

**GOVT. COLLEGE OF ENGINEERING,
AMRAVATI**



CURRICULUM

**B. TECH. (ELECTRICAL)
V and VI 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 Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	Theory				Practical		Total	
						TA	CT1	CT2	ESE	Internal	External		
Sem III													
EE301	Engineering Mathematics III	4	1	---	5	10	15	15	60	---	---	100	5
EE302	Electromagnetic 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 Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	Theory				Practical		Total	
						TA	CT1	CT2	ESE	Internal	External		
Sem V													
EE501	Communication Engineering	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 Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	Theory				Practical		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

EE501 COMMUNICATION 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.

Signal & Noise: Signals and its type, electromagnetic frequency spectrum, basics of communication, various base bands, bandwidth of different base band Sources of noise and its types, signal to noise ratio, noise factor, noise figure, noise temperature, noise equivalent temperature, communication systems, wave propagation and its different types, maximum usable frequency (MUF), critical frequency, fading, virtual height, skip distance, single and multi hop transmission, duct propagation.

Amplitude Modulation: Its need and types (only analog modulation), Amplitude Modulation (AM), DSB-SC, SSB, VSB and ISB transmissions, mathematical Analysis, modulation index, frequency spectrum, power requirement of these systems, generation of AM signal.

Angle Modulation: Frequency Modulation (FM), mathematical Analysis, modulation index, frequency spectrum, power requirement of FM, narrowband & wideband FM, noise triangle in FM, pre-emphasis & de-emphasis techniques, phase modulation, power contents of the carrier & the sidebands in angle modulation, noise reduction characteristics of angle modulation, generation of FM signals, comparison between AM & FM.

Receivers: Basic receiver (TRF), Super heterodyne receiver, performance parameters for receiver such as sensitivity, selectivity, fidelity, image frequency rejection etc., AGC technique, AM detectors, FM discriminators, AFC technique, double-spotting effect. Details of each block of AM and FM receiver.

Transmission line: Various parameters of transmission line, their relations, derivation of standing wave ratio, quarter wave transformer, stub matching, Smith chart.

Antenna: Radiation pattern, types of antenna, antenna arrays, turnstile, loop, log -periodic, UHF and microwave (only structure and principle)

Telephony: Basics of land line telephony, working of exchanges local and trunk, basics of integrated service digital network (ISDN), basics of wireless phones such as mobile, cellular, paging system, facsimile.

TEXT BOOKS

1. Principles of Communication Systems (3rd Edition 1995) by Taub, Herbert, Tata McGraw-Hill
2. Electronic Communication Systems (4th Edition 1999) by Kennedy, Devis, Tata McGraw-Hill
3. Electronic communication systems, by Kennedy, Davis, Tata Mc-Graw Hill

REFERENCE BOOKS

1. Fundamental of communication System(1st edition,2006),by Proakis, Pearson Education
2. Electronic Communication (4th edition) by Roddy and Coolen, Prentice Hall of India, New Delhi 2003
3. Electronic Communication System a Complete Course (4th Edition) by Schweber, PHI, New Delhi 2000
4. Electronic communication, by Shrader, Tata Mc-Graw Hill 2004
5. <http://www.nptel.iitm.ac.in/>

EE502 ELECTRICAL MACHINES -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.	

Fundamental of AC rotating machines: AC windings integral slots, fractional slots & fractional pitch winding. Distribution factor, pitch factor, winding factor- harmonic mmf of distributed windings, EMF equation.

Synchronous generators: constructional details, armature circuit reaction model and phasor diagram of salient and non- salient pole machines- determination of parameters of circuit models-methods of determining regulation and efficiency. transient & sub- transient reactances. Methods of synchronization- synchronous machine on infinite busbars-parallel operation

Synchronous Motor: Principle of operation, torque equation, V curves- hunting and damping starting applications.

Three phase induction motor: rotating magnetic fields, principles of operation-constructional details-circuit models and phasor diagram, performance equations-direct and indirect testing-circle diagram. Methods of starting and speed control of 3 phase IM-double cage motor-methods of braking-single phasing, cogging and crawling. Introduction to Induction Generator,

Single phase IM: different types-starting methods-characteristics and application.

AC Commutator machines: series motors-characteristics and application.

d-q transformation of three phase induction motor.

TEXT BOOKS

1. Theory of AC Machines : A.S. Langsdorf(McGraw Hill). 2004
2. Electrical Machines : Nagrath and Kothari(Tata McGraw Hill). 2003

REFERENCE BOOKS

1. Performance and Design of AC Commutator Motor :Openshov-Taylor(McGraw Hill) 2000
2. Performance and Design of Alternating Current Machines : M.G. Say. 1999
3. <http://www.nptel.iitm.ac.in/>
4. www.ocw.mit.edu

EE503 POWER SYSTEM ANALYSIS- I

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.

Transmission line parameters : calculation of resistance, inductance and capacitance of single phase and three phase transmission lines, skin effect and proximity effect, transposition, G.M.D. & G.M.R. methods, double circuit lines, bundled conductors, effect of earth on inductance and capacitance, interference with communication lines.

Electrical characteristics of transmission line : V-I characteristics of short, medium and long lines, A, B, C, D constants, nominal π and equivalent T representations, Ferranti effect, corona phenomenon, effect of corona and power loss due to corona.

Representation of power systems component: Single phase representation of balanced three phase system, Single line impedance or reactance diagrams. Per unit system: Basic concept, p.u representation of power systems components

Performance of transmission line: receiving and sending end power circle diagrams, methods of voltage control and power factor improvement, use of static VAR generators and synchronous phase modifiers, analytical and graphical methods, automatic voltage control.

Load flow studies : load flow problem, classification of buses, network modeling, Y-bus and Z-bus matrices, load flow equation, GS and NR methods, comparison of methods used.

Insulator : materials used, types of insulators, comparison of pin type and suspension type insulators, voltage distribution and string efficiency, methods of increasing string efficiency, guarding rings and arcing horns.,

Mechanical design: line supports for LV, HV and EHV, Sag calculation, stringing charts.

Underground Cables: Materials used for conductors and insulator, different types of cables comparison of Overhead conductors and Underground cables

TEXT BOOKS

1. Electric Energy Systems Theory: An Introduction, O. L. Elgerd – Second edition, McGraw-Hill Book Comp. N. Y. 1987
2. Elements of Power System Analysis , Stevenson, Tata- Mc-Graw Hill Publishing Company, New Delhi. 2001

REFERENCE BOOKS

1. Power System Analysis, Hadi Saadat McGraw Hill. -2003
2. Modern Power System Analysis, J. Nagrath & D. P. Kothari Tata- Mc-Graw Hill Publishing Company, New Delhi. 2001
3. Electrical Power Systems, C. L. Wadwa Wiley Eastern Limited, New Delhi 2004
4. Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems. Narain G. Hingorani and Lazlo Gyugyi -2000
5. Flexible AC transmission Systems (FACTS), Yong Hua Song and Allan T. Johns 2005
6. T and D reference book” Westing house. 2003
7. Electric Power System , B.M.Weedy John Willy and Sons Student Edition 2005
8. <http://www.nptel.iitm.ac.in/>
9. www.ocw.mit.edu

EE504 CONTROL SYSTEM-I

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 automatic control : open loop and closed loop system, servo-mechanisms, mathematical modeling of physical systems, transfer functions, block diagrams and signal flow graphs.

Effect of feed back on sensitivity to parameter variation and reduction of the noise.

Control System Components: Electrical / Electro-mechanical components such as A.C./D.C. servomotors, stepper motors, synchors, potentiometers, tachogenerators, Switch Reluctance Motor (SRM) their functional analysis and operating characteristics and their application. Pneumatic controls devices.

Time response analysis : time response of first and second order systems to standard inputs. Time response specifications, types of system, error analysis, error coefficients, steady state errors, dynamic error series.

Approximate methods for higher order system, proportional, derivative and integral control.

Stability Analysis : stability of control systems, characteristics equation, impulse response, Routh-Hurwitz stability criterion, relative stability.

Root Locus : construction of root locus, determination of roots from root locus conditions on variable parameter for stability, effect of addition of poles and zeros.

Frequency response methods : frequency response of linear system, specification, Logarithmic frequency response (Bode) plots from transfer function for various systems. Polar plots for various systems. Estimation of approximate transfer functions from the frequency response. Nyquist criterion, Nyquist plots Stability analysis from frequency response

TEXT BOOKS

1. Control System Engineering, Nagrath I.J., Gopal M Wiley Eastern.-2008
2. Automatic Control Systems, Kuo B.C Prentice Hall of India.-2000

REFERENCE BOOKS

1. Control Systems, Naresh Sinha Wiley Eastern Limited, New Delhi. 2005
2. Modern Control Engineering , D.Roy Choudhary Prentice Hall of India Pvt Ltd. New Delhi. 2001
3. Modern Control Engineering , 4 th Edition K. Oghata ,Pearson Education 2004
4. Control System Engineering ,Second Edition Norman Nise Addison Wesley Pub. Company 2002
5. <http://www.nptel.iitm.ac.in/>
6. www.ocw.mit.edu

EE505 INTRODUCTION TO MICROPROCESSOR AND MICROCONTROLLERS

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 microprocessor: 8085: Architecture, register structure, addressing modes. Instruction set of 8085, timing diagrams Assembly Language Programming of 8085, counters and time delays, stack and subroutines Memory mapped I/O and I/O mapped I/O, address decoding techniques, Interrupt system of 8085(software and hardware interrupts). Data transfer schemes, serial data tyransfer through SOD and SID line

Interfacing Devices (I): Internal architecture and programming of PPI (8255), PIC (8259), USART (8251)

Interfacing Devices (II): architecture and programming of programmable interval timer (8253), floppy disc controller (8272), programmable CRT controller (8275), DMA controller (8237).

Introduction to architecture 8086: addressing modes, register structure (Assembly Language Programs not required)

Introduction to microcontroller: 8051 architecture , 8051 Internal resources, pin diagram, I/O pins, ports and their internal logic circuits, counters, serial ports, interrupt structure, SFRs and their addressing, watch-dog timer, internal code memory, data memory, stack pointer, flags, bit addressable memory, comparative study 8051 families by different manufacturers, study of instruction set of 8051.

TEXT BOOKS

- 1) Microprocessor Architecture, Programming, and Applications with the 8085 , Romesh Gaonkar PHI Publication -2006
- 2) Introduction to Microprocessor L.Gibson, Prentice-Hall 2003
- 3) The 8051 Microcontroller Scott MacKenzie Prentice-Hall, Inc -2006

REFERENCE BOOKS

1. An Introduction to Microcomputers Volume 1 Basic Concepts, Adam Osborne Osborne-McGraw Hill, Berkely California, 1980
2. The 8051 Family of Microcontrollers Richard Barnett Prentice-Hall, Inc -2005
3. <http://www.nptel.iitm.ac.in/>
4. www.ocw.mit.edu

EE506 CONTROL SYSTEM-I LAB

Teaching Scheme : 02 P Total: 02

Credit: 01

Evaluation Scheme : 25 Internal + 25 External

Total Marks: 50

Minimum Eight Experiments to be performed covering the Entire Syllabus of EE504 CONTROL SYSTEM-I Representative list is as follows

1. To determine transfer function of given D.C. generator
2. To determine transfer function of armature controlled D C servomotor
3. To plot characteristics of Synchro transmitter.
4. To plot characteristics of Synchro receiver
5. To study potentiometers as error detector
6. To study of different type stepper motor.
7. To determine closed loop response of first order system
8. To determine closed loop response of second order system
9. To plot frequency response of given lead compensator
10. Use MATLAB to
 - a. Plot root locus of transfer function
 - b. Choosing value of K from root locus
 - c. Determine closed loop response of the system
11. To obtain Bode plot using MATLAB
12. Use **MATLAB** to obtain Nyquist plot & there from obtain gain & phase margin for given system

EE507 ELECTRICAL MACHINES –II LAB

Teaching Scheme : 02 P Total: 02

Credit: 01

Evaluation Scheme : 25 Internal + 25 External

Total Marks: 50

Minimum Eight Experiments to be performed covering the Entire Syllabus of EE502 ELECTRICAL MACHINES -II Representative List is as follows

- 1) To Determine the regulation of three phase Alternator by direct loading method
- 2) To determine the regulation of three phase Alternator by Synchronous Impedance Method
- 3) To find X_d and X_q of salient pole synchronous machine by slip test
- 4) To study starting and reversal of direction of rotation of three phase synchronous motor
- 5) To plot the 'V' and 'Inverted V' curves of synchronous motor
- 6) Application of synchronous motor as power factor correction device
- 7) To perform the load test on three phase induction motor and plot its characteristics
- 8) Perform the No load and short circuit test on three phase Induction motor to find its Equivalent circuit
- 9) Construction of Circle diagram from the No load and short circuit test Data
- 10) Speed control of three phase induction motor
- 11) Study of three phase induction motor starters
- 12) Running light and locked rotor test on single phase induction motor to find its equivalent circuit.
- 13) Parallel operation of Alternators (Synchronizing Methods)

**EE508 INTRODUCTION TO MICROPROCESSOR AND
MICROCONTROLLERS LAB**

Teaching Scheme : 02 P Total: 02

Credit: 01

Evaluation Scheme : 25 Internal + 25 External

Total Marks: 50

Minimum Eight Experiments to be performed covering the Entire Syllabus of EE505 INTRODUCTION TO MICROPROCESSOR AND MICROCONTROLLERS Representative list is as follows

- 1) To give brief description of Architecture of 8085
- 2) To write different addressing modes of 8085
- 3) To add two 8-bit numbers and check flag registers
- 4) To add two 16-bit numbers and check flag registers
- 5) To multiply two 8-bit numbers
- 6) To divide two 8-bit numbers
- 7) To display HELP, character by character after one second delay
- 8) To check parity of a 8-bit number

EE509 GENERAL PROFICIENCY - I

Teaching Scheme : 02 P Total: 02

Credit: 02

Evaluation Scheme : 100 Internal + 00 External

Total Marks: 100

Communication: Need, importance, types and objectives, communication process, barriers, principles of effective communication, modes of communication

Practice of effective communication through eye contact, voice modulation, audience awareness, presentation plan and non-verbal language, face to face conversation, self-analysis.

Understanding guidelines for telephonic conversation, making and receiving calls and telephone messages.

Interviews for Employments: Preparing self and reporting for sample questions on educational background, co-curricular activities, extra curricular activities, and experience and general knowledge, miscellaneous. Case study of Employment oriented Bio Data Profile and Case study of Planning and execution of organizing extra curricular activities in institute.

Data Collection: Role of communication in organizations around and experience sharing by the students. Data collection and report on latest events in Amravati city.

Group Discussion: Seminars and conferences, Understanding different aspects- experience sharing and reporting. Case study of report writing of organizing a seminar/ conference

Paragraph Writing: Understanding principles and general hints writing and analyzing paragraph writing on 3 to 5 topics. Case study on paragraph writing on latest themes on different topics of engineering.

Report Writing and Drafting: Understanding the principles and practices of office drafting such as circulars, notices, memos and telex/ telegraph/ fax/e-mail messages. Case study of report writing on organizing a meeting with Principal / HOD of institute. Report writing on industrial visits

TEXT BOOKS

1. Developing Communication Skills, Krishna Mohan and Meera Banerjee, McMillan Publishers.-2004
2. A Course in Listening and Speaking II, V. Sasikumar, P.Kiranmani Dutt and Geeta Rajeevan, Cambridge University Press. 2000
3. English for Science and Technology, Thiruvankataswami and Kiranmani Dutt, Cambridge University Press.-2004

EE601 SIGNALS & 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.

Extensive use of MATLAB should be done for imparting instructions

Introduction to Signals and Systems: Signals and Systems, Classification of Signals Classification of Systems, Systems Modeling Some Ideal Signals, Energy and Power Signals Frequency Response, Discrimination of Continuous-Time Signals Topological Models, Analysis of Continuous-Time Systems Time Domain and Frequency Domain, Properties of Elementary Signals Linear Convolution Integral, Response of Continuous-Time Systems. Fourier series and Its Properties Fourier Transform Properties of Fourier Transform, Tables of Fourier Transform Pairs Fourier Transform of Periodic Signals, Ideal Low-Pass Filter Frequency-Domain Analysis of Systems Fourier analysis of Sampled Signals

Analysis of LTI Discrete-Time Systems: Time Domain and Frequency Domain, Properties of Discrete-Time Sequences Linear Convolution, Discrete-Time System Response

Sampling: Representation of a continuous-Time Signal by its Samples; The Sampling Theorem; Reconstruction of Signals from its Samples using Interpolation; Effect of Under Sampling (Frequency Domain Aliasing); Discrete Time processing of Continuous-Time Signals

The Z Transform: The Z Transform; The Region of Convergence for the Z- Transform; Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot; Properties of Z- Transform; Analysis and Characterization of Discrete-Time LTI Systems using Z-Transform; System Transfer Function; Block Diagram Representation; The Unilateral Z-Transform; Solution of Difference Equation using the Unilateral Z-Transform.

Discrete Fourier Transform and Fast Fourier Transform Representation of Discrete-Time aperiodic signals and the Discrete-Time Fourier Transform; Fourier Transform for Periodic Signals; Properties of the Discrete-Time Fourier Transform; Discrete-Time LTI Systems and Discrete-Time Fourier Transform. Fast Fourier Transform (FFT)

TEXT BOOK

1. Signals And Systems , S.Haykin, 2nd Edition, John Wiley And Sons 1999
2. Analog And Digital Signal Processing , Ambardar A, 2/3; Thomson Learning-2005

REFERENCE BOOKS

1. Signals and systems, Oppenheim and Schaffer Prentice Hall India Of India 2nd Edition 1997
2. Signal & System: Analysis using , Transform Method and Matlab by M.J.Roberts, McGraw Hill company Ltd 2nd Edition 2003
3. <http://www.nptel.iitm.ac.in/>
4. www.ocw.mit.edu

EE602 POWER ELECTRONICS - I

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.

SCR, triac, diac-construction, characteristics & applications, two transistor analogy for turning ON-OFF SCR, turn ON mechanism, different methods of turning ON-OFF SCR, turn OFF mechanism, thyristor firing circuits-R,R-C & UJT, introduction to GTO, power transistor, power MOSFET & IGBT their construction & characteristics.

Series -parallel operation of SCRs, series and parallel operation, static & dynamic equalising ckt., equalisation of current in parallel connected SCRs, string efficiency, derating factor, protection of SCRs against di/dt, dv/dt, radio freq. interference, over voltage, over current.

Principle of phase control, half wave controlled rectifier, half controlled bridge & fully controlled bridge rectifier for resistive and RL load, derivation for output voltage and current, effect of free wheeling diode, single phase dual converters.

Classification of ckt. for forced commutation, series inverter, improved series inverter, parallel inverter, out put voltage and waveform control, principle of operation for three phase bridge inverter in 120 deg. and 180 deg. mode, single phase transistorized bridge inverter.

Basic principles of chopper, time ratio control and current limit control techniques, voltage commutated chopper ckt., Jones chopper, and AC chopper. Buck and boost converter. Basic principle of cycloconverters, single phase to single phase cycloconverter, voltage regulators.

TEXT BOOKS

1. Power Electronics Circuits Devices and Application, M.H.Rashid Prentice Hall of India (PHI) Pvt. Ltd., New Delhi.-2003
2. An Introduction to Thyristers and their Application, M.Ramamoorthy Affiliated East West Pvt. Ltd., New Delhi. 1999

REFERENCE BOOKS

1. Power Electronics, P.C.Sen TMH Publication Co. Ltd., New Delhi. 2003
2. Thyristered Power Controllers, G.K.Dubey, S.R.Doradia, A.Joshi, R.M.Sinha New Age International, New Delhi 2004
3. Power Electronics: Converters, Applications and Design (3rd edition) Ned Mohan Tore M. John Wiley & Sons Inc 2002
4. <http://www.nptel.iitm.ac.in/>
5. www.ocw.mit.edu

EE603 POWER SYSTEM ANALYSIS - II

Teaching Scheme : 04 L + 00 T Total: 04

Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE

Duration of ESE : 2 Hrs.30 min.

Credit: 04

Total Marks: 100

Symmetrical Fault Analysis

Transmission line transients, three phase symmetrical short circuit at alternator terminals, Power system fault calculations, short circuit MVA, Current limiting reactors, ring system and tie bar system, Circuit breaker rating calculation

Symmetrical components

Definition and choice, Alpha operator, transformation matrices, sequence components, power invariance, line and phase sequence quantities relations, three phase delta/star transformer bank-sequence voltages and currents relationship; power system elements – sequence impedance and sequence networks ; Various three phase transformer connections – zero sequence rules; Unbalanced load system – application.

Unsymmetrical Fault Analysis

L-G, L-L-G and L-L faults at unloaded generator terminals, Equivalent sequence network diagram, Fault impedance, Unsymmetrical faults through impedance, Power system faults-loaded and unloaded conditions.

Power system Stability

Introduction, Power angle equation, Steady state stability , Transient Stability , Equal Angle criteria .Numerical solution of Swing Equation , Introduction to Voltage stability.

HVDC : HVDC Transmission Basic principle, Transmission equipments, Comparison with AC links, Inverters – reactive power requirement; Converters, DC links, Circuit breaking, ground return, Economic distance, modern developments.

Reactive power compensation and concept of FACT devices

TEXT BOOKS

3. Electric Energy Systems Theory: An Introduction, O. L. Elgerd – Second edition, McGraw-Hill Book Comp. N. Y. 1987
4. Elements of Power System Analysis , Stevenson, Tata- Mc-Graw Hill Publishing Company, New Delhi. 2001

REFERENCE BOOKS

10. Power System Analysis, Hadi Saadat McGraw Hill. -2003
11. Modern Power System Analysis, J. Nagrath & D. P. Kothari Tata- Mc-Graw Hill Publishing Company, New Delhi. 2001
12. Electrical Power Systems, C. L. Wadwa Wiley Eastern Limited, New Delhi 2004
13. Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems. Narain G. Hingorani and Lazlo Gyugyi -2000
14. Flexible AC transmission Systems (FACTS), Yong Hua Song and Allan T. Johns 2005
15. T and D reference book” Westing house. 2003
16. Power System Stability and Control, Prabha Kundur Mc-Graw Hill Publishing Company, New Delhi. 2003
17. Power System Analysis and Design J.Dunchan Glover ,M.S.Sharma, Cengage Learning 2008.
6. <http://www.nptel.iitm.ac.in/>
7. www.ocw.mit.edu

EE604 OPTIMIZATION TECHNIQUES

Teaching Scheme : 04 L + 01 T Total: 05

Evaluation Scheme : 15 CT1 + 15 CT2 +10 TA+ 60 ESE

Duration of ESE : 2 Hrs.30 min.

Credit: 05

Total Marks: 100

Introduction: engineering applications of optimization, statement of an optimization problem, optimization techniques, classical optimization problem, optimization techniques. Classical optimization techniques - single and multi variable optimization with and without constraints.

Linear programming I - standard form, definitions and theorems, graphical method, solution of system of linear simultaneous equations, simplex method, two phase simplex method, revised simplex method.

Linear programming II - duality, theorems on duality, dual simplex method, decomposition principle, sensitivity analysis, balanced and unbalanced transportation problems.

Non linear programming - unimodal function, unrestricted search, Fibonacci search method and Golden section method, unconstrained optimization, direct search methods - pattern search methods, simplex method, descent method - steepest descent method, conjugate gradient and variable metric method.

Dynamic programming: multistage decision processes, principle of optimality, sub optimization, calculus and tabular method of solution, conversion of final value problem into initial value problem, solution of linear programming. Continuous dynamic programming.

TEXT BOOKS

1. Optimization - Theory & Application, S.S.Rao Wiley Eastern Ltd.2005
2. Operations Research, H.A.Taha PHI, New Delhi.-2000

REFERENCE BOOKS

1. Introduction Operations Research, Fredrick S.Hiller Gerald J.L. Lieberman Tata McGraw Hill Pub. Co., New Delhi.-2004
2. Introduction to Optimization, J.C.Pant Jain Brothers, New Delhi.-2001
3. PERT and CPM Principles & Application, L.S.Srinath Affiliated East West Pvt. Ltd., New Delhi.-2006
4. <http://www.nptel.iitm.ac.in/>
5. www.ocw.mit.edu

EE605 CONTROL SYSTEM – II

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.

Compensation Techniques: Introduction, Preliminary considerations of Classical Design, Lead Compensator, Lag Compensator, Lag- Lead Compensator, Cascade Compensation in time domain, Cascade compensation in Frequency domain, Feedback compensation in frequency domain .

State Space Techniques I: State, state space and state variables; SISO/MIMO linear systems state variable models - differential equations, Transfer Functions, Block Diagrams and State Diagrams (Signal Flow Graphs); Transfer functions decomposition - Phase variable forms, Canonical forms and Jordan canonical form; Transfer function - state model; Transfer matrix; State equations solution - State transition matrix (STM); STM Computation – Laplace transformation, Canonical transformation and Cayley Hamilton theorem; Time response – SISO Systems.

State Space Techniques II: Concept - controllability and observability; SISO/MIMO Linear systems -Gilbert's method and Kalman's test; SISO controllable systems Design -state feedback.

Sampled Data Control Systems: Representation, Z Transforms. review, Sampler and Hold - zero order hold; Sampling theorem; Z Transform analysis – open loop and closed loop sampled data systems, Z Transfer functions, Difference equation solution and response; Z Transform Method,. Discrete Systems Response, Open and closed loop systems pulse transfer functions - Different sampler locations; Digital Controller - transfer function; Stability analysis - S and Z Domain relationship, Jury's Test and Bi-Linear Transformation, Root and root locus method.

Non-Linear System Analysis I :Non-linear system behavior – types and characteristics; Describing functions - typical non-linearity and their characteristics; Stability analysis - Describing function method and Limit cycles; Limitations - describing function method.

Non-Linear System Analysis II Linearization - Around operating point; Singular points – Classification and Nature; Phase-plane method - non- linear systems analysis; Phase trajectories construction – analytical method and graphical method by isocline method; Stability analysis - limit cycle; Limitations - phase-plane method.

TEXT BOOKS:

1. Control System Engineering, Wiley I.J. Nagrath and M. Gopal Eastern Limited, New Delhi.
2. Modern Control Theory, K . Ogata Prentice Hall of India Pvt. Ltd. New Delhi.

REFERENCE BOOKS:

7. Control System Engineering ,Second Edition Norman Nise Addison Wesley Pub. Company 2002
8. D.Roy Choudhary –Modern Control Engineering , Prentice Hall of India Pvt Ltd. New Delhi.
9. Automatic Control System, B. C. Kuo Prentice Hall of India Pvt Ltd. New Delhi.
10. <http://www.nptel.iitm.ac.in/>
11. www.ocw.mit.edu

EE606 POWER ELECTRONICS - I LAB

Teaching Scheme : 02 P Total: 02

Credit: 01

Evaluation Scheme : 25 Internal + 25 External

Total Marks: 50

Minimum Eight Experiments to be performed covering the Entire Syllabus of EE602 POWER ELECTRONICS - I Representative list is as follows

- 1) To study the characteristic of SCR
- 2) To study the characteristic of TRIAC
- 3) To study the Half controlled converter
- 4) To study the full controlled converter
- 5) To study the Triggering method of SCR
- 6) To study the parallel inverter
- 7) To study the series inverter
- 8) To study the step down and step up choppers
- 9) To study the voltage controlled using triac

EE607 POWER SYSTEM ANALYSIS - II LAB

Teaching Scheme : 02 P Total: 02

Credit: 01

Evaluation Scheme : 25 Internal + 25 External

Total Marks: 50

Minimum Eight Experiments to be performed covering the Entire Syllabus of EE603 POWER SYSTEM ANALYSIS - II Representative List is as follows

1. To study the transmission line system training simulator
2. To find out efficiency and Regulation of transmission line with out compensation.
3. To study current limiting Reactors.
4. To determine A,B,C,D parameters by o.c & s.c. test
5. To find out transmission line parameters A,B,C,D. & Prove $AD-BC = 1$
6. To find out efficiency and Regulation of transmission line with shunt compensation.
7. To study surge impedance loading (SIL)
8. To study Ferranti effect
9. To study power World Simulator specific focus on Load flow study and Stability analysis.

EE608 MINI PROJECT

Teaching Scheme : 02 P Total: 02

Credit: 02

Evaluation Scheme : 25 Internal + 25 External

Total Marks: 50

For minor project group of for students is to be formed. Innovative ideas of students are expected to be implemented in hardware or software projects. Two groups will be assigning to each guide so that the same students will come for the main project of final year.

EE609 GENERAL PROFICIENCY - II

Teaching Scheme : 02 P Total: 02

Credit: 02

Evaluation Scheme : 100 Internal + 00 External

Total Marks: 100

Planning: Nature, importance, functions, types of plans, strategic decision making, types of decisions, business forecasting, types and techniques of forecasting. Case study of different forecasting techniques

Leadership and Organizational Structure: Characteristic, styles, types, qualities of leadership, Case study of Leadership styles and organizational structures in different organizations

Human Resources Management: Human resources planning, recruitment, selection, training and development, motivation, employee welfare, safety and health, trade unions and industrial relations. Case study of HRM in government and non-government organizations

Negotiation: Concept, types, Different types of MoU agreements and different contents. Case study of MoU agreement between 2 agencies / organizations

R and D Projects: Different types of research projects and funding agencies, their eligibility criteria, different types of formats. Case study of different funding agencies and different types of research projects funding

Finance Management in Industries: Different types of financing institutions and their funding agencies, financial management, Case study of financing procedures and schemes for SSI / SMEs

TEXT BOOKS/WEBSITES:

- 1) Dynamics of Personnel Management in India, R D Agrawal, Tata McGraw Hill Pub Co, New Delhi, 2005.
- 2) Personnel Management: Edwin B Flippo : McGraw Hill International Edition, New Delhi , 2003.
- 3) The Spirit of Leadership: Harrison Owen: Tata McGraw Hill Pub. Co, New Delhi 2005.
- 4) www: aicte.ernet.in
- 5) www.ugc.ac.in
- 6) www.dst.gov.in
- 7) www.ntmis-dst.org
- 8) www.isro.org
- 9) www.vichar.nic.in
- 10) www.serc-dst.org