EXC 501- Electrical Machine-II

Unit I - 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.

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 I**nsulators**: 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**.**

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.

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.

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 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

EXC-504(C) Entrepreneurship Development

UNIT-I

Introduction, Meaning and Importance, 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, McGragor'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

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

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
Microprocessor 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

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**.**

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 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.

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.
Jonartthan W. Valvano Brooks/cole " Embedded Micro Computer Systems. Real time Interfacing", Thomson learning

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