work			L	T	P	
							Lab work & sessional	Assignment/ quiz					
1	EX-701	Utilization of Electrical Energy	70	20	10	-	-	-	100	3	1	-	4
2	EX-702	Digital Signal Processing	70	20	10	30	10	10	150	3	1	2	6
3	EX-703	Electrical Drives	70	20	10	30	10	10	150	3	1	2	6
4	EX-704	Elective –I	70	20	10	-	-	-	100	3	1	-	4
5	EX-705	Elective –II	70	20	10	-	-	-	100	3	1	-	4
6	EX-706	Major Project Synopsys-I	-	-	-	60	20	20	100	-	-	4	4
7	EX-707	Industrial Training -I (2Week)	-	-	-	60	20	20	100	-	-	4	4
		Total	350	100	50	180	60	60	800	15	5	12	32

w.e.f July 2017

Elective –I

EX- 704[A] - High Voltage Engineering
EX- 704[B] – Generalized Theory of Electrical Machines

Elective –II

EX- 705[A] - Computer Aided Design of Electrical Machines
EX- 705[B] – Artificial Intelligence

EX- 701
Utilization of Electrical Energy

Unit-I Illuminations: Definitions, laws of illuminations, polar curves, luminous efficiency, photometer, incandescent lamps, filament materials, halogen lamp, electric discharge lamps, sodium vapor lamp, mercury vapour lamp, fluorescent lamp, light calculations: commercial, industrial, street and flood lighting

Unit-II Electric Heating: Different methods of electric heating, principle of high frequency induction and dielecuric heating, construction, operation, performance and applications of arc furnace and induction furnace
Electric Welding: Welding process, welding transformer, classification of electric welding: arc welding, resistance welding, welding of various metals.

Unit-III Electrolytic Process: Principles and applications of electrolysis, electro-deposition, manufactures of chemicals, anodizing, electro-polishing , electro-cleaning, electroextraction, electro-refining, electro-stripping (parting) power supplies for electrolytic process.

Unit-IV Electric Traction: Systems of Electric Traction: DC & AC Systems, power supply for electric traction system: comparison and application of different systems, sub-station equipment and layout, conductor rail & pantograph.

Unit-V Traction Methods and control: Types of services, speed time and speed distance curves, estimation of power and energy requirements, mechanics of train movement, Co-efficient of adhesion, adhesive weight, effective weight, traction motor controls: DC and AC traction motors, series parallel starting, methods of electric braking of traction motors.

References:

1. C. L. Wadhwa: Utilization of Electric Traction Electric Power, 1989
2. H. Partab: Art and Science of Electrical Energy, Dhanpat Rai & Sons
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.

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EX-702
Digital Signal Processing

Unit I- Discrete-Time Signals and Systems: Discrete-time signals, discrete-time systems, analysis of discrete-time linear time-invariant systems, stability and causality, discrete time systems described by difference equation, solution of difference equation, implementation of discrete-time systems .block diagrams and flow graph. convolution representation of digital network, matrix representation.

Unit II- The Z-Transform: The Direct z-transform, properties of the z-transform, , inversion of the z-transform. rational z-transforms, ROC and their properties, analysis of linear time-invariant systems in the z- domain , convolution theorem, parseval's relation, laplace transform, properties of laplace transform.

Unit III- Frequency Analysis of Discrete Time Signals: Discrete Fourier Series (DFS), properties of the DFS, Discrete Fourier Transform (DFT), properties of DFT, two dimensional DFT, circular convolution.

Unit IV- Computation of the DFT: FFT algorithms, decimation in time algorithm, decimation in frequency algorithm, linear Convolution using DFT, decomposition for 'N' composite number.

UnitV- FIR Filters: Analog filter Design, Butterworth & Chebyshev, design of IIR and FIR digital filters, impulse invariant and bilinear transformation. , Henning, Hamming & Kaiser, Windowing, rectangular and other windows, examples of FIR filters, design using Windows.

References:

1. A.V. Oppenheim and R. W. Schafer: Digital Signal Processing, Prentice Hall.
2. L.R. Rabiner and B. Gold: Theory and Application of Digital Signal Processing, Prentice Hall
3. John. G. Proakis and Monolakis: Digital Signal Processing, Pearson Education
4. Johnny R. Johnson: Introduction to Digital Signal Processing, PHI, New Delhi.
5. S. Ghosh: Signal and Systems, Pearson Education.
6. Schilling and Harris: Fundamentals of DSP using MATLAB, Cengage Learning

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List of Experiments:

1. MATLAB simulation of discrete time signals: time domain representation.
2. Write a MATLAB code to generate sum of sinusoidal signals.
3. Write a MATLAB code to design IIR Butterworth lowpass filter and verify its characteristics.
4. Write a MATLAB code to design IIR Chebyshev type I highpass filter.
5. Write a MATLAB code to design a LPF of FIR type using Keiser window function with order 25.
6. Write a MATLAB code to compute the linear convolution of two discrete sequences
7. Write a MATLAB code to compute the circular convolution of two discrete sequences.
8. Write a MATLAB code to compute the DFT of a sequence
9. Write a MATLAB code to compute the IDFT of a sequence

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EX- 703
Electrical Drives

Unit I- Introduction to Electric Drives: Elements of drive systems, requirement of electric drives, rating & selection of drives, groups and individual drives, constant power and constant torque drives. Review of characteristics of AC & DC motors, load torque, load-drive, speed torque characteristics, quadrant speed torque characteristics, load equalization, stability of electric drives, moment of inertia and torque of motor load combination.

Unit II-DC Drives: Starting, braking, transient & steady state analysis phase controlled and chopper controlled drives, speed control, energy recovery systems, dual converter.

Unit III- Induction Motor Drives: Starting braking and speed control, PWM, voltage source inverter and current sources fed im drives, cyclo converter fed drive, vector control drives, slip power recovery, conventional control methods, rotor impedance control, converter controlled-Static Scherbius & Static Krammers drives.

Unit IV- Synchronous Motors Drives: Starting, braking, transient analysis, synchronous motors variable speed drives, V/F control, cyclo converter fed synchronous motor drive.

Unit V- Special Motor Drives: Fundamentals of switched reluctance motors, stepper motors, permanent magnet motor, vector control, digital control of drives.
Traction: Electric traction, machine tool drive, electric cars, steel & cements plants, textile & paper mills.

References:

1. G.K. Dubey "Fundamentals of Electrical Drives"-. Narosa Publications
2. 2. Gopal K. Dubey "Power semiconductor Controlled Drives"- PHI
3. S.K. Pillai, "A first course of Electrical Drive" New age International.
4. Ned Mohan Electrical Drive Wiley India
5. V. Subramanyam "Thyristor control of Electric Drive" Tata Mc Graw Hill Pub.
6. S.Shiva Nagaraju power semiconductor drive PHI learning

List of Experiments:

1. To study the starting and running characteristics of converter fed DC traction motor.
2. To study the energy recovery systems and braking of a DC drive.
3. To study the braking methods of a three-phase induction motor.
4. To study the performance of VSI fed three-phase induction motor using PWM technique.
5. To control the speed of a three phase slip ring Induction motor using rotor impedance control.
6. To study the performance of Vector Controlled three phase Induction motor drive.
7. To Study frequency Controlled Synchronous motor drive.

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EX- 704 [A]

High Voltage Engineering

Unit –I Introduction: Basics of HV technology, advantages of transmitting electrical power at high voltages, need for generating high voltages in laboratory, applications of high voltage.

Unit –II Insulation & Breakdown: Classification of HV insulating media, its properties, gaseous dielectrics, ionizations. Townsend's theory & its limitations, 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, suspended particle theory, electronic breakdown, electro convection breakdown, cavity breakdown (bubble's theory).

Unit –III High Voltage AC DC : HV AC transformer, need for cascade connection, working of transformers units connected in cascade, series resonant circuit, principle of operation and advantages, tesla coil, HV DC voltage doubler circuit, Cock Croft- Walton type high voltage DC set.

Unit –IV: Impulse Voltage and current Introduction to standard lightning and switching impulse voltages, analysis of single stage impulse generator, expression for output impulse voltage, multistage impulse generator, its components, triggering of impulse generator by three electrode gap arrangement, triggering gap, oscillograph time sweep circuits, generation of switching impulse voltage, generation of high impulse current.

Unit –IV High Voltage Tests on Electrical Apparatus: Definitions of technologies, tests on isolators, circuit breakers, cables insulators and transformers.

Unit –V Measurement of High Voltages: Electrostatic voltmeter, generating voltmeter, series resistance micro ammeter, HV DC measurements, standard sphere gap measurements of HV AC & HV DC, potential dividers, resistance dividers, capacitance dividers, mixed RC potential dividers, surge current measurement.

References:

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 Easternlimited, 1987.
5. Transmission and distribution reference book-Westing House.
6. C.L. Wadhwa, High voltage engineering, New Age International Private limited, 1995.

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EX- 704[B]

Generalised Theory of Electrical Machines

Unit I Generalized Theory: Conversions, basic two pole machines, transformer with movable secondary, transformer voltage and speed voltage, Kron's primitive machine , analysis of electrical machines, voltage and torque equation.

Unit II Linear Transformations: Invariance of power, transformations from displaced brush axis, three phases to two phase, rotating axes to stationary axes, transformed impedance matrix, torque calculations.

Unit III DC Machines: Generalized representation, generator and motor operation, operation with displaced brushes, steady state and transient analysis, sudden short circuit, sudden application of inertia load ,electric braking of dc motors.

Unit IV Synchronous Machines: Generalized represenation, equivalent circuit, steady state analysis, transient analysis , phasor diagrams, electromechanical transients.
Induction Machines: Generalized representation, performance equation, equivalent circuit, steady state analysis, transient analysis, phasor diagrams, double cage machine, harmonics, voltage & torque equation for steady state operation of induction motor & Scharge motor.

Unit V Special Machines: Generalized representation, steady state analysis of reluctance motor, brushless dc motor, variable reluctance motor & single phase series motor.

References:

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.Bhumbra, Generalised theory of Electrical m/c
5. White & Woodson, Electro Mechanical Energy Conversion.

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EX- 705[A]

Computer Aided Design of Electrical Machines

Unit-I Computer Aided Design Philosophy of computer aided design, advantages, limitations, analysis and synthesis methods, selection of input data and design variables, flow charts for design of induction motor and synchronous machine, optimization of design constrained and unconstrained optimization problem

Unit-II DC machines-Design of armature windings & field systems, selection of variables for optimal design, formulation of design equations, objective function, constraint functions, algorithms for optimal design.

Unit-III Power Transformers-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.

Unit-IV Single Phase Induction Motor-Calculation of main dimensions of stator, complete design of stator with its punching details, design of main and auxiliary winding, design of rotor, performance calculation of designed rotor and performance by equivalent circuit approach.
Three 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.

Unit-V 3-Phase Alternator-Design of stator, windings, design of field systems for salient pole and non-salient pole machines, selection of variables for optimal design, formulation of design equations, objective function, constraint functions, algorithms for optimal design.

References:

1. Computer- Aided Design of Electrical Equipment- by Dr. M. Ramamoorthy-Affiliated East-West press Pvt. Ltd. New Delhi.
2. Electrical Machine Design- by A.K. Sawhney, Dhanpat Rai & Sons.
3. Performance and Design of A.C. Machines-M.G. Say, Affiliated East West Press Pvt. Ltd., New Delhi.
4. Performance and Design of D.C. Machines- Clayton & Hancock.
5. Principles of Electrical Machine Design with Computer Programmes by- S.K. Sen, Oxford & IBH Publishing Co.

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EX- 705(B)

Artificial Intelligence

Unit 1: Introduction: Organization of the brain, biological neuron, biological and artificial neuron models, historical developments, essentials of artificial neural networks, artificial neuron model, operations of artificial neuron, types of neuron activation function, ANN architectures

Unit 2: Classification Taxonomy of ANN: Connectivity, neural dynamics (activation and synaptic), learning strategy (supervised, unsupervised, reinforcement), learning rules, perceptron models: training algorithms: discrete and continuous perceptron networks, perceptron convergence theorem, multilayer feed forward neural networks

Unit 3: Memory: Associative memory, bi-directional associative memory, architecture, BAM training algorithms, storage and recall algorithm, BAM energy function, self-organizing maps (SOM) and adaptive resonance theory (ART).

Unit 4: Fuzzy Logic system: Fuzzy versus crisp, fuzzy sets, membership function, basic fuzzy set operations, properties of fuzzy sets, fuzzy relations, fuzzy control, predicate logic (interpretation of predicate logic formula, inference in predicate logic), fuzzy logic (fuzzy quantifiers, fuzzy inference), fuzzy rule based system, defuzzification methods.

Unit 5: Intelligent Tools: Introduction to genetic algorithm, biological background, GA operators, selection, encoding, crossover, mutation, chromosome, expert system, software architecture, rule base system.

References:

1. Simon Haykin, "Neural Networks: A Comprehensive Foundation", 2nd Edition, Pearson Education
2. S. Rajsekaran, G. A. Vijayalaxmi Pai, "Neural Networks, Fuzzy Logic & Genetic Algorithms Synthesis & Applications", Practice Hall India
3. James A. Anderson, "An Introduction to Neural Networks", Practice Hall India Publication
4. Mohamed H. Hassoun, "Fundamentals of Artificial Neural Network", Practice Hall
5. Kelvin Warwicke, Arthur Ekwlle, Raj Agarwal, "AI Techniques in Power System", IEE London U.K.
6. S. N. Sivanandam, S. Sumathi, S. N. Deepa, "Introduction to Neural Network Using MATLAB 6.0", Tata McGraw Hill.

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EX-706
Major Project Synopsis-I

The students have to keep in mind that in final semester they would be required to implement whatever has been planned in the **Major Project Synopsis-I** 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 also evaluated by an external examiner. At the end of semester, all students are required to submit a synopsis.

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EX-707
Industrial Training –I

Duration: 2 weeks after the VI semester in the summer break. Assessment in VII semester.

Students must observe following to enrich their learning during industrial training:

- Industrial environment and work culture.
- Organisational structure and inter personal communication.
- Machines/ equipment/ instruments - their working and specifications.
- Product development procedures and phases.
- Project planning, monitoring and control.

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Scheme of Examination

B.E. VII Semester (Electrical and Electronics Engineering)

S.No.	Sub Code	Subject Name	Max Marks Theory			Max. Marks Practical			Total Marks	Credits Allotted Subject wise			Total Credits
			End Sem Exam	Mid Sem MST (Two tests average)	Quiz-Assignment	End Sem Practical/ Viva	Term Work			Period per week			
							Lab work & sessional	Assignment/ quiz		L	T	P	
1	EX-801	Computer Application To Power System	70	20	10	30	10	10	150	3	1	2	6
2	EX-802	Switchgear & Protection	70	20	10	30	10	10	150	3	1	2	6
3	EX-803	Elective-III	70	20	10	-	-	-	100	3	1	-	4
4	EX-804	Elective-IV	70	20	10	-	-	-	100	3	1	-	4
5	EX-805	Major Project	-	-	-	120	80	-	200	0	0	8	8
6	EX-806	Ad. Software Lab – III	-	-	-	30	10	10	50	0	0	2	2
7	EX-807	Seminar / Group Discussion (Internal Assessment)	-	-	-	-	-	50	50	0	0	2	2
TOTAL			**280**	**80**	**40**	210	**110**	**80**	**800**	**12**	**4**	**16**	**32**

L: Lecture- T: Tutorial- P: Practical

w.e.f. July- 2017

Elective-III

(A) FACTS
(B) Power Quality
(C) Reliability Engineering

Elective-IV

(A) SCADA SYSTEMS AND APPLICATIONS)
(B) ELECTRICAL ENGG. MATERIALS
(C) RENEWABLE & NON CONVENTIONAL ENERGY SYSTEMS

EX-801COMPUTER APPLICATIONS TO POWER SYSTEMS

UNIT-I

Models of power system components, network model using graph theory, formation of Z bus, transmissionline models, regulating transformer, line loadability, capability curves of alternator.

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 loadability of transmission lines.

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.

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.

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.

References:

1. Power Generation, Operation and Control by A.J. wood and B.F. Wollenberg John Wiley & Sons Inc. 1984.
2. Computer methods in power systems analysis – by stagg G.W. and E.L. Abiad A.H. Mc Graw Hill.
3. Computer Techniques in Power Systems Analysis- Pai M.A. Tata Mc Graw Hill.
4. Computer Modeling of Electrical Power Systems, Arrillaga J. Arnord C.P Harker B.J. John Wiley & Son
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. & Stevenson 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.

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EX- 802 – SWITCHGEAR & PROTECTION

UNIT-I

Fault Analysis

Fault Analysis per unit, representation and its advantages, faults in power systems (Symmetrical & Unsymmetrical), Single line and equivalent impendence diagram representation of power system components. Symmetrical components and its application to power systems, fault analysis, Sequence networks and their interconnection for different types of faults, Effect of fault impedance, Current limiting reactors, its location and application, Short circuit calculation.

UNIT-II

Protective Relays

Requirement of relays, Primary & backup protection, Desirable qualities of relays, Concept of Pickup, reset & drop-off, Drop off/ Pickup ratio, inverse time & definite rime charters tics, Attracted armature, Balanced Beam, Induction disc, Induction cup, Moving coil & moving Iron, Rectifier , Thermal, Bimetal directional relay, Frequency, DC, all or nothing relays. Pilot & negative sequence, Over current, Over Voltage, Directional, Differential and Distance relays, R-X diagram, Impedance mho & reactance relay.Introduction of static analog & digital relays, Classification of static relays.

UNIT-III

Circuit Breakers

Elementary principle of arc quenching, recovery & re-striking voltage, arc quenching devices, description and operation of Bulk oil, Minimum oil, Air break, Air blast, SF6, Vacuum circuit breakers and DC circuit breakers, their comparative merits, LT Switch gear, HRC fuses, current limiting reactor.& their design features, influence of reactors in CB ratings Testing of circuit breaker, Description of a simple testing station, direct & indirect testing.

UNIT-IV

System Protection

Protection of Generators - Earth Fault, percentage, differential, Loss of excitation, Prime mover failure, Over current, Turn to turn fault, Negative phase sequence, heating, Reverse power protection schemes

Protection of Transformers

Internal & external fault protection, Differential, Earth fault, Over Current, Over heating, Protection schemes, Protection of transmission lines, Over current, Distance and carrier current protection schemes.

UNIT-V

Surge Protection & Insulation co-ordination

Switching surges, Phenomena of Lightning, over voltage due to lightning, Protection against lightning, Lightning arrestors selection of lightning arrestors, Surge absorbers and diverters, Rod gap, horn gap expulsion type & valve type lightning arrestors, solid resistance and reactance earthing, Arc suppression coil, Earthing transformers, Earthwires, Earthing of appliances, insulation co-ordination, Definitions determination of line insulation, insulation level of substation equipment, co-ordination amongst items of substation equipments.

References:

B. Ravindran and M Chander, "Power System protection and Switchgear", New Age International.

Badriram, Power System protection and switchgear, TMH.

CL. Wadhwa, Electrical Power systems, New age International.

Haddi Saadat, "Power System Analysis, TMH

A.F. Berger, Vijay Vittal, "Power System Analysis, Pearson Education, Asia.

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List of Experiments:

1. Determination of drop out factor of an instantaneous over current relay.
2. Determination of operating characteristic of IDMT relay.
3. Determination of operating characteristic of differential relay.
4. Study and operation of gas actuated protective relay.
5. Study and operation of static over current relay.
6. Determination of transmission line parameters using MATLAB.
7. Analysis of power system faults (Symmetrical & Asymmetrical) using MATLAB.
8. Study of SF6 circuit breaker
9. Protectional simulation study of generator, Transformer, Feeder & Motor protection.

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EX-803 A FLEXIBLE AC TRANSMISSION SYSTEMS (FACTS)

UNIT-I

Introduction: Facts basic concepts and general system considerations, power flow in ac system, definitions on facts, basic types of facts controllers, benefits from facts Technology, static var compensator (SVC): principle of operation and control strategy, thyristor controlled phase angle regulator (TCPAR): principle of operation and control strategy.

UNIT-II

Transient Stability Analysis: Analysis of Power systems installed with FACTS devices. Control with FACTS: Power Transmission Control using UPFC, power transmission control using phase shifting transformer (PST), power transmission control using SSSC.

UNIT-III

Oscillation Stability Analysis and Control with FACTS: Linearized model of power systems installed with FACTS based stabilizers, Heffron-Phillips model of a SMIB system installed with SVC, TCSC and TCPS, Heffron-Phillips model of a SMIB system with UPFC, Heffron-Phillips model of a multi-machine system installed with SVC, TCSC and TCPS.

UNIT-IV

Design of FACTS based stabilizers: Analysis of damping torque contribution by FACTS based stabilizers installed in SMIB systems, selection of installing locations and feedback signal for FACTS based stabilizers, Dynamic Voltage restorer.

UNIT-V

Power flow Controller: Unified Power Flow Controller (UPFC), principle of operation, configuration and control, simulation of UPFC, steady state model of UPFC, interline power flow controller (IPFC), principle of operation, configuration and control, static compensator (STATCOM), principle of operation and control, application for mitigation of SSR.

References:

1. "Understanding FACTS Devices" N.G. Hingorani and L. Guygi, IEEE Press Publications 2000.
2. Flexible AC Transmission System: Y.H.Song and A.T.Jhons, IEE, 1999(A Book)
3. Dr Ashok S & K S Suresh Kumar "FACTS Controllers and applications" course book for STTP, 2003.
4. Ned Mohan et.al, Power Electronics, John Wiley and Sons.
5. K R Padiyar, FACTS Controllers in Power Transmission and Distribution, New Age International, First Edition.

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EX- 803 B POWER QUALITY

UNIT-I

Introduction, power quality -voltage quality, power quality evaluations procedures term and definition: general clauses of power quality problem, causes & effect of power quality disturbances.

UNIT-II

Voltage sags and interruption: sources of sags and interruption, estimating voltages sag performance, fundamental principles of of protection, monitoring sags.

UNIT-III

Transients over voltages: sources of transient over voltages, principles of over voltages protection, utility Capacitor switching transients, fundamentals of harmonics and harmonics distortion, harmonics sources from commercial load and from industrial loads.

UNIT-IV

Applied harmonics : harmonics distortion evalutions, principles for controlling harmonics, harmonics studies devices for controlling harmonic distortion, filters, passive input filter standards of harmonics.

UNIT-V

Electro-magnetic compatibility, constant frequency control, constant tolerance band control, variable tolerance band control, discontinuous current control.

Reference Books:

1. Power Quality- by R.C. Duggan
2. Power System harmonics –by A.J. Arrillga
3. Power electronic converter harmonics –by Derek A. Paice

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ELECTIVE-I EX-803 C – RELIABILITY ENGINEERING)

UNIT-I

Introduction to reliability and indices. Review of probality theory. Density and distribution function of continuous and discrete random variable.

UNIT-II

Component reliability, hazard function, failure laws, exponential failure law, wear in period and its importance. Safety and reliability, replacement, methods of reliability improvement.

UNIT-III

Reliability evaluation of series, parallel, and series–parallel network. Complex network reliability evaluation using event, space, decomposition, tie-set, cut-set and. Satand by system and load sharing system,multi state models.

UNIT-IV

Markov process, State diagram, Availability and unavailability function. Evaluation of time dependent and limiting state probabilities. MTTF calculation. Concept of frequency and durations. State enumeration method for evaluating failure frequency, MUT, MDT,frequency balance approach.

UNIT-V

Reliability testing, estimation of reliability function, failure function and MTTF from grouped and ungrouped datas , censoring and accelerations ,parametric methods.

TEXT BOOKS

1 Introduction to reliability engineering –E.E.Lewis, John Wicly and Sons, 1987 2 Reliability and maintainability engineering, C.E. Ebeling, TMH, 2006

Reference books

1Reliability Engineering : Probability Models and maintanance methods –Joel A.Nachlas,Taylor and Francis 2005

2 Reliability evaluation of engineering system: concepts and techniques-R. Billinton, R.N.Allon, Pitman, 1984

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ELECTIVE-IV (EX-804A – SCADA SYSTEMS AND APPLICATIONS)

UNIT I

Introduction to SCADA and PLC:SCADA: Data acquisition system, evaluation of SCADA, communication technologies, monitoring and supervisory functions. PLC: Block diagram, programming languages, Ladder diagram, Functional Block diagram, Applications, Interfacing of PLC with SCADA.

UNIT II

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

UNIT III

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

UNIT IV

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

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.

Reference Books:

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

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EX-804 B ELECTRICAL ENGG. MATERIALS

UNIT I

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

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, Biasing (forward and reverse) of P-n junction, Reverse separation current, Zener effect, Junction, capacitance, hall defects and hall coefficient.

UNIT III

Magnetic Materials: Details of magnetic materials, reduction between B.H. and , 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. Hysteriis loss, eddy current loss, Magnetisation, magnetic susceptibility, coercive force, core temperature, rectangular hysteresis loop, Magnet rest square loop core materials, iron silicon, Iron alloys.

UNIT IV

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

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.

References:

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
7. Dekkar AK; Electrical Engineering Materials; PHI.

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EX-804-C RENEWABLE & NON CONVENTIONAL ENERGY SYSTEMS

UNIT - I

Renewable Energy Systems:-Energy Sources, Comparison of Conventional and non-conventional, renewable and 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.

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, winddiesel,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 stand alone systems. Use of electronic load controllers and self excited induction generators.Wave Energy System: System configuration: grid connected and hybrid systems.

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.Biomass Energy System: System configuration. Biomass engine driven generators, feeding loads in stand-alone or hybrid modes, Biomass energy and their characteristics.

UNIT – IV

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

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

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SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES

(Established Under Act. 06 of 2014 by Govt. of Madhya Pradesh)
Approved by Madhya Pradesh Private University Regulatory Commission
Bhopal Indore Road, Opposite Parliament Oilfed Plant, Pachama, Sehore, Phone: (07562) - 222482
Corp. Office: 202, Zone-I, Ganga Jamuna Complex (Basement), M.P. Nagar, Bhopal (M.P.) Ph: (0755) 5270916, Fax (0755) 5270916

(Minutes of the Board of Studies Committee Meeting)

School Of Engineering

Department of Electrical and Electronics Engineering

Minutes of Board of Studies Committee Meeting Dated : 10.05.2018

The Board of Studies Committee Meeting was held in the room of HOD (EX) at 10:30 AM on 10.05.2018. Following members were present.

1. Mr. Mukesh Tiwari
2. Mr. Vijay Prakash Singh
3. Mr. Prabodh Khampariya
4. Ms. Alka Thakur
5. Mr. Devendra Patle
6. Ms. Jyotsna Sagar
7. Mr. Sandesh Pradhan (external)
8. Dr. N.P. Patidar (External)

The Chairman of Board of Studies Committee welcomes and appreciated the efforts put up by the faculty for progress of the departmental activities. The following Agenda points were discussed and resolved.

Agenda 1. Approval of EX-6 semester Scheme and Syllabus (CBCS)

Discussion (If any) : Scheme and Syllabus should be prepared as per current demand in industry.

Resolution of the Discussion : Scheme and Syllabus was prepared as per current demand in industries and was approved for forthcoming 6 semester

The Chairman thanks the members for peaceful conduction of meeting.

Signature of All members (Including chairman)

1. Dr. Mukesh Tiwari
2. Mr. Vijay Prakash Singh
3. Dr. Prabodh Khampariya
4. Ms. Alka Thakur
5. Mr. Devendra Patle
6. Ms. Jyotsna Sagar
7. Mr. Sandesh Pradhan (External)
8. Dr. N.P. Patidar (External)

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Sri Satya Sai University of Technology & Medical Sciences, Sehore (M.P)

Scheme of Examination - CBCS Pattern

Academic Year 2018- 2019

Branch : Electrical and Electronics Engineering **Semester - VI**

S.No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Periods/ hour/ week			Credits	Total Marks
			End Sem. Exam.	Mid Tests	Assignments/Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation	L	T	P		
1	EEC-601	Power electronics	60	30	10	30	20	2	1	2	4	150
2	EEC-602	Electrical Drives	60	30	10	30	20	2	1	2	4	150
3	EEC-603	Power System protection	60	30	10	30	20	2	1	2	4	150
4	EEC-604	Department Elective-III	60	30	10			2	1		3	100
5	EEC-605	Department Elective-IV	60	30	10			2	1		3	100
6	EEC-606	Open Elective	60	30	10			2	1		3	100
7	EEC-607	Industrial Training Project-I				100				4	2	100
TOTAL			360	180	60	190	60	12	6	10	23	850

Department Elective III-EEC-604	EEC-604(A) Neural Networks	EEC-604(B) Energy Conservation	EEC-604(C) Reactive Power Control & FACTS
Department Elective IV-EEC-605	EEC-605(A) High Voltage Engineering	EEC-605(B) Special Machines	EEC-605(C) Design for Testability
Open Elective -EEC-606	EE- 606(C) - Artificial Intelligence	EEC-606(B) OPERATING SYSTEM	EEC-606(C) Power Controller

EXC 601 – Power Electronics

Unit-I Power Electronic Devices: Power diodes, power transistors, GTO, Triac, Diac, Power MOSFET, IGBT, LASCR, Fast recovery diode, schottey diode, construction, principle , operation & characteristics of SCR, Two transistor analogy, turn on & off of SCR, commutation techniques (Class A,B,C,D,E, & F Commutation), UJT, ramp triggering, SCR raring & protection, snubber circuit, heating, cooling & mounting of SCR, series and parallel operation of SCR, String efficiency.

Unit-II Rectifier: Single phase half wave & full wave uncontrolled and controlled rectifier circuit with resistive, resistive & inductive load (continuous & non continuous conduction), & RLE loads, average load voltage and load current, active and reactive power, effect of free wheeling diode and source inductance, comparison of mid poim & bridge rectifier circuits.

Unit-III Inverter: 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.

Unit-IV Chopper: Chopper operation, Step up & step down choppers, chopper configuration (A, B, C, D, & E), Steady state analysis, Current & voltage commutation of chopper circuits, Jones & Morgens chopper.

Unit-V AC voltage controllers: AC voltage controllers using SCRs & traics, single phase full wave controller with R and RL load, RMS load voltage, load current and input power factor, three phase AC voltage controller, Dual converter, Switched mode voltage regulator, buck, Boost, & Chuck regulators, Single phase & three phase cyclo convertor.

References:

1. M.H. Rashid, Power Electronics Circuits, Devices and Applications, Pearson
1. 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.
6. P.S. Bhimbhra, Power Electonics, Khanna Pub.
7. Vedam Subramanyam, Power Electronics New Age International Revised II ed. 2006.

List of Experiments (Extendable):

1. To study V-I characteristics of SCR.
2. To study UJT trigger circuit for half wave and full wave control.
3. To study single-phase half wave controlled rectified with R load (ii) L load with and without freewheeling diode.

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4. To study single phase (i) fully controlled (ii) half controlled bridge rectifiers with resistive and inductive loads.
5. To study single-phase ac voltage regulator with resistive and inductive loads.
6. To study single phase cyclo-converter.
7. To study triggering of (i) IGBT (ii) MOSFET (iii) power transistor.
8. To study three-phase fully/half controlled bridge rectifier with resistive and inductive loads.

EXC- 602 Electrical Drives

Unit I- Introduction to Electric Drives: Elements of drive systems, requirement of electric drives, rating & selection of drives, groups and individual drives, constant power and constant torque drives. Review of characteristics of AC & DC motors, load torque, load-drive, speed torque characteristics, quadrant speed torque characteristics, load equalization, stability of electric drives, moment of inertia and torque of motor load combination.

Unit II-DC Drives: Starting, braking, transient & steady state analysis phase controlled and chopper controlled drives, speed control, energy recovery systems, dual converter.

Unit III- Induction Motor Drives: Starting braking and speed control, PWM, voltage source inverter and current sources fed im drives, cyclo converter fed drive, vector control drives, slip power recovery, conventional control methods, rotor impedance control, converter controlled-Static Scherbius & Static Krammers drives.

Unit IV- Synchronous Motors Drives: Starting, braking, transient analysis, synchronous motors variable speed drives, V/F control, cyclo converter fed synchronous motor drive.

Unit V- Special Motor Drives: Fundamentals of switched reluctance motors, stepper motors, permanent magnet motor, vector control, digital control of drives.
Traction: Electric traction, machine tool drive, electric cars, steel & cements plants, textile & paper mills.

References:

1. O.K. Dubey "Fundamentals of Electrical Drives"-. Narosa Publications
2. 2. Gopal K. Dubey "Power semiconductor Controlled Drives"- PHI
3. S.K. Pillai, "A first course of Electrical Drive" New age International.
4. Ned Mohan Electrical Drive Wiley India
5. V. Subramanyam "Thyristor control of Electric Drive" Tata Mc Graw Hill Pub.
6. S.Shiva Nagaraju power semiconductor drive PHI learning

List of Experiments:

1. To study the starting and running characteristics of converter fed DC traction motor.
2. To study the energy recovery systems and braking of a DC drive.
3. To study the braking methods of a three-phase induction motor.
4. To study the performance of VSI fed three-phase induction motor using PWM technique.
5. To control the speed of a three phase slip ring Induction motor using rotor impedance control.
6. To study the performance of Vector Controlled three phase Induction motor drive.
7. To Study frequency Controlled Synchronous motor drive

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EXC-603 Switchgear and Protection

Unit I Faults: Introduction, need for protective schemes, nature and cause of faults, types of fault, per unit representation, analysis of symmetrical fault, current limiting reactors, current transformers, potential transformers and their applications in their protection schemes.

Unit II Protective Relays :Requirement of relays, universal torque equation, non directional and directional over current relays, earth fault relays, distance relays ,impedance, mho and reactance relays, differential relays ,negative sequence relays ,under frequency relays, static relays, microprocessor and computer based protective relaying, apparatus and line protection: alternator, transformer, bus bar and motor protection using relay, feeder protection, radial and ring main system, microprocessor based protective schemes.

Unit III Circuit Breakers: Functions of switchgear, elementary principles of arc extinction ,arc control devices, recovery voltage and restriking voltage, current chopping and capacitance current breaking, bulk oil, low oil, air break, air blast, and sulphur hexafluoride and vacuum circuit breakers , HVDC breakers, rating, testing of circuit breakers.

Unit IV Surge Protection: Switching surges, lightning phenomenon, traveling waves on transmission lines, over voltage due to lightning, protections against lightning, lightning arresters ,types ,lightning arrester selection ,surge absorbers.

Unit V Earthing and Insulation Co-Ordination: Solid, resistance and reactance earthing, arc suppression coil, earthing transformers, earth wires, earthing of appliances, insulation coordination: determination of line insulation, insulation levels of sub-station equipment, co-ordination amongst items of substation equipment, introduction to Indian electricity rules.

References:

1. CL Wadhwa. Electrical Power systems, New age International.
2. B. Ravindran and M Chander, Power System protection and Switchgear, New Age International reprint 2006.
3. Badrirka, Power System protection and switchgear, TMH
4. Haddi Saadet, Power System Analysis, TMH
5. Switchgear & protection Sunil S. Rao. Khanna Publication

List of Experiments:

1. Determination of drop out factor of an instantaneous over current relay.
2. Determination of operating characteristic of IDMT relay.
3. Determination of operating characteristic of differential relay.

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4. Study and operation of gas actuated protective relay.
5. Study and operation of static over current relay.
6. Analysis of power system faults (Symmetrical & Asymmetrical) using MATLAB.
7. Study of SF6 circuit breaker
8. Protectional simulation study of generator, Transformer, Feeder & Motor protection.

Elective-I EXC-604(A) Neural Networks

Unit-I

Neural Network (NN) Introduction, benefits of neural network, models of a neuron, neural network as directed graph, network architectures, artificial intelligence and neural network. Learning processes: error correction learning, memory based learning, Hebbian learning, competitive learning, Boltzman learning, learning tasks, adaptation, statistical nature of learning process, statistical learning theory.

Unit-II

Perceptrons Single layer perceptrons: adaptive filtering problem, unconstrained optimization technique, linear least squares filter, least mean square algorithm (LMS), perceptron convergence theorem Multi layer perceptron: architecture, back propagation algorithm, generalization, approximations of functions, network pruning techniques.

Unit-III

Radial Basis Function (RBF) Networks Cover's theorem on the separability of patterns, interpolation problem, supervised learning as an ill-posed hyper surface reconstruction problem, regularization theory, regularization network, generalized radial basis function networks (RBF), estimation of the regularization parameter, approximation properties of RBF networks, comparison of RBF networks and multilayer perceptrons, Kernel regression and its relation to RBF networks, learning strategies.

Unit-IV

Information- Theoretic Models Entropy, maximum entropy principle, mutual information, Kullback-Leibler divergence, mutual information as an objective function to be optimized, maximum mutual information principle, infomax and redundancy reduction, spatially coherent and incoherent features, independent components analysis, maximum likelihood estimation, maximum entropy method.

Unit V

Dynamically Driven Recurrent Networks introduction, recurrent network architectures, state space model, non-linear autoregressive with exogenous inputs model, computational power of recurrent networks, learning algorithms, back propagation through time, real time recurrent learning, Kalman filter, decoupled Kalman filter, vanishing gradients in recurrent networks, system identification, model reference adaptive control.

References: 1. Haykin: Neural Networks- A Comprehensive Foundation, PHI Learning.

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2. Sivanandam, Sumathi and Deepa: Introduction to Neural Networks using Matlab, TMH.

3. Freeman and Skapura: Fundamentals of Neural Networks- algorithms, applications and programming techniques, Pearson Education.

4. Hagan, Demuth and Beale: Neural Network Design, Cengage Learning.

5. Anderson: An introduction to Neural Networks, PHI Learning.

6. Satish Kumar: Neural Networks, TMH.

EX 604 (B) – Energy Conservation

Unit-I General Energy Problem: Energy use patterns and scope for conservation, energy audit, energy monitoring, energy accounting analysis, and targeting, energy management, types of energy audit, qualities and function of energy managers, language of an energy manager, check list for top management, loss of energy in material flow, energy performance, maximizing system efficiency, input energy requirements, energy auditing instruments, material load energy balance diagram.

Unit- III Thermodynamics of Energy Conservation: Basic principle, irreversibility, second law, efficiency analysis of systems, primary energy sources, optimum use of prime-movers, energy recovery in thermal systems, waste heat recovery techniques, thermal insulation, thermal energy audit in heating, ventilation and air conditioning, friction, lubrication, predictive and preventive maintenance.

Unit-III Load curve analysis: 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, pay back period, energy economics, cost benefit risk analysis,

Unit-IV Energy Efficient System: Energy efficient electric drives, energy efficient house keeping, energy efficient motors, energy flow networks, simulation & modeling, matrix chart.

Unit-V Energy conservation: Energy conservation policy, energy conservation task before industry, energy conservation equipment's , co-generation, energy conservation process, energy conservation in transportation system in electric vehicle industry, sugar, textiles, cement industries, electrical energy conservation in building, heating, lighting & domestic gadgets .

References:

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.

EXC-404(C) Reactive Power Control & FACTS

UNIT-I

Introduction: Facts basic concepts and general system considerations, power flow in ac system, definitions on facts, basic types of facts controllers, benefits from facts Technology, static var compensator (SVC): principle of operation and control strategy, thyristor controlled phase angle regulator (TCPAR): principle of operation and control strategy.

UNIT-II

Transient Stability Analysis: Analysis of Power systems installed with FACTS devices, Control with FACTS: Power Transmission Control using UPFC, power transmission control using phase shifting transformer (PST), power transmission control using SSSC.

UNIT-III

Oscillation Stability Analysis and Control with FACTS: Linearised model of power systems installed with FACTS based stabilizers, Heffron-Phillips model of a SMIB system installed with SVC, TCSC and TCPS, Heffron-Phillips model of a SMIB system with UPFC, Heffron-Phillips model of a multi-machine system installed with SVC, TCSC and TCPS.

UNIT-IV

Design of FACTS based stabilizers: Analysis of damping torque contribution by FACTS based stabilizers installed in SMIB systems, selection of installing locations and feedback signal for FACTS based stabilizers, Dynamic Voltage restorer.

UNIT-V

Power flow Controller: Unified Power Flow Controller (UPFC), principle of operation, configuration and control, simulation of UPFC, steady state model of UPFC, interline power flow controller (IPFC), principle of operation, configuration and control, static compensator (STATCOM), principle of operation and control, application for mitigation of SSR.

References:

1. "Understanding FACTS Devices" N.G. Hingorani and L. Gyugi. IEEE Press Publications 2000.

2. Flexible AC Transmission System: Y.H.Song and A.T.Johns, IEE, 1996(A Book)

3. Dr Ashok S & K S Suresh Kumar "FACTS Controllers and applications" course book for STTP, 2003.

4. Ned Mohan et.al, Power Electronics, John Wiley and Sons.

5. K. R. Padiyar, FACTS Controllers in Power Transmission and Distribution, New Age International. First Edition.

EXC-605(A) High Voltage Engineering

Unit –I Introduction: Basics of HV technology, advantages of transmitting electrical power at high voltages, need for generating high voltages in laboratory, applications of high voltage.

Unit –II Insulation & Breakdown: Classification of HV insulating media, its properties, gaseous dielectrics, ionizations. Townsend's theory & its limitations, 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, suspended particle theory, electronic breakdown, electro convection breakdown, caviry breakdown (bubble's theory).

Unit –III High Voltage AC DC : HV AC transformer, need for cascade connection, working of transformers units connected in cascade, series resonant circuit, principle of operation and advantages, tesla coil, HV DC voltage doubler circuit, Cock Croft- Walton type high voltage DC set.

Unit –IV: Impulse Voltage and current Introduction to standard lightning and switching impulse voltages, analysis of single stage impulse generator, expression for output impulse voltage, multistage impulse generator, its components, triggering of impulse generator by three electrode gap arrangement, triggering gap, oscillograph time sweep circuits, generation of switching impulse voltage, generation of high impulse current.

Unit –IV High Voltage Tests on Electrical Apparatus: Definitions of technologies, tests on isolators, circuit breakers, cables insulators and transformers.

Unit –V Measurement of High Voltages: Electrostatic voltmeter, generating voltmeter, series resistance micro ammeter, HV DC measurements, standard sphere gap measurements of HV AC & HV DC, potential dividers, resistance dividers, capacitance dividers, mixed RC potential dividers, surge current measurement.

References:

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 Easternlimited, 1987.
5. Transmission and distribution reference book-Westing House.
6. C.L.Wadhwa, High voltage engineering, New Age International Private limited, 1995.

EXC-605(B) Special Machines

UNIT I

Square wave permanent magnet brushless dc motor, magnetic circuit analysis on open circuit torque & emf equations, torque speed characteristics, efficiency, commutation, winding inductances, armature reaction and controllers.

UNIT 2

Sine wave permanent magnet brushless dc motor, torque & emf equation, Inductance of phase winding, synchronous reactance, phasor diagram, torque-speed characteristics.

UNIT 3

Switched reluctance motor, static torque production, partition of energy and the effects of saturation, Dynamic torque production, torque speed characteristics, shaft position sensing, solid rotors.

UNIT 4

Linear Induction Motors, construction, performance, thrust-speed characteristic, application, end effect.

UNIT 5

Stepper motor – variable reluctance stepper motor, single stack stepper motor multistack stepper motor, permanent magnet stepper motor, Important features of stepper motor, torque v/s stepping rate characteristics, Drive circuits, unipolar drive circuits, Bipolar drive circuits.

Reference Books:

1.Brushless Permanent Magnet & Reluctance Motor Drives – T.J.E.Miller
2.Principles of Electric Machines & Power Electronics – P.C.Sen
3.Electric Drives – G.K.Dubey

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EXC-605 (C) Design for Testability

UNIT- I

Introduction to Testing Process:CMOS Testing, Reliability, Failures & Faults, Levels of Testing, Test economics, Elementary Testing Concepts, System and Field Testing, Burn in boards.

UNIT- II

Logic Simulation & Fault modelling: Delay Models, Event driven simulation, general fault simulation, fault detection and redundancy, fault equivalence and fault dominance. Stuck-at faults, bridging faults, transistor faults, delay faults etc. Fault detection using Boolean Difference, Path Sensitization, Fault Collapsing

UNIT- III

Test generation for combinational & sequential circuits:D-algorithm, PODEM, SPOOF. Automatic Test Pattern Generation. Primitive and Propagation Cubes. Fanout Oriented Test Generation.

Controllability and Observability. Testing of sequential circuits as iterative combinational circuits, state table verification, random testing.

UNIT- IV

Design for testability: Ad-hoc methods, Full scan & Partial scan design. Boundary scans. Testability analysis.

UNIT- V

Built-in self-test & IDDQ testing: RAM BIST, Logic BIST Random and weighted random pattern testability BIST Pattern generator and response analyzer Scan-based BIST architecture Test point insertion for improving random testability. IDDQ testing, IDDQ test patterns, IDDQ measurement Case studies, Design for IDDQ testability

TEXT / REFERENCE BOOKS:

- N. Weste and K. Eshraghian, Principles of CMOS VLSI design, Addison-Wesley.
- Parag K. Lala, Fault Tolerant and Fault Testable Hardware Design, BS Publication.

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Open Elective

EXC-606(A) Artificial Intelligence

Unit 01: Introduction: Organization of the brain, biological neuron, biological and artificial neuron models, historical developments, essentials of artificial neural networks, artificial neuron model, operations of artificial neuron, types of neuron activation function, ANN architectures

Unit 02: Classification Taxonomy of ANN: Connectivity, neural dynamics (activation and synaptic), learning strategy (supervised, unsupervised, reinforcement), learning rules, perceptron models, training algorithms: discrete and continuous perceptron networks, perceptron convergence theorem, multilayer feed forward neural networks

Unit 03: Memory: Associative memory, bi-directional associative memory, architecture, BAM training algorithms, storage and recall algorithm, BAM energy function, self-organizing maps (SOM) and adaptive resonance theory (ART).

Unit 04: Fuzzy Logic system: Fuzzy versus crisp, fuzzy sets, membership function, basic fuzzy set operations, properties of fuzzy sets, fuzzy relations, fuzzy control, predicate logic (interpretation of predicate logic formula, inference in predicate logic), fuzzy logic (fuzzy quantifiers, fuzzy inference), fuzzy rule based system, defuzzification methods.

Unit 05: Intelligent Tools: Introduction to genetic algorithm, biological background, GA operators, selection, encoding, crossover, mutation, chromosome, expert system, software architecture, rule base system.

References:

1. Simon Haykin, "Neural Networks: A Comprehensive Foundation", 2nd Edition, Pearson Education
2. S. Rajsekaran, G. A. Vijayalaxmi Pai, "Neural Networks, Fuzzy Logic & Genetic Algorithms Synthesis & Applications", Practice Hall India
3. James A. Anderson. "An Introduction to Neural Networks", Practice Hall India Publication
4. Mohamed H. Hassoun, "Fundamentals of Artificial Neural Network", Practice Hall
5. Kelvin Warwicke, Arthur Ekwlle, Raj Agarwal, "AI Techniques in Power System", IEE London U.K.
6. S. N. Sivanandam, S. Sumathi, S. N. Deepa, "Introduction to Neural Network Using MATLAB 6.0", Tata McGraw Hill.

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EXC-406(B) OPERATING SYSTEM

UNIT I

Introduction:- History of operating System, Types of Operating System: Batch Processing, Real Time, Multitasking & Multiprogramming, Time-sharing system. Operating system services. Operating system structure. System Call & System Boots, Operating system design & Implementations, System protection, Buffering & Spooling.

UNIT II

Processes Management:- The Process concept, The process control block, Systems programmer's view of processes, Operating system services for process management, Scheduling algorithms, First Come first serve. Round Robin, Shortest run time next, Highest response ratio next, Multilevel Feedback Queues, Performance evaluation of scheduling algorithms stated above.

UNIT III

Deadlock:- Characterization, Methods for deadlock handling, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock, Process Management in Linux. File Management:- File system, access methods, free space managements, allocation methods, directory systems, protection, organization, sharing & implementation issues, Disk & Drum Scheduling, File system in Linux & Windows

UNIT IV

I/O Management:- I/0 devices organization, I/0 devices organization, I/0 buffering, I/O Hardware, Kernel I/O subsystem, Transforming I/O request to hardware operations. Device Management:- Path managements, Sub module, Procedure, Scheduler, Handler, Interrupt Service Routine.

UNIT V

Memory Management:- Memory Hierarchy, MFT & MVT, logical and physical address space, Concept of swapping and Paging, Memory management without swapping or paging, contiguous and non-contiguous allocation, segmentation, demand paging, page replacement algorithms, allocation of frames, thrashing, demand segmentation and paging combined with segmentation. Structure & implementation of Page table, Virtual memory, Cache Memory Organization.

REFERENCES:

1. Silberschatz ,"Operating system", Willey Pub.

2. Stuart,"Operating System Principles, Design & Applications",Cengage Learning.

3. Tannanbaum, "Modern operating system",PHI Learning.

EXC-606(C) Power Controller

UNIT 1

Various power semiconductor devices i.e. SCR, GTO, MOSFET, BJT, IGBT & MCT's & their protection, series-parallel operation. Heat sink calculations, Design of firing circuit for converters, choppers & inverters.

UNIT 2

Analysis & design of 1-φ bridge converter, 3-φ bridge converter with and without freewheeling diode, effect of source impudence, power factor improvement techniques, and pulse width modulated converters, Dual converters, converter for HVDC application & DC drives.

UNIT 3

Analysis & design of voltage commutated, current commutated and load commutated choppers, multiquadrant choppers, chopper for traction application. Resonant choppers, SMPS.

UNIT 4

Detailed analysis of 1-φ VSI, 3-φ VSI (180° mode, 150° mode & 120° mode of conduction), various inverter commutation circuits, harmonic reduction techniques, PWM inverters, Inverters for HVDC application & AC drives. Advantages & limitation of current source inverters over VSI, 1-phase and 3-phase CSI. Resonant inverters.

UNIT 5

1-φ to 1-φ, 3-φ to 3-φ cycloconverter circuits, circulating current scheme, non-circulating current operation, Mean output voltage, harmonics in supply current waveform & input-power factor. Concept of power quality

Reference Books :

1. Thyristorised Power Controllers - G.K.Dubey, Doradla, Joshi, Sinha
2. Power Electronics - C.W.Lander
3. Power Electronics - Rashid
4. Thyristorised power controlled converters & cycloconverters - B.R.Pelly
5. Power Electronics - N.Mohan
6. Power Electronics Application - Vidyasahil.

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SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES

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Approved by Madhya Pradesh Private University Regulatory Commission
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(Minutes of the Board of Studies Committee Meeting)

School Of Engineering

Department of Electrical and Electronics Engineering

Minutes of Board of Studies Committee Meeting Dated : 03.05.2018

The Board of Studies Committee Meeting was held in the room of HOD (EX) at 10:30 AM on 03.05.2018. Following members were present.

1. Mr. Mukesh Tiwari
2. Mr. Vijay Prakash Singh
3. Mr. Prabodh Khampariya
4. Ms. Alka Thakur
5. Mr. Devendra Patle
6. Ms. Jyotsna Sagar
7. Mr. Sandesh Pradhan (external)
8. Dr. N.P. Patidar (External)

The Chairman of Board of Studies Committee welcomes and appreciated the efforts put up by the faculty for progress of the departmental activities. The following Agenda points were discussed and resolved.

Agenda 1. Approval of EX-5 semester Scheme and Syllabus (CBCS)

Discussion (If any) : Scheme and Syllabus should be prepared as per current demand in industry.

Resolution of the Discussion : Scheme and Syllabus was prepared as per current demand in industries and was approved for forthcoming 5 semester

The Chairman thanks the members for peaceful conduction of meeting.

Signature of All members (Including chairman)

1. Dr. Mukesh Tiwari
2. Mr. Vijay Prakash Singh
3. Dr. Prabodh Khampariya
4. Ms. Alka Thakur
5. Mr. Devendra Patle
6. Ms. Jyotsna Sagar
7. Mr. Sandesh Pradhan (External)
8. Dr. N.P. Patidar (External)

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Scheme of Examination - CBCS Pattern

Academic Year 2018- 2019

Branch : Electrical and Electronics Engineering **Semester - V**

S.No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Periods/ hour/ week			Credits	Total Marks
			End Sem. Exam.	Mid Tests	Assignments/Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation	L	T	P		
1	EEC-501	Electrical Machine-II	60	30	10	30	20	2	1	2	4	150
2	EEC-502	Power System Analysis	60	30	10	30	20	2	1	2	4	150
3	EEC-503	Control System	60	30	10	30	20	2	1	2	4	150
4	EEC-504	Department Elective-I	60	30	10			2	1		3	100
5	EEC-505	Department Elective-II	60	30	10			2	1		3	100
6	EEC-506	Open Elective	60	30	10			2	1		3	100
7	EEC-507	Industrial Training - I					100			4	2	100
TOTAL			360	180	60	90	160	12	6	10	23	950

Department Elective I-EEC -504	EEC-504(A) Solar PV Application	EEC-504(B) Power Quality	EEC-504(C) Entrepreneurship Development
Department Elective II-EEC-505	EEC-505(A) Digital signal processing	EEC-505(B) Advanced Microprocessor	EEC-505(C) Demand side management
Open Elective -EEC-506	EEC-506(A) Utilization of Electrical Energy	EEC-506(B) Embedded System	EEC-506(C) Fuzzy Logic System

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EXC 501- Electrical Machine-II

Unit 1 - Basics of Synchronous Machine: Construction & working principle, types of prime movers, excitation system, polyphase distributive winding, coil span and winding factors , integral and fractional slot windings; emf equation, 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 A.S.A method.

Unit II - Synchronous Machine- I: Salient pole machines, two reaction theory equivalent circuit model and phasor diagram, determination of Xd and Xq by slip test, power angle equation and characteristics, synchronizing of alternator with infinite busbar, parallel operation and load sharing, synchronizing current, synchronizing power and synchronizing torque coefficient, synchroscopes and phase sequence indicator; effect of varying excitation and mechanical torque.

Unit III - Synchronous machine-II: Synchronous motor operation, starting and stopping of synchronous motor, pull in & pull out torque, motor under load power and torque, reluctance torque, effect of excitation, effect of armature reaction, power factor adjustment, V curves, inverted V curves, super synchronous and sub synchronous motors, hunting, damper winding, efficiency and losses.

UNIT IV- Short Circuit Ratio: SCR and its significance, short circuit oscillogram, determination of various transient, sub transient, steady reactances and time constants, expression of transient and sub transient reactances w.r.t self and mutual inductances of various winding, short circuit current, equivalent circuit.

Unit V- Special Electrical machines: PM brushless DC motor, switched reluctance motor, linear induction motor, stepper motor, their constructional features, principle of operation & applications.

References:

1. P.S. Bimbhra, Generalised Theory of Electrical Machines.
2. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002.
3. Electrical Engineering by JB Gupta, SK Kataria & sons, New Delhi
4. Fitzgerald, C.Kingslay, S.D. Umans, Electric machinery ,5th Ed., McGraw Hills, 1992
5. Electrical Machines, Ashfaq Hussain ,2014

List of Experiments :(Extendable)

1. Study of torque step rate characteristic of a stepper motor.
2. Study of Characteristic of switched reluctance motor.
3. To determine regulation of alternator using mmf and zpf methods.
4. To synchronise alternator with infinite bus bar.
5. To plot V and inverted V curves for a synchronous motor.
6. To find Xd and Xq of salient pole synchronous machine by slip test.

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EXC-502 Power System Analysis

Unit-I Mechanical Features of Overhead Lines: Conductor material and types of conductor, conductor arrangements and spacing, calculation of sag and tension, supports at different levels, effect of wind and ice loading, stringing chart and sag template, conductor vibrations and vibration dampers.

Unit-II Parameters of Transmission Lines: Resistance, inductance and capacitance of overhead lines, effect of earth, line transposition, GMD and distance, inductance and capacitance of line with symmetrical and unsymmetrical spacing, inductance and capacitance of double circuit lines, skin and proximity effects, equivalent circuits & performance of short, medium and long transmission lines.

Unit-III Insulators: Pin, shackle, suspension and strain insulators, voltage distribution across insulator string, grading and methods of improving string efficiency.

Unit-IV Underground Cables: Conductor, insulator, sheathing and armoring materials, types of cables, insulator resistance and capacitance calculation, electrostatic stresses and reduction of maximum stresses, causes of breakdown, thermal rating of cable, introduction to oil filled and gas filled cables.

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, calculation of cost of generation, fixed charges, interest and depreciations methods of depreciation, power factor improvement.

References:

1. B. R. Gupta: Power System Analysis & Design, S. Chand Publishers. 2008
2. Soni, Gupta and Bhatnagar: A Course in Electrical Power, Dhanpat Rai. 1987
3. C. L. Wadhwa Electrical Power Systems, New Age. 2009
4. Nagrath Kothari: Modern Power System Analysis, MGH. 2011
5. J. J. Grainger & W. D. Stevenson: Power System Analysis, MGH. 2003
6. Kamaraju: Electrical Power Distribution Systems, MGH.

List of Experiment (Extendable):

1. Electrical design of transmission line.
2. Mechanical design of transmission line.
3. Drawing of Tower structure.
4. Drawing of insulators.
5. Drawing of cables.
6. Determination of transmission line parameters using MATLAB.

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EXC- 503 Control Systems

Unit I Introduction to Control System & Classification : Differential equations of systems, linear approximation, laplace transform and transfer function of linear system, model of physical system (electrical, mechanical and electromechanical), block diagram, signal flow graph, mason's gain formula, return difference and return ratio, error detectors, servomotor, tachogenerator, servo amplifier , magnetic amplifier, rotating amplifier.

Unit II Time Domain Analysis: Representation of deterministic signals, first order system response, s- plane root location and transient response, impulse and step response of second order systems, performance characteristics in the time domain, effects of derivative and integral control, steady state response, error constant, generalized definition of error coefficients, concepts of stability, Routh Hurtwitz criterion.

Unit III Frequency Domain Analysis: Frequency response bode plot, polar plot, nicol's chart, closed loop frequency response, frequency domain performance characteristics, and stability in the frequency domain, nyquist criterion.

Unit IV Root Locus Method: Basis theory and properties of root loci, procedure for the construction of root loci, complete root locus diagram, design and compensation of feed back control system, approaches to compensation, cascade compensation networks and their design in the frequency domain, simple design in s- plane.

Unit V State Variable Methods: Introduction to state variable concepts, state variable description of linear dynamic systems, representation in matrix forms, block diagram and signal flow graph representation of state equations – transfer matrix from state equations, transition matrix, general solution for linear time invariant state equations, basic principles of adaptive control systems.

References:

1. Ogata K, "Modern Control Engineering ", Prentice Hall
2. KUO B.C, "Automatic Control System", Prentice Hall
3. Nagarath & Gopal," Control System Engineering," Wiley Eastern
4. Bakshi & Goyal. Feedback control system, Technical publication.

List of Experiment (Extendable):

1. To determine speed torque characteristics of armature controlled D.C. servomotor.
2. To determine the speed torque characteristics and relationship between torque speed and control windings voltage by AC servomotor.
3. To obtain the step response transient characteristics of first order electric system and to measure system parameters.
4. To plot the nyquist plot of a given transformer function using matlab.
5. To plot the bode plot of a given transformer function using matlab.

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EXC-504(A) Solar PV Application

UNIT-I

Introduction to photovoltaic (PV) systems. Historical development of PV systems. Overview of PV usage in the world, Solar energy potential for PV, irradiance, solar radiation and spectrum of sun, geometric and atmospheric effects on sunlight, Photovoltaic effect, conversion of solar energy into electrical energy, behavior of solar cells,

UNIT -II

Solar cells, basic structure and characteristics: Single-crystalline, multi-crystalline, thin film silicon solar cells, emerging new technologies, Electrical characteristics of the solar cell, equivalent circuit, modeling of solar cells including the effects of temperature, irradiation and series/shunt resistances on the open-circuit voltage and short-circuit current.

UNIT-III

Solar cell arrays, PV modules, PV generators, shadow effects and bypass diodes, hot spot problem in a PV module and safe operating area. Terrestrial PV module modeling, Interfacing PV modules to loads, direct connection of loads to PV modules, connection of PV modules to a battery and load together, Energy storage alternatives for PV systems. Storage batteries, lead-acid, nickel-cadmium, nickel-metal-hydride and lithium type batteries. Small storage systems employing ultracapacitors, charging and discharging properties and modeling of batteries,

UNIT IV

Power conditioning and maximum power point tracking (MPPT) algorithms based on buck- and boost-converter topologies, Maximum power point tracking (MPPT) algorithms, Inverter control topologies for stand-alone and grid-connected operation. Analysis of inverter at fundamental frequency and at switching frequency. Feasible operating region of inverter at different power factor values for grid-connected systems.

UNIT V

Stand-alone PV systems. Consumer applications, residential systems, PV water pumping, PV powered lighting, rural electrification, etc., Grid-connected (utility interactive) PVsystems. Active power filtering with real power injection, Modeling and simulation of stand-alone and grid-connected PV systems.

References:

1.A. Goetzberger, V. U. Hoffmann, Photovoltaic Solar Energy Generation, Springer-Verlag, 2005.

2.L. Castaner, S. Silvestre, Modeling Photovoltaic Systems Using PSpice,John Wiley & Sons, 2002.

3.R. J. Komp,
Practical photovoltaics: electricity from solar cells, 3rd ed., Aatec Publications, 2001.

4.M. R. Patel, Wind and Solar Power Systems, CRC Press, 1999.

5.R. H. Bube,
Photovoltaic Materials, Imperial College Press, 1998.

6.T. Markvart, Solar Electricity, John Wiley & Sons, 1994.

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EX- 504(B) POWER QUALITY

UNIT-I

Introduction, power quality -voltage quality, power quality evaluations procedures term and definition: general classes of power quality problem, causes & effect of power quality disturbances.

UNIT-II

Voltage sags and interruption: sources of sags and interruption, estimating voltages sag performance, fundamental principles of of protection, monitoring sags.

UNIT-III

Transients over voltages: sources of transient over voltages, principles of over voltages protection, utility Capacitor switching transients, fundamentals of harmonics and harmonics distortion, harmonics sources from commercial load and from industrial loads.

UNIT-IV

Applied harmonics : harmonics distortion evaluations, principles for controlling harmonics, harmonics studies devices for controlling harmonic distortion, filters, passive input filter standards of harmonics.

UNIT-V

Electro-magnetic compatibility, constant frequency control, constant tolerance band control, variable tolerance band control, discontinuous current control.

Reference Books:

1. Power Quality- by R.C. Duggan
2. Power System harmonics –by A.J. Arrillga
3. Power electronic converter harmonics –by Derek A. Paice

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EXC-504(C) Entrepreneurship Development

UNIT-I

Introduction, Meaning and Imporiance, Evolution of term 'Entrepreneurship', Factors influencing entrepreneurship', Psychological factors, Social factors, Economic factor, Environmental, factors, Characteristics of an entrepreneur, Entrepreneur and Entrepreneur, Types of entrepreneur, According to Type of Business, According to Use of Technology, According to Motivation According to Growth, According to Stages, New generations of entrepreneurship viz. social entrepreneurship,

UNIT-II

Entrepreneurial Motivation, Maslow's theory, Herjburg's theory, McGregor's Theory, McClelland's Need Achievement Theory, Culture & Society Values / Ethics Risk taking behavior

UNIT-III

Creativity Creativity and entrepreneurship Steps in Creativity ,Innovation and inventions Using left brain skills to harvest right brain ideas Legal Protection of innovation Skills of an entrepreneur, Decision making and Problem Solving (steps indecision making)

UNIT-IV

Organisation Assistance, Assistance to an entrepreneur, New Ventures ,Industrial Park (Meaning, features, & examples) Special Economic Zone (Meaning, features & examples),Financial assistance by different agencies MSME Act, Small Scale Industries, Carry on Business (COB) license Environmental Clearance, National Small Industries Corporation (NSIC)

UNIT-V

Rules and Legislation, Applicability of Legislation, Industries Development (Regulations) Act, Factories Act, 1948,The Industrial Employment (Standing Orders) Act, 1946, Suspension, Stoppage of work, Termination of employment

References:

1.Abhishek nirjar "Entrepreneurship Development" word press

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EX-505(A) Digital Signal Processing

Unit I- Discrete-Time Signals and Systems: Discrete-time signals, discrete-time systems, analysis of discrete-time linear time-invariant systems, stability and causality, discrete time systems described by difference equation, solution of difference equation, implementation of discrete-time systems ,block diagrams and flow graph, convolution representation of digital network, matrix representation.

Unit II- The Z-Transform: The Direct z-transform, properties of the z-transform, , inversion of the z-transform, rational z-transforms, ROC and their properties, analysis of linear time-invariant systems in the z- domain , convolution theorem, parseval's relation, laplace transform, properties of laplace transform.

Unit III- Frequency Analysis of Discrete Time Signals: Discrete Fourier Series (DFS), properties of the DFS, Discrete Fourier Transform (DFT), properties of DFT, two dimensional DFT, circular convolution.

Unit IV- Computation of the DFT: FFT algorithms, decimation in time algorithm, decimation in frequency algorithm, linear Convolution using DFT, decomposition for 'N' composite number.

UnitV- FIR Filters: Analog filter Design, Butterworth & Chebyshev, design of IIR and FIR digital filters, impulse invariant and bilinear transformation, , Henning, Hamming & Kaiser, Windowing, rectangular and other windows, examples of FIR filters, design using Windows.

References:

1. A.V. Oppenheim and R. W. Schafer: Digital Signal Processing, Prentice Hall.
2. L.R. Rabiner and B. Gold: Theory and Application of Digital Signal Processing, Prentice Hall
3. John. G. Proakis and Monolakis: Digital Signal Processing, Pearson Education
4. Johnny R. Johnson: Introduction to Digital Signal Processing, PHI, New Delhi.
5. S. Ghosh: Signal and Systems, Pearson Education.
6. Schilling and Harris: Fundamentals of DSP using MATLAB, Cengage Learning

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EXC-505 B Advance Microprocessors

UNIT I- Introduction to Microprocessors and Microcontrollers
Review of basics microprocessor, architecture and instruction set of a typical 8 bit microprocessor, Overview of 16 bit & 32 bit microprocessors, arithmetic and I/O coprocessors. Architecture, register details, operation, addressing modes and instruction set of 16 bit 8086 microprocessor, assembly language programming, introduction to multiprocessing, multi-user, multitasking operating system concepts, Pentium-1,2,3 and 4 processors, Motorola 68000 processor, Concepts of micro controller and micro computer, microcontroller (8051/8751) based design, applications of microcomputer in on line real time control.

UNIT II- Input-Output Memory Interfacing
Parallel and series I/O, Interrupt driven I/O, single and multi interrupt levels, use of software polling and interrupt controlling for multiplying interrupt levels, programmable interrupt controller, DMA controller, programmable timer/counter, programmable communication and peripheral interface, synchronous and asynchronous data transfer, standard serial interfaces like RS 232. Types of Memory, RAM & ROM interfacing with timing considerations.

UNIT III- Programmable Support Chips
Functional schematic operating modes, programming and interfacing of 8255, 8251 , 8259 and 8253 with microprocessor.

UNIT IV- Analog Input & Output
Microproeessor compatible ADC and DAC chips, interfacing of ADC and DAC with microprocessor, user of sample and hold circuit and multiplexer with ADC.

UNIT V- Microprocessor Applications
Application of Microprocessors, Microcomputer-based Industrial Process-control System, Hardware for Control Systems and Temperature Controller, Overview of Smart-Scale Operation. Design methodology, examples of microprocessor applications.

References:

1. Advanced Microprocessors, PHI, D.V.Hall
2. The Intel Processors, Pearson Education, B. Brey
3. Gibson, "Microprocessors", Prentice Hall of India.
4. K.J. Ayala, "Micro Controller", Penram International
5. Advanced Microprocessors, A.K. Ray, K.M.Bhurchandi, TMH
6. Microprocessor, Gaonkar

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EXC-505(C) Demand side management

Unit I- Energy Scenarios: Energy Conservation, Energy Audit, Energy Scenarios, Energy Consumption, Energy Security, Energy Strategy, Clean Development Mechanism.

Unit II- Types of Energy Audits and Energy Audit Methodology: Definition of Energy Audit, Place of Audit, Energy – Audit Methodology, Financial Analysis, Sensitivity Analysis, Project Financing Options, Energy Monitoring and Training.

Unit III- Survey Instrumentation: Electrical Measurement, Thermal Measurement, Light Measurement, Speed Measurement, Data Logger and Data – Acquisition System, Thermal Basis. Revised Bloom's

Unit IV- Energy Audit Applied to Buildings: Energy – Saving Measures in New Buildings, Water Audit, Method of Audit, General Energy – Savings Tips Applicable to New as well as Existing Buildings.

Unit V- Demand side Management: Scope of DSM, Evolution of DSM concept, DSM planning and Implementation, Load management as a DSM strategy, Applications of Load Control, End use energy conservation, Tariff options for DSM, customer acceptance, implementation issues, Implementation strategies, DSM and Environment.

References:

Clark W. Gellings, John H. Chamberlin, Demand-Side Management: Concepts and Methods, Pennwell Pub. 1993.

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EXC-506(A) Utilization of Electrical Energy

Unit-I Illuminations: Definitions, laws of illuminations, polar curves, luminous efficiency, photometer, incandescent lamps, filament materials, halogen lamp, electric discharge lamps, sodium vapor lamp, mercury vapour lamp, fluorescent lamp, light calculations: commercial, industrial, street and flood lighting

Unit-II Electric Heating: Different methods of electric heating, principle of high frequency induction and dielectric heating, construction, operation, performance and applications of arc furnace and induction furnace

Electric Welding: Welding process, welding transformer, classification of electric welding: arc welding, resistance welding, welding of various metals.

Unit-III Electrolytic Process: Principles and applications of electrolysis, electro-deposition, manufactures of chemicals, anodizing, electro-polishing , electro-cleaning, electroextraction, electro-refining, electro-stripping (parting) power supplies for electrolytic process.

Unit-IV Electric Traction: Systems of Electric Traction: DC & AC Systems, power supply for electric traction system: comparison and application of different systems, sub-station equipment and layout, conductor rail & pantograph.

Unit-V Traction Methods and control: Types of services, speed time and speed disance curves, estimation of power and energy requirements, mechanics of train movement, Co-efficient of adhesion, adhesive weight, effective weight, traction motor controls: DC and AC traction motors, series parallel starting, methods of electric braking of traction motors.

References:

1. C. L. Wadhwa: Utilization of Electric Traction Electric Power. 1989
2. H. Partab: Art and Science of Electrical Energy, Dhanpat Rai & Sons
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.

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EXC-506(B) – EMBEDDED SYSTEMS

UNIT-I

8 Bit Micro controllers: Introduction to MCS-51 family, Peripheral of MCS-51 family, PIC Micro Controller –CPU architecture, registers, instruction sets addressing modes, loop timing, On chip Peripherals of PIC, Motorola MC68H11 Family Architecture Registers, Addressing modes, Interrupts features of interrupts- Interrupt vector and Priority, timing generation and measurements, Input capture, Out capture.

UNIT-II

16 Bit Micro controller: Introduction to MCS-96 family, Peripherals of MCS-96 family, 80196-
architecture, CPU operation, memory organization, I/O port, Operand addressing, instruction set, Interrupts, On chip Peripherals-PWM, Timers, HIS/HSO, Serial Port, External memory interfacing.

UNIT-III

32 bit Micro controller: Intel 80960-architecture, memory address space, Salient features of ARM processor family-ARM7 /ARM9/ ARM9E/ ARM10/ ARM11/ SecureCore /Strong ARM, XScale technology, ARM9200 Architecture,Pinouts, Peripheral Identifier, System Interrupts, External Interrupts, Product memory mapping, External memory mapping, Internal memory mapping, On chip Peripherals-Memory controllers, external Bus Interface(EBI), Advanced interrupt controller(AIC), USART, Timer counter.

UNIT-IV

Software development and tools: Embedded system evolution trends, Round- Robin, Roundrobin with Interrupts, function- One- Scheduling Architecture, Algorithms, Introduction toassembler- compiler- cross compilers and Integrated Development Environment (IDE) Object Oriented Interfacing, Recursion, Debugging strategies, Simulators.

UNIT-V

Real Time Operating Systems: Task and Task States, tasks and data, semaphores and shared Data Operating system Services- Message queues- Timer Function- Events- Memory Management, Interrupt Routines in an RTOS environment, basic design Using RTOS.

References:

David E Simon, " An embedded software Primer" Pearson education Asia.
John B Peat man " Design with Micro controller" Pearson education Asia.
Jonarthan W. Valvano Brooks/cole " Embedded Micro Computer Systems. Real time Interfacing", Thomson learning

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EXC-506(C)– FUZZY LOGIC & NEURAL NETWORKS

UNIT-I

Fuzzy system introduction, Fuzzy relation, Membership function, Fuzzy matrices and entropy, Fuzzy operation and composition.

UNIT-II

Fuzzy Variables, Linguistic variables, measures of fuzziness, concepts of defuzzification, Fuzzy control applications.

UNIT-III

Fundamentals of Artificial Neural networks- Biological prototype – Artificial neuron, Activation functions, Single layer and multiplayer networks. Training Artificial neural networks, Preceptrons, Exclusive Or Problem – Linear seperability, Storage efficiency, Preceptron learning, perceptron training algorithms, Back propagation, Training algorithm, network configurations, Network paralysis, Local minima, temporal instability.

UNIT-IV

Counter propagation networks. Kohonen layer, Training the kohonen layer, Pre processing the inputed vectors, Initialising the wright vectors. Statistical properties, Training the grosberg layer. Full counter propagation networks, Applications.

Statistical methods, Boltzman training, Cauchy training, artificial specific heat methods. Applications to general non-linear optimization problems. Back propagation and cauchy training.

UNIT-V

Hopfield nets, Recurrent networks, Stability, Associative memory, Thermodynamic systems, Statistical Hopfiled networks, Applications, Bi-directional associative memories, Retrieving on stored association, Encoding the associations.

References:

- Laurence Fausett, "Fundamentals of Neural Networks", Prentice Hall.
- Zimmermann H.J., "Fuzzy Set Theory and its Applications", Allied Publishers Ltd.
- Klir G.J., and Folger T., "Fuzzy Sets, Uncertainty and Information", Prentice Hall.
- Limin Fu., "Neural Networks in Computer Intelligence", McGraw Hill.
- Zuroda J.M., "Introduction to Artificial Neural Systems", Jaico Publishing.
- Haykin S., "Artificial Neural Network: A Comprehensive Foundation: Asia Pearson PuB

EXC-507 Industrial Training –I

Duration: 2 weeks after the VI semester in the summer break, Assessment in VII semester.

Students must observe following to enrich their learning during industrial training:

- Industrial environment and work culture.
- Organizational structure and inter personal communication.
- Machines/ equipment/ instruments - their working and specifications.
- Product development procedures and phases.
- Project planning, monitoring and control.

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Approved by Madhya Pradesh Private University Regulatory Commission
Bhopal Indore Road, Opposite Pachama Oilfad Plant, Pachama, Sehore, Phone: (07562) - 222482
Corp. Office: 203, Zone-I, Ganga Jamuna Complex (Basement), M.P. Nagar, Bhopal (M.P.) Ph: (0755) 5270956, Fax (0755) 5270916

(Minutes of the Board of Studies Committee Meeting)

School Of Engineering

Department of Electrical and Electronics Engineering

Minutes of Board of Studies Committee Meeting Dated : 03.05.2019

The Board of Studies Committee Meeting was held in the room of HOD (EX) at 03:30 AM on 30.05.2019. Following members were present.

1. Mr. Mukesh Tiwari
2. Mr. Vijay Prakash Singh
3. Mr. Prabodh Khampariya
4. Ms. Alka Thakur
5. Mr. Devendra Patle
6. Ms. Jyotsna Sagar
7. Mr. Sandesh Pradhan (external)
8. Dr. N.P. Patidar (External)

The Chairman of Board of Studies Committee welcomes and appreciated the efforts put up by the faculty for progress of the departmental activities. The following Agenda points were discussed and resolved.

Agenda 1. Approval of EX-7 and 8 semester Scheme and Syllabus (CBCS)

Discussion (If any) : Scheme and Syllabus should be prepared as per current demand in industry.

Resolution of the Discussion : Scheme and Syllabus was prepared as per current demand in Industries and was approved for forthcoming 7 and 8 semester

The Chairman thanks the members for peaceful conduction of meeting.

Signature of All members (Including chairman)

1. Dr. Mukesh Tiwari
2. Mr. Vijay Prakash Singh
3. Dr. Prabodh Khampariya
4. Ms. Alka Thakur
5. Mr. Devendra Patle
6. Ms. Jyotsna Sagar
7. Mr. Sandesh Pradhan (External)
8. Dr. N.P. Patidar (External)

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Scheme of Examination - CBCS Pattern

Academic Year 2019– 2020

Branch : Electrical and ElectronicsEngineering

Semester - VII

S.No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Periods/ hour/ week			Credits	Total Marks
			End Sem. Exam.	Mid Tests	Assign-ments/Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz /	L	T	P		
1	EXC - 701	Advanced Electrical Drives	60	30	10	30	20	2	1	2	4	150
2	EXC - 702	Generalized Theory of Electrical Machines	60	30	10	30	20	2	1	2	4	150
3	EXC - 703	Computer Aided Design of Electrical machine	60	30	10	30	20	2	1	2	4	150
4	EXC - 704	Department Elective-I	60	30	10			2	1		3	100
5	EXC - 705	Department Elective-II	60	30	10			2	1		3	100
6	EXC - 706	Open Elective	60	30	10			2	1		3	100
7	EXC - 707	Industrial Training - II					100			4	2	100
TOTAL			360	180	60	90	160	12	6	10	23	850
Department Elective-I			EXC-704(A) High voltage Engineering			EXC-704(B) FACT Devices		EXC-704(C) Power Quality				
Department Elective-II			EXC-705(A) Application of Power electronics to power system			EXC-705(B)Renewable Energy Sources		EXC -705(C) Electrical Hybrid vehicle				
Open Elective			EXC-706(A) Soft Computing Techniques			EXC-706(B) Reliability Evaluation of Power		EXC-706(C) Computer Application to Power System				

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EXC-701 Advanced Electrical Drives

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.

UNIT-II

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

UNIT-III

AC & DC Drives : Converter & chopper fed DC drive, Reversing, Starting, Regenerative breaking , Four quadrant operation, High power application. AC Drive: Inverter & cyclo converter fed drive, Vector control, Sensor less operation, Linear electrical motor concept, Synchronous motor Drive

UNIT-IV

Special Drives: Switched reluctance & permanent magnet brushless DC Operation, Converters, Characteristics &Control, PLC based drives. Servo drives & stepper motor- AC& DC Servomotor, Stepper motor, Control techniques, Controllers, Microstepping, Sensorless operation.

UNIT-V

Power Quality & energy Conservation- Line Side pollution, standards, Harmonic elimination techniques in converter, Filters, Energy efficient electric motors, Pay back periods, Energy conservation through solid state control

Reference:

Ned Mohan, T.M. Undeland, W.P. Robbins, Power Electronics-Converters, Applications and design". John Wiley & Sons.

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

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

Sivanagaraju-Power Semiconductor Drives –PHI Learning

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

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

Vedam Subramanyam, "Electrical Drives".

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

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

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List of experiments:

1. To study the half wave, full wave & fully controlled bridge rectifier using SCR's.
2. To study various type of forced Commutation techniques.
3. To study the SCR triggering circuit.

4. To study the Characteristics and Applications of the following Devices:

5.To study the Conversion of DC to AC by using Single-phase Inverter Circuit using Power MOSFET in Bridge configuration

6. Advanced electric drives analysis control and modeling using matlab simulink

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EXC-702 GENERALIZED THEORY OF ELECTRICAL MACHINE

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.

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 |- ō induction motor & scharge motor.

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.

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, Derived synchronous machine time constams, parameters from short circuit characteristics.

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.

References:

P.C.Krause, Analysis of Electric Machinery.

B.Adkins, The General theory of Electrical Machines.

B.Adkins & R.G.Hurley, The General theory of AC Machines.

P.S.Bhimbra, Generalised theory of Electrical m/c White & Woodson, Electro Mechanical Energy Conversion

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List of experiments:

1.Speed Control of a D.C Shunt Motor.
2.Brake Test on a DC Shunt Motor
3.Brake Test on a DC Compound Motor
4.Open Circuit Characteristics of a DC Shunt Generator.
5.Load test on a D.C. Shunt Generator.
6.Load test on a D.C. Series Generator..
7.Load test on D.C. Compound Generator.
8.Hopkinson Test

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EXC-703 Computer aided Design of Electrical Machines

Unit - I

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.

Unit - II

Optimal design of DC machines:-Design of armature, Windings and field systems, Selection of variables for optimal design, Formulation of design equations, Objective function, Constraint functions, Algorithms for optimal design.

Unit - III

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.

Unit - IV

Optimal design for 3-phase alternator:-Design of stator, windings, Design of Field systems for salient pole and non-salient pole machines, Selection of variables for optimal design, Formulation of design equations, Objective function, Constraint functions, Algorithms for optimal design.

Unit - V

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.

References:

P.C.Krause, Analysis of Electric Machinery.

B.Adkins, The General theory of Electrical Machines.

B.Adkins & R.G.Harley, The General theory of AC Machines.

P.S.Bhimbra, Generalised theory of Electrical m/c White & Woodson, Electro Mechanical Energy Conversion

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List of experiments:

1.First the steps ofusing Simulation software in Electrical engineering 3b.State the procedure to build simple circuits

2.Draw electrical and electronic symbols using CAD and take print out

3.Draw D.C. and A.C machine parts using CAD and take print out

4.Draw winding diagram for given DC machine using CAD and take print out of (a)Lap winding and (b)Wave winding

5.Draw different types of rectifier circuit using CAD and take print out of

:(a)Single phase half wave(b)Single phase full wave

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EXC-704 (A) High Voltage Engineering

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.

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's theory. 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.

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 circuitprinciple of operation and advantages. Tesla coil. HV DC- voltage doubler circuit, cock 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.

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 voltages;Factors affecting the measurements. Potential dividers-resistance dividers capacitance dividers mixed RC potential dividers. Surge current measurement.

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UNIT-V

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

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 Easternlimited, 1987.

5. Transmission and distribution reference book-Westing House.C.L.Wadhwa, High voltage engineering, New Age International Private limited, 1995.

EX-704 (B) FLEXIBLE AC TRANSMISSION SYSTEMS (FACTS)

UNIT-I

Introduction: Facts basic concepts and general system considerations, power flow in ac system, definitions on facts, basic types of facts controllers, benefits from facts Technology, static var compensator (SVC): principle of operation and control strategy, thyristor controlled phase angle regulator (TCPAR): principle of operation and control strategy.

UNIT-II

Transient Stability Analysis: Analysis of Power systems installed with FACTS devices. Control with FACTS: Power Transmission Control using UPFC, power transmission control using phase shifting transformer (PST), power transmission control using SSSC.

UNIT-III

Oscillation Stability Analysis and Control with FACTS: Linearised model of power systems installed with FACTS based stabilizers, Heffron-Phillips model of a SMIB system installed with SVC, TCSC and TCPS, Heffron-Phillips model of a SMIB system with UPFC, Heffron-Phillips model of a multi-machine system installed with SVC, TCSC and TCPS.

UNIT-IV

Design of FACTS based stabilizers: Analysis of damping torque contribution by FACTS based stabilizers installed in SMIB systems, selection of installing locations and feedback signal for FACTS based stabilizers, Dynamic Voltage restorer.

UNIT-V

Power flow Controller: Unified Power Flow Controller (UPFC), principle of operation, configuration and control, simulation of UPFC, steady state model of UPFC, interline power flow controller (IPFC), principle of operation, configuration and control, static compensator (STATCOM), principle of operation and control, application for mitigation of SSR.

References:

1. "Understanding FACTS Devices" N.G. Hingorani and L. Guygi, IEEE Press Publications 2000.
2. Flexible AC Transmission System: Y.H.Song and A.T.Jhons, IEE, 1996(A Book)
3. Dr Ashok S & K S Suresh Kumar "FACTS Controllers and applications" course book for STTP, 2003.
4. Ned Mohan et.al, Power Electronics, John Wiley and Sons.
5. K. R. Padiyar, FACTS Controllers in Power Transmission and Distribution, New Age International, First Edition.

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EXC- 704 (C) POWER QUALITY

UNIT-I

Introduction, power quality -voltage quality, power quality evaluations procedures term and definition: general classes of power quality problem, causes & effect of power quality disturbances.

UNIT-II

Voltage sags and interruption: sources of sags and interruption, estimating voltages sag performance, fundamental principles of of protection, monitoring sags.

UNIT-III

Transients over voltages: sources of transient over voltages, principles of over voltages protection, utility Capacitor switching transients, fundamentals of harmonics and harmonics distortion, harmonics sources from commercial load and from industrial loads.

UNIT-IV

Applied harmonics : harmonics distortion evalutions, principles for controlling harmonics, harmonics studies devices for controlling harmonic distortion, filters, passive input filter standards of harmonics.

UNIT-V

Electro-magnetic compatibility, constant frequency control, constant tolerance band control, variable tolerance band control, discontinuous current control.

Reference Books:

1. Power Quality- by R.C. Duggan
2. Power System harmonics –by A.J. Arrillga
3. Power electronic converter harmonics –by Derek A. Paice

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EXC 705 (A) APPLICATION OF POWER ELECTRONICS TO POWER SYSTEMS

UNIT-I Review of transmission lines; surge impedance loading; voltage profile along radial and symmetrical lines, effect of load, Ferranti effect; role of reactive power compensators; series, shunt and unified compensation; effect on power flow and voltage profile; FACTS; Requirements of distribution systems, power quality (PQ) problems and classification, numerical indices of PQ.

UNIT-II The Static Var Compensator (SVC); TCR, FC-TCR and TSC-TCR variants: circuits, characteristics; transmission line compensation capability; dynamic model.The Static Compensator (STATCOM): circuit and steady state characteristic; effect on transmission line compensation; advantages over SVC; the D-STATCOM and its use in power quality compensation; reactive power compensator; control; active filtering for harmonic compensation; hybrid active filters.

UNIT-III The Thyristor Controlled Series Compensator (TCSC); circuit and steady-state characteristic; effect on transmission line compensation; critical aspects of operation; the NGH damper.The Dynamic Voltage Restorer (DVR); circuit and steadystate characterisitic; effect on transmission line compensation; advantages over TCSC; DVR for power quality compensation; modes of control.

UNIT-IV The Unified Power Flow Compensator (UPFC); circuit and steady-state characteristic; effect on transmission line compensation; advantages over all the previous compensators; usage for power quality compensation; critical aspects of control.

UNIT-V The Interline Power Flow Controller (IPFC); circuit and steady-state characteristic; effect on transmission line compensation; advantages over the UPFC.

References:

1. N. G. Hingorani & Laszlo Gyugi, "Understanding FACTS", IEEE Press.

2. K. R. Padiyar, "FACTS Controllers in Power Transmission and Distribution", New Age International (P) Ltd. Publishers.

3. Arindam Ghosh & Gerard Ledwich, "Power Quality Enhancement Using Custom Power Devices", Kluwer Academic Publishers.

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EXC 705 (B) Renewable Energy Sources

Unit - I Renewable Energy Systems Energy Sources, Comparison of Conventional and non-conventional, renewable and 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.

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 stand alone systems. Use of electronic load controllers and self excited induction generators. Wave Energy System: System configuration: grid connected and hybrid Systems.

Unit - III Solar Radiation Extraterrestrial solar radiation, terrestrial solar radiation, Solar thermal conversion, Solar Phototonic 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. Biomass Energy System: System configuration, Biomass engine driven generators, feeding loads in stand-alone or hybrid modes, Biomass energy and their characteristics.

Unit - IV Energy from oceans Ocean temperature difference, Principles of OTEC, plant operations, Geothermal Energy Electric Energy from gaseous cells, Magneto-hydro generated energy, Non hazardous energy from nuclear wastes, Possibilities of other modern nonconvemional energy sources.

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.

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References:
1. John Twidell & Toney Weir, Renewable Energy Resources, E & F N Spon.
2. El-Wakil, 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-III", Allied Publishers Ltd., New Delhi,
6. S.P. Sukhatme: Solar Energy, TMH- 4e,
7. Dr. A. Ramachandran, Prof B.V Sreekantan & M P.C. Kohli etc, "TERI Energy Data Directory & Year book 1994-95", Teri Tata Energy Research Institute, New Delhi,
8. Solanki –Renewable Energy Technologies – PHI Learning 9. Sawhney –Non Conventional Energy Resources – PHI Learning

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EXC 705 (C) Electrical Hybrid Vehicles

Unit - I

Introduction

Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance. Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental imporiance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Hybrid Electric Drive-trains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

Unit - II

Electric Trains

Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis. Electric Propulsion unit: Introduction to electric componems used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control Of Switch Reluctance Motor drives, drive system efficiency, drive-train topologies, fuel efficiency analysis.

Unit - III

Energy Storage:

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems

Unit - IV

Energy Management Strategies

Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

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Unit - V

Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

Text / References:

1. C. Mi, M. A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons, 2011.
2. S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies", Springer, 2015.
3. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design", CRC Press, 2004.
4. T. Denton, "Electric and Hybrid Vehicles", Routledge, 2016

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EXC-706 (A) SOFT COMPUTING TECHNIQUES

UNIT-1 Review of probability theory: Random variable, distribution functions , function of random variable, generation of random digit, and random variants from various distribution function, Monte Carlo simulation, sampling distributions station evolution using MCS, confidence interval, coefficient of variation.

UNIT-2 - Rule and back propagation rule of training, RBF and FLN network.

UNIT-3 Draw back of classical optimization techniques, genetic algorithm; binary and real parameter GA, constraints handling in GA.

UNIT-4 Evolution strategies(ES), two members non-recombinative ES, multi member ES, recombinative ES. Optimization based on swarm intelligence particle, swarm optimization and its variants .

UNIT-5 Application of soft computing techniques to problem of electrical engineering e.g. economic dispatch, reliable optimization, ANN training using evolutionary algorithms.

References:

1. R.Y. Rubinstein Simulation and the Monte Carlo method, John Wiley & sons 1st Edition.
2. Paul. L. Mayer-Introducing probability and statical application. Addition Wesley.
3. Rajasekaran and pai- Neural Network, Fuzzy logic & Genetic Algorithms. PHI Learing
4. LiMin. Fu, Neural Networks in Computer Intelligence, 9th Reprint TMH
5. Muki objective optimization using evoluriosary algorithm- Kalyanmoy Deb John Wiley & Sons Ltd.
6. Probability and Random processes for Electrical Engineering , Alberto Leon Garcia IInd Pearson .
7. Principles of soft computing- S N Shivanandan. S N Deepa Wiley India (P) Ltd, I edition 2007.
8. Hand book of genetic algorithm- Rajaserkharans, vijaya laxmi pai.
9. PSO Tutorial- Kennedy Eberhart.
10. Sivanandam & Deepa- An Introduction to Neural Networks using Matlab 6.0 1st ed., TMH

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EXC-706 (B) Reliability Evaluation of Power Systems

UNIT-I Review of Probability Theory Element of probability theory Probability Distribution, Random variable, Density and distribution functions. Mathematical expectation. Binominal distribution, Poisson distributions, Normal distribution, Exponential distribution, Weibull distribution.

UNIT-II Reliability of Engineering Systems Component reliability, Hazard models, Reliability of systems with non-repairable components, series, Parallel, Series-Parallel, Parallel-series configurations, Non-series-parallel configurations, minimal tie-set, minimal cut-set and decomposition methods, Repairable systems, MARKOV process, Long term reliability, Power System reliability.

UNIT-III Reliability of Engineering Systems Reliability model of a generating unit, State space methods, Combing states, sequential addition method, Load modeling, Cumulative load model, merging of generation and load models, Loss of load probability, Percentage energy loss, Probability and frequency of failure, Operating reserve calculations.

UNIT-IV Power Network Reliability Weather effect on transmission lines, Common mode failures, Switching after fauls, three, state components, Normally open paths, Distribution system reliability.

UNIT-V Composite System Reliability Bulk Power supply systems, Effect of varying load, Inter connected systems, correlated and uncorrelated load models, Cost and worth of reliability.

References:

J. Endreny, Reliability Modeling in Electric Power Systems, John Wiley & Sons.

Roy Billinton & Ronald, N allan, Reliability Evaluation of Power Systems, Plenum Press, New York.

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Scheme of Examination - CBCS Pattern

Academic Year 2019– 2020

Branch : Electrical and Electronics Engineering Semester - VIII

S.No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Periods/ hour/ week			Credits	Total Marks
			End Sem. Exam.	Mid Tests	Assign-ments/Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation	L	T	P		
1	EXC - 801	Power Quality Problems and Mitigation Techniques	60	30	10	30	20	2	1	2	4	150
2	EXC - 802	Asynchronous Machines	60	30	10	30	20	2	1	2	4	150
4	EXC-803	Department Elective-I	60	30	10			2	1		3	100
5	EXC-804	Department Elective-II	60	30	10			2	1		3	100
6	EXC-805	Open Elective	60	30	10			2	1		3	100
7	EXC - 806	Industrial Training Project - II				50	100			8	4	150
8	EXC - 807	General Proficiency					100		2	-	2	100
TOTAL			300	150	50	110	240	10	7	12	23	850

Department Elective-I	EXC - 803(A) EHVAC/DC Transmission	EXC - 803(B) Power Generation and Economic	EXC - 803(C) Advance Power Electronics
Department Elective-II	EXC - 804(A) SCADA Systems And Applications	EXC - 804(B) Objected Oriented Methodologies C & C++	EXC - 804 (C) VLSI circuits and systems
Open Elective	EXC-805(A) Power Electronics Converters for Renewable Energy	EXC-805(B) Environmental Issues, Policy, Standards & Regulations	EXC-805(C)Estimating and Costing

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EXC-001- Power quality Problems and mitigation Techniques

UNIT-I

Introduction, power quality –voltage quality, power quality evaluations procedures term and definition: general classes of power quality problem, causes & effect of power quality disturbances.

UNIT-II

Loads that causes power quality problems, State of art on Passive shunt and series compensation, Classification and working of passive shunt and series compensation, Classification, Principle and control of active shunt compensator: DSTATCOM, Active series compensators, working and its control.

UNIT-III

Introduction to unified power quality compensators, classification, working and operation of UPQC.

UNIT-IV

Voltage sags and interruption: sources of sags and interruption, estimating voltages sag performance, fundamental principles of protection, monitoring sags. Transients over voltages: sources of transient over voltages, principles of over voltages protection, utility capacitor switching transients, fundamentals of harmonics and harmonics distortion, harmonics sources from commercial load and from industrial loads.

UNIT-V

Applied harmonics: harmonics distortion evaluations, principles for controlling harmonics, harmonics studies devices for controlling harmonic distortion, Shunt active and passive filters, their operation and control.

Reference Books:

Power Quality- by R.C. Duggan 2

Power System harmonics –by A.J. Arrillga

Power electronic converter harmonics –by Derek A. Paice

Power quality problems and mitigation techniques: Bhim singh, Amrish Chandra, Kamal Al- Haddad.

List of experiments:

1. Simulation showing the effect of power quality problems.
2. Simulation of reactive power compensation of linear load.
3. Simulation of harmonic analysis of balanced non-linear loads.
4. Simulation of harmonic analysis of un-balanced non-linear loads.
5. Simulation of active shunt filters for harmonics compensation.
6. Simulation of compensation device showing power factor correction.
7. Simulation of compensation device showing voltage regulation.
8. Simulation of hybrid filter as a combination of active series and passive shunt filters.
9. Simulate the effect of neutral current.
10. Simulate the effect of dynamic load connected to 3-phase system.

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EXC-802 Asynchronous Machines

UNIT- I

Stepper Motors: Discretisation of angular position by stepper structures, stepping angle and frequency of excitation. VR and PM rotor structures and their torque production, torque angle characteristics. The hybrid structure and torque production by permanent magnet and excitation fluxes. Power electronic converters for stepper motors, control by load angle.

UNIT - II

Switched reluctance motor. static torque production, partition of energy and the effects of saturation, Dynamic torque production, torque speed characteristics, shaft position sensing, solid rotors.

UNIT- III

BrushLess DC Motor construction and principle, speed control, basic concept of torque, outer and inner rotor, magnetic circuit concept, electrical analogy, winding pattern series and parallel, Thermal consideration.

UNIT- IV

Permanent magnet materials and circuits; Characteristics, parameters, properties, classification and calculations, Permanent magnet motors, D.C. brushed motors, design analysis and control and applications.

UNIT- V

PM synchronous motors, rotor construction, theory, operation, control and applications. PM step motors, hybrid step motors, sensorless control, reduction of torque pulsations; Case studies such electric vehicles, industrial drives, PV fed water pumping.

Reference Books:

1. Brushless Permanent Magnet & Reluctance Motor Drives – T.J.E.Miller
2. Principles of Electric Machines & Power Electronics – P.C.Sen 3.
3. Electric Drives – G.K.Dubey
4. Permanent magnet synchronous & brushless DC motor drives- R Krishnan, CRCPress, 2004

List of experiments:

Experiment will be above content

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EXC-803 (A) EHVAC/DC Transmission

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 capacity. Converter analysis graetz circuit, Firing angle control, Overlapping.

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 compensator(SVC), series-series controller, combined series-shunt controller, unified power flow controller(UPFC), thyristor controlled phase shifting transformer(TCPST).

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.

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.

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

Reference:

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. Sukhija, -"Power System Analysis", Oxford University
6. Narain.G. Hingorani, L Gyugyi-"Undustanding of FACTS concept and technology", john willy & sons pub.
7. P.Kundur- "H.V.D.C. Transmission" McGraw Hill Pub.

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EXC-803 (B) Power Generation and Economic

UNIT -I

Power System Fundamentals Regulation and Deregulation, condition for deregulation, problems with regulation, risk management,
congestion management, ATC, screening curve.

UNIT-II

Competitions in Power Market What is competition, efficiency of perfect competition, marginal cost in power market, role of marginal cost,
working with marginal cost, results of marginal cost.

UNIT-III

Market Power And Structure Define market power, price quality outcomes, three stages of market power, using price quality outcomes to show power, monopoly in power auction, market power on demand side.

UNIT-IV

Restructure Fundamental restructure system, transmission pricing, restructure models, OASIS, structure of OASIS, transfer capability of OASIS.

UNIT -V

Designing And Testing Market Rules Design for competitive prices, testing of market design, designing to reduce market power.

REFERENCES:

1- Power system economics-designing for electricity-steven stoft. (IEEE press & WILEYINTERSCIENCE).
2- Electric Power Systems weedy,cory, wily india 2nd edition

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EXC-803 (C) Advance Power Electronics

UNIT- I

Introduction to various power electronics supplies. Performance parameters for power electronics supplies and their measurement. Device selection, Control circuits. Switch mode power supplies, Square wave switching, Resonant mode operation of Power supplies , Ferroresonant, Linears and the switchers.

UNIT- II

DC to DC Converters: Analysis and design of buck, boost, buck-boost and cuk converters, two quadrant and full bridge converters. Isolated converters i.e., flyback, forward and bridge topology. Design of d.c. inductor. Concept of integrated magnetics, converter control, averaged model, statespace
model.

UNIT- III

DC to Controlled AC: Controlled inversion, three phase full bridge inverters. 180□ mode and 120□ mode operation, harmonic analysis, PWM control of VSI, current mode control of PWM VSI, space vector modulation, three phase current sourced PWM CSI.

UNIT- IV

AC Choppers: Modeling and analysis of AC choppers, harmonics control using symmetrical and asymmetrical waveform pattern.

UNIT- V

Soft switching DC to DC converters, zero current switching topologies, zero voltage switching topologies, generalized switching cell, ZCT and ZVT DC converters.

Text Books:

1. "Power Electronics Circuits", Issa Batarseh, John Wiley & Sons Inc., 2004.
2. "Power Electronics: ", L.Umanad, Wiley India.
3. "Power Electronics: Converters, Applications, and Design", Ned Mohan, John Wiley & Sons Inc., 2001.
4. "Power Electronics: Devices and Circuits", Jagannathan, PHI Learning 2012

Reference Books:

1. "Power Electronic Systems Theory and Design", Jai P Agrawal, Pearson Education Asia, 2001.
2. "Switching Power Supply Design", A I Pressman, McGraw Hill Publication, 1991.
3. "Handbook of Power Electronics", M H Rashid

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EXC-804 (A) SCADA Systems And Applications

UNIT I

Introduction to SCADA and PLC:SCADA: Data acquisition system, evaluation of SCADA, communication technologies, monitoring and supervisory functions. PLC: Block diagram, programming languages, Ladder diagram, Functional Block diagram, Applications, Interfacing of PLC with SCADA.

UNIT II

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

UNIT III

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

UNIT IV

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

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.

Reference Books:

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

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EXC-804 (B) Objected Oriented Methodologies C & C++

UNIT-I

Fundamentals of C Programming: History of C; Structure of a C Program; Data types; Constant & Variable, naming variables; Operators & expressions; Control Constructs – if-else, for, while, do-while; Case switch statement; Arrays; Formatted & unformatted I/O; Type modifiers & storage classes; Ternary operator; Type conversion & type casting; Priority & associativity of operators.

UNIT-II

Modular Programming: Functions; Arguments; Return value; Parameter passing – call by value, call by reference; Return statement; Scope, visibility and life-time rules for various types of variable, static variable; Calling a function; Recursion – basics, comparison with iteration, types of recursion- direct, indirect, tree and tail recursion, when to avoid recursion, examples.

UNIT – III

Advanced Programming Techniques: Special constructs – Break, continue, exit(), goto & labels; Pointers - & and * operators, pointer expression, pointer arithmetic, dynamic memory management functions like malloc(), calloc(), free(); String; Pointer v/s array; Pointer to pointer; Array of pointer & its limitation; Function returning pointers; Pointer to function, Function as parameter; Structure – basic, declaration, membership operator, pointer to structure, referential operator, self-referential structures, structure within structure, array in structure, array of structures; Union – basic, declaration; Enumerated data type; Typedef; command line arguments. Miscellaneous Features: File handling and related functions; printf & scanf family;C preprocessor – basics, #include, #define, #undef, conditional compilation directive like #if, #else, #elif, #endif, #ifdef and #ifndef; Variable argument list functions.

UNIT-IV

C++ basics, loops and decisions, structures and functions, object and classes, object arrays, constructor and destructor functions. Operator and function overloading, pointers, pointers to base and derived classes inheritance, public and private inheritance, multiple inheritance.

UNIT-V

Polymorphism, virtual functions, abstract base classes and pure virtual function, friend function, early and late binding. C++ I/O system, formatted I/O, creating insertors and extractors, file I/O basis, creating disk files and file manipulations using seekg(), seekp(), tellg() and tellp() functions, exception handling: try, catch and throw.

BOOKS:

1. Kernighan & Ritchie "The C programming language", PHI
2. Schildt "C:The Complete reference" 4th ed TMH
3. Cooper Mullish "The Spirit of C", Jaico Publishing House, Delhi
4. Kanetkar Y. "Let us C", BPB.

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5. Kanetkar Y.: "Pointers in C" , BPB

6. Gottfried : "Problem Solving in C", Schaum Series

7. Jones, Harrow Brooklish "C Programming with Problem Solving", Wiley Dreamtech India. Note : Paper is to be set unit wise with internal choice.

8. LaFore R. "Object Oriented Programming in C++", Galgotia Pub.

9. Lee "UML & C++ a practical guide to Object Oriented Development 2 ed, Pearson.

10. Schildt "C++ the complete reference 4ed, 2003.

11. Hans Erit Eriksson "UML 2 toolkit" Wiley.

12. Balaguruswamy "Object Orienter Programming with C++".

13. B.G., Booch "Object Oriented Analysis & Design with Applications", Addision Wesly.

14. S. Parute "C++ Programming", BPB. 8. Boggs "Mastering UML" BPB Publications.

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EXC-804 (C) VLSI circuits and systems

UNIT I

Introduction to CMOS VLSI circuit, VLSI design flow, Design strategies ,Hierarchy, regularity, modularity, locality, MOS Transistor as a Switches, CMOS Logic, Combinational circuit, latches and register, Introduction of CAD Tool , Design entry, synthesis, functional simulation.

UNIT- II

Specification of sequential systems Characterizing equation & definition of synchronous sequential machines. Realization of state diagram and state table from verbal description, Mealy and Moore model machines state table and transition diagram. Minimization of the state table of completely and incompletely specified sequential machines.

UNIT III

Asynchronous Sequential Machine Introduction to asynchronous sequential machine, Fundamental mode and Pulse mode asynchronous sequential machine, Secondary state assignments in asynchronous sequential machine, races and hazards.

UNIT IV

State Machine Algorithmic state machine and fundamental concept of hardware/ firmware algorithms. Controllers and data system designing.

UNIT V

Fault Detection in combinational circuit Types of faults, Fault detection using Boolean Difference and path sensitization method. Concept of PROM, PLA, PAL, CPLD and FPGA, PALASM software applications.

Refrences:

1. Neil Weste: Principle of CMOS VLSI Design, TMH.
2. Kohavi: Switching & Finite Automata Theory, TMH.
3. Lee: Digital Circuits and Logic Design, PHI Learning..
4. Roth Jr.: Fundamentals of Logic Design. Jaico Publishing House.
5. Parag K. Lala: Fault Tolerant and Fault Testable Hardware Design, BS Publication.

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EXC-805 (A) Power Electronics Converters for Renewable Energy

UNIT- I

Introduction to renewable sources: world energy scenario. Wind, solar, hydro, geothermal, availability and power extraction. Introduction to solar energy: Photovoltaic effect, basics of power generation, P-V & I-V characteristics, effect of insolation, temperature, shading; Modules, connections, ratings; Power extraction (MPP), tracking and MPPT schemes; standalone systems, grid interface, storage, AC-DC loads.

UNIT-II

Power converters for solar: Micro converter, DC-DC buck/boost/buck-boost /flyback /forward/cuk, bidirectional converters; Inverters: 1ph, 3ph inverters Multilevel Neutral point clamp, Modular multilevel, CSI; Control schemes: unipolar, bipolar.

UNIT- III

Single phase and three-phase back Controllers. Triggering techniques for power factor and harmonic controls. Design and analysis of phase control circuits. Solid state transfer switches. Concept of three-phase to single phase and single phase to three-phase cyclo-converter. Effect of source inductance. Concept of PWM techniques single and multiple pulse form. Working of STATCON, SVC, UPS, SMPS.

UNIT- IV

Intro to wind energy: P-V, I-V characteristic, wind power system: turbine-generator-inverter, mechanical control, ratings; Power extraction (MPP) and MPPT schemes. PLL and synchronization, power balancing / bypass, Parallel power processing; Grid connection issues: leakage current, Islanding mode, harmonics, Mitigation of harmonics, filters, passive filters, Active filters, active/reactive power feeding, unbalance.

UNIT-V

Generators for wind: DC generator with DC to AC converters; Induction generator with & w/o converter; Synchronous generator with back to back controlled/ uncontrolled converter; Doubly fed induction generator with rotor side converter topologies; permanent magnet based generators. Battery: Types, charging discharging.

References:

1. Sudipta Chakraborty, Marcelo G. Sim303265es, and William E. Kramer. Power Electronics for Renewable and Distributed Energy Systems: A Sourcebook of Chetan Singh Solanki, Solar Photovoltaics: fundamentals, Technologies and Applications, Prentice Hall of India, 2011.
2. N. Mohan, T.M. Undeland & W.P. Robbins, Power Electronics: Converter, Applications & Design, John Wiley & Sons, 1989
3. Muhammad H. Rashid, Power Electronics: Circuits, Devices, and Applications, Pearson Education India, 2004.
4. Topologies, Control and Integration. Springer Science & Business, 2013. 5. Remus Teodorescu, Marco Liserre, Pedro Rodriguez, Grid Converters for Photovoltaic and Wind Power Systems, John Wiley and Sons, Ltd., 2011.

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EXC-805 (B) Environmental Issues, Policy, Standards & Regulations

UNIT I

Global environmental concerns: The Scenario, The Changing Global atmosphere &common concerns. United Nations Framework Convention on Climate Change (UNFCC), Kyoto Protocol, Conference of Parties (COP), Various Clean Development Mechanism (CDM), Prototype Carbon fund (PCF), Earth Summit, Sustainable development, Green Certificate

UNIT-II

The Global Program for protected area management, Strategies for environmental improvement plan. Organizations working in the field of energy and environment - UNEP, IPCCC, CPCB etc. Basic features of ISO 14000.

UNIT-III

Water Quality: Parameters: Physical, Chemical and Bacteriological ,Potable Water Standards,Waste Waster Effluent Standards, Minimal National Standards (MINAS).

UNIT -IV

Environment Policies: Water Act 1974, The Air Act, 1981, Environmental (Protection) Act,- 1986, M. P. State Environment Policy, Municipal Solid Waste (Management & Handling) Rules, 1998, Biomedical Waste (Management & Handling) Rules 1998.

UNIT-V Review of various energy sources. Importance of unconventional sources such as solar, biogas, wind, tidal etc. Study of typical energy converters such as high performance motors, special generators driven by biogas engines, wind turbines etc. Mini-hydro generators. Modern state-ofthe art and futuristic systems in this area.

References:

1. Environmental Issues and Polices, Prentice Hall--Stephon Ison, Stephen Peake, Stuart Wall
2. ISO 14000 Environmental Management by Goetsch, Davis, Prentice Hall
3. Standard methods for the Examination of Water and Wastewater. (1989).17thEd. APHA, Washigton. D.C., 2-12
4. Energy Management by Paul O'Callaghan -McGraw Hill
5. Cleaner Production - Energy Efficiency Manual for GERIAP, UNEP, Bangkok prepared by National Productivity Council
6. Training material on 'Environmental concerns' prepared by National Productivity Council
7. Parivesh, October 2002 – Central Pollution Control Board.

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EXC-805 (C) Estimating and Costing

UNIT- I

Introduction :Purpose of estimating and costing, proforma for making estimates, preparation of materials schedule costing, price list, tender document net price list, market survey, overhead charges, labour charges, electrical point method and fixed percentage method, contingency, profit, purchase system, enquiries, comparative statements, orders for supply, payment of bills, tenders, its constituents, finalization specimen tender.

UNIT- II

Types of wiring: Electrical, batten, casing-casing and conduit wiring, comparison of different wiring, selection and design of wiring schemes for particular situation (domestic and industrial), selection of wires and cables, wiring accessories and use of protective devices i.e. MCB, ELCB etc, use of wire-gauge and tables.

UNIT- III

Estimating and Costing: Domestic installations, planning of circuits, sub-circuits electrical layout, preparing estimates including cost as per schedule rate pattern and actual market rate (single storey and multi-storey buildings), industrial installations, relevant IE rules and IS standard practices, planning, designing and estimation of installation for single phase motors of different ratings, electrical circuit diagram, starters, preparation of materials lists, estimating and costing exercises on workshop with singe-phase, 3-phase motor load and the light load (3-phase supply system), service line connection estimate for domestic and industrial loads (over-head and under ground connections) from pole to energy meter, different types of fans and their sizes, air-conditioners, exhaust fans, determination of size and number of fans for a given situation.

UNIT- IV

Transmission and distribution lines: (overhead and underground) planning and designing of lines with different fixtures, earthing etc. based on unit cost calculations. U

UNIT- V Substation: Types of substations, layout of substations, substation schemes and components, estimate of 11/0.4 KV pole mounted substation up to 200 KVA rating.

References:

1. Electrical Estimating and Costing by JB Gupta, Satya Prakashan, New Delhi
2. Estimating and Costing by SK Bhattacharya, Tata McGraw Hill, New Delhi
3. Estimating and Costing by by Surjeet Singh, Dhanpat Rai & Co., New Delhi
4. Estimating and Costing by Qureshi
5. Estimating and Costing by SL Uppal, Khanna Publishers, New Delhi
6. Electrical Estimating and Costing by N Alagappan and B Ekambaram, TMH, New Delhi

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S.S.S.U.T.M.S.

EXC- 806 INDUSTRIAL TRAINING PROJECT-II

The focus of the Industrial Training Project-II 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 of the working system (if any).

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SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES

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Bhopal Indore Road, Opposite Pachama Oilfed Plant, Pachama, Sehore. Phone: (07562) - 222482
Corp. Office: E02, Zone-I, Ganga Kaveri Complex (Basement), M.P. Nagar, Bhopal (M.P.) Ph. (0755) 5370995, Fax (0755) 5270916

(Minutes of the Board of Studies Committee Meeting)

School Of Engineering

Department of Electrical and Electronics Engineering

Minutes of Board of Studies Committee Meeting Dated : 03.6.2019

The Board of Studies Committee Meeting was held in the room of HOD (EX) at 10:30 AM on 03.6.2019. Following members were present.

1. Dr. Mukesh Tiwari
2. Mr. Vijay Prakash Singh
3. Dr. Prabodh Khampariya
4. Ms. Alka Thakur
5. Mr. Devendra Patle
6. Ms. Jyotsna Sagar
7. Dr. N.P. Patidar (External Academic Expert)
8. Mr. Amit Raje (External Industry Expert)

The Chairman of Board of Studies Committee welcomes and appreciated the efforts put up by the faculty for progress of the departmental activities. The following Agenda points were discussed and resolved.

Agenda 1. Approval of EX-3 rd and 4 th semester Scheme and Syllabus (AICTE)

Discussion (If any) : Scheme and Syllabus should be prepared as per current demand in industry.

Resolution of the Discussion : Scheme and Syllabus was prepared as per current demand in Industries and was approved for forthcoming 3 rd and 4 th semester

The Chairman thanks the members for peaceful conduction of meeting.

Signature of All members (Including chairman)

1. Dr. Mukesh Tiwari
2. Mr. Vijay Prakash Singh
3. Dr. Prabodh Khampariya
4. Ms. Alka Thakur
5. Mr. Devendra Patle
6. Ms. Jyotsna Sagar
7. Dr. N.P. Patidar (External Academic Expert)
8. Mr. Amit Raje (External Industry Expert)

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Scheme of Examination

Bachelor of Engineering (Electrical and Electronics Engineering)

IV Semester/ II Year **Academic Year 2019-20**

S.No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Total Marks	Periods/ hour/ week			Credits
			End Sem. Exam.	Mid Tests	Assign-ments/Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation		L	T	P	
1	BEA-401	Energy, Ecology, Environment & Society	60	30	10	-		100	3		-	3
2	EXA-402	Digital Electronics & Logic Design (DELD)	60	30	10	30	20	150	2	1	2	4
3	EXA-403	Electrical Machine-I	60	30	10	30	20	150	3	-	2	4
4	EXA-404	Power System-I	60	30	10	30	20	150	2	1	2	4
5	EXA-405	Control System	60	30	10	30	20	150	3	-	2	4
6	EXA-406	Software Lab I (Circuit Simulator)	-	-	-	30	20	50	-	-	2	1
7	EXA-407	Industrial Training-I	To be completed during fourth semester semester break. Its evaluation/credit to be added in fifth semester									
		TOTAL	**300**	**150**	**50**	**150**	**100**	**750**	**13**	**2**	**10**	**20**

w.e.f. july 2019

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Scheme of Examination

Bachelor of Engineering (Electrical and Electronics Engineering)

III Semester/ II Year — Academic Year 2019-20

S.No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Total Marks	Periods/ hour/ week			Credits
			End Sem. Exam.	Mid Tests	Assign-ments/ Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation		L	T	P	
1	BEA-301	Mathematics-III	60	30	10	-	-	100	3	-	-	3
2	EXA-302	Signals & Systems	60	30	10	-	-	100	2	1	-	3
3	EXA-303	Electrical Measurement & Measuring Instruments	60	30	10	30	20	150	3	-	2	4
4	EXA-304	Network Analysis	60	30	10	30	20	150	3	-	2	4
5	EXA-305	Analog Electronics	60	30	10	30	20	150	2	1	2	4
6	EXA-306	Computer Programming – I (Java)	-	-	-	30	20	50	-	-	2	1
7	EXA-307	Self Study / GD Seminar	-	-	-	-	50	50			2	1
-		**Total**	**300**	**150**	**50**	**120**	**130**	**750**	**13**	**2**	**10**	**20**

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BEA-301 Engineering Mathematics-III

UNIT-I

Numerical Methods – 1 Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

UNIT-II

Numerical Methods – 2 Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Solution of Simultaneous Linear Algebraic Equations by Gauss's Elimination, Gauss's Jordan, Crout's methods, Jacobi's, Gauss-Seidal, and Relaxation method.,

UNIT-III

Numerical Methods – 3 Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. RungeKutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator-corrector methods. Partial differential equations: Finite difference solution two dimensional Laplace equation and Poission equation, Implicit and explicit methods for one dimensional heat equation (Bender-Schmidt and Crank-Nicholson methods). Finite difference explicit method for wave equation.

UNIT-IV

Transform Calculus - Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace Transform method, Fourier transforms.

UNIT-V

Concept of Probability - Probability Mass function, Probability Density Function, Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution.

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References:

1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
7. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
8. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
9. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968. Statistics

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EXA- 302 Signals and Systems

UNIT-I

Classification of 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, CT systems and DT systems, basic properties of systems, basic properties of systems, linear time invariant systems and properties.

UNIT-II

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.

UNIT-III

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.

UNIT-IV

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.

UNIT-V

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.

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, Signals and Systems, McGraw Hill
4.Simon Haykins and Barry Van Veen, Signals and 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.

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EXA- 303 Electrical Measurements and Instruments

UNIT-I

Galvanometers – Theory, principle of operation and construction of ballistic galvanometer, D'arsonal galvanometer, Definition of analog & digital instruments, Classification of analog instruments, their operating principle, Operating force, Types of supports, Damping, Controlling.

UNIT-II

Different types of Ammeter & Voltmeter – PMMC, MI, Electrodynamometer, Induction, Expression for control & deflection torque, their advantages, disadvantages & error, Extension of range of instruments using shunt & multiplier. Digital Voltmeter, Ammeter, Multimeter and Wattmeter.

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.

UNIT-IV

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]

UNIT-V

Measurement of Energy: Single phase and three phasedigital / Electronic energy meter – construction & operation – Energy flow and power calculations, errors – Testing by phantom loading, Tri-vector meter, Maximum demand meter, Ampere hour meter.

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 & shunt type, Megger & Ratio meter.
Resistance Measurement – Classification of low, medium & high resistance – Voltmeter-Ammeter method, Wheatstone Bridge, Kelvin's double bridge & loss of charge methods for resistance measurement, Earth resistancemeasurement.
Magnetic Measurement – B-H Curve, Hysteresis Loop determination, Power loss in sheet metal – Lloyd Fischer square for measurement of power loss.

Topics for the laboratory (Expandable):

1. Measurement of low resistance using Kelvin's Double bridge
2. Measurement of medium resistance using Wheatstone's bridge
3. Measurement of high resistance by loss of charge method
4. Measurement of Insulation resistance using Megger

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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 method
7. Calibration of a dynamometer type of wattmeter with respect to a standard/Sub Standard wattmeter
8. Calibration of single phase digital/ Electronic type 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 wattmeters.

Text book:-

1. A.K. Sawhney; 'A course in Electrical & Electronic Measurements & Instrumentation'; Dhanpu Rai & co(p) Ltd ,New Delhi

Reference books:-

1. G. K. Banerjee,' Electrical and Electronic Measurements', PHI Learning Pvt. Ltd.
2. R. B. Northrop,' Introduction to Instrumentation and Measurement'; CRC press Taylor & Francis
3. Vijay Singh;' Fundamentals of Electrical & Electronic Measurements', New Age International Publishers.

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EXA-304 Network Analysis

UNIT-I

Introduction to circuit elements R,L,C and their characteristics in terms of linearity & time dependent 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, Dot convention, coupling co- efficient, tuned circuits, Series & parallel resonance.

UNIT-II

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

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

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.]

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 network.

Topics for the laboratory (Expandable):

1. To Verify Thevenin 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 and to Determine Short Circuit parameters of a Two Port Network.
7. To Determine A,B, C, D parameters of a Two Port Network
8. To Determine h parameters of a Two Port Network
9. To Find Frequency Response of RLC Series Circuit.
10. To Find Frequency Response of RLC parallel Circuit.

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REFERENCES

1. M.E. Van Valkenburg, Network Analysis,Pearson
2. William H Hayt & Jack E. Kemmerly, Steven M Durbin; Engineering Circuit Analysis;McGrawHill
3. Richard C Dorf, James A Svoboda, Introduction to Electric Circuits, Wiley India, 2015
4. Charles K. Alexander & Matthew N.O. Sadiku: Electrical Circuits; McGrawHill
5. J David Irwin, Robert M Nelms, Engineering Circuit Analysis, Wiley India,2015
6. Robert L Boylestad, introductory circuit analysis, Pearson,2016
7. M S Sukhija, T K Nagsarkar; Circuits and Networks, Oxford University Press, 2015
8. Samarajit Ghosh, Network Theory Analysis and Synthesis

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EXA-305 Analog Electronics

UNIT-I

Semiconductor Diodes: Theory of P-N junction, temperature dependence and break down characteristics, junction capacitances, Zener diode, Varactor diode, Tunnel diode, PIN diode, LED, Photo diode, Schonky diode, Diode applications: series –parallel configurations, full wave and half wave rectification, voltage multiplier circuits, diode testing.

UNIT-II

Transistors: BJT, types& configuration, working principal, characteristics, and region of operation, load line, biasing methods, Small signal analysis of transistor (low frequency) using h-parameters, thermal runaway and thermal stability,FET, MOSFET, Transistor as an amplifier, gain,bandwidth, frequency response.

UNIT-III

Feedback amplifierand Oscillators: 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, Push-pull and complimentary symmetry push-pull amplifier.

UNIT-IV

Wave Shaping circuits: Switching characteristics of diode and transistor, turn ON, OFF time, reverse recovery time, transistor as switch, Multivibrators, Bistable, Monostable. Astable multivibrators. Clipper and clamper circuit, Differential amplifier, calculation of differential, common mode gain and CMRR using h- parameters, Darlington pair, Boot strapping technique. Cascade and cascade amplifier.

UNIT-V

Operational Amplifier: Operational amplifier basics, practical Op-amp circuits & 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.

Topics for the laboratory (Expandable):

1. Design & measure the frequency response of an RC coupled amplifier using discrete components.
2. Design a two stage RC coupled amplifier and determine the effect of cascading on gain and bandwidth.
3. Study the effect of voltage series, current series, voltage shunt and current shunt feedback on amplifier using discrete components.
4. Design & realize inverting, non-inverting and buffer amplifier using 741 op-amps.
5. Verify the operation of a differentiator circuit using op amp IC 741 and show that it acts as a high pass filter.

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6. Verify the operation of a integrator circuit using op amp 741 and show that it acts as a low pass filter.
7. Design & Verify the operation of adder and subtractor circuit using op amp 741.
8. Plot frequency response of AC coupled amplifier using op amp 741 and study the effect of negative feedback on the bandwidth and gain of the amplifier.
9. Study of IC 555 as astable and monostable multivibrator.
10. Design & realize using op amp 741, wein-bridge oscillator

REFERENCES

1. Robert L Boylestad, Louis Nashelsky; Electronic Devices and Circuits; Pearson
2. Jacob Millman, Cristos C Halkias, Satyabrata Jit; Electronic Devices and Circuits; McGraw-Hill
3. Anil K Maini, Electronic Devices and Circuits, Wiley
4. S Salivahanan, N Suresh Kumar; Electronic Devices and Circuits; McGraw- Hill

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EXA- 306 Computer Programming-I (JAVA)

UNIT-I

Basic Java Features - C++ Vs JAVA, JAVA virtual machine, Constant & Variables, Data Types, Class, Methods, Objects, Strings and Arrays, Type Casting, Operators, Precedence relations, Control Statements, Exception Handling, File and Streams, Visibility, Constructors, Operator and Methods Overloading, Static Members, Inheritance: Polymorphism, Abstract methods and Classes

UNIT-II

Java Collective Frame Work - Data Structures: Introduction, Type-Wrapper Classes for Primitive Types, Dynamic Memory Allocation, Linked List, Stack, Queues, Trees, Generics: Introduction, Overloading Generic Methods, Generic Classes, Collections: Interface Collection and Class Collections, Lists, Array List and Iterator, Linked List, Vector, Collections Algorithms: Algorithm sorts, Algorithm shuffle, Algorithms reverse, fill, copy, max and min Algorithm binary Search, Algorithms add All, Stack Class of Package java. Until, Class Priority Queue and Interface Queue, Maps, Properties Class, Un-modifiable Collections.

UNIT-III

Advance Java Features - Multithreading: Thread States, Priorities and Thread Scheduling, Life Cycle of a Thread, Thread Synchronization, Creating and Executing Threads, Multithreading with GUI, Monitors and Monitor Locks. Networking: Manipulating URLs, Reading a file on a Web Server, Socket programming, Security and the Network, RMI, Networking, Accessing Databases with JDBC: Relational Database, SQL, MySQL, Oracle.

UNIT-IV

Advance Java Technologies - Servlets: Overview and Architecture, Setting Up the Apache Tomcat Server, Handling HTTP get Requests, Deploying a web Application, Multitier Applications.

UNIT-V

Using JDBC from a Servlet, Java Server Pages (JSP): Overview, First JSP Example, Implicit Objects, Scripting, Standard Actions, Directives, Multimedia: Applets and Application: Loading, Displaying and Scaling Images, Animating a Series of Images, Loading and playing Audio clips

Advance Web/Internet Programming (Overview): J2ME, J2EE, EJB, XML.

References:

1. Deitel & Deitel, "JAVA, How to Program"; PHI, Pearson.
2. E. Balaguruswamy, "Programming In Java"; TMH Publications
3. The Complete Reference: Herbert Schildt, TMH
4. Peter Norton, "Peter Norton Guide To Java Programming", Techmedia.
5. Merlin Hughes, et al; Java Network Programming , Manning Publications/Prentice Hall

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List of Program to be perform (Expandable)

1. Installation of J2SDK
2. Write a program to show Concept of CLASS in JAVA
3. Write a program to show Type Casting in JAVA
4. Write a program to show How Exception Handling is in JAVA
5. Write a Program to show Inheritance and Polymorphism
6. Write a program to show Interfacing between two classes
7. Write a program to Add a Class to a Package
8. Write a program to demonstrate AWT.
9. Write a program to Hide a Class
10. Write a Program to show Data Base Connectivity Using JAVA
11. Write a Program to show "HELLO JAVA " in Explorer using Applet
12. Write a Program to show Connectivity using JDBC
13. Write a program to demonstrate multithreading using Java.
14. Write a program to demonstrate applet life cycle.

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EXA- 307 Self Study /GD 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.

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EXA- 401 Energy Ecology Environment and Society

UNIT –I

Sources of Energy : Renewable & Non Renewable, Fossil fuel, Biomass Geothermal, Hydrogen, Solar, Wind, hydal, nuclear sources.

UNIT-II

Segments of Environment: Atmosphere, hydrosphere, Lithosphere, biosphere. Cycles in Ecosystem – Water, Carbon, Nitrogen. Biodiversity: Threats and conservation

UNIT-III

Air Pollution: Air pollutams, classification, (Primary & secondary Pollutants) Adverse effects of pollutants. Causes of Air pollution chemical, photochemical, Green house effect, ozone layer depletion, acid Rain, Sound Pollution; Causes, controlling measures, measurement of sound pollution (decibiage), Industrial and non – Industrial.

UNIT-IV

Water Pollution– Water Pollution: Pollutants in water, adverse effects. Treatment of Domestic & Industrial water effluent. Soil Pollution – Soil Profile, Pollutants in soil, their adverse effects, controlling measures.

UNIT-V

Society, Ethics & Human values– Impact of waste on society. Solid waste management Nuclear, Thermal, Plastic, medical, Agriculture, domestic and e-waste). Ethics and moral values, ethical situations, objectives of ethics and its study . Preliminary studies regarding Environmental Protection Acts , introduction to value education, self exploration, sanyam & swasthya.

REFERENCES:

1. Harris, CE, Prichard MS, Rabin's MJ, "Engineering Ethics"; Cengage Pub.
2. Rana SVS ; "Essentials of Ecology and Environment"; PHI Pub.
3. Raynold, GW "Ethics in information Technology"; Cengage.
4. Svakumar; Energy Environment & Ethics in society; TMH
5. AK De "Environmental Chemistry"; New Age Int. Publ.
6. BK Sharma, "Environmental Chemistry" ; Goel Publ. House.
7. Bala Krishnamoorthy; "Environmental management"; PHI

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EXA- 402 Digital Electronics Logic Design

UNIT-I

Number Systems and Codes: Digital number systems, base conversion, Binary, Decimal, octal, Hexadecimal, number system with radix r, Gray codes, Alpha numeric codes – ASCII code and BCD codes, concept of parity, complement's& (r-1)'s, subtraction with complements, signed Binary numbers, Error Detecting & Correcting codes. Basic Theorems & Properties of Boolean algebra: AND, OR, NOT operators, laws of Boolean algebra, Demorgon's theorem, Boolean expression & logic diagram. Negative logic, Alternate logic gate representation (concept of bubbled gates) canonical and standard Forms (Minterms & Maxterms), sum of minters& product of maxterms, conversion between canonical forms. Truth table & maps, 2,3,4,5 and 6 variable maps, solving digital problems using Maps, Don't care conditions, Tabular minimization. Sum of product & product of sum reduction, Exclusive OR & Exclusive NOR circuits, Parity generator &checkers.

UNIT-II

Combinational Circuits: Design procedure, Adders (half and Full), subtracted (half and full) code convertors, Analysis of design, Universal building blocks, Implementation of any logic circuit with only NAND gates or with only NOR gates, Binary serial adder, parallel adder, serial/parallel adder, look ahead carry generator, BCD adder, Binary multiplier, Magnitude comparator, Decoder, DE multiplexer, Encoders, priority encoder, Multiplexers & implementation of combinational logic diagram.

UNIT-III

Sequential Logic Circuit: Latches, SR latch with NAND & NOR gates, D latch, edge triggered flip flop, J-K flip flop, T flip flop, Master slave flip flop, Analysis of clocked sequential circuit, state table, state diagram, state reduction state equations, state assignments, flip flop excitation table & characteristic equations, Design procedure for sequential circuits, Design with state reduction, Applications of flip-flop.

UNIT-IV

Registers and Counters : Asynchronous and Synchronous counter, counters with MOD numbers, Down coumer, UP/DOWN counter, propagation delay in ripple counter, programmable counter, Pre- settable counter, BCD counter, cascading, counter applications, Decoding in counter, Decoding glitches, Ring Counter, Johnson counter, Rotate left & Rotate right counter, Registers – Buffer, Shift left, shift right, shift left/Right registers, parallel in parallel out, serial in serial out, parallel in serial out, serial in parallel out registers.

UNIT-V

Random Access Memory, Timing waveform, Memory Decoding, Internal Construction, Coincident decoding, Address multiplexing, Read only memory – Combinational circuit

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implementation, Type of ROMs, combinational PLDs, Programmable Logic Array (PLA), Programmable Array Logic (PAL), sequential programmable device. Analog to digital conversion – Ramp type, dual slope, integration, successive approximation, parallel conversion, parallel/ serial conversion, convertor specifications, Digital to Analog convertors – Binary weighted & R/2R D to A convertors.

References:

1. A. Anand Kumar, Fundamentals of digital circuits, PHI
2. A K Maini, Digital Electronics, Wiley India
3. Thomas Blakeslee; Digital Design with standard MSI and LSI; Wiley Interscience
4. Jain RP; Modern digital electronics; TMH
5. M Mano; Digital Logic & Computer design; PHI
6. Tocci ; Digital Systems Principle & applications; Pearson EducationAsia
7. Gothmann; Digital Electronics;PHI
8. Malvino, Leech; Digital Principles and applications–(TMH)
9. Floyad; Digital Fundamentals(UBS)
10. Nripendra N. Biswas; Logic Design Theory(PHI)
11. D.C. Green; Digital Electronics (Pearson EducationAsia)
12. SubrataGhoshal; Digital Electronics, Cengage

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EXA- 403 Electrical Machine-I

UNIT-I

Transformer-I: Working principle, e.mf. 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, allday efficiency, Excitation phenomenon. Autotransformer: working, advantages, its equivalent circuit and phasor diagram.

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.

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

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

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

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List of Experiments (expandable)

1. Perform turn ratio and polarity test on 1-phasetransformer
2. Perform load test on a 1-phase transformer and plot its load characteristic
3. 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.
4. 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.
5. Perform Sumpner's test on two 1-phase transformer and determine its efficiency at various load.
6. Perform No-load and block rotor test on a 3- phase IM and determine its equivalent circuit.
7. Perform load test on a 3- phase IM and plot its performance characteristics.
8. Study various types of starters used for 3- IMs.
9. Perform No-load and block rotor test on a 1- phase IM and determine its equivalent circuit.

TEXT BOOKS

1. Electrical Machines by Nagrath and Kothari, McGraw-Hill
2. P.S.Bimbhra, Electrical Machines.Khanna Publishers

REFERENCES

1.V.Del Toro, "Electrical Machines & Power Systems", 1985, Prentice-Hall, Inc., EnglewoodCliffs
2.S K Bhattacharya, Electrical Machines, McGraw-Hill
3. Ashfaq Hussain, Electrical Machines, Dhanpat Rai & Co
4. Langsdorf, A.C. Machines, McGraw-Hill
5. Samarajit Ghosh, Electrical Machines, Pearson

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EXA- 404 Power System-1

UNIT-I

An overview of Electrical Energy Generation General background, structure and components of power network. Power generation – Introduction to conventional, non-conventional & distributed generation, Effect of transmission voltage on power system economy. Selection of size of feeder. Comparison of isolated versus interconnected power system. Problems associated with modern large interconnected power system. Power Plant Economics - Load curves, base load, peak load, load factor, demand factor, diversity factor, capacity factor, utilization factor, cost of electricity, capital cost, fuel and operation cost.

UNIT-II

Transmission Line Components & Under Ground Cabling: Inductance resistance and capacitance of transmission line, Calculation of inductance for 1-Φ and 3- Φ, Single and double circuit line, Concept of GMR and GMD, Symmetrical & asymmetrical conduction configuration, Calculation of capacitance for 2 wire and 3 wire systems, Effect of ground or capacitance, Capacitance calculation for symmetrical and asymmetrical 1-phase and three phase, Single and double circuit line, Charging current, Transposition of line, Composite conductor, Skin and proximity effect, bundle conductor. Underground Cable Comparison of cables and overhead transmission lines, Classification of cables, requirement of cable construction, capacitance of single and multi-core cable, economic core diameter, dielectric stress in cable, Grading of cables, ionization of Heating of cables, Phenomena of dielectric losses and sheath loss in cables, Thermal resistance of cables.

UNIT-III

Transmission systems & performance of transmission line: Various systems of transmission, effect of system voltage, comparison of conductor materials required for various overhead systems. Short, Medium & long transmission line and their representation, Nominal T, Nominal Π, Equivalent T and equivalent Π, network models. ABCD constants for symmetrical &asymmetrical network, Mathematical solution to estimate regulation & efficiency of all types of lines. Surge Impedance, loading, Interpretation of long line equation and its equivalent equation. Tuned power lines. Power flow through transmission line, Circle diagram, Method of voltage control, Static & rotating VAR generator, transformer control.

UNIT-IV

Insulator & Mechanical design, types of conductors used in overhead transmission line, Types of line supports and towers, Distribution of conductors over transmission towers, Spacing between conductors, Length of span and sag tension calculation for transmission line, Wind & ice loading, support of line at two different levels, string chart, Sag template, Stringing of conductor, Vibration and Vibration dampers. Insulator Materials used for transmission line insulations, Types of insulator for overhead transmission line failure of insulator, Voltage distribution of suspension insulator, String efficiency, Shielding and grading.

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UNIT-V

Voltage control & Distribution system: AC single phase, 3 phase, 3wire & 4 wire distribution, Kelvin's law for most economical size of conductor Substation layout showing substation equipment, bus bar single bus bar and sectionalized bus bar, main and transfer for bus bar system, sectionalized double bus bar system, ring mains.

REFERENCES

1. John Grainger and William Stevenson, Power system Analysis, McGraw Hill.
2. C.L. Wadhwa, Electrical Power System Analysis, New Age International.
3. D.P. Kothari, I.J. Nagrath, Power System Engineering TMH II Ed. Reprint 2009.

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EKA- 405 Control Systems

UNIT-I

Modeling of dynamic systems: Electrical, Mechanical and hydraulic systems, Concept of transfer function. Laplace Transform, 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), tacho-generators, power amplifier, steeper motors.

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.

UNIT-III

Stability: Routh-Hurwitz stability analysis Characteristics equation of closed loop system root loci, construction of loci, Effect of adding, poles and Zeros on the loci, Stability by root loci.

UNIT-IV

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

UNIT-V

Design of control systems with PD/PI/PID Control in time domain and Frequency domain, lead-lag, Lag-lead compensation, Design of compensating networks. Solution of state equation: Eigen values & eigenvectors digitalization state transitive matrix

List of experiments (Expandable)

1. Time response of second order system.
2. Characteristics of Synchros.
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 2nd 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.

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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 orderand 2nd order dynamic equations.
15. Formulation of proportional control on 1st order and 2nd order dynamic systems.
16. Feedback 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.

REFERENCES

1. B.C. Kuo and FaridGolnaraghi, 'Automatic Control Systems', Wiley India.
2. M. Gopal, 'Control system engineering', McGraw Hill
3. K. Ogata, 'Modern Control Engineering', Pearson
4. D. Roy, Chaudhary,'Modern Control Systems', PHI.
5. S. Salivahanan, R. Rengaraj, G.R. Venkatakrishnan, 'Control System Engineering', Pearson.
6. Stefani ShahinSavant,Hostetter, 'Design of feedback control systems' Oxford
7. B.S.Manke, Control system Engineering, Khanna Publishers

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EXA- 406 Python

UNIT-I

Python –Overview

Introduction
History
Features

Python –Environment Setup

Local Environment Setup
Getting Python
Installation of Python Use
of IDE

UNIT-II

Python –Basic Syntax

Python Identifiers
Reserved Words
Lines & Indentation
Multiline Statements
Quotation in Python
Comments & other useful constructs

UNIT-III

Python –Variables

Assigning Values to

Variables Multiple

Assignment

Standard Data Types

Python Numbers

Python Strings

Python Lists

Python Tuples

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UNIT-IV

Data Type Conversion
Python –Basic Operators

Types of Operators
Arithmetic Operators
Comparison Operators
Assignment Operators
Bitwise Operators
Logical Operators
Operator Precedence

Python –Decision Making

If statement Flowchart & Syntax

UNIT-V

Python – Loops
Available loops flowchart
Syntax
Usage

Python-Functions
Defining a Function
Syntax
Calling a Function
Function Arguments
Anonymous Functions

Python-Applications & Further Extensions

EXA- 406 Self Study /GD 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.

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EXA-407 Internship-I

1. Internship on area in Electrical and Electronics filed .

Note- In this Internship student should complete 90 Hr Internship on Electrical and Electronics filed

EXA-408 Industrial Training

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The following objective should be fulfilled in industrial training –I, and student must participate in any Chemical, Petrochemical, Pharmaceutical, Oil and Gas industry where they can learn to apply the Technical knowledge in real Industrial situations.

- Gain experience in writing Technical reports/projects.
- Expose students to the engineer's responsibilities and ethics.
- Expose the students to future employers.
- Understand the social, economic and administrative considerations that influence the working environment of industrial organizations.

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(Minutes of the Board of Studies Committee Meeting)

Name of Department: - Electrical and Electronics Engineering

Minutes of Board of Studies Committee Meeting Dated : 05.07.2020

The Board of Studies Committee Meeting was held through video conference at 1:30 PM on: 05.07.2020 Following members were present.

1. Dr. Mukesh Tiwari
2. Mr.Vijay Prakash Singh
3. Dr. Prabodh Khampariya
4. Mr. Devendra patle
5. Ms. Alka Thakur
6. Mr. Amit Raje (external)
7. Dr. N.P.Patidar (external)

The Chairman of Board of Studies Committee welcomes and appreciated the efforts put up by the faculty for progress of the departmental activities. The following Agenda points were discussed and resolved.

Agenda 1. Approval of EK-5th, 6th semester Scheme and Syllabus (AICTE)

Discussion (if any): Syllabus should be prepared as per current demand in industry.

Resolution of the Discussion: Syllabus was prepared as per current demand in industries and was approved for forthcoming 5th, 6th semester

The Chairman thanks the members for peaceful conduction of meeting.

Signature of All members (including chairman)

1. Dr. Mukesh Tiwari
2. Mr Vijay Prakash Singh
3. Dr. Prabodh Khampariya
4. Mr. Devendra patle
5. Ms. Alka Thakur
6. Mr. Amit Raje (external)
7. Dr. N.P.Patidar (external)

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Department of Electrical and Electronics Engineering

V SEMESTER

S.No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Total Marks	Periods/ hour/ week			Credits
			End Sem. Exam.	Mid Tests	Assign-ments/Quiz	End Sem. Practical & Viva	Practical Record /Assignment / Quiz / Presentation		L	T	P	
1	EXA-501	Control System	60	30	10	30	20	150	2	1	2	4
2	EXA -502	Microprocessors	60	30	10	30	20	150	2	1	2	4
3	EXA -503	Line Commutated and Active Rectifiers	60	30	10	30	20	150	2	1	2	4
4	EXA -504	Program Elective - I	60	30	10	-	-	100	3	1	0	4
5	EXA -505	Open Core Elective - I	60	30	10	-	-	100	3	1	0	4
6	EXA -506	Industrial Training-I				150	100	250			4	2
	TOTAL		300	150	50	240	160	900	12	5	10	22

Program Elective - I	
EXA -504	EXA -504 (A) Electrical Machine Design
	EXA -504 (B) Computer Networks
Open Core Elective-I	
EXA -505	EXA -505 (A) Analog and Digital Communication
	EXA -505 (B) Data Structures and Algorithms

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SEMESTER -V

EXA-501	Control Systems	2L:1T:0P	3 credits	3Hrs/Week

Prerequisites:

To make students understand the concept of state –space analysis, stability and to design the compensator in time and frequency domain.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Understand the modeling of linear-time-invariant systems using transfer function and state- space representations.
- Understand the concept of stability and its assessment for linear-time invariant systems.
- Design simple feedback controllers.

Unit 1: Introduction to control problem (5 hours)

Industrial Control examples, Mathematical models of physical systems. Control hardware and their models. Transfer function models of linear time-invariant systems.

Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback. Block diagram algebra.

Unit 2: Time Response Analysis (9 hours)

Standard test signals. Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second-order systems based on the time-response. Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci.

Unit 3: Frequency-response analysis (8 hours)

Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response.

Unit 4: Introduction to Controller Design (10 hours)

Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems.

Root-loci method of feedback controller design.

Design specifications in frequency-domain. Frequency-domain methods of design.

Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs. Analog and Digital implementation of controllers.

Unit 5: State variable Analysis (10 hours)

Concepts of state variables. State space model. Diagonalization of State Matrix. Solution of state equations. Eigenvalues and Stability Analysis. Concept of controllability and observability.

Pole-placement by state feedback.

Discrete-time systems. Difference Equations. State-space models of linear discrete-time systems. Stability of linear discrete-time systems, Introduction to Optimal Control and NonlinearControl

Performance Indices. Regulator problem. Tracking Problem. Nonlinear system–Basic concepts and analysis.

References Book:

1. M. Gopal, "Control Systems: Principles and Design", McGraw Hill Education, 1997.
2. B. C. Kuo, "Automatic Control System", Prentice Hall, 1995.
3. K. Ogata, "Modern Control Engineering", Prentice Hall, 1991.
4. I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International, 2009

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Control Systems Laboratory

EXA-501	Control Systems	0L:0T:1P	1 Credits	2 Hrs/week

List of Experiments:

1. To determine speed torque characteristics of armature controlled D.C. servomotor.
2. To determine the speed torque characteristics and relationship between torque speed and control windings voltage by AC servomotor.
3. To obtain the step response transient characteristics of first order electric system and to measure system parameters.
4. To plot the nyquist plot of a given transformer function using matlab.
5. To plot the bode plot of a given transformer function using matlab.

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Department of Electrical and Electronics Engineering

EXA-502	Microprocessors	2L:1T:0P	3 Credits	3Hrs/Week

Preamble:

To introduce students with the architecture and operation of typical microprocessors,programming and interfacing of microprocessors and to provide strong foundation for designing real world applications using microprocessors and microcontrollers.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Do assembly language programming.
- Do interfacing design of peripherals like I/O, A/D, D/A, timer etc.
- Develop systems using different microcontrollers.

Unit 1: Fundamentals of Microprocessors (10 Hours)

Fundamentals of Microprocessor Architecture. 8-bitMicroprocessor and Microcontroller architecture, Comparison of 8-bit microcontrollers, 16-bit and 32-bit microcontrollers. Definition of embedded system and its characteristics, Role of microcontrollers in embedded Systems. Overview of the 8051 family.

Unit 2: The 8051 Architecture (10 Hours)

Internal Block Diagram, CPU, ALU, address, data and control bus, Working registers, SFRs, Clock and RESET circuits, Stack and Stack Pointer, Program Counter, I/O ports, Memory Structures, Data and Program Memory, Timing diagrams and Execution Cycles.

Unit 3: Instruction Set and Programming (10 Hours)

Addressing modes: Introduction, Instruction syntax, Data types, Subroutines Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, Indexed addressing, Bit inherent addressing, bit direct addressing, 8051 Instruction set, Instruction timings, Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction. Assembly language programs, C language programs. Assemblers and compilers. Programming and debugging tools.

Unit 4: Memory and I/O Interfacing (6 Hours):

Memory and I/O expansion buses, control signals, memory wait states. Interfacing of peripheral devices such as General Purpose I/O, ADC, DAC, timers, counters, memory devices.

Unit 5: External Communication Interface (6Hours)

Synchronous and Asynchronous Communication, RS232, SPI, I2C. Introduction and interfacing to protocols like Bluetooth and Zig-bee. LED, LCD and keyboard interfacing. Stepper motor interfacing, DC Motor interfacing, sensor interfacing.

References:

1. M. A.Mazidi, J. G. Mazidi and R. D. McKinlay, "The8051Microcontroller and Embedded Systems: Using Assembly and C",Pearson Education, 2007.
2. K. J. Ayala, "8051 Microcontroller", Delmar Cengage Learning,2004.
3. R. Kamal, "Embedded Systems", McGraw Hill Education,2009.
4. R. S. Gaonkar, ", Microprocessor Architecture: Programming and Applications with the 8085", Penram International Publishing, 1996
5. D.A. Patterson and J.H. Hennessy, "Computer Organization and Design: The Hardware/Software interface", Morgan Kaufmann Publishers, 2013.
6. D. V. Hall, "Microprocessors & Interfacing", McGraw Hill Higher Education, 1994.

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EXA-502	Microprocessors	0L:0T:1P	1 Credits	2 Hrs/week

Hands-on experiments related to the course contents

1. To study 8085 based microprocessor system.
2. To study 8086 based microprocessor system.
3. Write an Assembly Language Program to add two 16 bit numbers.
4. Write an Assembly Language Program to subtract two 16 bit numbers.
5. To perform multiplication/division of given numbers.
6. To perform computation of square root of a given number.
7. To obtain interfacing of RAM chip to 8085/8086 based system
8. To develop and run a program for finding out the largest/smallest number from a given set of numbers.

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EXA-503	Line Commutated and Active Rectifiers	2L:1T:0P	3 Credits	3Hrs/Week

Course Outcomes:
At the end of this course, students will demonstrate the ability to
- Analyse controlled rectifier circuits.
- Understand the operation of line-commutated rectifiers – 6 pulse and multi-pulse configurations.
- Understand the operation of PWM rectifiers – operation in rectification and regeneration modes and lagging, leading and unity power factor mode.

Unit 1: Diode rectifiers with passive filtering (6 Hours)
Half-wave diode rectifier with RL and RC loads; 1-phase full-wave diode rectifier with L, C and LC filter; 3-phase diode rectifier with L, C and LC filter; continuous and discontinuousconduction, input current waveshape, effect of source inductance; commutation overlap.

Unit 2: Thyristor rectifiers with passive filtering (6 Hours)
Half-wave thyristor rectifier with RL and RC loads; 1-phase thyristor rectifier with L and LC filter; 3- phase thyristor rectifier with L and LC filter; continuous and discontinuous conduction, input current waveshape

Unit 3: Multi-Pulse converter (6 Lectures)
Review of transformer phase shifting, generation of 6-phase ac voltage from 3-phase ac, 6- pulse converter and 12-pulse converters with inductive loads, steady state analysis, commutation overlap, notches during commutation.

Unit 4: Single-phase ac-dc single-switch boost converter (6 Hours)
Review of dc-dc boost converter, power circuit of single-switch ac-dc converter, steady state analysis, unity power factor operation, closed-loop control structure.

Unit 5: Ac-dc bidirectional boost converter (6 Hours)
Review of 1-phase inverter and 3-phase inverter, power circuits of 1-phase and 3-phase ac-dc boost converter, steady state analysis, operation at leading, lagging and unity power factors. Rectification and regenerating modes. Phasor diagrams, closed-loop control structure.

Isolated single-phase ac-dc flyback converter (10 Hours) Dc-dc flyback converter, output voltage as a function of duty ratio and transformer turns ratio. Power circuit of ac-dc flyback converter, steady state analysis, unity power factor operation, closed loop control structure.

Text / References:

1. G. De, "Principles of Thyristorised Converters", Oxford & IBH Publishing Co, 1988.
2. J.G. Kassakian, M. F. Schlecht and G. C. Verghese, "Principles of Power Electronics", Addison- Wesley, 1991.
3. L. Umanand, " Power Electronics: Essentials and Applications", Wiley India, 2009.
4. N. Mohan and T. M. Undeland, " Power Electronics: Converters, Applications and Design", John Wiley & Sons, 2007. 5. R. W. Erickson and D. Maksimovic, "Fundamentals of Power Electronics", Springer Science & Business Media, 2001

EXA-503	Signals and Systems	0L:0T:1P	1 Credits	2 Hrs/week

1. Single phase half wave diode rectifier with RC load, input current waveshape
2. Performance parameter of single phase full wave diode rectifier, continuous and discontinuous conduction.
3. Power factor improvement of controlled rectifier
4. Review of DC to DC converters: Buck and Boost converter.
5. push pull converter.

Program Elective - I

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EXA-504 (A)	Electrical Machine Design	3L:1T:0P	4 Credits	4Hrs/Week

Preamble:

To familiarize students with the design concepts and various factors which influence the design

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Understand the construction and performance characteristics of electrical machines.
- Understand the various factors which influence the design: electrical, magnetic and thermal loading of electrical machines.
- Understand the principles of electrical machine design and carry out a basic design of an ac machine.
- Use software tools to do design calculations.

Unit 1: Introduction (10 Hours)

Major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings, thermal considerations, heat flow, temperature rise, rating of machines.

Unit 2: Transformers (10 Hours)

Sizing of a transformer, main dimensions, kVA output for single- and three-phase transformers, window space factor, overall dimensions, operating characteristics, regulation, no load current, temperature rise in transformers, design of cooling tank, methods for cooling of transformers.

Unit 3: Induction Motors (10 Hours)

Sizing of an induction motor, main dimensions, length of air gap, rules for selecting rotor slots of squirrel cage machines, design of rotor bars & slots, design of end rings, design of wound rotor, magnetic leakage calculations, SC current circle diagram, leakage reactance of polyphase machines, magnetizingcurrent

Unit 4: Synchronous Machines (11 Hours)

Sizing of a synchronous machine, main dimensions, design of salient pole machines, short circuit ratio, shape of pole face, armature design, armature parameters, estimation of air gap length, design of rotor, design of damper winding, determination of full load field mmf, design of field winding, design of turbo alternators, rotor design.

Unit 5: Computer aided Design (CAD): (9 Hours)

Limitations (assumptions) of traditional designs, need for CAD analysis, synthesis and hybrid methods, design optimization methods, variables, constraints and Preamble function, problem formulation, Introduction to FEM based machine design. Introduction to complex structures of modern machines-PMSMs, BLDCs, SRM and claw-pole machines.

Text / References:

1. A. K. Sawhney, "A Course in Electrical Machine Design", Dhanpat Rai and Sons, 1970.
2. M.G. Say, "Theory & Performance & Design of A.C. Machines", ELBS London.
3. S. K. Sen, "Principles of Electrical Machine Design with computer programmes", Oxford and IBH Publishing, 2006.
4. K. L. Narang, "A Text Book of Electrical Engineering Drawings", SatyaPrakashan, 1969.
5. A. Shanmugasundaram, G. Gangadharan and R. Palani, "Electrical Machine Design Data Book", New Age International, 1979.
6. K. M. V. Murthy, "Computer Aided Design of Electrical Machines", B.S. Publications, 2008.
7. Electrical machines and equipment design exercise examples using Ansoft's Maxwell 2D machine design package

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EXA-504 (B)	**Computer Networks**	3L+1T+0P	4 Credits	**4Hrs/Week**

Preambles of the course

- To develop an understanding of modern network architectures from a design and performance perspective.
- To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
- To provide an opportunity to do network programming
- To provide a WLAN measurement ideas.

Course Outcomes

1. Explain the functions of the different layer of the OSI Protocol.
2. Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) describe the function of each block.
3. For a given requirement (small scale) of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) design it based on the metrics available components
4. For a given problem related TCP/IP protocol developed the network programming.
5. Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

Unit 1: (9 Hours)

Data communication Components: Representation of data and its flow Networks , Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

Unit 2: (9 Hours)

Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD,CDMA/CA

Unit 3: (10 Hours)

Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP-Delivery, Forwarding and Unicast Routing protocols.

Unit 4: (8 Hours)

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

Unit 5: (6 Hours)

Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography

Suggested books :

1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGraw- Hill

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2. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.
3. Computer Networks, 5th Edition, Andrew S. Tanenbaum, Pearson New International Edition.
4. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.
5. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

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SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES

Outcome based Curriculum for

Undergraduate Degree Courses in Engineering & Technology

Department of Electrical and Electronics Engineering

Open Core Elective-I

EXA-505 (A)	Analog and Digital Communication	3L:1T:0P	4 Credits	4Hrs/Week

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Analyze and compare different analog modulation schemes for their efficiency and bandwidth
2. Analyze the behavior of a communication system in presence of noise
3. Investigate pulsed modulation system and analyze their system performance
4. Analyze different digital modulation schemes and can compute the bit error performance

Unit 1 : Introduction (6 Hours)

Review of signals and systems, Frequency domain representation of signals, Principles of AmplitudeModulation Systems- DSB, SSB and VSB modulations. Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals.

Unit 2 : Probability (10Hours)

Review of probability and random process. Gaussian and white noise characteristics,Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and De- emphasis, Threshold effect in angle modulation.

Unit 3 : Sampling (10 Hours)

Pulse modulation. Sampling process. Pulse Amplitude and Pulse code modulation (PCM),Differential pulse code modulation. Delta modulation, Noise considerations in PCM, Time Division multiplexing, Digital Multiplexers.

Unit 4 : Interfacing (10 Hours)

Elements of Detection Theory, Optimum detection of signals in noise,Coherent communication with waveforms- Probability of Error evaluations. BasebandPulse Transmission- Inter symbol Interference and Nyquist criterion.Pass band Digital Modulation schemes- Phase Shift Keying, Frequency Shift Keying,Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying.

Unit 5 : Digital Modulation (6 Hours)

Digital Modulation tradeoffs. Optimum demodulation of digital signals over band-limited channels- Maximum likelihood sequence detection (Viterbi receiver). Equalization Techniques. Synchronization and Carrier Recovery for Digital modulation.

Text/Reference Books:

1. Haykin S., "Communications Systems", John Wiley and Sons, 2001.
2. Proakis J. G. and Salehi M., "Communication Systems Engineering", Pearson Education, 2002.
3. Taub H. and Schilling D.L., "Principles of Communication Systems", Tata McGraw Hill, 2001.
4. Wozencraft J. M. and Jacobs I. M., "Principles of Communication Engineering",John Wiley, 1965.
5. Barry J. R., Lee E. A. and Messerschmitt D. G., "Digital Communication", Kluwer Academic Publishers, 2004.
6. Proakis J.G., "Digital Communications", 4th Edition, McGraw Hill, 2000.

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Department of Electrical and Electronics Engineering

EXA-505 (B)	**Data Structures and Algorithms**	**3L:1T:0P**	**4 Credits**	**4Hrs/Week**

Prerequisites:

1. To impart the basic concepts of data structures and algorithms.
2. To understand concepts about searching and sorting techniques
3. To understand basic concepts about stacks, queues, lists, trees and graphs.
4. To enable them to write algorithms for solving problems with the help of fundamental data structures

Course outcomes:

1. For a given algorithm student will able to analyze the algorithms to determine the time and computation complexity and justify the correctness.
2. For a given Search problem (Linear Search and Binary Search) student will able to implement it.
3. For a given problem of Stacks, Queues and linked list student will able to implement it and analyze the same to determine the time and computation complexity.
4. Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.
5. Student will able to implement Graph search and traversal algorithms and determine the time and computation complexity.

Unit 1 Introduction (6 Hours):

Basic Terminologies: Elementary Data Organizations, Data Structure Operations: Insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. **Searching:** Linear Search and Binary Search Techniques and their complexity analysis.

Unit 2: Stacks and Queues: (6 Hours):

ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

Unit 3: Linked Lists: (10 Hours):

Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

Unit 4:Sorting and Hashing: (10- Hours): Preamble and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort: Performance and Comparison among all the methods, Hashing.

Unit 5:Graph: : (10- Hours): Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.**Trees:** Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity

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analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.

Suggested reference books:

1. Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
2. "How to Solve it by Computer", 2nd Impression by R.G. Dromey, Pearson Education.

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Department of Electrical and Electronics Engineering

EXA-506	**Industrial Training-I**	**0L:0T:2P**	**2 credits**	**4Hrs/Week**

Preamble:

1. To expose the students to actual working environment of electrical engineering and enhance their knowledge and skill from what they have learned in the classes.
2. Another purpose of this program is to instill the good qualities of integrity, responsibility and self-confidence.
3. To pertain students with the electrical field ethics and rules in terms of the society.

Course Outcomes:

Ability to communicate efficiently. Acquired to be a multi-skilled engineer with good technical knowledge of electrical and electronics components and their processing, management, leadership and entrepreneurship skills. Ability to identify, formulate and model problems and find engineering solution based on a systems approach.

Students must observe following points to enrich their learning in electrical engineering during industrial training:

- Industrial environment and work culture.
- Organizational structure and inter personal communication.
- Machines/ equipment/ instruments - their working and specifications.
- Product development procedures and phases.
- Project planning, monitoring and control.
- Quality control and assurance.
- Maintenance system.
- Costing system.
- Stores and purchase systems.
- Roles and responsibilities of different categories of personnel.
- Customer services.
-Problems related to various areas of Work etc.
- Layout if any

To be submitted : The students has to submit the power point presentation of minimum15 slides of the training performed(comprising of points stated above) along with the original certificate of training performed with proper seal and signature of the authorized person.

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Department of Electrical and Electronics Engineering

Scheme of Examination
VI Semester – Bachelor of engineering–(Electrical and Electronics Engineering)

S.No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Total Marks	Periods/ hour/ week			Credits
			End Sem. Exam.	Mid Tests	Assignments/Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation		L	T	P	
1	EXA-601	Power Systems – II	60	30	10	30	20	150	2	1	2	4
2	EXA-602	Measurements and Instrumentation	60	30	10	30	20	150	2	1	2	4
3	EXA-603	Program Elective - II	60	30	10			100	3	1	0	4
4	EXA-604	Program Elective - III	60	30	10	-		100	3	0	0	3
5	EXA-605	Open Core Elective-II	60	30	10	-		100	3	0	0	3
6	EXA-606	Minor Project	-	-	-	180	120	300	-	-	4	2
		TOTAL	300	150	50	240	160	900	13	3	8	20

Program Elective - II		
EXA-603	EXA-603 (A) Computer Architecture	EXA-603 (B)Digital Signal Processing
Program Elective - III		
EXA-604	EXA-604 (A)Industrial Electrical Systems	EXA-604 (B) Digital Control Systems
Open Core Elective-II		
EXA-605	EXA-605 (A)VLSI circuits	EXA-605 (B)Image Processing

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Outcome based Curriculum for
Undergraduate Degree Courses in Engineering & Technology
Department of Electrical and Electronics Engineering

EXA-601	Power Systems – II	2L:1T:0P	3 credits	3Hrs/Week

Prerequisite:

- To introduce the students to the general structure of the network for transferring power from generating stations to the consumers.
- To expose the students to the different electrical & mechanical aspects of the power network along with its environmental and safety constraints.
- To familiarize the students with the price structure of Indian power market

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Use numerical methods to analyze a power system in steady state.
- Understand stability constraints in a synchronous grid.
- Understand methods to control the voltage, frequency and power flow.
- Understand the monitoring and control of a power system.
- Understand the basics of power system economics.

Unit 1: Power Flow Analysis (7 hours)

Review of the structure of a Power System and its components. Analysis of Power Flows: Formation of Bus Admittance Matrix. Real and reactive power balance equations at a node. Load and Generator Specifications. Application of numerical methods for solution of non-linear algebraic equations – Gauss Seidel and Newton-Raphson methods for the solution of the power flow equations. Computational Issues in Large-scale Power Systems.

Unit 2: Stability Constraints in synchronous grids (8 hours)

Swing Equations of a synchronous machine connected to an infinite bus. Power angle curve. Description of the phenomena of loss of synchronism in a single-machine infinite bus system following a disturbance like a three-phase fault. Analysis using numerical integration of swing equations (using methods like Forward Euler, Runge-Kutta 4th order methods), as well as the Equal Area Criterion. Impact of stability constraints on Power System Operation. Effect of generation rescheduling and series compensation of transmission lines on stability.

Unit 3: Control of Frequency and Voltage (9 hours)

Turbines and Speed-Governors, Frequency dependence of loads, Droop Control and Power Sharing. Automatic Generation Control. Generation and absorption of reactive power by various components of a Power System. Excitation System Control in synchronous generators, Automatic Voltage Regulators. Shunt Compensators. Static VAR compensators and STATCOMs. Tap Changing Transformers.Power flow control using embedded dc links, phase shifters and

Unit 4: Monitoring and Control (8 hours)

Overview of Energy Control Centre Functions: SCADA systems, Phasor Measurement Units and Wide-Area Measurement Systems. State-estimation. System Security Assessment. Normal, Alert, Emergency, Extremis states of a Power System. Contingency Analysis. Preventive Control and Emergency Control.

Unit 5: Power System Economics and Management (10 hours)

Basic Pricing Principles: Generator Cost Curves, Utility Functions, Power Exchanges, Spot Pricing. Electricity Market Models (Vertically Integrated, Purchasing Agency, Whole-sale competition, Retail Competition), Demand Side-management, Transmission and Distributions charges, Ancillary Services. Regulatory framework.

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References Book:

1. J. Grainger and W. D. Stevenson, "Power System Analysis", McGraw Hill Education, 1994.
2. O. I. Elgerd, "Electric Energy Systems Theory", McGraw Hill Education, 1995.
3. A. R. Bergen and V. Vittal, "Power System Analysis", Pearson Education Inc., 1999.
4. D. P. Kothari and I. J. Nagrath, "Modern Power System Analysis", McGraw Hill Education. 2003.
5. B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, "Electric Power Systems", Wiley, 2012.

EXA-601	Power Systems-II Laboratory	0L:0T:1P	1 credits	2Hrs/Week

List of experiments (Extendable):

1. To develop a program in Matlab 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 Matlab 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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EXA-602	Measurements and Instrumentation	2L:1T:0P	3 credits	3Hrs/Week

Prerequisite:

The objective of the course is to provide a brief knowledge of measurements and measuring instruments related to engineering. To give the sufficient information of measurements and error related to instruments and their minimization in any kind of industry viz. electrical, electronics, mechanical etc and basic knowledge of AC bridges.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Design and validate DC and AC bridges.
- Analyze the dynamic response and the calibration of few instruments.
- Learn about various measurement devices, their characteristics, their operation and their limitations.
- Understand statistical data analysis.
- Understand computerized data acquisition.

Unit I-Philosophy of Measurement(10Hrs): Methods of measurement, measurement system, classification of instrument system, characteristics of instruments & measurement systems, Accuracy and precision, sensitivity resolution, errors in measurement & its analysis, standards, operating force, types of supports, damping, controlling.

Analog Measurement of Electrical Quantities(10Hrs):: PMMC, MI, electrodynamic, thermocouple, electrostatic & rectifier type ammeters & voltmeters, electrodynamic type wattmeter, three phase wattmeter, power in three phase systems, low power factor & UPF wattmeter, errors & remedies in wattmeter, energy meter, D'arsonal galvanometer.

Unit II- Instrument Transformers(4Hrs):: CT and PT; their errors, applications of CT and PT in the extension of instrument range, measurement of speed, frequency and power factor.

Unit III- Measurement of Parameters(6Hrs):: Different methods of measuring low, medium and high resistances, measurement of inductance & capacitance with the help of AC Bridges, Q meter, Megger.

Unit IV- AC Potentiometers(10Hrs): Polar type & Co-ordinate type AC potentiometers, application of AC Potentiometers in electrical measurement.
Magnetic Measurement- Ballistic galvanometer, flux meter, determination of hysteresis loop, measurement of iron losses, Lloyd Fischer square for measurement of power loss.

Unit V- Digital Measurement of Electrical Quantities(10Hrs):: Concept of digital measurement, block diagram, analog & digital instruments, digital voltmeter, frequency meter, spectrum analyzer, electronic multimeter.
Cathode Ray Oscilloscope: CRO block diagram, Cathode Ray Tube & its components, applications of CRO, lissajous pattern, dual trace & dual beam oscilloscopes.

Reference Book:

1. E. W. Golding & F. C. Widdis, "Electrical Measurement &Measuring Instrument", A. W. Wheeler & Co. Pvt. Ltd. India
2. A. K. Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons, India
3. Purkait, "Electrical & Electronics Measurement & Instrumentation", TMH
4. Forest K. Harris, "Electrical Measurement", Willey Eastern Pvt. Ltd. India
5. M. B. Stout , "Basic Electrical Measurement", Prentice Hall of India
6. W. D. Cooper, "Electronic Instrument & Measurement Technique", Prentice Hall International
7. J. B. Gupta, "Electrical Measurement & Measuring Instrument", S. K. Kataria & Sons

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EXA-602	Measurements and Instrumentation	0L:0T:1P	1 credits	2Hrs/Week

List of Experiments:

1. Measurement of low resistance using Kelvin's Double Bridge.
2. Measurement of medium resistance using Wheatstone's bridge.
3. Measurement of high resistance by loss of charge method.
4. Measurement of insulation resistance using Megger.
5. Measurement of power in a single phase ac circuit by 3 voltmeter/ 3 Ammeter method
6. Calibration of a induction type single phase energy meter
7. Calibration of a dynamometer type of wattmeter by Phantom Loading method.
8. Measurements using Instrument Transformers.
9. Study of various types of Indicating Instruments.
10. Measurement of Power in three phase circuit by one, two & three wattmeters.
11. Measurement of a batch of resistors and estimating statistical parameters.
12. Measurement of L using a bridge technique as well as LCR meter.
13. Measurement of C using a bridge technique as well as LCR meter.

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Program Elective - II

EXA-603 (A)	Computer Architecture	3L:1T:0P	4 Credits	4Hrs/Week

Preamble:

To study the basic organization and architecture of digital computers (CPU, memory, I/O, software). Discussions will include digital logic and microprogramming. Such knowledge leads to better understanding and utilization of digital computers, and can be used in the design and application of computer systems or as foundation for more advanced computer-related studies

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Understand the concepts of microprocessors, their principles and practices.
- Write efficient programs in assembly language of the 8086 family of microprocessors.
- Organize a modern computer system and be able to relate it to real examples.
- Develop the programs in assembly language for 80286, 80386 and MIPS processors in real and protected modes.
- Implement embedded applications using ATOM processor

Unit 1: Introduction to computer organization (10 hours)

Architecture and function of general computer system, CISC Vs RISC, Data types, Integer Arithmetic - Multiplication, Division, Fixed and Floating point representation and arithmetic, Control unit operation, Hardware implementation of CPU with Micro instruction, microprogramming, System buses, Multi-bus organization.

Unit 2: Memory organization (8 hours)

System memory, Cache memory - types and organization, Virtual memory and its implementation, Memory management unit, Magnetic Hard disks, Optical Disks.

Unit 3: Input – output Organization (6 hours)

Accessing I/O devices, Direct Memory Access and DMA controller, Interrupts and Interrupt Controllers, Arbitration, Multilevel Bus Architecture, Interface circuits - Parallel and serial port. Features of PCI and PCI Express bus.

Unit 4: 16 and 32 microprocessors (10hours)

80x86 Architecture, IA – 32 and IA – 64, Programming model, Concurrent operation of EU and BIU, Real mode addressing, Segmentation, Addressing modes of 80x86, Instruction set of 80x86, I/O addressing in 80x86

Unit 5: Pipelining (10 hours)

Introduction to pipelining, Instruction level pipelining (ILP), compiler techniques for ILP, Data hazards, Dynamic scheduling, Dependability, Branch cost, Branch Prediction, Influence on instruction set, VLIW Architecture, DSP Architecture, SoC architecture, MIPS Processor and programming

Text/Reference Books

1. V. Carl, G. Zvonko and S. G. Zaky, "Computer organization", McGraw Hill, 1978.
2. B. Brey and C. R. Sarma, "The Intel microprocessors", Pearson Education, 2000.
3. J. L. Hennessy and D. A. Patterson, "Computer Architecture A Quantitative Approach", Morgan Kauffman, 2011.
4. W. Stallings, "Computer organization", PHI, 1987.
5. P. Barry and P. Crowley, "Modern Embedded Computing", Morgan Kaufmann, 2012.
6. N. Mathivanan, "Microprocessors, PC Hardware and Interfacing", Prentice Hall, 2004.
7. Y. C. Liu and G. A. Gibson, "Microcomputer Systems: The 8086/8088 Family", Prentice Hall India, 1986.

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8. J. Uffenbeck, "The 8086/8088 Design, Programming, Interfacing", Prentice Hall, 1987.
9. B. Govindarajalu, "IBM PC and Clones", Tata McGraw Hill, 1991.
10. P. Able, "8086 Assembly Language Programming", Prentice Hall India

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EXA-603 (B)	Digital Signal Processing	3L:1T:0P	4 Credits	4Hrs/Week

Preamble:
To make students familiar with the most important methods in DSP, including digital filter design, transform-domain processing and importance of Signal Processors. To make students aware about the meaning and implications of the properties of systems and signals.

Course Outcomes:
At the end of this course students will demonstrate the ability to
1. Represent signals mathematically in continuous and discrete time and frequency domain
2. Get the response of an LSI system to different signals
3. Design of different types of digital filters for various application

Unit -1 Discrete time signals (10Hrs):
Sequences; representation of signals on orthogonal basis; Sampling and reconstruction of signals; Discrete systems attributes, Z-Transform.

Unit -2 Analysis of LSI systems (6Hrs):
Analysis of LSI systems, frequency Analysis, Inverse Systems, Discrete Fourier Transform (DFT),Fast Fourier Transform Algorithm, Implementation of Discrete Time Systems

Unit -3 Design of FIR Digital filters(10Hrs):
: Window method, Park-McClellan's method, Design of IIR Digital Filters: Butterworth, Chebyshev and Elliptic Approximations; Low pass, Band pass, Band stop and High pass filters.

Unit -4(10Hrs) Analysis of FIR:
Effect of finite register length in FIR filter design Parametric and non-parametric spectral estimation.

Unit -5 Signal Processing (6Hrs):
Introduction to multirate signalprocessing, Application of DSP.

Reference Books:
1. S.K.Mitra, Digital Signal Processing: A computer based approach,TMH
2. A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall, 1999.
3. John G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms And Applications, Prentice Hall, 1997.
4. L.R. Rabiner and B. Gold, Theory and Application of Digital Signal Processing, Prentice Hall, 1992.
5. J.R. Johnson, Introduction to Digital Signal Processing, Prentice Hall,1992.
6. D.J.DeFatta, J. G. Lucas andW.S.Hodgkiss, Digital Signal Processing, John Wiley& Sons, 1988.

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Program Elective - III

EXA-604 (B)	**Industrial Electrical Systems**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Preamble:

To equip learners with the skills and knowledge necessary to successfully carry out basic service and maintenance of Industrial Electrical Systems in a safe and environmentally sound manner.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Understand the electrical wiring systems for residential, commercial and industrial consumers, representing the systems with standard symbols and drawings, SLD.
- Understand various components of industrial electrical systems.
- Analyze and select the proper size of various electrical system components.

Unit 1: Electrical System Components (10 Hours)

LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices.

Unit 2: Residential and Commercial Electrical Systems (12 Hours)

Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components.

Unit 3: Illumination Systems (6 Hours)

Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premises, flood lighting.

Unit 4: Industrial Electrical Systems I (8 Hours)

HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting of motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factor correction – kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components.

Unit 5: Industrial Electrical Systems II (6 Hours)

DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and

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Battery Banks, Selection of UPS and Battery Banks.

Industrial Electrical System Automation: Study of basic PLC, Role of in automation, advantages of process automation, PLC based control system design, Panel Metering and Introduction to SCADA system for distribution automation.

Reference Books

2. S.L. Uppal and G.C. Garg, "Electrical Wiring, Estimating & Costing", Khanna publishers, 2008.
3. K. B. Raina, "Electrical Design, Estimating & Costing", New age International, 2007.
4. S. Singh and R. D. Singh, "Electrical estimating and costing", Dhanpat Rai and Co., 1997.
5. Web site for IS Standards.
6. H. Joshi, "Residential Commercial and Industrial Systems", McGraw Hill Education, 2008.

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Department of Electrical and Electronics Engineering

EXA-605 (A)	VLSI Circuits	3L:0T:0P	3 credits	3Hrs/Week

Preamble:

To provide students with a sound knowledge of **VLSI** system **design** verification and testability, and system reliability. The emphasis of the course is on techniques for system **design**, testing, system noise and performance analysis.

Outcomes:

Wires and Vias, Scalable Design rules, Layout Design tools. Logic Gates & Layouts: Static Complementary Gates, Switch Logic, Alternative

UNIT –I: Review of Microelectronics and Introduction to MOS Technologies: (10Hrs)
MOS, CMOS, BiCMOS Technology. Basic Electrical Properties of MOS, CMOS & BiCMOS Circuits: Ids - Vds relationships, Threshold Voltage VT, Gm, Gds and ωo, Pass Transistor, MOS, CMOS & Bi CMOS Inverters, Zpu/Zpd, MOS Transistor circuit model, Latch-up in CMOS circuits.

UNIT –II: Layout Design and Tools: (10Hrs)
Transistor structures, Wires and Vias, Scalable Design rules, Layout Design tools. Logic Gates & Layouts: Static Complementary Gates, Switch Logic, Alternative Gate circuits, Low power gates, Resistive and Inductive interconnect delays.

UNIT –III: Combinational Logic Networks: (6 Hrs)
Layouts, Simulation, Network delay, Interconnect design, Power optimization. Switch logic networks, Gate and Network testing.

UNIT –IV: Sequential Systems: (10 Hrs)
Memory cells and Arrays, Clocking disciplines, Design, Power optimization, Design validation and testing.

UNIT –V: Floor Planning: (6Hrs)
Floor planning methods, Global Interconnect, Floor Plan Design, Off-chip connections.

References:

1. Essentials of VLSI Circuits and Systems, K. Eshraghian Eshraghian. D, A. Pucknell, 2005, PHI.
2. Modern VLSI Design – Wayne Wolf, 3rd Ed., 1997, Pearson Education.
3. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011.
4. Principals of CMOS VLSI Design – N.H.E Weste, K. Eshraghian, 2nd Ed., Addison Wesley.

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Department of Electrical and Electronics Engineering

EXA-605 (B) Image Processing

EXA-605 (B)	**Image Processing**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Prerequisite

to give an introduction to basic concepts and methodologies for digital image processing , to develop a foundation that can be used as the basis for further study and research in this field.

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Mathematically represent the various types of images and analyze them.
2. Process these images for the enhancement of certain properties or for optimized use of the resources.
3. Develop algorithms for image compression and coding

Unit 1 Digital Image Fundamentals(6 Hrs)-

Elements of visual perception, image sensing andacquisition, image sampling and quantization, basic relationships between pixels – neighborhood, adjacency, connectivity, distance measures.

Unit 2 Image Enhancements and Filtering(6 Hrs)

-Gray level transformations, histogramequalization and specifications, pixel-domain smoothing filters – linear and order-statistics, pixel-domain sharpening filters – first and second derivative, two-dimensional DFT and its inverse, frequency domain filters – low-pass and high-pass.

Unit 3 Color Image Processing-Color models (10 Hrs):

RGB, YUV, HSI; Color transformations– formulation, color complements, color slicing, tone and color corrections; Color image smoothing and sharpening; Color Segmentation. Image Segmentation- Detection of discontinuities, edge linking and boundarydetection, thresholding, global and adaptive, region-based segmentation.

Wavelets and Multi-resolution image processing- Uncertainty principles of FourierTransform, Time-frequency localization, continuous wavelet transforms, wavelet bases and multi-resolution analysis, wavelets and Subband filter banks, wavelet packets.

Unit 4 Image Compression-Redundancy (10 Hrs):

inter-pixel and psycho-visual; Lossless compression – predictive, entropy; Lossy compression-predictive and transform coding; Discrete Cosine Transform; Still image compression standards–JPEG and JPEG-2000.

Unit 5 Fundamentals of Video Coding(10 Hrs):

-Inter-frame redundancy, motion estimationtechniques – full-search, fast search strategies, forward and backward motion prediction, frame classification – I, P and B; Video sequence hierarchy–Group of pictures, frames, slices, macro-blocks and blocks; Elements of a video encoder and decoder; Video coding standards – MPEG and H.26X.

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Video Segmentation-Temporal segmentation–shot boundary detection, hard-cutsand soft-cuts; spatial segmentation–motion-based; Video object detection and tracking.

Reference Books:

1. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Second Edition, Pearson Education 3rd edition 2008
2. Anil Kumar Jain, Fundamentals of Digital Image Processing, Prentice Hall of India 2nd edition 2004
3. Murat Tekalp , Digital Video Processing" Prentice Hall, 2nd edition 2015

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SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES
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Outcome based Curriculum for
Undergraduate Degree Courses in Engineering & Technology
Department of Electrical and Electronics Engineering

EXA 606	**Minor Project**	**0L:0T:4P**	**2 credits**	**4Hrs/Week**

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Design and validate DC and AC bridges
2. Analyze the dynamic response and the calibration of few instruments
3. Learn about various measurement devices, their characteristics, their operation and their
4. limitations
5. understand statistical data analysis
6. Understand computerized data acquisition.

7. Conceive a problem statement either from rigorous literature survey or from the requirements
8. raised from need analysis.
9. Design, implement and test the prototype/algorithm in order to solve the conceived problem.
10. Write comprehensive report on Minor project work.

Guidelines:

1. The Minor-project is a team activity having 3-4 students in a team. This is electronic product design work with a focus on electronic circuit design.
2. The Minor project may be a complete hardware or a combination of hardware and software. The software part in Minor project should be less than 50% of the total work.
3. Minor Project should cater to a small system required in laboratory or real life.
4. It should encompass components, devices, analog or digital ICs, micro controller with which functional familiarity is introduced.
5. After interactions with course coordinator and based on comprehensive literature survey/need analysis, the student shall identify the title and define the aim and Preambles of Minor project.
6. Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and submit the proposal within first week of the semester.
7. The student is expected to exert on design, development and testing of the proposed work as per the schedule.
8. Art work and Layout should be made using CAD based PCB simulation software. Due considerations should be given for power requirement of the system, mechanical aspects for enclosure and control panel design

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(Established Under Act. 06 of 2014 by Govt. of Madhya Pradesh)
Approved by Madhya Pradesh Private University Regulatory Commission
Bhopal Indore Road, Opposite Pachama Oilfed Plant Pachama, Sehore. Phone: (07562) - 222492

Corp. Office: 102, Zamrud, Ganga Jamuna Complex (Ramprasad), M.P. Nagar, Bhopal (M.P.) Ph: (0755) 5270000, Fax (0755) 5870914

(Minutes of the Board of Studies Committee Meeting)

School Of Engineering

Department of Electrical and Electronics Engineering

Minutes of Board of Studies Committee Meeting Dated 06/07/2021

The Board of Studies Committee Meeting was held in the room b/a Google meet of HOD (EX) at 10:30 AM on 06/07/2021. Following
members were present.

1. Mr. Vijay Prakash Singh
2. Dr. Prabodh Khampariya
3. Ms. Alka Thakur
4. Mr. Devendra Patle
6. Dr. N.P. Patidar (External Academic Expert)
7. Mr. Amit Raje (External Industry Expert)

The Chairman of Board of Studies Committee welcomes and appreciated the efforts put up by the faculty for
Progress of the departmental activities. The following Agenda points were discussed and resolved.

Agenda 1. Approval of EX-7 and 8 th semester Scheme and Syllabus (AICTE)

Discussion (If any) : Scheme and Syllabus should be prepared as per current demand in industry.

Resolution of the Discussion: Scheme and Syllabus was prepared as per current demand in industries and was
approved for forthcoming EX-7 and 8 th semester

The Chairman thanks the members for peaceful conduction of meeting.

Signature of All members (Including chairman)

1. Mr. Vijay Prakash Singh
2. Dr. Prabodh Khampariya
3. Ms. Alka Thakur
4. Mr. Devendra Patle
5. Dr. N.P. Patidar (External Academic Expert)

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Scheme of Examination - AICTE Pattern

Undergraduate Degree Courses in Engineering & Technology

Bachelor of Engineering (Electrical and Electronics Engineering)

VII SEMESTER

S.No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Total Marks	Periods/ hour/ week			Credits
			End Sem. Exam	Mid Tests	Assignments/ Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation		L	T	P	
1	EXA-701	Power system Protection	60	30	10	30	20	150	3	0	2	4
2	EXA-702	Electrical Drives	60	30	10	30	20	150	3	0	2	4
3	EXA-703	Program Elective-IV	60	30	10		-	100	3	0	0	3
4	EXA-704	Open Core Elective-III	60	30	10	-	-	100	3	0	0	3
5	EXA-705	Project Stage-I	-	-	-	120	80	200	-	-	10	5
6	EXA-706	Self-Study/GD/Seminar	-	-	-	-	200	200	-	-	2	1
	TOTAL		240	120	40	180	320	900	12	0	16	20

Program Elective-IV	
EXA-703	EXA-703 (A) Wind and Solar Energy System
	EXA-703 (B) Strength of Materials
	EXA-703 (C) Intelligent System
Open Core Elective-III	
EXA-704	EXA-704 (A) Prime Movers
	EXA-704 (B) Total Quality Management
	EXA-704 (C) Evolutionary Techniques

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Scheme of Examination - AICTE Pattern

Undergraduate Degree Courses in Engineering & Technology

Bachelor of Engineering (Electrical and Electronics Engineering)

VII SEMESTER

S.No.	Subject Code	Subject Name	Maximum Marks Theory Slot			Maximum Marks (Practical Slot)		Total Marks	Periods/ hour/ week			Credits
			End Sem. Exam	Mid Tests	Assignments/ Quiz	End Sem. Practical & Viva	Practical Record /Assignment/ Quiz / Presentation		L	T	P	
1	EXA-801	Power Controller	60	30	10	30	20	150	3	0	2	4
2	EXA-802	Program Elective-V	60	30	10		-	100	3	0	0	3
3	EXA-803	Open Core Elective-IV	60	30	10	-	-	100	3	0	0	3
4	EXA-804	Project Stage -II	-	-	-	240	160	400	-	-	16	8
TOTAL			180	90	30	270	180	750	9	0	18	18

Professional Elective-V	
EXA-802	EXA-802 (A) EHVAC & DC
	EXA-802 (B) Machine Learning
	EXA-802 (C) Modern Manufacturing Processes
Open Core Elective-IV	
EXA-803	EXA 803(A) Economic Policies in India
	EEA 803(B) Cyber Law and Ethics
	EXA 803(C) Internet of Things

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SEMESTER – VII

EXA-701 Power System Protection

EXA-701	Power System Protection	3L:0T:0P	3 credits	3Hrs/Week

Course Preamble:

To provide an overview of the principles and schemes for protecting power lines, transformers, buses, generators and introduces the fundamentals of wide-area monitoring and control

Course Outcomes: At the end of this course, students will demonstrate the ability to

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

Unit 1: Introduction and Components of a Protection System (6 hours)
Principles of Power System Protection, Relays, Instrument transformers, Circuit Breakers

Unit 2: Faults and Over-Current Protection (6 hours)
Review of Fault Analysis, Sequence Networks. Introduction to Overcurrent Protection and overcurrent relay co-ordination.

Unit 3: Equipment Protection Schemes (10 hours)

Directional, Distance, Differential protection. Transformer and Generator protection. Busbar Protection, Bus Bar arrangement schemes,

Digital Protection Computer-aided protection, Fourier analysis and extraction of Phasors from DFT. Sampling, aliasing issues.

Unit 4: Modeling and Simulation of Protection Schemes (10 hours)
CT/PT modeling and standards, Simulation of transients using Electro-Magnetic Transients (EMT) programs. Relay Testing.

Unit 5: System Protection (10hours)
Effect of Power Swings on Distance Relaying. System Protection Schemes. Under-frequency, under- voltage and df/dt relays, Out-of-step protection, Synchro-phasors, Phasor Measurement Units and Wide-Area Measurement Systems (WAMS). Application of WAMS for improving protection systems.

Text/References

1. J. L. Blackburn, "Protective Relaying: Principles and Applications", Marcel Dekker, New York, 1987.
2. Y. G.Paithankar and S. R. Bhide, "Fundamentals of power system protection", Prentice Hall, India, 2010.
3. A. G. Phadke and J. S. Thorp, "Computer Relaying for Power Systems", John Wiley & Sons, 1992.
4. A. G. Phadke and J. S. Thorp, "Synchronized Phasor Measurements and their Applications", Springer, 2008.
5. D. Reimert, "Protective Relaying for Power Generation Systems", Taylor and Francis, 2006.

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EXA-701 Power System Protection

6.

EXA-701	Power System Protection	0L:0T:1P	1 credits	2Hrs/Week

List of Experiments :(Extendable)

1.
2. 1. Determination of drop out factor of an instantaneous over-current relay.
3. 2. Determination of operating characteristic of IDMT relay.
4. 3. Determination of operating characteristic of differential relay.
5. 4. Study and operation of gas actuated protective relay.
6. 5. Study and operation of static over current relay
7. 6. Analysis of power system faults (Symmetrical & Asymmetrical) using MATLAB.
8. 7. Study of SF6 circuit breaker

8. Protectional simulation study of generator, Transformer, Feeder & Motor protection

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EXA-702 Electrical Drives

EXA-702	**Electrical Drives**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Preamble:

To provide fundamental knowledge in dynamics and control of Electric Drives. To justify the selection of Drives for various applications. To familiarize the various semiconductor controlled drives employing various motors.

Outcomes:

At the end of this course, students will demonstrate the ability to

- Understand the characteristics of dc motors and induction motors.
- Understand the principles of speed-control of dc motors and induction motors.
- Understand the power electronic converters used for dc motor and induction motor speed control.

Unit 1: DC motor characteristics (6 hours)

Review of emf and torque equations of DC machine, review of torque-speed characteristics of separately excited dc motor, change in torque-speed curve with armature voltage, example load torque-speed characteristics, operating point, armature voltage control for varying motor speed, flux weakening for high speed operation.

Unit 2: Chopper fed DC drive (6 hours)

Review of dc chopper and duty ratio control, chopper fed dc motor for speed control, steady state operation of a chopper fed drive, armature current waveform and ripple, calculation of losses in dc motor and chopper, efficiency of dc drive, smooth starting.

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Unit 3: Multi-quadrant DC drive (6 hours)

Review of motoring and generating modes operation of a separately excited dc machine, four quadrant operation of dc machine; single-quadrant, two-quadrant and four-quadrant choppers; steady-state operation of multi-quadrant chopper fed dc drive, regenerative braking.

Unit 4: Closed-loop control of DC Drive (12 hours)

Control structure of DC drive, inner current loop and outer speed loop, dynamic model of dc motor – dynamic equations and transfer functions, modeling of chopper as gain with switching delay, plant transfer function, for controller design, current controller specification and design, speed controller specification and design.

Induction motor characteristics

Review of induction motor equivalent circuit and torque-speed characteristic, variation of torque- speed curve with (i) applied voltage, (ii) applied frequency and (iii) applied voltage and frequency, typical torque-speed curves of fan and pump loads, operating point, constant flux operation, flux weakening operation.

Unit 5: Scalar control or constant V/f control of induction motor (12 hours)

Review of three-phase voltage source inverter, generation of three-phase PWM signals, sinusoidal modulation, space vector theory, conventional space vector modulation; constant V/f control of induction motor, steady-state performance analysis based on equivalent circuit, speed drop with loading, slip regulation.

Control of slip ring induction motor

Impact of rotor resistance of the induction motor torque-speed curve, operation of slip-ring induction motor with external rotor resistance, starting torque, power electronic based rotor side control of slip ring motor, slip power recovery.

References:

1. G. K. Dubey, "Power Semiconductor Controlled Drives", Prentice Hall, 1989.
2. R. Krishnan, "Electric Motor Drives: Modeling, Analysis and Control", Prentice Hall, 2001.
3. G. K. Dubey, "Fundamentals of Electrical Drives", CRC Press, 2002.
4. W. Leonhard, "Control of Electric Drives", Springer Science & Business Media, 2001.

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EXA-702	**Electrical Drives**	0L:0T:1P	1 credits	**2Hrs/Week**

List of experiments:

1. To study the starting and running characteristics of converter fed DC traction motor.
2. To study the energy recovery systems and braking of a DC drive.
3. To study the braking methods of a three-phase induction motor.
4. To study the performance of VSI fed three-phase induction motor using PWM technique.
5. To control the speed of a three phase slip ring Induction motor using rotor impedance control.
6. To study the performance of Vector Controlled three phase Induction motor drive.
7. To Study frequency Controlled Synchronous motor drive.

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Open Core Elective-III

EXA-703 (A) Wind and Solar Energy Systems

EXA-703 (A)	Wind and Solar Energy Systems	3L:0T:0P	3 credits	3Hrs/Week

Course Preamble:

To study clean and *renewable* energy sources, i.e. *wind energy turbines* and *systems*, *solar* photovoltaic devices and *systems* and to practice *system*-level designs, analytical design and analysis and modeling and simulation.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

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

Unit 1: Physics of Wind Power: (6 Hours)

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.

Unit 2: Wind generator topologies: (10 Hours)

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.

Unit 3: The Solar Resource: (6 Hours)

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

Unit 4: Solar photovoltaic: (10 Hours)

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

Unit 5: Network Integration Issues: (10 Hours)

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.

Solar thermal power generation:

Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis.

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Text / References:

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.
6. J. A. Duffie and W. A. Beckman, "Solar Engineering of Thermal Processes", John Wiley & Sons, 1991.

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EXA-703 (B) Strength of Materials

EXA-703 (B)	**Strength of Materials**	**3L:0T:0P**	**3 credits**	3Hrs/Week

Preambles:

- To understand the nature of stresses developed in simple geometries such as bars, cantilevers, beams, shafts, cylinders and spheres for various types of simple loads
- To calculate the elastic deformation occurring in various simple geometries for different types of loading

Course Outcomes:

- After completing this course, the students should be able to recognise various types loads applied on machine components of simple geometry and understand the nature of internal stresses that will develop within the components
- The students will be able to evaluate the strains and deformation that will result due to the elastic stresses developed within the materials for simple types of loading

Unit 1 Deformation in solids-: (10 Hours)

Hooke's law, stress and strain- tension, compression and shear stresses- elastic constants and their relations- volumetric, linear and shear strains- principal stresses and principal planes- Mohr's circle.

Unit 2 Beams and types transverse loading on beams-: (10 Hours)

shear force and bend moment diagrams- Types of beam supports, simply supported and over-hanging beams, cantilevers. Theory of bending of beams, bending stress distribution and neutral axis, shear stress distribution, point and distributed loads.

Unit 3 Moment of inertia: (10 Hours)

Moment of inertia about an axis and polar moment of inertia, deflection of a beam using double integration method, computation of slopes and deflection in beams, Maxwell's reciprocal theorems.

Unit 4 Torsion: (6 Hours)

Torsion, stresses and deformation in circular and hollow shafts, stepped shafts, deflection of shafts fixed at both ends, stresses and deflection of helical springs.

Unit 5 Axial and hoop stresses (6 Hours)

Axial and hoop stresses in cylinders subjected to internal pressure, deformation of thick and thin cylinders, deformation in spherical shells subjected to internal pressure

Course Outcomes:

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- After completing this course, the students should be able to recognise various types loads applied on machine components of simple geometry and understand the nature of internal stresses that will develop within the components
- The students will be able to evaluate the strains and deformation that will result due to the elastic stresses developed within the materials for simple types of loading

Text Books:

1. Egor P. Popov, Engineering Mechanics of Solids, Prentice Hall of India, New Delhi, 2001.
2. R. Subramanian, Strength of Materials, Oxford University Press, 2007.
3. Ferdinand P. Beer, Russel Johnson Jr and John J. Dewole, Mechanics of Materials, Tata McGrawHill Publishing Co. Ltd., New Delhi 2005.

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EXA-703(C) Intelligent System

EXA-703 (C)	Intelligent System	3L:0T:0P	3 credits	3Hrs/Week

Course Preamble:

The primary Preamble of this course is to introduce the basic principles, techniques, and applications of Artificial Intelligence. ... Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.

Course Outcomes:
Students will gain deep understanding of the basic artificial *intelligence* techniques. o Strategies and Actions used to produce the *outcome*: • Learn about artificial *intelligence* techniques and *intelligent systems*

UNIT I Fundamental Issues in IS: (6 Hrs)

Definition of AI , History ,Domains AI ,AI problems & State space ,Some examples problems representations like Travelling Salespersons, Syntax analysis Problem. Basic issues to solve AI problems, Underlying assumptions, AI techniques, Level of model, Criteria for success, Control strategies, DFS, BFS

UNIT II Heuristic Search Techniques (4 Hrs)
Generate & Test, Hill Climbing (simple &stripes), Best first search, A*, AO*, Constraint Satisfaction.

UNIT III Knowledge Representation Issues: (12 Hrs)
Syntax & Semantic for Propositional logic, Syntax & Semantic for FOPL, Properties for WFF_s, Resolution Basics : conversion to clausal form ,Resolution of propositon logic, Resolution algorithms for predicates, Problems with FOPL ,Semantic nets ,Frames ,Scripts

UNIT IV Reasoning under Uncertainty: (10 Hrs)
An Introduction, Default reasoning & Closed world assumptions, Model & Temporal logic ,Fuzzy logic, Bayes Probabilistic inference Dempster Shafer theory ,Heuristic reasoning methods

UNIT V Planning & Learning: (10 Hrs)
Planning, Planning in Situational calculus ,Representation for planning ,Partial order palnning, Partial order palnning algorithm, Learning by Examples, Learning by Analogy, Explanation based learning, Neurals nets, Genetics algorithms
Minimax: Game playing strategy, Natural language processing ,Overview of linguistics , Grammer& Language, Transformation Grammer, Basic Parsing Techniques, Expert System, Architecture of Rule based Expert system ,Non Rule based Expert system.

References:

1. Artificial Intelligence by Elain Rich & Kevin Knight, Tata McGraw Hills Pub.
2. Principals of AI by Nills J.Nilsson, Pearson Education Pub. 177
3. Artificial Intelligence by DAN. W.Peterson, Printice Hall of India
4. Artificial Intelligence by Petrick Henry Winston,
5. Artificial Intelligence by Russel and Norvig, Pearson Education Pub.

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Open Core Elective IV

EXA-704 (A) Prime Movers

EXA-704 (A)	**Prime Movers**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Unit-I Fluid Mechanics: (10 Hrs):
Newtonian and non-newtonian fluids, viscosity, types of fluid flows, continuity, momentum & energy equations, Bernoulli's equation and its applications, laminar and turbulent flows, flow through pipes, friction losses in pipes, Darcy equation, Reynolds number and its significance.

Unit-II Hydraulic Turbines: (10 Hrs):
Classification and working principles of turbines, Pelton, Francis, and Kaplan turbine, velocity diagrams for impulse and reaction turbine, calculation of blade angles, work-done, power output and efficiencies, specific speed of turbines, function of draft tube and type of draft tubes, unit quantities, performance and characteristic curves.

Unit-III Generation of steam: (10 Hrs):
Dryness fraction and properties of steam function of boilers, working principle of Lancashire boiler, Cornish boiler, Cochran boiler, Locomotive boiler, Babcock and Wilcox boiler, boiler mounting and accessories, Rankine and Modified Rankine cycle for steam engines, evaluation of mean effective pressure, power and cylinder dimension for single acting and double acting steam engines.

Unit-IV Steam turbines: (4 Hrs):
Classification of steam turbines, velocity diagrams for simple impulse and reaction turbines, compounding of steam turbines, pressure compounding, velocity compounding, and pressure-velocity compounding, problems on work done, blade angles, power and thermal efficiency of the turbine. Gas turbine, classification of gas turbine-constant pressure combustion cycle, closed cycle and constant volume combustion gas turbine plants, calculation of various efficiencies and parameters.

Unit-V Pumps: (8 Hrs):
Reciprocating pumps, working of single and double acting types, effect of acceleration head and friction, use of air vessels, work done and power required without and with air vessels centrifugal pumps: classification and working of centrifugal pumps, need for priming, work done and efficiencies, specific speed of pumps, cavitation and its effect on performance.

References:

1. R.K.Rajput, Thermal Engineering, Laxmi Publications, 2004
2. R.Yadav, Steam and Gas turbines, Central Publishing House Ltd 2004 .
3. S.Ramamrutham, Hydraulic Machines, Dhanpat Rainal Sons 2004

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SCHOOL OF ENGINEERING
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EXA-704 (B) Total Quality Management

EXA-704 (B)	**Total Quality Management**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Preambles: To facilitate the understanding of total quality management principles and processes

Course Outcomes: Upon completion of this course, the students will be able to use the tools and techniques of TQM in manufacturing and service sectors.

Unit 1 Introduction (6 Hrs)

need for quality, evolution of quality; Definitions of quality, product quality and service quality; Basic concepts of TQM, TQM framework, contributions of Deming, Juran and Crosby. Barriers to TQM; Quality statements, customer focus, customer orientation & satisfaction, customer complaints, customer retention; costs to quality.

Unit 2 TQM principles (6 Hrs)

leadership, strategic quality planning; Quality councils- employee involvement, motivation; Empowerment; Team and Teamwork; Quality circles, recognition and reward, performance appraisal; Continuous process improvement; PDCE cycle, 5S, Kaizen; Supplier partnership, Partnering, Supplier rating & selection.

Unit 3 The seven traditional tools of quality (10Hrs)

New management tools; Six sigma- concepts, methodology, applications to manufacturing, service sector including IT, Bench marking process; FMEA- stages, types.

Unit 4 TQM tools and techniques, (10 Hrs)

control charts, process capability, concepts of six sigma, Quality Function Development (QFD), Taguchi quality loss function; TPM- concepts, improvement needs, performance measures. Quality systems, need for ISO 9000, ISO 9001-9008;

Unit 5 Quality system-(10Hrs)

Elements, documentation,; Quality auditing, QS 9000, ISO 14000- concepts, requirements and benefits; TQM implementation in manufacturing and service sectors.

Text Books:

1. Bester field D.H. et al., Total quality Management, 3rd ed., Pearson Education Asia, 2006.

2. Evans J.R. and Lindsay W.M., The management and Control of Quality, 8th ed., first Indian edition, Cengage Learning, 2012.

3. Janakiraman B. and Gopal R.K., Total Quality Management, Prentice Hall India, 2006. Suganthi L. and Samuel A., Total Quality Management, Prentice Hall India, 2006.

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EXA-704 (C) Evolutionary Techniques

EXA-704 (C)	Evolutionary Techniques	3L:0T:0P	3 credits	3Hrs/Week

Unit –I: Introduction: (8 Hrs)
Approaches to intelligent control, architecture for intelligent control, symbolic reasoning system, rule-based systems, the AI approach, knowledge representation - expert systems.

Unit –II: Artificial Neural Networks: (6 Hrs)
Basic concept mathematical model, mcculloch-pitts neuron model, simple perceptron, Adaline and Madaline, feed-forward multilayer perceptron, learning and training the neural network, data processing, scaling, fourier transformation, principal-component analysis, wavelet transformations, hopfield network, self-organizing network and recurrent network, neural network based controller.

Unit –III: Fuzzy Logic System: (12 Hrs)
Crisp sets, fuzzy sets, basic fuzzy set operation and approximate reasoning, fuzzy logic modeling and control, fuzzification, inferencing and defuzzification, fuzzy knowledge and rule bases, fuzzy modeling and control schemes for nonlinear systems, self organizing fuzzy logic control.

Unit –IV: Genetic Algorithm: (10 Hrs)
Basic concept of genetic algorithm and detail algorithmic steps, adjustment of free parameters, solution of typical control problems using genetic algorithm, concept on some other search techniques like Tabu search and Ant-colony search techniques for solving optimization problems.

Unit –V: Applications: (10 Hrs)
GA application to power system optimization problem, Case studies: Identification and control of linear and nonlinear dynamic systems using MATLAB-neural -network toolbox, stability analysis of neural-network interconnection systems, implementation of fuzzy logic controller using MATLAB fuzzy-logic toolbox, stability analysis of fuzzy control systems.

References:

1. Introduction to Artificial Neural Systems - Jacek.M.Zurada, Jaico Publishing House, 1999.
2. Neural Networks and Fuzzy Systems - Kosko, B., Prentice-Hall of India Pvt. Ltd., 1994.
3. Fuzzy Sets, Uncertainty and Information - Klir G.J. & Folger T.A., Prentice-Hall of India Pvt. Ltd., 1993.
4. Fuzzy Set Theory and Its Applications - Zimmermann H.J. Kluwer Academic Publishers, 1994. Introduction to Fuzzy Control - Driankov, Hellendroon, Narosa Publishers.
5. Artificial Neural Networks - Dr. B. Yegnanarayana, 1999, PHI, New Delhi.
6. Elements of Artificial Neural Networks - Kishan Mehrotra, Chelkuri K. Mohan, Sanjay Ranka, Penram International.
7. Artificial Neural Network –Simon Haykin, 2nd Ed., Pearson Education.
8. Introduction Neural Networks Using MATLAB 6.0 - S.N. Shivanandam, S. Sumati, S. N. Deepa, I/e, TMH, New Delhi.

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EXA 705 Projects-I (Major)

EXA 705	**Project-I (Minor)**	**0L:0T:4P**	**4 credits**	**8Hrs/Week**

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Design and validate electrical algorithms for optimum solution
2. Analyze the dynamic response and the calibration of few instruments
3. Build projects as per industry and society demands.

Guidelines:

1. The Major-project is a team activity having 3-4 students in a team. This is electronic product design work with a focus on electronic circuit design.
2. The Major project may be a complete hardware or a combination of hardware and software. The software part in Minor project should be less than 50% of the total work.
3. Minor Project should cater to a small system required in laboratory or real life.
4. It should encompass components, devices, analog or digital ICs, micro controller with which functional familiarity is introduced.
5. After interactions with course coordinator and based on comprehensive literature survey/need analysis, the student shall identify the title and define the aim and Preambles of Minor project.
6. Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and submit the proposal within first week of the semester.
7. The student is expected to exert on design, development and testing of the proposed work as per the schedule.
8. Art work and Layout should be made using CAD based PCB simulation software. Due considerations should be given for power requirement of the system, mechanical aspects for enclosure and control panel design.

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EXA-706 Self Study/GD/Seminar

EXA-706	Self-Study/GD/Seminar	0L:0T:1P	1 credits	1Hrs/Week

Course Preamble:

The main Preamble is to improve the mass communication and convincing/understanding skills of students .And to give the students an opportunity to exercise their rights to express themselves. The evaluation will be done based on their presentation work and group discussion.

Course Outcomes:
In terms of content, students will be able to

Presentation Skills

They will be able to make use of visual, audio and audio-visual material to support their presentation, and will be able to speak cogently with or without notes. Students will present either in groups or as individuals.

Discussion Skills

Students will be able to judge when to speak and how much to say, speak clearly and audibly in a manner appropriate to the subject, ask appropriate questions, use evidence to support claims, respond to a range of questions, take part in meaningful discussion

Listening Skills

Students will demonstrate that they have paid close attention to what others say and can respond constructively. Through listening attentively, they will be able to build on discussion fruitfully, supporting and connecting with other discussants. They will be able to follow academic discussions, infer meanings that are not overt, and take notes from a discussion or presentation.

Argumentative Skills and Critical Thinking

Students will develop persuasive speech, present information in a compelling, well-structured, and logical sequence, respond respectfully to opposing ideas, show depth of knowledge of complex subjects, and develop their ability to synthesize, evaluate and reflect on information.

Questioning

Through asking appropriate questions, students will demonstrate their understanding of discussions and spark further discussion.

Interdisciplinary Inquiry

Students will be able to reach across diverse disciplines to apply theories, methods and knowledge bases from multiple fields to a single question or problem.

Engaging with Big Questions

Students will engage with important questions that stimulate discussion and debate.

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Studying Major Works

Students will engage with works that are widely held to be significant in the field of study, while recognizing cultural diversity and the ever-changing nature of what is regarded as important.

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EXA-801 Power Controller

EXA-801 (A)	**Power Controller**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Unit I Various Power Semiconductor Devices: (6 Hrs)

SCR, GTO, MOSFET, BJT, IGBT & MCT's & their protection, series-parallel operation, Heat sink calculations, Design of firing circuit for converters, choppers & inverters.

Unit II- Analysis & Design: (6 Hrs)
1-φ bridge converter, 3-φ bridge converter with and without freewheeling diode, effect of source impedance, power factor improvement techniques, and pulse width modulated converters, Dual converters, converter for HVDC application & DC drives.

Unit III-Analysis & Design: (10 Hrs)
voltage commutated, current commutated and load commutated choppers, multiquadrant choppers, chopper for traction application. Resonant choppers. SMPS.

Unit IV-VSI & CSI : (10 Hrs)
1-φ VSI, 3-φ VSI (180° mode, 150° mode & 120° mode of conduction), various inverter commutation circuits, harmonic reduction techniques, PWM inverters, Inverters for HVDC application & AC drives. Advantages & limitation of current source inverters over VSI, 1-phase and 3-phase CSI. Resonant inverters.

Unit V- Cycloconverter: (10Hrs)
1-φ to 1-φ, 3-φ to 3-φ cycloconverter circuits, circulating current scheme, non-circulating current operation, Mean output voltage, harmonics in supply current waveform & input-power factor. Concept of power quality

References:

1. Thyristorised Power Controllers - G.K.Dubey, Doradla, Joshi, Sinha
2. Power Electronics - C.W.Lander
3. Power Electronics - Rashid
4. Thyristorised power controlled converters & cycloconverters - B.R.Pelly
5. Power Electronics - N.Mohan
6. Power Electronics Application - Vithyathil.

EXA-801 Power Controller

EXA-801	**Power Controller**	**0L:0T:1P**	**1 credits**	**2Hrs/Week**

List of Experiments :(Extendable)

2: To study the characteristics of microcontroller based over current relay.
3: To perform symmetrical fault analysis in AC network analyser.
4: To perform symmetrical fault analysis in DC network analyser & perform the experiment for Unsymmetrical fault analysis on DC network.
5: To study the characteristics of the operation of Buchholz relay.
6: To study the characteristics of the microprocessor based DMT/IDMT over current

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relay and determines the time current characteristics.
7: Testing of negative Sequence relay using the negative sequence I/P against negative sequence current balanced and unbalanced load condition.
8: To study the characteristics of Electromechanical over current relay.
9: To study microcontroller base over/ under voltage relay.
10: To study characteristics of microcontroller based earth fault relay.
11: To study characteristics of electromechanical earth fault relay.
12: To find out the string efficiency across the string of insulators.
Experiment 13:To study various effects on transmission line simulator
a) Ferranti effect simulation for an unloaded line
b) Shunt Reactor Compensation for Unloaded Line
c) Loading of Transmission line
d) Shunt capacitive compensation of transmission line (to improve voltage profile)
e) Parallel operation of transmission line
f) Simulation of 3-Phase fault
g) Simulation of SLG, LLG and LL fault
h) Effect of Parallel line on Fault Current
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EXA-802 (A)	EHVAC & DC	3L:0T:0P	3 credits	3Hrs/Week

Unit- I Introduction: (6Hrs)
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 capacity, firing angle control, overlapping.

Unit- II FACTS Devices: (10Hrs)
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 compensator(SVC), series series controller, combined series-shunt controller, unified power flow controller (UPFC), thyristor controlled p+

phase shifting transformer(TCPST).

Unit- III Converters in EHV D.C: (10Hrs)
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 ,commutation failure, multi terminal D.C. lines.

Unit- IV Controlling: (10Hrs)
Control of EHV D.C. system, control characteristics, constant current control, constant extinction angle control, ignition angle control, parallel operation of HVAC & DC system, problems & advantages.

Unit- V Transmission Systems: (6Hrs)
Travelling waves on transmission systems, attenuation, distortion, effect of junction and termination on propagation of travelling waves, over voltages in transmission system, lightning, switching and temporary over voltages, control of lighting and switching over voltages.

References:

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

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EXA-802 (B) Machine Learning

EXA-802 (B)	**Machine Learning**	**3L:0T:0P**	**Credits**	**3Hrs/Week**

UNIT-I Introduction: (10Hrs)

Learning, Types of Machine Learning. Some Basic Statistics: Averages, Variance and Covariance, Gaussian distribution, Bayes theorem. Concept learning: Introduction, Version Spaces and the Candidate Elimination Algorithm. Learning with Trees: Constructing Decision Trees, CART, Classification Example

UNIT-II Time Series : (6Hrs)

AR, MA, ARMA, ARIMA , ARMAX for predictions using time dependent data. Linear Discriminants: Linear Separability, Linear Regression , Dimensionality Reduction: Linear Discriminant Analysis, Principal Component Analysis SUPPORT Vector Machines: Optimal Separation, Kernels The Bias-Variance Tradeoff.

UNIT-III Bayesian learning: (6Hrs)

Introduction, Bayes Optimal Classifier, Naive Bayes Classifier, Bayesian belief networks, Approximate Inference, Making Bayesian Networks, Hidden Markov Models, The Forward Algorithm, Neural Networks : The Perceptron, Multilayer Perceptron (MLP): Going Forwards, Backwards, MLP in practice: Deriving back Propagation

UNIT-IV Clustering: (10Hrs)

Introduction, Similarity and Distance Measures, Outliers, Hierarchical Methods, Partitional Algorithms, Clustering Large Databases, Clustering with Categorical Attributes, Comparison Evolutionary Learning: Genetic Algorithms, Genetic Operators, Genetic Programming Ensemble learning: Boosting, Bagging

UNIT-V Case studies : (10Hrs)

Use of Data sets , Data Pre-processing and application of the suitable algorithms .

Suggested Reading:

1. Tom M. Mitchell, Machine Learning, Mc Graw Hill, 1997

2. Stephen Marsland, Machine Learning - An Algorithmic Perspective, CRC Press, 2009

3. Margaret H Dunham, Data Mining, Pearson Edition., 2003.

4. Galit Shmueli, Nitin R Patel, Peter C Bruce, Data Mining for Business Intelligence, Wiley India Edition, 2007 5. Rajjan Shinghal, Pattern Recognition, Oxford University Press, 2006.

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EXA-802 (C) Modern Manufacturing Processes

EXA-802 (C)	**Modern Manufacturing Processes**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Preambles:

To motivate and challenge students to understand and develop an appreciation of the processes in correlation with material properties which change the shape, size and form of the raw materials into the desirable product by conventional or unconventional manufacturing methods

Course Outcomes:

Upon completion of this course, students will be able to understand the different conventional and unconventional manufacturing methods employed for making different products

Unit 1 Conventional Manufacturing processes: (8Hrs)

Casting and moulding: Metal casting processes and equipment, Heat transfer and solidification, shrinkage, riser design, casting defects and residual stresses.

Unit 2 Introduction to bulk and sheet metal forming, (10Hrs)

plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk forming(forging, rolling, extrusion, drawing) and sheet forming (shearing, deep drawing, bending) principles of powder metallurgy.

Unit 3 Metal cutting: (10Hrs)

Single and multi-point cutting; Orthogonal cutting, various force components; Chip formation, Tool wear and tool life, Surface finish and integrity, Machinability, Cutting tool materials, Cutting fluids, Coating; Turning, Drilling, Milling and finishing processes, Introduction to CNC machining.

Unit 4 Additive manufacturing: (6Hrs)

Rapid prototyping and rapid tooling Joining/fastening processes: Physics of welding, brazing and soldering,design considerations in welding,Solid and liquid state joining processes;Adhesive bonding.

Unit 5 Unconventional Machining Processes: (10Hrs)

Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet Machining, Ultrasonic Machining, principles and process parameters

Electrical Discharge Machining, principle and processes parameters, MRR, surface finish, tool wear, dielectric, power and control circuits, wire EDM; Electro-chemical machining (ECM), etchant &maskant, process parameters, MRR and surface finish. Laser Beam Machining (LBM), Plasma Arc Machining (PAM) and Electron Beam Machining

Text Books:

1. Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition)- Pearson India, 2014
2. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems
3. Degarmo, Black &Kohser, Materials and Processes in Manufacturing

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EXA-803(A) Economic Policies in India

EXA 803(A)	Economic Policies in India	[illegible]	[illegible] credits	3Hrs/Week

Unit –I Basic features and problems of Indian Economy: -(6 Hrs)
Nature of Indian Economy, demographic features and Human Resource Development (HDI), Problems of Poverty, Unemployment, Inflation, income inequality, Black money in India.

Unit-II Sectoral composition of Indian Economy (6 Hrs)
- Issues in Agriculture sector in India ,land reforms Green Revolution and agriculture policies of India , Industrial development , small scale and cottage industries, industrial Policy, Public sector in India, service sector in India.

Unit-III Economic Policies :- (6 Hrs)
Economic Planning in India , Planning commission v/s NITI Aayog, monetary policy in India, Fiscal Policy in India,

Unit IV Centre state Finance Relations, (6 Hrs)
Finance commission in India. LPG policy in India.

Unit-V External sector in India: -(6 Hrs)
India's foreign trade value composition and direction, India Balance of payment since 1991, FDI in India, Impact of Globalization on Indian Economy, WTO and India.

Suggested Readings:

1. Dutt Rudder and K.P.M Sunderam (2001): Indian Economy, S Chand & Co. Ltd. New Delhi.

2. Mishra S.K & V.K Puri (2001) "Indian Economy and –Its development experience", Himalaya Publishing House.

3. KapilaUma: Indian Economy: Policies and Performances, Academic Foundation

4. Bardhan, P.K. (9th Edition) (1999), The Political Economy of Development in India, Oxford University Press, New Delhi.

5. Jalan, B. (1996), India's Economic Policy- Preparing for the Twenty First Century, Viking, New Delhi.

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EXA-803 (B) Cyber Law and Ethics

EXA 803(B)	Cyber Law and Ethics	3L:0T:0P	3 credits	3Hrs/Week

Course Preambles:

Understanding the Real Approach, Cyber Ethics, Cyber Jurisdiction, Cyber Laws of other rules.

Course Outcomes:

Students identify and analyze statutory, regulatory, constitutional, and organizational *laws* that affect the information technology professional. Students locate and apply case *law* and common *law* to current *legal* dilemmas in the technology field.

UNIT I History of Information Systems and its Importance, (10 Hrs)

basics, Changing Nature of Information Systems, Need of Distributed Information Systems, Role of Internet and Web Services, Information System Threats and attacks, Classification of Threats and Assessing Damages Security in Mobile and Wireless Computing- Security Challenges in Mobile Devices, Authentication Service Security, Security Implication for organizations, Laptops Security Basic Principles of Information Security, Confidentiality, Integrity Availability and other terms in Information Security, Information Classification and their Roles

UNIT II Security Threats to E Commerce, (10 Hrs)

Virtual Organization, Business Transactions on Web, E Governance and EDI, Concepts in Electronics payment systems, E Cash, Credit/Debit Cards. Physical Security- Needs, Disaster and Controls, Basic Tenets of Physical Security and Physical Entry Controls, Access Control- Biometrics, Factors in Biometrics Systems, Benefits, Criteria for selection of biometrics, Design Issues in Biometric Systems, Interoperability Issues, Economic and Social Aspects, Legal Challenges

UNIT III Model of Cryptographic Systems, (6 Hrs)

Issues in Documents Security, System of Keys, Public Key Cryptography, Digital Signature, Requirement of Digital Signature System, Finger Prints, Firewalls, Design and Implementation Issues, Policies Network

Unit IV Security (6 Hrs)

Basic Concepts, Dimensions, Perimeter for Network Protection, Network Access, Need of Intrusion Monitoring and Detection, Intrusion Detection Virtual Private Networks- Need, Use of Tunneling with VPN, Authentication Mechanisms, Types of VPNs and their Usage, Security Concerns in VPN

UNIT V Security metrics (10 Hrs)

Classification and their benefits Information Security & Law, IPR, Patent Law, Copyright Law, Legal Issues in Data mining Security, Building Security into Software Life Cycle Ethics- Ethical Issues, Issues in Data and Software Privacy Cyber Crime Types & overview of Cyber Crimes

References:

1. Godbole,— Information Systems Security‖, Wile
2. Merkov, Breithaupt, — Information Security‖, Pearson Education
3. Yadav, —Foundations of Information Technology‖, New Age, Delhi 4. Schou, Shoemaker, — Information Assurance for the Enterprise‖, Tata McGraw Hill
5. Sood,—Cyber Laws Simplified‖, Mc Graw Hill
6. Furnell, —Computer Insecurity‖, Springer 7. IT Act 2000

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EXA-803(C) Internet of Things

EXA 803(C)	**Internet of Things**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Course Preamble:

1. To assess the vision and introduction of IoT.
2. To Understand IoT Market perspective.
3. To Implement Data and Knowledge Management and use of Devices in IoT Technology.
4. To Understand State of the Art – IoT Architecture.
5. To classify Real World IoT Design Constraints, Industrial Automation in IoT.

Course Outcomes:

On successful completion of the course, the student will: ▪ Understand the concepts of Internet of Things ▪ Analyze basic protocols in wireless sensor network ▪ Design IoT applications in different domain and be able to analyze their performance ▪ Implement basic IoT applications on embedded platform

Unit 1 Introduction to IoT – **(10 Hrs)**

Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs

Unit 2 IoT & M2M – **(10 Hrs)**

Machine to Machine, Difference between IoT and M2M, Software define Network

Unit 3 Network & Communication **(10 Hrs)**

Network & Communication aspects Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination

Challenges in IoT Design challenges, Development challenges, Security challenges, Other challenges

Unit 4 Domain specific applications **(6 Hrs)**

Domain specific applications of IoT Home automation, Industry applications, Surveillance applications.

Unit 5 Other IoT applications **(6 Hrs)**

Developing IoTs Introduction to Python, Introduction to different IoT tools, Developing applications through IoT tools, Developing sensor based application through embedded system platform, Implementing IoT concepts with python

Reference Books:

1. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach"

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2. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"

EXA-804 Projects –II (Major)

EXA 804	**Projects –II (Major)**	**0L:0T:6P**	**6 credits**	**12Hrs/Week**

Preambles:

The object of Project Work II & Dissertation is to enable the student to extend further the investigative study taken up under EC P1, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned in the light of the Report prepared under EEP1;
2. Review and finalization of the Approach to the Problem relating to the assigned topic;
3. Preparing an Action Plan for conducting the investigation, including team work;
4. Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experimental as needed;
5. Final development of product/process, testing, results, conclusions and future directions;
6. Preparing a paper for Conference presentation/Publication in Journals, if possible;
7. Preparing a Dissertation in the standard format for being evaluated by the Department.
8. Final Seminar Presentation before a Departmental Committee

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