DR. A P J ABDUL KALAM UNIVERSITY, INDORE

SYLLABUS

of

BACHELOR OF ENGINEERING

(Electrical & Electronics Engineering)

(THIRD Year)

(Session July- December 2017)

College of Engineering

Dr. A P J Abdul Kalam University, Indore

DR. A P J ABDUL KALAM UNIVERSITY, INDORE

Syllabus for Bachelor of Engineering

(Electrical & Electronics Engineering)

List of Subject (Third Year)

Sub Code: EX-501 Sub Name: Utilisation of Electrical Energy 4 Credits

Unit-I Illumination Engineering

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

Unit-II Heating, Welding And Electrolysis

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

Unit-III Traction

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

Unit-IV Electric Drives

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

Unit-V Introduction to Electric and Hybrid Vehicles

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

References:

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

Sub Code: EX-502 Sub Name: Electrical Machine-II 4 Credits

Unit-I D.C. Machine-I

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

Unit-II D.C. Machine-II

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

Unit-III Synchronous Machine-I

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

Unit-IV Synchronous Machine-II

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

Unit-V Synchronous machine-III

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

References:

1. M.G. Say,Performance & design of AC machines, CBS publishers & distributors, Delhi, 3rd edition
2. A.E. Clayton & N.N. Nancock, The Performance & design of DC machines CBS publications & distributors, Delhi, 3rd edition
3. P.S. Bhimbra, Electrical Machinery, Khanna Pub.

4. P.S. Bhimbra, Generalized theory of Electrical Machines, Khanna publishers, Delhi,
5. Ashfaq Husain, Electric Machines, Dhanpat Rai, New Delhi
5. I.J. Nagrath & D.P. Kothari, Electric Machines, Tata McGraw Hill , New Delhi,
6. Syed A. Nasar,Electric Machines & Power Systems, Volume I , Tata McGraw Hill, New Delhi
7. A. E. Fitzerald, C. Kingsley & S.D. Umans , Electric Machinery Tata McGraw Hill ,New Delhi ,5th edition

List of Experiments (expandable)

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

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

Sub Code: EX-503 Sub Name: Microprocessors and Microcontrollers 4 Credits

UNIT 1: Microprocessor 8086

Introduction to 16-bit 8086 microprocessors, architecture of 8086, Pin Configuration, interrupts, minimum mode and maximum mode, timing diagram, Memory interfacing, Comparative study of Salient features of 8086, 80286 and 80386.

UNIT 2: Microprocessor 8086 programming

Instruction set of 8086, Addressing mode, Assembler directives & operations, assembly and machine language programming, subroutine call and returns, Concept of stack, Stack structure of 8086, timings and delays,

UNIT 3: Input-Output interfacing

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

UNIT 4: Microcontroller 8051

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

UNIT 5: 8051 Interfacing, Applications and serial communication

8051 interfacing to ADC and DAC, Stepper motor interfacing, Timer/ counter functions, 8051 based thyristor firing circuit, 8051 connections to RS-232, 8051 Serial communication , Serial communication modes, Serial communication programming, Serial port programming in C.

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. V.Udayashankara and M.S.Mallikarjunaswamy, 8051 Microcontroller: Hardware, Software & Applications, Tata McGraw – Hill, 2009.
7. McKinlay, The 8051 Microcontroller and Embedded Systems – using assembly and C, PHI, 2006 / Pearson, 2006.
8. Microprocessor and Interfacing, I edition 2012, oxford press setnil kumar, Saravam Jeevanathan shah.

List of Experiment

A. Introduction

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

B. Assembly language programming of 8086 & 8051.

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

Unit I Power electronic devices

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

Unit II Rectifier

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

Unit IV Chopper

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

Unit V Converter

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

References:

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

3. M Ramsmoorthy, An Introduction to transistor and their application, Affiliated East-West Press.
4. P.C. Sen, Power Electonics, TMH.
5. M.D. Singh, K.B. Khanchandani, Power Electronics, TMH, Delhi, 2001.
6. Chakravarti A., Fundamental of Power Electronics and Drives, Dhanpat Ray & Co.,
7. Dr. P.S. Bhimbhra, Power Electonics, Khanna Pub.
8. Vedam Subramanyam, Power Electronics New Age International Revised II ed. 2006.
9. Randall Shaffer, Fundaments of Power Electronics With MATLAB Cengage Leaening 2008.

List of Experiments

1. VI Characteristics of SCR
2. VI Characteristics of DIAC
3. VI Characteristics of BJT
4. VI Characteristics of TRIAC
5. VI Characteristics of MOSFET
6. Transfer Characteristics of MOSFET
7. Output Characteristics of IGBT
8. Transfer Characteristics of IGBT
9. Single Phase SCR Half Controlled Converter With R Load
10. 1Φ SCR Fully Controlled Converter With R-Load
11. Study of 3Φ SCR Half Controlled Converter
12. Study of 3Φ SCR Fully Controlled Converter
13. Study of Classes of Commutation A,B,C,D,E,F.

Sub Code: EX-505 Sub Name: Energy Conservation & Management 4 Credits

UNIT-I

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

Unit-II

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

Unit-III

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

UNIT-IV

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

Unit-V

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

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 Pres
4. Energy Conservation- Paul O Callagan- Pergamon Press.
5. Design & Management of energy conservation. Callaghan,
6. Elect, Energy Utilization & Conservation. Dr. Tripathi S.C.,

Sub Code: EX-506 Sub Name: Electrical Engineering Simulation Lab-I 1 Credits

Unit- 1

MATLAB Basics

Simulation Mechanism and Simulation Tools, Starting and Ending MATLAB, MATLAB Desktop, Help Browser, Types of Files, Command Input Assistance, Operators and Special Characters, Variables and Arrays, Handling Arrays, Useful Built-in Functions, Control Structures, Input/Output Commands, File Handling

Unit- 2

Introduction to Plotting The plot command, Formatting and Labeling a Plot, Multiple Plots, Adding Legend, Sub Plots, Plotting Complex Data, 2-D and 3-D Plots, Plotting a Function, Plot Editor, Interactive Plotting using Plotting Tool

Unit- 3

Programming in MATLAB MATLAB Editor, MATLAB Programming, Debugging MATLAB Programs, MATLAB Debugger, Functions and Function Files, Differential Equation Solver, Symbolic Mathematics, Programming Examples

Unit- 4

Basic Electrical and Networks Applications Analysis of Electrical Networks – Experiments based on Solution of Series-Parallel Circuits, Solution of system with linear equations - Experiments based on mesh and nodal analysis, Experiments for Validation of Network Theorems, Solution of Network Problems, Solution of First Order Differential Equation – Experiments for the study of Transients, Experiments for AC Signal Waveform Analysis, Study of Resonance in AC Circuit, Study of Frequency Response Waveform Analysis, Study of Resonance in AC Circuit, Study of Frequency Response

Unit- 5

System Modeling using SIMULINK Simulation Steps, Getting Simulink, Creating and Simulating a Simulink Model, Simulink Solution of Differential Equation, Assigning Variables, Observing Variables During Simulation, Storing/Saving Data, Linking M-file with Model file, Creating and Masking Sub-systems, Solution using Laplace Transform Approach, Solution using Laplace Transform Approach, Study of dynamic response, Simulation of Non-Linear System, Examples such as Simulink model to generate sine, cosine waveform and ramp signal

References:

1. "Modelling And Simulation Using Matlab-Simulink",2011 Dr Shailendra Jain, Willey India.
2. "Matlab Programming", Rudraprasad.

Sub Code: EX-507 Sub Name: Soft Skill-I (Internal Assessment) 1 Credits

Objective: To develop conversation skills, group skills, persuasion skills, presentation skills, critical and creative thinking, emotional skills, positive thinking and vocational skills.

UNIT I Development of Proficiency in English

- Practice on Oral and spoken communication skill & testing –
- voice & accent, voice clarity, voice modulation & intonation,word stress etc.
- Feedback and questioning Technique
- Objectiveness in Argument
- Development etiquettes and manners
- Study of different pictorial expression of non-verbal communication and its analysis

UNIT II Microsoft office

- Microsoft word,
- Microsoft power point, Microsoft Excel,
- use of skype,
- use of internet

UNIT III Communication skills

- Visual, nonverbal and aural communication,
- Understanding the communicative environment,
- Understanding the communicative environment,
- What to listen for and why,
- When to speak and how,
- Starting and sustaining a conversation

UNIT IV Communication skills Visual, nonverbal and aural communication

- The world of visual culture
- Visual perception
- The aural: Its relevance and impact
- The body and the way it communicates
- The face, its expressions and what it says

UNIT V Concept of 4 method for presentation

- Preparation & introduction
- Presentation
- Evaluation / feedback
- Summarization / Conclusion
- Presentation Skill practice
- Preparing in presentation
- Delivery of presentation

References

1. E.H. Mc Grath: S.J.:Basic Managerial Skills for All (Published by Phi)
2. Allen Pease:Body Language(published by agreement and Pease international)
3. Joan Lambert: Microsoft Office 2016 Step by Step (Step By Step (Microsoft)

Sub Code: EX-508 Sub Name: Seminar / Group Discussion (Internal Assessment) 1 Credits

Objective of GD and 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.

Sub Code: HU223	Sub Name: NSS/NCC	0 Credits

Objective of NSS/NCC:

Objective of NSS/NCC is to improve the Helping Nature in Social/ Develop Skills, Respect to each other, 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 Qualifier.

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 time 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 equipment.

References:

1. B. Ravindran and M Chander, "Power System protection and Switchgear", New Age International.
2. Badrirka, Power System protection and switchgear, TMH.
3. CL Wadhwa, Electrical Power systems, New age International.Haddi Saadet, "Power System Analysis, TMH
4. A.R. Bergen, Vijay Vittal, "Power System Analysis, Pearson Education, Asia.
5. Switchgear & protection Sunil S. Rao. Khanna Publication.Ravindra P. Singh, Switchgear & Power System Protection, PHI Learning.

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.

Sub Code: EX-602 Sub Name: Digital Signal Processing 4 Credits

Unit- I

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

Unit- II

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

Unit- III

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

Unit- IV

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

Unit- V

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

References:

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

Sub Code: EX-603 Sub Name: Electronic Instrumentation 4 Credits

Unit-I

Electronic Voltmeter: Electronic voltmeter and their advantages, VTVMs Differential amplifier type electronic voltmeter, D.C. voltmeter using direct coupled amplifier, chopper amplifier type of voltmeter, Electronic voltmeters using rectifiers, True RMS responding voltmeter, Electronic multimeters, Differential voltmeter, Vector voltmeter, Vector impedance meter, measurement of power at radio frequency, calorimeter, Bolometer

CRO: Different parts of CRO, Its Block diagram, Electrostatic focusing, Electrostatic deflection, post deflection acceleration, Screen for CRTs, Graticule, Vertical & Horizontal deflection system, Time base circuit, Oscilloscope probes and transducers, Attenuators, Application of CROs, Lissajous patterns, Special purpose CROs- Multi input, Dual trace, Dual beam, Sampling, Storage (Analog & Digital) Oscilloscopes.

Unit-II

A.C. Bridge Measurement: Sources and detectors, Use of Bridges for measurement of inductance, Capacitance & Q factor Maxwells bridge, Maxwells inductance capacitance bridge, Hays bridge, Andersons bridge, Owen's Bridge, De-sauty's Bridge, Schering Bridge, High Voltage Schering bridge, Measurement of relative permittivity, Heaviside cambell's bridge, Weins bridge, Universal bridge, Sources of errors in Bridge circuit, Wagner's Earthing device, Q meter and its applications and measurement methods.

Transducers: Transducers definition and classification, mechanical devices as primary detectors, Characteristic & choice of Transducers, Resistive inductive and capacitive transducers, strain gauge and gauge factor, Thermistor, Thermo couples, LVDT, RVDT, Synchros, Piezo-Electric transducers, Magnet elastic and magnetostrictive Hall effect transducers, Opto-electronic transducers such as photo voltaic, Photo conductive, photo diode and photo conductive cells, Photo transistors, Photo optic transducers.

Acoustics: Microphones – Carbon, moving coil, ribbon, crystals condenser, their working principle and characteristic, Noise Figure and sensitivity and shielding. Loud Speakers – Moving Coil, electrodynamics horn type, multi-way speaker system, cross over network and their frequency characteristic. Various types of sound recording, magnetic recording, disk and crystal recording, Reverberations, building and studio acoustics, high fidelity.

Unit-III

Signal Generators: Fixed & variable frequency AF oscillators, Sine wave generators, Standard signal generator, AF Sine and Square wave generator Function generator, Square and pulse generator, Random noise generator, Sweep generator, TV Sweep generator, Marker generator, Sweep- Marker generator, Wobblyscope, Video pattern generator Vectroscope, Beat frequency oscillator

Wave analyser: Basic wave analyzer, Frequency selective wave analyzer, Heterodyne wave analyzer, Harmonic distortion, analyzer, spectrum analyzer digital Fourier analyzer.

Unit-IV

Digital Instruments Advantages of Digital instruments over analog instruments, resolution and sensitivity of Digital meters. Digital Voltmeter - Ramp type, Dual slope integration type, Integrating type, Successive approximation type, VM. Digital Continuous balance DVM or Servo balancing potentiometer type Multimeter, Digital frequency meter,

Time period measurement, High frequency measurement, Electronic counter, Digital tachometer, Digital PH meter, Digital phase meter, Digital capacitance meter. Digital display system and indicators like CRT, LED, LCD, Nixies, Electro luminescent, Incandescent, Electrophoretic image display, Liquid vapour display dot-matrix display Analog recorders, Graphic
recorders, Strip chart recorders, Galvanometer type recorders, Null recorders, single point & multipoint recorders, X-Y records, Ultraviolet recorders, Magnetic tape recorders, Basic components of tape recorders, Methods of recording, Direct recording, Frequency modulated recording, Pulse duration modulation recording, Digital tape recorders.

Unit-V

Instruments used in computer-controlled instrumentation RS 232C and IEEE 488, GPIB electric interface. Introduction to analog & Digital data acquisition systems Instrumentation systems used, Interfacing transducers to electronic control & measuring systems Multiplexing - D/A multiplexing A-D Multiplexing, Special encoders. Digital control description Microwave instruments, Scattering parameters, Transmission
and reflection parameters, Network analyzer, Measurement uncertainty measurement with scalar & vector network, Network analyzers, Microwave power measurement- Sources & detectors, Fiber optic power measurement, Stabilized calibrated light sources end to end measurement of fiber losses, Optical time domain reflectometry.

References:

1. Albert. D. Helfrick, W.D. Cooper, "Modern Electronic Instrumentation and measurement
2. techniques", PHI.Kalsi H.S., "Electronic Instrumentation", TMH.
3. Ghosh, Introduction to Measurement & Instrumentation, forth Edition. PHI.
4. Morris A.S., "Principles of Measurement & Instrumentation".
5. Rangan C.S., G.R. Sarma, Mani, "Instrumentation : Devices & systems", TMH
6. Murthy BVS, "Transducers and Instrumentation", PHI.
7. Doeblin D.O., "Measurement Systems- Applications and Design".

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.

Unit –I General - Problems associated with modern interconnected power Systems, deregulation, power systems restructuring, distributed generation, congestion, available transfer capacities, pricing of energy and transmission services.

Unit –II Power flow studies –

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

Unit-III MW Frequency control-

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

Unit-IV MVAR Voltage control Problem-

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

Unit-V Power System Stability –

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

Reference Books :

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

13. Economic Operation of Power Systems- by L.K. Kirchmayer Wiley Eastern Ltd.

List of Experiments:

[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, methods up to 3 iteration.
[3]Load flow solution for 3-bus system using Newton Raphson methods up to 3 iteration.
[4]Load flow solution for 3-bus system using FDLF methods up to 3 iteration.
[5] Load flow solution for IEEE 6-bus and 30-bus system in Matlab using Newton Raphson method.
[6] Assessment of transient stability of a single machine system.
[7] Effect of compensation on voltage profile of IEEE 6-bus system.
[8] Study of any software tools (PSCAD,EDSA, Mi POWER, ETAP etc)

Sub Code: EX-605 Sub Name: High Voltage Engineering 4 Credits

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 cascadeconnection and working of transformers units connected in cascade, Series resonant circuit- principle of operation and advantages. Tesla coil. HV DC- voltage doubler circuit, cock croft- 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. Generatingvoltmeter- 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 currentmeasurement.

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.
6.C.L.Wadhwa, High voltage engineering, New Age International Private limited, 1995.

Sub Code: EX-606 **Sub Name: Minor Project** **1 Credits**

COURSE GUIDELINES

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

Sub Code: EX-607 Sub Name: Soft Skill-II (Internal Assessment) 1 Credits

Objectives: To make students well versed with at the business communication skills.

UNIT I Essential and vocational skills: survival strategies

i. Managing time ii. Managing stress
iii. Resilience iv. Work-life balance
v. Applying soft-skills to workplace

UNIT II Written Communication Skill Practice for:

i. Correction of errors ii. Making of Sentences
iii. Paragraph Writing iv. Leave Application and simple letter writing

UNIT III Team Building / Coordination Skills

i. Team Building Practices through group exercises , team task / role play
ii. Ability to mixing & accommodation
iii. Ability to work together

UNIT IV Self Management

i. Self Evaluation ii. Self Discipline
iii Self Criticism iv. Recognition of one's own limits and deficiencies
v. Independency etc. vi. Thoughtful & Responsible
vii. Self Awareness

UNIT V Team Management Technique

i. Practice by game play & other
ii. learning methodology for achieving
iii targets and getting of right first time

References

1. Soft skills Training – A workbook to develop skills for employment by Fredrick H. Wentz
2. Personality Development and Soft skills , Oxford University Press by Barun K. Mitra
3.The Time Trap : the Classic book on Time Management by R. Alec Mackenzi

Sub Code: EX-608 Sub Name: Seminar / Group Discussion (Internal Assessment) 1 Credits

Objective of GD and 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.

Sub Code: HU223	Sub Name: NSS/NCC	0 Credits

Objective of NSS/NCC:

Objective of NSS/NCC is to improve the Helping Nature in Social/ Develop Skills, Respect to each other, 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 Qualifier.