GOVT. COLLEGE OF ENGINEERING, AMRAVATI

CURRICULUM

B. TECH. (ELECTRICAL)
VII and VIII Semester

Department of Electrical Engineering
2010-11

ELECTRICAL ENGINEERING DEPARTMENT

B.Tech. (Electrical Engineering)

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
						Theory				Practical		Total	
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	Internal	External		
Sem III													
EE301	Engineering Mathematics III	4	1	---	5	10	15	15	60	---	---	100	5
EE302	Elecromagnetic Engineering	4	1	---	5	10	15	15	60	---	---	100	5
EE303	Network Analysis	4	---	---	4	10	15	15	60	---	---	100	4
EE304	Electronic Devices and Circuits	4	---	---	4	10	15	15	60	---	---	100	4
EE305	Electrical Measurement and Instrumentation	4	---	---	4	10	15	15	60	---	---	100	4
EE306	Network Analysis Lab	---	---	2	2	---	---	---	---	25	25	50	1
EE307	Electronic Devices and Circuits Lab	---	---	2	2	---	---	---	---	25	25	50	1
EE308	Electrical Measurement and Instrumentation Lab	---	---	2	2	---	---	---	---	25	25	50	1
EE309	Computational Lab-I *	---	---	2	2	---	---	---	---	50	50	100	2
Total		**20**	**2**	**8**	**30**	**50**	**75**	**75**	**300**	**125**	**125**	**750**	**27**
Sem IV													
EE401	Engineering Mathematics IV	4	1	---	5	10	15	15	60	---	---	100	5
EE402	Pulse & Digital Circuits	4	---	---	4	10	15	15	60	---	---	100	4
EE403	Electrical Machines –I	4	---	---	4	10	15	15	60	---	---	100	4
EE404	Energy Resources & Generation	4	1	---	5	10	15	15	60	---	---	100	5
EE405	Numerical Methods	4	---	---	4	10	15	15	60	---	---	100	4
EE406	Pulse & Digital Circuits Lab	---	---	2	2	---	---	---	---	25	25	50	1
EE407	Electrical Machines –I Lab	---	---	2	2	---	---	---	---	25	25	50	1
EE408	Numerical Methods Lab	---	---	2	2	---	---	---	---	25	25	50	1
EE409	Computational Lab-II **	---	---	2	2	---	---	---	---	50	50	100	2
Total		**20**	**2**	**8**	**30**	**50**	**75**	**75**	**300**	**125**	**125**	**750**	**27**

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
						Theory				Practical		Total	
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	Internal	External		
Sem V													
EE501	Communication Enginering	4	1	---	5	10	15	15	60	---	---	100	4
EE502	Electrical Machines -II	4	---	---	4	10	15	15	60	---	---	100	4
EE503	Power System Analysis- I	4	1	---	5	10	15	15	60	---	---	100	5
EE504	Control System I	4	---	---	5	10	15	15	60	---	---	100	5
EE505	Introduction to Microprocessor and Microcontrollers	4	---	---	4	10	15	15	60	---	---	100	4
EE506	Control System I Lab	---	---	2	2	---	---	---	---	25	25	50	1
EE507	Electrical Machines -II Lab	---	---	2	2	---	---	---	---	25	25	50	1
EE508	Introduction to Microprocessor and Microcontrollers Lab	---	---	2	2	---	---	---	---	25	25	50	1
EE509	General Proficiency - I	---	---	2	2	---	---	---	---	100	---	100	2
Total		**20**	**2**	**8**	**30**	**50**	**75**	**75**	**300**	**175**	**75**	**750**	**27**
Sem VI													
EE601	Signals & Systems	4	1	---	4	10	15	15	60	---	---	100	4
EE602	Power Electronics - I	4	---	---	4	10	15	15	60	---	---	100	4
EE603	Power System Analysis - II	4	---	---	4	10	15	15	60	---	---	100	4
EE604	Optimization Techniques	4	1	---	5	10	15	15	60	---	---	100	5
EE605	Control System – II	4	1	---	5	10	15	15	60	---	---	100	4
EE606	Power Electronics - I Lab	---	---	2	2	---	---	---	---	25	25	50	1
EE607	Power System Analysis - II Lab	---	---	2	2	---	---	---	---	25	25	50	1
EE608	Minor Project	---	---	2	2	---	---	---	---	25	25	50	2
EE609	General Proficiency -II	---	---	2	2	---	---	---	---	100	---	100	2
Total		**20**	**3**	**8**	**31**	**50**	**75**	**75**	**300**	**175**	**75**	**750**	**27**

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							Credits
						Theory				Practical		Total	
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	Internal	External		
Sem VII													
EE701	Linear Integrated Circuits	4	---	---	4	10	15	15	60	---	---	100	4
EE702	Power Systems Dynamics	4	1	---	5	10	15	15	60	---	---	100	4
EE703	Power Electronics - II	4	---	---	4	10	15	15	60	---	---	100	4
EE704	Electrical Machine Design	4	----	---	4	10	15	15	60	---	---	100	4
EE705	Elective – I	4	1	---	5	10	15	15	60	---	---	100	5
EE706	Power Electronics - II Lab	----	---	2	2	---	---	---	---	25	25	50	1
EE707	Electrical Machine Design Lab	----	----	2	2	---	---	---	---	25	25	50	1
EE708	Linear Integrated Circuits Lab	----	----	2	2	---	---	---	---	25	25	50	1
EE709	Project and Seminar#	---	---	4	4	---	---	---	---	100	---	100	3
Total		**20**	**2**	**10**	**32**	**50**	**75**	**75**	**300**	**175**	**75**	**750**	**27**
Sem VIII													
EE801	Digital Signal Processing	4	---	---	4	10	15	15	60	---	---	100	4
EE802	Switch Gear and Protection	4	---	---	4	10	15	15	60	---	---	100	4
EE803	Elective – II	4	1	---	5	10	15	15	60	---	---	100	4
EE804	Elective – III	4	1	---	5	10	15	15	60	---	---	100	4
EE805	Switch Gear and Protection Lab	----	---	2	2	---	---	---	---	25	25	50	1
EE806	Digital Signal Processing Lab	---	---	2	2	---	---	---	---	25	25	50	1
EE807	Project and Seminar#	---	---	4	4	---	---	---	---	75	175	250	9
Total		**16**	**2**	**8**	**26**	**40**	**60**	**60**	**240**	**150**	**225**	**750**	**27**

Duration of ESE for all courses is 2 Hrs. 30 Min.

TA :Techer Assesment CT: Class Tests ESE: End Sem.Examination

*** Computational LAB-I will contain the introduction to MATLAB and experiments will be based on all subjects**

**** LAB-II will contain the applications of MATLAB and experiments will be based on all subjects**

 # For project there will be 8 students in each batch (two groups of 4 students)

LIST OF ELECTIVES

Elective I EE705

A) Power System Operation and Control
B) Energy Management
C) Computer Methods in PSA
D) Power System Reliability
E) Power Quality and Deregulation

Elective II EE803

A) HVDC and FACTS
B) High Voltage Transmission
C) Power System Design Practice
D) Power System Transients
E) High Voltage Engineering

Elective III EE804

A) Applications of AI Techniques to Power Systems
B) Network Synthesis using Operational Amplifiers
C) Artificial Neural Network
D) Digital Image Processing
E) Robotics and Automation

EE701 LINEAR INTEGRATED CIRCUITS

Teaching Scheme : 04 L + 00 T Total: 04 Credit: 04
Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks: 100
Duration of ESE : 2 Hrs.30 min.

Op-amp Fundamentals: Differential amplifiers, ac and dc analysis of differential amplifiers, review of operation amplifier- block diagram representation, basic configurations, ideal op-amp, negative feedback, non – ideal closed loop characteristics.

Basic op-amp Circuits: voltage follower, sign changer, adder, subtractor etc, I to V and V to I converters, current amplifiers, difference amplifiers, instrumentation amplifiers and their applications, transducer bridge amplifier.

Op-amp Parameters: Input bias and offset current, input offset voltage, input offset error compensation, slew rate, common mode rejection ratio etc, frequency response, input and output impedance, operation limits, compensated and uncompensated op-amps, compensation techniques.

Non-linear Circuit Applications: Voltage comparator and its applications, Schmitt trigger and its application, precision rectifiers, limiters, analog switches, peak detectors, sample and hold circuits, integrator and differentiator, log/antilog amplifiers, practical log/antilog circuits, analog multipliers, op-amp as phase detector, op-amp electronic thermometers.

Active Filters: Classification, transfer function, butter worth filters. low pass, high pass, band pass, band stop, notch and all pass.

Timer: IC 555, functional diagram, monostable and astable multivibrator.

Voltage regulators: Series op-amp regulators, IC voltage regulators, switching regulators etc, IC 723.

Text Books

1. Op-amps and Linerar Integrated Circuits Technology, R.A.Gaikwad, PHI publication, 1999
2. Design of Operational Amplifier and Analog Integrated Circuits, S.Franco TMH Publication, 2002

References

1. Linear Integrated Circuits, D.Roy Chaudhari ,New Age International Publisher, 2005

EE702 POWER SYSTEMS DYNAMICS

Teaching Scheme : 04 L + 01 T Total: 05 Credit: 04
Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks: 100
Duration of ESE : 2 Hrs.30 min.

Basics of Power System Dynamics Basic concepts of systems dynamics and stability, types of stability, Basic modeling of power system components for stability studies, dynamics of synchronous machine, swing equation, factors affecting stability and recent trends for improving stability.

Small Disturbance Stability: Steady state stability of two-machine system, power angle curve, stability criterion, definition and computation of SSSL by analytical and graphical methods, effect of inertia, saliency, saturation, governor action and SCR on SSSL.

Large disturbance Stability: Single machine infinite bus (SMIB) system, classical model, equal area criteria technique and its applications to various types of disturbances, numerical method of solving swing equation.

Excitation System: Effect of excitation system on generator power limit, various types of excitation systems, transformation model of excitation system, dynamic stability.

Text Books

1. Power System stability and Control, P.Kundur, McGraw Hill, New York, 2007
2. Modern Power System Analysis , Nagrath and Kothari, McGraw Hill, 2005

References

1. Power System Stability, E.W.Kimbark, Vol 1 and 3 , Dover Publications 1999
2. Power System Dynamics, Stability and Control, K.R.Padiyar Interline Publishers, Ban galore,2007
3. Power System Control and Stability, P.M Anderson and A.A. Fouad, McGraw Hill,2004
4. http://www.nptel.iitm.ac.in/
5. www.ocw.mit.edu

EE703 POWER ELECTRONICS - II

Teaching Scheme : 04 L + 00 T Total: 04 Credit: 04
Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks: 100
Duration of ESE : 2 Hrs.30 min.

Introduction to Electrical Drives: Concept, Classification and Advantages. Basic elements, Components of load torque, Torque equation, Equivalent values of drive parameters. Types of mechanical loads. Selection of motor and Controller, Classes of duty, Stability of an electrical drive. Comparison of AC and DC drives.

Starting and Braking of Electrical Drives: Solid-state starters, soft starting, Calculation of starting/acceleration/reversal time and energy loss during starting. Types, advantages, limitations and purposes/objectives of electrical braking, Braking of d c and induction motors.

DC Drives: Single phase half, full and dual converter based d c drives - Circuit configurations, input-output waveforms, Calculation of torque, speed, power factor, firing angle etc. Torque-Speed characteristics. DC Chopper based d c drives - Circuit configurations, input-output waveforms, Calculation of torque, speed, duty cycle etc. Torque-Speed characteristics.

Induction Motor Drives: Scalar control of induction motor – stator voltage and stator frequency control using stator voltage controllers and inverters – circuit configurations, calculation of current, torque, speed etc. Torque-Speed characteristics.
Slip power recovery schemes – rotor chopper / inverter control of induction motor - Circuit configurations and theoretical concepts only.

Industrial Applications: Study of electrical drives in rolling mills, paper mills, cement mills, sugar mills, textile mills, traction and machine tool applications.

Text Books

1. Fundamentals of Electrical Drives, G. K. Dubey, Narosa Publishing House,2005
2. Electric Drives-Concepts and Applications, V.Subrahmanyam TMH Pub,2004
3. A first course on Electrical Drives, S.K.Pilley Wiley Eastern Pub,2002
4. Electric Drives, De and Sen PHI Pub,1999

References

1. Thyristor DC Drives" P.C.Sen John Wiley & Sons, 1981.
2. Power Electronic Control of AC Motors", JMD Murphy & FG Turnbull, Pergamon Press, 1988.
3. Power Semiconductor Controlled Drives", G.K. Dubey PH Int., 1989.
4. Power Semiconductor Drives" Deewan,Straughan & Slemon John Wiley & Sons.
5 http://www.nptel.iitm.ac.in/
6. www.ocw.mit.edu

EE704 ELECTRICAL MACHINE DESIGN

Teaching Scheme : 04 L + 00 T Total: 04 Credit: 04
Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks: 100
Duration of ESE : 2 Hrs.30 min.

Introduction: Ttransformers and three phase induction motors - types, specifications, constructional features, magnetic and insulating materials used;

Computer Aided Design of Machines: Approaches - analysis, synthesis and hybrid methods; Design optimization - variables, constraints and objective function, Problem formulation;
Curves: magnetization, loss and carter's coefficient curves - applications, representation using Piecewise Linearisation and Least Square Error methods.

Transformer Design - Magnetic Circuit Specific electric and magnetic loadings selection, output equation, core and yoke cross sections, main dimensions design, core loss from design data Winding types and design, magnetizing current calculation, primary and secondary winding resistances and leakage reactances from design data; mechanical forces - types, causes and calculations,Thermal circuit cooling methods, Tank wall dimensions design. Design of tank with radiators. Study of Tender drawings & Guaranteed technical Particulars for standard ratings

Induction Motor Stator Design: specific electric and magnetic loadings selection, output equation, main dimensions design, winding - types and design, slot numbers and dimensions design.

Induction Motor Rotor Design: Air gap length design, cage rotor winding design - slot numbers and shapes, bar and ring dimensions; slip ring rotor winding design - slot numbers and shapes, conductors per slot and its cross sections.

Induction Motor Parameters : core loss from design data, magneto motive force calculation - air gap, stator and rotor cores and teethl; no load current - magnetizing and core loss components, stator and rotor winding resistances and leakage reactances from design data, parameters effect on performance.

Text Books

1. Design of Transformers, Indrajit Dasgupta, Tata McGraw Hill, 1st Edition (Fifth Reprint2008).
2. Design of Electrical Machines, K.G.Upadhyay, New Age International Publishers, 1st Edition 2008

References

1. The Performance and Design of Alternating Current Machines, M.G.Say, C.B.S. Pub. and Distri., Delhi.
2. Principles of Electrical Machine Design with Computer Programs, S.K.Sen ,Oxford and I.B.H. Company Pvt. Ltd., New Delhi.
3. Introductory Methods of Numerical Analysis, S.S.Sastry ,Prentice Hall of India Pvt. Ltd., New Delhi.
4. Principles of Electrical Machine Design, R.K.Agrawal, S.K.Kataria and Sons, Delhi.
5. A course in Electrical machine design , A.K.Sawhney,A.Chkrabarti Dhanpat Rai & Co, New Delhi 6th Edition 2006
6. http://www.nptel.iitm.ac.in/
7. www.ocw.mit.edu

EE705 ELECTIVE – I
A) POWER SYSTEM OPERATION AND CONTROL

Teaching Scheme : 04 L + 01 T Total: 05 Credit: 05
Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks: 100
Duration of ESE : 2 Hrs.30 min.

Economic Operation : Meaning of optimum scheduling, UCP and LSP; Input – Output characteristics, Heat rate characteristic, Incremental fuel rate, Incremental fuel cost; Methods of obtaining incremental fuel costs, Conditions for incremental loading; Optimum scheduling of generation between different units (Only Two plant system without transmission loss).
Transmission loss as a function of plant generation; Calculation of loss co-efficient (Two plant system); Incremental transmission loss; Optimum scheduling of generation between different plants including transmission loss; Concept and significance of penalty factor; Automatic load dispatch: Operation and Functions.

Generator Control Loops: Concept of real and reactive power; Effect of real and reactive power on system parameters; Philosophy of real and reactive power control; Basic generator control loops.

Automatic Voltage Regulator (AVR): Functions of AVR; Types of Exciter; Brushless AVR loop: Exciter modeling, Generator modeling, Transfer function block diagram representation, Static performance, dynamic response, Stability compensation, Effect of generator loading.

Automatic Load Frequency Control: Automatic generation control (AGC); Speed governing system; Transfer function modeling: Governor, Hydraulic valve actuator, Turbine, Generator, Load; Transfer function representation of an isolated generator; Static performance of speed governor; Closing of ALFC loop.

Control Area: Meaning; Primary ALFC Loop: Static response, Dynamic response, physical interpretation of results; Secondary ALFC loop; Integral Control; Pool operation; Tie-line Modeling; Two area system – Dynamic response; Tie-line bias control.

Steady-State Instabilities: Natural torsional oscillatory modes in power system; Natural mode of a single generator operating onto infinite bus; Effect of damper winding; Effect of changing excitation; Power system stabilizer; Introduction to modern control application**.**

Text Books

1. Power System Analysis, Hadi Saadat , WCB/McGraw-Hill International Edition 1999
2. Electric Energy Systems Theory: An Introduction, O. L. Elgerd , Second edition, McGraw-Hill Book Comp. N. Y. 1987.
3. Modern Power System Analysis, I. J. Nagrath, D. P. Kothari, Second edition, Tata Mc-Graw Hill Publishing Company, New Delhi. 2000

References

1. Economic Operation of Power System, L. K. Kirchamayor Wiley Estern Pvt. Ltd., New Delhi 2007
2. http://www.nptel.iitm.ac.in/
3. www.ocw.mit.edu

EE705 ELECTIVE – I
B) ENERGY MANAGEMENT

Teaching Scheme : 04 L + 01 T Total: 05 Credit: 05
Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks: 100
Duration of ESE : 2 Hrs.30 min.

Energy Scenario: Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance.
Re-structuring of the energy supply sector, energy strategy for the future, air pollution, climate change. Energy Conservation Act-2001 and its features.

Energy Management & Audit: Definition, need and types of energy audit. Energy management (audit) approach-understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments.

Material and Energy Balance: Facility as an energy system, methods for preparing process flow, material and energy balance diagrams.

Energy Action Planning: Key elements, force field analysis, Energy policy purpose, perspective, contents, formulation, ratification, Organizing - location of energy management, top management support, managerial function, roles and responsibilities of energy manager, accountability. Motivating-motivation of employees: Information system-designing barriers, strategies; Marketing and communicating-training and planning.

Financial Management: Investment-need, appraisal and criteria, financial analysis techniques-simple payback period, return on investment, net present value, internal rate of return, cash flows, risk and sensitivity analysis; financing options, energy performance contracts and role of ESCOs.

Text Books:

1. Energy –Economy and prospective –Andre Gardel , Pergmann Press-2005
2. Electrical Energy utilization and energy conversion –S.C.Tripathy, Tata Mc-GrawHill -2003
3. Conventional energy technology – S.B.Pandya, Tata Mc-GrawHill -2003

References

1. Energy and Atmosphere, I.M.Campbell, Wiley, New York -2000
2. Power station engineering and economy, Skortzki and Vopat , Tata Mc-GrawHill -2003
3. Introduction to energy technologies , V.A.Venikov ,E.V.Putiatin , Mir, Moskow -2006
4. http://www.nptel.iitm.ac.in/
5. www.ocw.mit.edu

EE705 ELECTIVE – I
C) COMPUTER METHODS IN POWER SYSTEM ANALYSIS

Teaching Scheme : 04 L + 01 T Total: 05 Credit: 05
Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks: 100
Duration of ESE : 2 Hrs.30 min.

Introduction: Graph of a power system, incidence matrices, primitive network, formation of network matrices by singular and non singular transformation, Representation of power system for computerized analysis, mathematical model of synchronous generator for steady state and transient analysis, transformer with tap changer, transmission line, phase shifter and loads.
Algorithm for formation of bus impedance matrix, modification for changes in the network. Incidence and network matrices for three phase network, transformation matrices, algorithm for formation of bus impedance matrix for three phase networks.

Short Circuit Studies: Symmetrical component, Thevenin's theorem and short circuit analysis of multi node power systems using bus impedance matrix. Short circuit calculations for balanced and unbalanced faults.

Load Flow Analysis: types of buses, load flow equations, power flow solution through GS and NR methods, decoupled and fast decoupled methods, sparsity.

Transient Stability Analysis: Including synchronous machines, system network and loads, solution of swing equation by Euler's, Euler's modified and RK methods.

Economic Load Scheduling: Unit commitment, transmission loss, load scheduling considering transmission losses, unit commitment by dynamic programming method, start up consideration, reliability analysis, hydrothermal scheduling.

Text Books

1. Computer Methods in Power System Analysis, G.W. Stagg & A.H.El-Abiad McGraw Hill 2003
2. Computer Aided Analysis of Sower System , Kusis, PHI-2006

References

1. Modern Power System Analysis (3rd Edn.) , Kothari & Nagrath TMH.-2004
2. Power System Analysis , Hadi Saadat TMH-2004
3. Advanced Power System Analysis and Dynamics, L. P. Singh WEL-2002.
4. http://www.nptel.iitm.ac.in/
5. www.ocw.mit.edu

EE705 ELECTIVE – I
D) POWER SYSTEM RELIABILITY

Teaching Scheme : 04 L + 01 T Total: 05 Credit: 05
Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks: 100
Duration of ESE : 2 Hrs.30 min.

Introduction To Power System Reliability: Reliability definition and concept, reliability indices and criteria, availability and reliability

Probability And Reliability : probability concepts, probability distributions, probability distribution in reliability evaluation, reliability indices, network modeling and evaluation of simple networks, system reliability evaluation using probability distributions.

Generation System Reliability Evaluation: Concept of loss of load probability (LOLP), Energy demand(ED), Evaluation of these indices for isolated systems, generation system, reliability analysis using the frequency and duration techniques.

Transmission Systm Reliability Evaluation: Evaluation of LOLP and ED, indices for isolated transmission system, interconnected system reliability

Distribution Systm Reliability Evaluation: Reliability analysis of ring main and radial systems with perfect and imperfect switching.

Text Books

1. Reliability Evaluation of Engineering Systems ,Bilinton R. and Allan Ronald , MIT Press 1985

References

1. Electrical Power System Planning , A.S.Pabla, Machmillan India Ltd. 2000
2 http://www.nptel.iitm.ac.in/
3 www.ocw.mit.edu

EE705 ELECTIVE – I
E) POWER QUALITY AND DEREGULATION

Teaching Scheme : 04 L + 01 T Total: 05 Credit: 05
Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks: 100
Duration of ESE : 2 Hrs.30 min.

Power Quality: Power quality problems in distribution systems, Harmonics, Harmonics creating loads, Harmonics propagation, series and parallel resonance, harmonic power flow,

Mitigation Of Harmonics: filters, active filters, shunt and series hybrid filters, voltage sag and swells, voltage flicker, Introduction to mitigation of power quality problems using power electronics conditioners

Fundamentals Of Restructured System: History of power system restructuring concept of power system deregulation, regulation vs de-regulation ,entities in deregulated system , Market architecture.

Transmission Open Access Issues: Available transfer capability (ATC), Definition & methods of determination, Transmission network congestion, congestion management techniques

Power Sector Restructuring In India: Electricity act 2003, Evaluation of integrated, monopoly state owned electricity boards, introduction to various institutions in Indian power sector and their role. Ministry of power, SEBS.

Text Books

1. Electrical Power Systems Quality, Dugan Roger ,McGraw-Hill Edition 2002
2. Operation of restructured power system, Bhattacharya Kankar, IEEE Publication.2001

References:

1. FACTS & Power Quality ,Accha Ervin ,IEEE Publication 2001
2. Restructured Electrical Power System, Shahidehpour Mohammad , IEEE Publication 2001
3. Energy generation under new environment, Loi Lei Lai ,John Wiley &Sons Ltd.2001
4 http://www.nptel.iitm.ac.in/
5 www.ocw.mit.edu

EE706 POWER ELECTRONICS - II LAB

Teaching Scheme : 02 P Total: 02 Credit: 01

Evaluation Scheme : 25 Internal + 25 External Total Marks: 50

It is representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise. Minimum eight experiments should be performed.

(The laboratory may consist of 2-3 simulation studies based on Matlab - Simulink / PSIM / PSPICE platform and one industrial visit for study of electrical drive.)

Representative List:

1. Converter controlled d c motor.
2. Chopper controlled d c motor.
3. Stator voltage controlled induction motor.
4. Stator frequency controlled induction motor.
5. Plugging / rheostatic braking of d c motor.
6. Plugging / rheostatic braking of induction motor.
7. Study of solid state / soft starters for electrical motors.
8. Study of electrical drive in any industry. (Industrial visit)
9. Simulation of 1 / 2 / 4 quadrant Converter controlled dc drive.
10. Simulation of 1 / 2 / 4 quadrant Chopper controlled dc drive
11. Simulation of open loop / closed loop V/f control of I.M.
12. Simulation of rotor chopper control of I.M.

EE707 ELECTRICAL MACHINE DESIGN LAB

Teaching Scheme : 02 P Total: 02 Credit: 01

Evaluation Scheme : 25 Internal + 25 External Total Marks: 50

It is representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise. Minimum eight experiments should be performed.

Representative List:

Write a program for following (C/ MATLAB)

1. To fit Loss curve
2. To fit Magnetisation curve
3. TO fit Carter's coefficient curve
4. To determine main dimensions of transformer
5. To design cooling system for transformer
6. To calculate losses from design data
7. To determine No load current of transformer
8. To determine main dimensions of 3 phase Induction motor
9. To design squirrel cage rotor for three phase induction motor
10. To determine No load current of Induction motor
11. To determine winding resistance & leakage resistance from design data

EE708 LINEAR INTEGRATED CIRCUITS LAB

Teaching Scheme : 02 P Total: 02 Credit: 01

Evaluation Scheme : 25 Internal + 25 External Total Marks: 50

It is representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise. Minimum eight experiments should be performed.

Representative List:

1. Inverting amplifier using IC 741 and its frequency response.
2. Non-inverting amplifier using IC 741 and its frequency response.
3. Summing amplifier- to build summing amplifier in inverting and non-inverting mode.
4. Measurement of Op-amp parameters: Input offset voltage, input bias current. Input offset current, CMRR.
5. Measurement of slew rate.
6. To build voltage comparator and to generate the waveforms on CRO.
7. Voltage limiter-to build Voltage limiter and to generate the output waveforms.
8. Differentiator -to build and to generate the output waveforms for various values of R and C.
9. Integrator -to build and to generate the output waveforms for various values of R and C.
10. Precision rectifiers-to build precision rectifiers and to generate the output waveforms

EE709 PROJECT AND SEMINAR

Teaching Scheme : 04 P Total: 04 Credit: 03

Evaluation Scheme : 100 Internal + 00 External Total Marks: 100

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100 marks divided in two parts, 50 marks for seminar and 50 marks for project work.

A. Seminar

1. Student shall select a topic for seminar which is not covered in curriculum. Student shall complete the conceptual study of the selected topic and expected to know functional and technical details of selected topic.
2. Before end of semester student shall deliver a seminar and submit the seminar report in proper format.
   Introduction
   Literature Survey
   Concept
   Functional and Technical Details
   Future scope
   Applications
   Comparison with similar topics / methods
   References
3. Student shall deliver a seminar on submitted report which shall be assessed for 50 marks by two examiners
   1) Project Guide
   2) Senior faculty appointed by HOD

B. Project

1. In general a group of 4-5 students should be allowed to complete one project.
2. Student should complete the literature survey and finalized the topic for the project
3. They shall submit the synopsis on the selected topic to HOD
4. On approved topic base work should be complete. For hardware project design and procurement of hardware should be complete.
5. At end of semester, group should submit the progress in proper format.
6. Oral examination for 50 marks shall be conducted on the progress report by the examiner panel as follows
   1) Project Guide
   2) Senior faculty appointed by HOD

EE801 DIGITAL SIGNAL PROCESSING

Teaching Scheme : **04 L + 00 T Total: 04** **Credit: 04**
Evaluation Scheme : **15 CT1 + 15 CT2 +10 TA+ 60 ESE** **Total Marks: 100**
Duration of ESE : **2 Hrs.30 min.**

Signals and Signal Processing : Characterization and classification of signals, Typical signal processing operations , Typical signal processing applications , Advantages of digital signal processing

Time Domain Representations Of Signals and Systems: Discrete time signals Operations on sequences, Discrete time systems, Linear time invariant discrete time systems, Characterization of LTI systems.

Transform Domain Representation of Signals And Systems : The discrete time Fourier transform , The frequency response , The transfer function ,Discrete Fourier series ,Discrete Fourier transform , Computation of DFT , Linear convolution using DFT ,The z-transform , The region of convergence of z-transform

Structures For Discrete Time Systems : Block diagram and signal flow representation of constant coefficient , linear difference equation, Basic structures for IIR systems ,Basic structures for FIR systems, Lattice structures , Effects of coefficient quantization , Effect of round off noise in digital filters , Zero-input limit cycles

Filter Design Techniques: Design of discrete time IIR filters from continuous time filters, Design of FIR filters by windowing , Optimum approximation of FIR filters , Linear phase filters

Sampling of Continuous Time Signals : Periodic sampling, Frequency domain representation of sampling, Reconstruction of bandlimited signal from its samples, Discrete time processing of continuous time signals, Continuous time processing of discrete time signals, Changing the sampling rate using discrete time processing

Text Book:

1. Digital Signal processing A computer Based Approach by S.K.Mitra; Third Edition,; McGraw Hill, 2007

Reference Books:

1. Digital Signal Processing by Proakis and Manolakis; Third Edition ; Pearson Eduaction 2006
2. Analog and Digital Signal Processing by Ashok Ambardar Thomson Learning 2007
3. http://www.nptel.iitm.ac.in/
4. www.ocw.mit.edu

EE802 SWITCH GEAR AND PROTECTION

Teaching Scheme : 04 L + 00 T Total: 04 Credit: 04
Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks: 100
Duration of ESE : 2 Hrs.30 min.

Circuit Interruption : Circuit breaker control circuit, Fault clearing process, Auto-reclosure, Arc phenomenon- maintenance, properties and interruption theories; AC circuit breakers- current interruption, transient recovery voltage (TRV), rate of rise of TRV, factors affecting TRV, ratings; Inductive and Capacitive current interruptions, current chopping.

Fuses: Types, Constructional features, operation, Characteristics and Applications

Circuit Breaker (Part – I): Air break, Air blast, Bulk oil and minimum oil-types, constructional features, operationand application.

Circuit Breaker (Part – II): SF_6, Vaccum, Miniature, Earth leakage and Moulded Case – types, Constructional features, operation and application; Testing, Installation and Maintenance.

Relaying Principle: Components, Essential features, Characteristics, Terminology, CT's and PT's, Relay classification.
Electromagnetic Relays: Over current, Directional, Distance and Differential – types, constructional features, operation, characteristics and application.

Protection of Transmission Lines
Relaying schemes: overcurrent, earth fault, directional, distance and differential; Parallel feeders and ring mains protection, Carrier current relaying, Overload and Power swing.
Other Power System Elements Protection Transformers, Motors, Generators and Buses.

Modern trends in power system protection
Basic concepts, equipments, comparators, Characteristics realization – over current, directional, differential and distance relay. Microprocessor based relay introduction.

Text Book

1. Power System Protection and Switchgear , Badri Ram and B. N. Vishwkarma, 3rd Edition Tata Mc-Graw Hill Publishing Company Limited, New Delhi. 2003

References

1. Switchgear Handbook, R. T. Lythall, J and P Newness Butterworth, London. 1993.
2. Switchgear and Protection, Sunil S. Rao , 2 nd edition, Khanna Publications New Delhi, New
3. Protective Relaying, A. R. Van and C Warringtan , Chapman Hall, London.,2 Edition, Vol 1 and 2,2000
4. Generation Protection and Switchgear, V. A. Slabikov , CIT Press , Coimbatore. 1998.
5. Power System Protection and Switchgear, B. Ravindranath and M Chander ,Wiley Eastern Ltd, New Delhi., 2006.
6. Fundamental of power system protection, Y.G. Paithankar and S. R. Bhide ,PHI publications, 2008
7. http://www.nptel.iitm.ac.in/
8. www.ocw.mit.edu

EE803 ELECTIVE – II
A) HVDC and FACTS

Teaching Scheme : **04 L + 01 T Total: 05** **Credit: 04**
Evaluation Scheme : **15 CT1 + 15 CT2 +10 TA+ 60 ESE** **Total Marks: 100**
Duration of ESE : **2 Hrs.30 min.**

DC Power Transmission Technology: Introduction, comparison of AC & DC Transmission, application of DC transmission, Description of DC transmission systems, planning & modern trends.

Analysis of HVDC Converters :3-pulse, 6-pulse,12-pulse converters , converters station and terminal equipment , commutation process, rectifier & inverter operation, equivalent circuit for converters , simplified analysis of Graetz circuit.

Control of Converters And HVDC System Control: Firing angle control, Current and extinction angle control, starting and stopping of DC link, power control, higher level Controllers, Converter faults and protection: Introduction, Converter faults, protection against over current ,over voltage in a converter station, surge arrestors. Smoothing reactor.

Multi Terminal DC Systems: Potential applications of MTDC systems, types of system, operation & control and protection of MTDC systems. Parallel operation of HVDC

Flexible AC Transmission Systems (FACTS): Steady state and dynamics problems in AC systems, Introduction of Flexible AC transmission systems (FACTS) Necessity & objectives of FACTS,

Basic Types of FACTS Controller: Description of static var compensation (SVC), Thyristor controlled series compensation (TCSC), Static condenser (STATCON),Static synchronous series compensator (SSSC) and Unified power flow controller (UPSC)

Text Books

1. HVDC Transmission , Padiyar K.R, Wiely Eastern Ltd ; New Delhi
2. Understanding FACTS: Concepts and Technology of flexible AC transmission system, Hingorani N. G. & Gyugyi L., IEEE press 2000.

References

1. Direct Current Transmission, Kimbark E.W., John Wiley &Sons,1999
2. http://www.nptel.iitm.ac.in/
3. www.ocw.mit.edu

EE803 ELECTIVE – II
B) HIGH VOLTAGE TRANSMISSION

Teaching Scheme : 04 L + 01 T Total: 05 Credit: 04
Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks: 100
Duration of ESE : 2 Hrs.30 min.

Extra High Voltage AC Transmission: Introduction to EHV-AC transmission, transmission line trends & preliminary aspects, standard transmission voltages-power handling capacities and line losses-mechanical aspects.

Electrostatic Field of EHV Lines: Electric shock & threshold currents, capacitance of long object, Effect of Electrostatic field on Human and Animal.

Over Voltages In EHV System: origin & causes, over voltage caused by switching operations, over voltage caused by interruption of low inductive current, over voltage caused by interruption of capacitive currents, Lightening stroke to tower and midspan, Insulation coordination based on lightning

High Voltage DC Transmission: Introduction of DC Power Transmission Technology, Comparison of AC & DC Transmission, Advantages & Application of DC transmission, Types of DC links: Monopolar, Biopolar & homopolar lines
Converters Station and Terminal Equipment: Analysis of HVDC Converters: 3-pulse, 6-pulse, commutation process, rectifier & inverter operation, Ground return, Circuit breaking

Converter Faults and Protection: Introduction, Converter faults, protection against over current, over voltage in a converter station, surge arrestors. Smoothing reactor, Parallel operation of HVDC and HVAC

Text Book

1. Extra High Voltage AC Transmission Engineering , Rakosh Das Begamudre ,New Age International(P) Ltd Third Edition, 2003
2. Electrical Power Systems, C.L.Wadhwa ,New Age International (P) Ltd Fourth Edition 2000

References

1. EHV Transmission Line Reference Book – Edison Electric Institute 1998
2. Direct Current Transmission , Kimbark E.W , John Wiley & Sons 2003
3. HVDC Transmission, K.R.Padiyar ,Wiely Eastern Ltd; New Delhi 1995

C) http://www.nptel.iitm.ac.in/
D) www.ocw.mit.edu

EE803 ELECTIVE – II
C) POWER SYSTEM DESIGN PRACTICE

Teaching Scheme : 04 L + 01 T Total: 05 **Credit: 04**
Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE **Total Marks: 100**
Duration of ESE : 2 Hrs.30 min.

Transmission Line Design: Electrical & Mechanical design of transmission line, design of EHV transmission lines.

Design of distribution system: Improvement & expansion of power system

Bus bar arrangement, Isolating switches, current transformer & potential transformer.

Power transformer, Three phase unit Vs bank of single phase unit, Tertiary winding, requirement of tapings, fittings, method of cooling, drying out, rating & their choice, testing, technical details for ordering & tendering.

Lightning arrestor, rating, characteristic, testing, standard followed for insulation coordination
Shunt capacitors, need, construction, location, connections, protection, analysis, special types, testing, technical details.

Earthling: earthling systems step potential, touch potential & transfer potential, design of earthling, fencing, and general instructions for laying earthling grid.

Text Books

1. Electrical Power system design, M.V.Deshpande, Tata McGraw Hill, Fourteenth reprint 2000
2. Substation design & equipment , Pratap Sing Satnam & P.V.Gupta Dhanpat Rai &sons, Third edition 1994

References

1. T & D Hand book Westing house.
2. http://www.nptel.iitm.ac.in/
3. www.ocw.mit.edu

EE803 ELECTIVE – II
D) POWER SYSTEM TRANSIENTS

Teaching Scheme : 04 L + 01 T Total: 05 **Credit: 04**
Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE **Total Marks: 100**
Duration of ESE : 2 Hrs.30 min.

Introduction: Basic concept and simple switching transient, Transients in electric power systems switching of RL, LC, RLC circuits, Transient analysis for 3 phase Power System-Sequence network, Sequence component for unbalanced network impedance, Analysis of unsymmetrical 3 phase faults

Traveling Waves: Internal and external causes of over voltages, Lightning strokes, Lightening stroke to tower and midspan, Traveling waves in transmission lines, Circuits with distributed constants, Wave equations, Reflection and refraction of traveling waves, Traveling waves at different line terminations, Effect of short length of cables, Shape and attenuation and distortion of traveling waves, Selection of typical wave to represent over voltages, Lattice diagram

Switching Transients : Switching transients, The circuit closing transient, The recovery transient initiated by the removal of the short circuit, Double frequency transients, Abnormal switching transients, Current suppression, Capacitance switching, Arcing, Transformer inrush current, Ferro resonance, Neutral connections, Transients in switching a three phase reactor, Three phase capacitor, The short line fault.

Switching Surges In Transformers, Motors And Generators: Step voltage, Voltage distribution in transformer winding, Winding oscillations, Traveling wave solutions, Transformer core under surge conditions, Voltage surges, Transformers, Generators and motors , Transient parameter values for transformers , Surge diverters, Surge absorbers, Ground fault neutralizers, Protection of lines and stations by shielding, Ground wires, Counter poises, Driven rods, Modern lighting arrestors, Insulation coordination

Generation and Measurement of High Voltages And Current : Generation of high AC and DC voltage, Impulse voltage, Impulse current, Measurement using Sphere gaps peak Voltmeters, Potential dividers ,measurement set-up for transient voltage and current .

Text Books

1. Transients in Power Systems –Lou Van der Sluis, John Wiley & Sons, 1998
2. Transient Phenomenon in Electrical Power System-V.A.Venikov,McMillan Publications, 2000

Reference Books

1. A statistical approach to power system transients- Dr.C.S.Indulkar ,PHI,2003
2. Power System Grounding and transients:An Introduction ,A.P.Sakis Meliopoulos,Marcel Dekker,2002
4. http://www.nptel.iitm.ac.in/
5. www.ocw.mit.edu

EE803 ELECTIVE – II
E) HIGH VOLTAGE ENGINEERING

Teaching Scheme : **04 L + 01 T Total: 05** **Credit: 04**
Evaluation Scheme : **15 CT1 + 15 CT2 +10 TA+ 60 ESE** **Total Marks: 100**
Duration of ESE : **2 Hrs.30 min.**

Mechanism Of Breakdown In Gases: Classification of insulating materials. Gases as insulating media, Ionization & decay process, breakdown in gases, Townsend's law. The streamer mechanism of spark Paschen's law, corona discharge, electronegative gases

Breakdown In Liquid And Solid Dielectrics : Breakdown in pure and commercial liquids, Solid Dielectrics and composite dielectrics, High Voltage bushings, Guarding, Shielding, Field Plotting.

Lightning and Switching over Voltages and Protection: Lightning strokes to lines and towers, mechanism & characteristics. Protection of transmission lines from lightning, Lightning Arrestors. Insulation to co-ordination of HV and EHV transmission line, Power system and substation.

High Voltage and Current Generation: Generation of High D.C, A.C. and Impulse voltages, Standard impulse wave shapes, Switching Surges , High Impulse Generator

High Voltage And Current Measurement: Peak voltage, Impulse voltage and High Direct current Measurement methods, Non-destructive measurement and testing, High Voltage dielectrics Loss and capacitance measurement, Radio Frequency and partial discharge measurement.

High Voltage Testing: Basic Terminology, Testing – Insulation, Bushings, Cables, Transformers, Surge Diverters and Isolators, Electric Shock and threshold current

Text Book

1. High Voltage Engineering, Naidu M.S. and Kamaraju V Tata McGraw Hill Pub. Co. New Delhi Third Edition

References

1. High Voltage Engineering , E. Kuffel and W.S. Zaenglo , Pergamon Press
2. EHV AC Transmission Engineering, Rokosh Das Begamudre, Wiley Eastern Ltd. New Delhi.
3. High Voltage Engineering, D.V.Razevig ,Khanna Pub. New Delhi
4. http://www.nptel.iitm.ac.in/
5. www.ocw.mit.edu

EE804 ELECTIVE – III
A) APPLICATIONS OF AI TECHNIQUES TO POWER SYSTEMS

Teaching Scheme : 04 L + 01 T Total: 05 Credit: 04
Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks: 100
Duration of ESE : 2 Hrs.30 min.

Technology of Intelligent Systems : Introduction, Fuzzy Logic and Decision Trees, Artificial Neural Networks (ANN), Robust Artificial Neural Network, Expert Systems, Fuzzy Sets and Systems, Expert reasoning and Approximate reasoning

Application of ANN to Short-term Load Forecasting: An ANN approach to the Diagnosis of Transformer Faults, Real-Time Frequency and Harmonic Evaluation using ANN.

Application of Artificial Intelligence to Angle Stability Studies: Introduction, Transient Stability, Critical Clearing Time(CCT), Methods of Fast Assessment of CCT. Knowledge-Based System for Direct Stability Analysis.

Application of Artificial Intelligence to Voltage Stability Assessment and Enhancement to Electrical Power System, ANN-Based Voltage Stability Assessment, ANN-Based Voltage Enhancement, A Knowledge-Based Support System for Voltage Collapse Detection and Prevention (KBVCDP), Implementation of KBVCDP

Evolutionary Computation: Introduction, Genetic Algorithms (GAS), Object –oriented Analysis of GAS, Object oriented GA Design, Evolutionary Programming (EP), Object oriented analysis, Design and implementation of EP.

EP Approach to Reactive Power Planning, Optimal Reactive Power Dispatch using EP, Application of EP to Transmission Network Planning: Introduction, Problem formulation, EP, Numerical Results,

Text Books

1. Intelligent System Applications in Power Engineering , Loi Lei Lai John Wiley Publication-2004
2. Electrical Systems, Dynamics, and Stability with Artificial Intelligence Application , James A. Momoh and Mohamed E. El-Hawary Marcel Dekker, Inc Publication USA -2003

References

1. Genetic Algorithms , David E. Goldberg, Pearson Education -2003
2. Introduction to Neural Systems , Jacek Zurada, Jaico Publishing House -2004
3. http://www.nptel.iitm.ac.in/
4. www.ocw.mit.edu

EE804 ELECTIVE – III
B) NETWORK SYNTHESIS USING OPERATIONAL AMPLIFIERS

Teaching Scheme : 04 L + 01 T Total: 05 Credit: 04
Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks: 100
Duration of ESE : 2 Hrs.30 min.

Analog/Digital, Digital/Analog Networks: Multiplexers with MOSFET and JFET switches; Differential input multiplexers, Multitiered multiplexing; Digital to Analog converters- D/A converter designs, sources of error, bipolar operation, multiplying D/A converter; Analog to Digital converters- counter ramp type, continuous ramp type, successive approximation type, dual slope integrator type A/D converter

Sampling Networks: Sample - Hold Modules, sample-hold fundamentals; Sample-hold circuits; Peak detectors, design considerations, non-inverting peak detector circuits, reset and hold mode circuits; Peak to Peak detector; Level detector; Amplitude classifier.

Modulation Networks: Amplitude Modulation- using multipliers, pulse amplitude modulation; Voltage Controlled Oscillator; Voltage to Frequency converters- square wave output VFC, pulse train output VFC, high performance VFC, Pulse width modulation.

Demodulation Networks: Amplitude Demodulation- phase sensitive demodulation, pulse sample demodulator; Demodulation of FM signals- time averaging FM demodulation, FM demodulation by measuring the period, FM demodulation using phase lock techniques; Pulse width demodulation.

Active Filters: Active filer characteristics, pole pairs, network functions, parameters; Filter realizations; Tuning active filter stages; Filter performance; Circuit elements; Filter design and tuning tables.

Text Books

1. Operational amplifier: Design and application, J. G. Graeme, G. E. Tobey McGraw-Hill Publication, 1971
2. Design of Operational Amplifier and Analog Integrated Circuits, S.Franco , TMH Publication, 2002

References

1. http://www.nptel.iitm.ac.in/
2. www.ocw.mit.edu

EE804 ELECTIVE – III
C) ARTIFICIAL NEURAL NETWORKS

Teaching Scheme : 04 L + 01 T Total: 05 **Credit: 04**
Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE **Total Marks: 100**
Duration of ESE : 2 Hrs.30 min.

Introduction: Introduction to Artificial Intelligence, Artificial Neural Network (ANN), Characteristics of ANN

Biological neurons: Function of single biological neuron, Comparison of brain and computer, Comparison between Artificial and Biological neural network.
Basic terminology related to artificial neuron, Basic building blocks of ANN. Network architecture, setting of weights, Activation functions.

Fundamental Models of ANNs and Learning Processes: McCulloch Pitts neuron model, Hebb net.
Concept of Learning with a Teacher, Learning without a Teacher, Different Learning rules such as Hebbian learning rule, Perceptron learning rule, Delta and extended delta learning rule, Competitive learning rule, outstar learning rule, Boltzman learning rule.
Concept of Linear separability

Single Layer Network and Multi-layer Network : Single Layer Perceptron: architecture – training algorithm, Application Procedure, different performance indices, different training stopping conditions and their limitations, learning curves.

Adaline and Medaline Networks: Architecture, Training and Application Algorithms

Back Propogation Network: Architecture, Back propogation Learning algorithm, Selection of parameters, Concept of learning rate, momentum coefficient, Local and global minima, Advantages and disadvantages of BPN.

Radial Basis Function Network: Architecture, Training algorithm

Self Organizing Feature Map: Concept of clustering, Concept of winner unit, methods for determining the winner unit, Kohonen self organizing Feature Map (SOFM).

Applications of ANN: Applications of ANN in bioinformatics, Forecasting (Regression), Pattern recognition (Classification)

Text Books

1. Neural Networks: A Comprehensive Foundation, Simon Haykin ,2nd Edition,Pearson Education 2007

References

1. AI Techniques in Power System, Kelvin Waruicke, Arthur Ekwlle, Raj Agarwal, IEE press 2003
2. Introduction to Neural Network, Anderson J.A., MIT press, Cambridge 2006
3. Neural Network , A classroom Approach, Satish Kumar, McGraw Hill , 2008
4. http://www.nptel.iitm.ac.in/
5. www.ocw.mit.edu

EE804 ELECTIVE – III
D) DIGITAL IMAGE PROCESSING

Teaching Scheme : 04 L + 01 T Total: 05 Credit: 04
Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE Total Marks: 100
Duration of ESE : 2 Hrs.30 min.

Digital Image Representation: Digitizing images, discrete curves, connected component, space frequency representation, multi resolution representation;

Basics Tools in Image Processing: Point operations (LUT), neighborhood processing (linear filtering, rank filtering, basic morphological filtering);

Image Enhancement Techniques and Image Restoration : Ad'hoc and optimal techniques; Extraction and characterization of visual cues in images : edge detection techniques (first and second derivative operations, matched filtering, optimal edge detectors), texture characterization (co – occurrence matrices, RLC, curvilinear integration, ARMA modeling), Image segmentation; fixed and adaptive histrogram threshold, boundary detection and extraction (edge thinning, edge following & edge closing), Region growing techniques, Split & Merge techniques, statistical image segmentation by markovian techniques; Statistical Pattern recognition techniques in images : methods, applications. Image analysis and scene description.

Text Books:

1. Fundamental of Digital Image Processing , Anil K.Jain Prentice Hall-2004

References

1. Digital Image Processing, Gonzalez & Woods 2nd Edition , Prentice Hall -2005
2. Digital Image Processing using MATLAB Gonzalez & Woods , Prentice Hall -2004
3. http://www.nptel.iitm.ac.in/
4. www.ocw.mit.edu

EE804 ELECTIVE – III
E) ROBOTICS AND AUTOMATION

Teaching Scheme : 04 L + 01 T Total: 05 **Credit: 04**
Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE **Total Marks: 100**
Duration of ESE : 2 Hrs.30 min.

Introduction: Robot definition, Robot classification, Robotic system components. Notations, Position definitions, Coordinate frames, Different orientation descriptions, Free vectors, Translations, rotations and relative motion, Homogeneous transformations, Spatial Descriptions and Transformations.

Manipulator Kinematics and Mechanics of Robot Motion: Link coordinate frames, Denavit-Hartenberg convention, Joint and end-effectors, Cartesian space, Forward kinematics transformations of position, Inverse kinematics of position, Translational and rotational velocities, Velocity Transformations. Manipulator Jacobian. Forward and inverse kinematics of velocity, Singularities of robot motion, Static Forces, Transformations of velocities and static forces, Joint and End Effectors force/torque transformations.

Manipulator Dynamics: Trajectory Planning, Control. Lagrangiant formulation, Model properties, Newton-Euler equations of motion, Joint-based motion planning, Cartesian-based path planning. Independent joint control, Feed-forward control, Inverse dynamics control, Robot controller architectures, Implementation problems.

Automated Manufacturing Systems: Introduction, Manufacturing systems, Performance measure, Computer controlled machines, Material handling systems, Plant layout. Flexible manufacturing system, Computer control system.

Texts Books

1. Introduction to Robotics: Machines and Control, John J. Craig, 3rd Edition, Prentice Hall -2004

References

1. Modeling Identification & control of Robot , W.Khalil & E.Dombare , McGra Hill -2005
2. http://www.nptel.iitm.ac.in/
3. www.ocw.mit.edu

EE805 SWITCH GEAR AND PROTECTION LAB

Teaching Scheme : 02 P Total: 02 **Credit: 01**

Evaluation Scheme : 25 Internal + 25 External **Total Marks: 50**

It is representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise. Minimum eight experiments should be performed.

1) To study Characteristics of Miniature circuit breaker
2) To study Characteristics of rewirable fuse
3) To study parallel feeder
4) To study combined protection for generator transformer unit
5) To study various circuit breaker
6) To study over current relay
7) To study earth fault relay
8) To study generalized protection scheme

EE806 DIGITAL SIGNAL PROCESSING LAB

Teaching Scheme : 02 P Total: 02 **Credit: 01**

Evaluation Scheme : 25 Internal + 25 External **Total Marks: 50**

It is representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise. Minimum eight experiments should be performed.

1) Plotting signal with MATLAB
2) Step, Impulse response using MATLAB
3) Evaluation of convolution and deconvolution
4) Evaluation of Laplace, Fourier transforms, DFT etc. with symbolic Math.
5) Evaluation of frequency response with MATLAB
6) FIR filter design using MATLAB
7) IIR filter design using MATLAB
8) Implementation of decimation interpolation with MATLAB

EE807 PROJECT AND SEMINAR

Teaching Scheme : 04 P Total: 04 Credit: 09

Evaluation Scheme : 75 Internal + 175 External Total Marks: 250

1. Project work decided in previous semester will be continued.
2. Students should complete implementation of ideas given in synopsis, so that project work should be completed before end of semester.
3. Students shall submit the final project report in proper format which shall include the work of both semesters.
4. For uniform and continuous evaluation, evaluation committee for each group shall be formed by HOD in which guide must be a member. Internal marks should be awarded by committee at end of semester based on continuous evaluation.
5. Final examination of project shall include demonstration of working model, presentation of complete work and oral examination based on total project work.