GOVT. COLLEGE OF ENGINEERING, AMRAVATI

CURRICULUM

B. TECH. (ELECTRICAL)
III and IV 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

EE301 Engineering Mathematics III

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.

Linear Differential Equations with constant coefficients:
General solution to L.D.E. of nth order with constant coefficients, rules for finding C.F., General method for finding P.I., P.I. of some standard functions, Method of Variation of Parameters, Cauchy's and Legendre's L.D.E., simultaneous linear differential equations . Applications of L.D.E.: Electrical Circuits, Kirchoff's Law, LCR Circuits, Coupled Electrical Circuits.

Partial Diff. Equations: Definition, formation of P.D.E., complete solution of PDE, Linear and non-linear PDE of types (i) f(p, q)= 0, (ii)f(p, q, z)= 0, (iii)f(p, q, x, y)= 0,(iv)f(p, q, x, y, z)= 0 ie Lagrange's form Pp+Qq=R and Clairaut's form z = px + qy + f(p, q), (v)Equations reducible to above forms. Complete solution of PDE of first and second order by method of separation of variables.

Laplace Transform: Definition, standard formulae and properties of LT., Laplace transform of unit step and periodic functions. Laplace Transform of unit impulse function., Inverse Laplace Transform, Convolution Property, Application of LT to solve LDE with constant coefficients.

Vector Calculus: Scalar and vector point functions, Differentiation of a vector function, Tangent and normal components of velocity and acceleration, orthogonal curves, Operator delta, Gradient of scalar point function& their physical meaning . Divergence and Curl of vector point function & their physical meaning. vector identities, solenoidal and conservative fields. Line integral, work done by force.

Functions of complex variables: Analytic function, C-R equations(Cartesian & polar), Harmonic function, Milne Thompson method for finding analytic function, Conformal mappings, Bilinear transformation.

Text Books :
1) Text book of applied Mathematics by P.N.Wartikar and J.N.Wartikar, Pune vidyarthi griha,Pune 2001.
2) Higher Engineering Mathematics by B.S.Grewal, Khanna publication,6th edition, New Delhi,1976.

Reference Books:
1) Advanced Engineering Mathematics by Kreyzig, John Wiley & sons 9th edition 1995.
2) Advanced Engineering Mathematics by John bird 5th edition Elsevier publication 2007.
3) Higher Engineering mathematics by C.R.Wiley, 8th edition John Wiley and sons 1999.

EE302 Electromagnetic Engineering

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.**

Review of vector analysis: Scalars and vectors, vector algebra, the rectangular coordinate systems, vector components and unit vectors, the vector field, the dot product, the cross product, the cylindrical and spherical coordinate system.

Coulombs Law and Electric field intensity: The experimental law of Coulomb, Electric field intensity, field due to continuous volume charge distribution, field of line charge, field of sheet charge, streamlines and sketches of fields.

Electric Flux density, Gauss's Law and divergence: Electric flux density, Gauss's law, and Applications of Gauss's law: some symmetrical charge distributions, differential volume element, and divergence, Maxwell's First Equation (Electrostatics), The vector operator ∇ and the divergence theorem.

Energy and potential : Energy expended in moving a point charge in electric field, the line integral, definition of potential difference and potential, the potential field of a point charge, the potential field of a system of charges, conservative property, potential gradient, The dipole, the potential gradient in the electrostatic field.

Current and conductors : The nature of dielectric materials, the boundary conditions for perfect dielectric materials, capacitance, capacitance of two wire line, using field sketches to estimate capacitance in two dimensional problems, current analogies

Poisson's and Laplace's Equations: Derivations of Poisson's and Laplace's equations, uniqueness theorem, Examples of solution of Laplace's and Poisson's equations, product solutions of Laplace's equation

The steady Magnetic fields: Biot-Savart's Law, Ampere's circuital law, curl, Stoke's theorem, magnetic flux and magnetic flux density, the scalar and vector magnetic potentials, derivations of steady magnetic field laws.

Magnetic forces, materials, and inductance: Force on moving charge, force on a differential current element, and force between differential current elements, force and torque on a closed circuit, the nature of magnetic materials, magnetization and permeability, magnetic boundary conditions, the magnetic circuit, the potential energy and forces on magnetic materials, inductance and mutual inductance.

Time varying magnetic fields and Maxwell's equations: Faraday's laws, displacement current, Maxwell's equations in point form, Maxwell's equations in integral form, the retarded potentials.

Text books:

1. Engineering Electromagnetics 7/e By W.H. Hayt TMH Publication 2006

Reference books:

1. Electromagnetic Engg. V Edition By N.N.Rao Prentice Hall. 2005
2. Applied Electromagnetics By Fawwaz T.Ulaby Prentice Hall. 1999
3. Electromagnetic Engg. IV Edition By Krauss Tata Mc Graw Hill. 2003
4. Electromagnetic Waves By Shevgaonkar - Tata Mc Graw Hill 2002
5. http://www.nptel.iitm.ac.in/
6. www.ocw.mit.edu

EE303 Network Analysis

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.

Terminal Element Relationships: V-I relationship for Inductance and Capacitance- Constant Flux Linkage Theorem and Constant Charge Theorem- v-i relationship for Independent Voltage and Current Sources - v-i relationship for dependent voltage and current sources- Source Functions: unit impulse, unit step, unit ramp and inter relationship, sinusoidal input ,generalized exponential input.

Basic Nodal and mesh Analysis: Introduction, Nodal analysis, the super node, mesh analysis, the super mesh, nodal vs mesh analysis, computer aided circuit analysis using Pspice

Useful circuit analysis techniques: Linearity and superposition, source transformations, Thevinin's theorem , Norton's theorem, Maximum power transfer theorem, Delta-wye transformations

Time Domain Analysis of Circuits: Linear Differential Equations for Series RC, Parallel RC, Series RL, Parallel RL, Series RLC, Parallel RLC and Coupled Circuits-Complete Solution for step/impulse/sinusoid voltage/current inputs-Natural Response-Transient Response-Time Constant-Rise and Fall times-Concept of d.c steady state and sinusoidal steady state-Frequency Response of simple circuits from steady state solution-Solution of two mesh circuits by differential equation method-Determination of initial conditions. Time domain analysis using Pspice

Review of Laplace Transforms: Laplace Transform-Transform Pairs-Gate Functions-Shifting Theorem-Solution of Differential Equations by Laplace Transforms-Initial and Final Value Theorems-Laplace Transforms of periodic signals-Inversion of transforms by partial fractions-Convolution Theorem and Convolution Integral. *(Review to be done by students. No class hour will be spent for this review.)*

Transformation of a Circuit into s-domain: Transformed equivalent of inductance, capacitance and mutual inductance -Impedance and admittance in the transform domain - Node Analysis and Mesh Analysis of the transformed circuit - Nodal Admittance Matrix and Mesh Impedance Matrix in the s-domain - Solution of transformed circuits including mutually coupled circuits-Input and transfer immittance functions - Transfer functions - Impulse response and Transfer function - Poles and Zeros - Pole Zero plots, using Pspice for transform domain analysis

Sinusoidal Steady State analysis: Introduction, characteristics of sinusoids, forced response to sinusoidal functions, the complex forcing function, The phasor, phasor relationships for R L C, impedance and admittance , sinusoidal steady state analysis with phasors, pspice for sinusoidal steady state analysis.

Fourier Series: Fourier Series representation of non-sinusoidal periodic waveforms - Fourier Coefficients-Determination of Coefficients-Waveform Symmetry-Exponential Fourier Series-Discrete Amplitude and Phase Spectra-Steady State Solution of Circuits with non-sinusoidal periodic inputs by Fourier Series

Two Port Networks: two port networks-characterizations in terms of impedance, admittance, hybrid and transmission parameters-inter relationships among parameter sets-Reciprocity Theorem-Interconnection of Two port networks: Series, Parallel and Cascade - Network

Functions-Pole Zero plots and steady state response from pole-zero plots. Use of Pspice for two port networks.

The operational Amplifier: Introduction, the ideal opamp, some basic ciruits using ideal opamps, cascaded stages, more detailed model of opamp. Opamp circuits with pspice.

Textbooks :

1. Engineering Circuit Analysis 6/e By Hayt & Kemmerly TataMcgraw Hill 2004

References:-

1. Network Analysis, By M.E. Van Valkenberg PHI 2005
2. Basic Circuit Theory 3/e, By Lawrence P Huelsman PHI 2001
3. Circuit and Network Analysis By Sudhakar Shyammohan Tata Mc Graw Hill 2005
4. http://www.nptel.iitm.ac.in/
5. www.ocw.mit.edu

EE304 Electronic Devices and 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.**	

Semiconductor Diodes: Semiconductor materials- intrinsic and extrinsic types Ideal Diode, Terminal characteristics of diodes ,p-n junction under open circuit condition ,p-n junction under forward bias and reverse bias conditions, p-n junction in breakdown region , Diode small signal model , Zener diode and applications , Rectifier Circuits, Clipping and Clamping circuits

Bipolar Junction Transistors (BJTs) : Physical structure and operation modes, Active region operation of transistor, D.C. analysis of transistor circuits, Transistor as an amplifier, Biasing the BJT: fixed bias, emitter feedback bias, collector feedback bias and
voltage divider bias ,Basic BJT amplifier configuration: common emitter, common base and common collector amplifiers ,Transistor as a switch: cut-off and saturation modes , High frequency model of BJT amplifier

Field Effect Transistor (FET): Enhancement-type MOSFET: structure and physical operation, current-voltage characteristics, Depletion-type MOSFET, D.C. operation of MOSFET circuits, MOSFET as an amplifier, Biasing in MOSFET amplifiers, Basic MOSFET amplifier configuration: common source, common gate and common drain types, High frequency model of MOSFET amplifier, Junction Field-Effect Transistor (JFET)

Operation Amplifier (Op-amps): Ideal Op-Amp, Differential amplifier: differential and common mode operation, common mode rejection ratio (CMRR), Practical op-amp circuits: inverting amplifier, non -inverting amplifier, weighted summer, integrator, differentiator, Large signal operation of op-amps, Other applications of op-amps: instrumentation circuits, active filters, controlled sources, logarithmic amplifiers, waveform generators, Schmitt triggers, comparators

Power Circuits and Systems : Class A large signal amplifiers, second-harmonic distortion , Transformer coupled audio power amplifier, Class B amplifier, Class AB operation , Power BJTs , Regulated power supplies , Series voltage regulator ,Four layer diodes: p-n-p-n characteristics, Silicon controlled rectifier

Textbooks :

1. Electronics Devices and Circuits By Jacob Millman and Christos C.Halkias , Mc-Graw Hill 2001

References:-

1. Electronics Devices and Circuits By Boylestad R , PHI 2007
2. http://www.nptel.iitm.ac.in/
3. www.ocw.mit.edu

EE305 Electrical Measurement and Instrumentation

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.

Measuring Instruments: Classification, deflecting, controlling, damping, breaking torques. Basic principles of operation of Ammeter & Voltmeter: PMMC, MI, Electro dynamic, Electrostatic: construction, Principle of operation, torque equation, Scale shape, errors, merits & demerits of each type.
Wattmeters & Energy meters: Electro dynamic & Induction type: construction, theory of operation, torque equation, errors & demerits, Electronic energy meter.
Analysis of three phase balanced load, Blondel's Theorem, Measurement of active & reactive power & energy in single phase & three phase circuits.
Instrument Transformer: Need of extension of range: extension using shunt & multipliers Instrument transformers: CT & PT, Theory & construction, Phasor diagram, Ratio & Phase angle error, causes of error, applications Hall effect sensors for voltage and current measurement.
Special Measuring Instruments :- Maximum demand indicator, Trivector meter, Frequency meter, P.F. meter, Phase sequence indicator, Synchroscope, stroboscope, potentiometers.
Measurement of circuit parameters: Different methods of measurement of low, medium & high value of resistance, sensitivity & accuracy of different methods.
AC & DC bridges : Wheatstone, Kelvin, Maxwell, Wein, Hay, Desauty, Anderson, Schearing
Generalized instrumentation system , characteristics of measurement & instrumentation system Transducers : Definition, classification, specification, selection & loading effect, Displacement, Velocity, force, & Torque transducers, Resistive, Inductive, capacitive, Strain gauge, Piezoelectric, current & voltage transducers.
Transducers for pressure & temperature: Manometer, Elastic members (Bellows, Bourdon tube, Diaphragm), RTD, Thermocouple, Thermister, Infrared & Crystal
Cathode ray oscilloscope: Time, frequency & phase angle measurement using CRO. Spectrum & Wave analyzer.

Text Books:

1. A course in Electrical, Electronics measurement and Instrumentation, By A.K.Sawhney Dhanpat Rai & sons 2006

Reference Books:

1. Electrical measurement and measuring Instruments By Golding Wheeler Publishing 2003
2. Electronic measurement and measuring Instruments By Cooper 1999
3. Electronic Instrumentation By H.S. Kalsi TMH 2000
4. Fundamentals of Electrical Measurements By C.T.Baldwin 1998
5. Electrical Measurements By M.U. Reissland 1997
6. Instrumentation Measurement &Analysis By B.C.Nakra & K.K.Chaudhari 2003
7. http://www.nptel.iitm.ac.in/
8. www.ocw.mit.edu

EE306 Network Analysis 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 EE303 Network Analysis. Representative list is as follows.

1. To find self inductance of two coils, mutual inductance between the coils and coefficient of coupling.
2. To verify Maximum Power Transfer theorem.
3. To verify Compensation theorem.
4. To verify Tellegen's theorem.
5. To find Z parameters of two, two port networks connected in series.
6. To find Y parameters of two, two port networks connected in parallel.
7. To find transmission parameters of two, two port networks connected in cascade.
8. To study the response of RL series circuit to sinusoidal input and dc input (using MATLAB).
9. To study the response of RC series circuit to sinusoidal input and dc input (using MATLAB).

EE307 Electronic Devices and Circuits 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 EE304 Electronic Devices and Circuits. Representative list is as follows

1) To plot the Characteristics of PN junction diode
2) To study the half wave rectifier
3) To study the center tapped full wave rectifier
4) To study bridge full wave rectifier
5) To study bridge full wave rectifier with filter
6) To plot the characteristics of CE configuration
7) To study the transistor as switch
8) To study the h parameters of transistors
9) To plot frequency response of RC coupled amplifier
10) To plot the characteristics of light emitting diode
11) To plot the characteristics of Zener diode
12) To the field effect transistor.

EE308 Electrical Measurement and Instrumentation 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 EE305 Electrical Measurement and Instrumentation. Representative list is as follows

1) To study LVDT.
2) To measure three phase power by two-wattmeter method.
3) Calibration of three-phase energy meter at unity power factor.
4) Measurement of capacitance by Desaulty method.
5) Measurement of inductance by Maxwell inductance Capacitance Bridge.
6) Measurement of High resistance by loss of charge method.
7) Calibration of single-phase energy meter at load having UPF, 0.5 lag and 0.5 lead.
8) Measurement of low resistance by Kelvin's double bridge.
9) To study Megger.
10) To study phase sequence meter.
11) Measurement of temperature, pressure-using strain based pressure transducer.
12) a) Measurement of temperature using thermocouple.
    b) To study characteristics of RTD, PT 100 transducer.

EE309 Lab Practice-I

Teaching Scheme : 02 P Total 02 **Credit: 02**
Evaluation Scheme : 50 Internal + 50 External **Total Marks: 100**

This laboratory course is intended to introduce the students to software packages like **Matlab/Maple/Scilab.** The instructor may choose any one of the above packages.

Introduction to Matlab – The Matlab environment, the command window, edit window, advantages of Matlab, workspace, getting help

Matlab Basics- variables and arrays, initializing variables in Matlab, subarrays, special values, displaying output data, data files, scalar and array operations, hierarchy of operations, built in Matlab functions, introduction to plotting, simple plots, multiple plots, logarithmic scales

Programming in Matlab:- Good programming practices, relational and logical operators, branches, additional plotting features, loops, while and for loops, programming examples.

User defined functions: - Introduction to Matlab functions, variable passing in Matlab, optional arguments, sharing data using global memory. preserving data between calls to a function, function functions, subfunctions and private functions, input/output functions

Advanced topics :- Brief introduction to GUIs, Handle graphics, designing asimple GUI

The term work for this lab course will consist of at least 50 simple Matlab programs covering the entire syllabus

EE401 Engineering Mathematics IV

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.

Z-Transform:
Definition, standard forms and properties of Z-transform (i.e. linearity, shifting, multiplication by k and change of scale property), Z-transform of impulse and unit step function, Z-transform of derivatives and integrals, inverse Z-transform. Application of Z-transform to find the solution to difference equations of the first and second order.

Fourier transform:
Complex exponential form of Fourier series, Fourier integral, Fourier sine and cosine integrals, Fourier transform, Fourier sine and cosine transform, inverse Fourier transform.

Vector spaces:
vector spaces and subspaces, null spaces, column spaces and linear transformations, linearly independent sets, bases, coordinate systems, dimensions of vector space, change of bases ,application to difference equations. Orthogonality and least squares: Inner product, length and orthogonality, orthogonal sets, orthogonal projections, Gram-Schmidt process, least square problems, inner product spaces.

Complex integration:
Line and contour integration, singular points, expansion of functions in Taylor's and Laurent's series, Cauchy's integral theorem and integral formula, residue theorem, evaluation of real integrals using residue theorem.

Probability:
Introduction to random processes, probability distributions i.e. discrete and continuous distributions, probability density function, Binomial, Poisson, Normal distributions.

Text Books:
1) Text book of applied Mathematics by P.N.Wartikar and J.N.Wartikar Pune vidyarthi griha,Pune 2001.
2) Higher Engineering Mathematics by B.S.Grewal, khanna publication, new Delhi, 6th edition,1976.
3) Linear algebra and its applications by D.C.Lay 3th edition Addison Wesley, 2004.

Reference Books:
1) Advanced Engineering Mathematics by John bird 5th edition Elsevier publication 2007.
2) Advanced Engineering Mathematics by Kreyzig, 9th edition, John Wiley Publication 1995.
3) Linear Algebra with applications by Nicolson, Mc Graw Hill 2004.

EE402 Pulse & Digital 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.

Introduction: Digital Systems; Data representation and coding; Logic circuits, integrated circuits; Analysis, design and implementation of digital systems; CAD tools.
Number Systems and Codes: Positional number system; Binary, octal and hexadecimal number systems; Methods of base conversions; Binary, octal and hexadecimal arithmetic; Representation of signed numbers; Fixed and floating point numbers; Binary coded decimal codes; Gray codes; Error detection and correction codes - parity check codes and Hamming code.
Combinatorial Logic Systems: Definition and specification; Truth table; Basic logic operation and logic gates.
Boolean Algebra and Switching Functions: Basic postulates and fundamental theorems of Boolean algebra; Standard representation of logic functions - SOP and POS forms; Simplification of switching functions - K-map and Quine-McCluskey tabular methods; Synthesis of combinational logic circuits.
Logic families: Introduction to different logic families; Operational characteristics of BJT in saturation and cut-off regions; Operational characteristics of MOSFET as switch; TTL inverter - circuit description and operation; CMOS inverter - circuit description and operation; Structure and operations of TTL and CMOS gates; Electrical characteristics of logic gates – logic levels and noise margins, fan-out, propagation delay, transition time, power consumption and power-delay product.
Combinational Logic Modules and their applications: Decoders, encoders, multiplexers, demultiplexers and their applications; Parity circuits and comparators; Arithmetic modules-adders, subtractors and ALU; Design examples.
Sequential Logic systems: Definition of state machines, state machine as a sequential controller; Basic sequential circuits- latches and flip-flops: SR-latch, D-latch, D flip-flop, JK flip-flop, T flip-flop; Timing hazards and races; Analysis of state machines using D flip-flops and JK flip-flops; Design of state machines - state table, state assignment, transition/excitation table, excitation maps and equations, logic realization; Design examples
State machine design approach: Designing state machine using ASM charts; Designing state machine using state diagram; Design examples
Sequential logic modules and their applications : Multi-bit latches and registers, counters, shift register, application examples.

Text Books :

1. Modern Digital Electronics 3/e By R.P.Jain Tata McGraw Hill, 2003.
2. Fundamentals of Digital Circuits By Anad Kumar Prentice-Hall India, 2003.

Reference Books :

1. Digital Integrated Electronics By Herbert Taub-Donald Schilling TMH 1999
2. Microelectronics By Jacob Millman and Arvin Grabel McGraw Hill 2001
3. http://www.nptel.iitm.ac.in/
4. www.ocw.mit.edu

EE403 Electrical Machines –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.**	

D.C. machines: construction ,principle of operation EMF equation torque equation , Armature winding- Lap, wave single layer double layer. Armature reaction and commutation method of improving commutation.

D.C. Generators: Types characteristics and application of d.c.shunt ,series and compound generators. Parallel operation of d.c. shunt ,series and compound generators. Introduction for conducting the tests on d.c. machines as per IS 94320-1979.

D.C. Motors: Characteristics and applications of d.c.shunt ,series and compound motors, starting and speed control of motors. Losses and efficiency of motors. Introduction for conducting the tests on d.c. motors as per IS 94320-1979.

Single Phase Transformer: Heat run test separation of core losses into its components Parallel operation equivalent circuit. All day efficiency.

Conducting the tests on as per Transformer IS 2026-1962

Autotransformer: Construction working merits demerits and applications.

Three Phase Transformer: Construction , working, types connections, applications testing, parallel operation. Power transformer , Distribution transformer construction.

Three phase to single phase ,two phase six phase twelve phase conversion. Three winding transformer and tap changing of transformer. Waveforms of no load current and inrush phenomenon.

Text Books:

1. Electrical Machinery By Nagrath Kothari, TMH 2006
2. Theory of Electrical Machines By Langsdrof TMH 1999

Reference Books :

1. Electrical engineering Vol.I : Direct Current 4/e. By Dawes. 1998
2. Advance Electrical Technology By H.Cooton. 1999
3. Substation Equipment By Satnam and Gupta 2003
4. Electrical Machines Sigma Series By Nagrath and Kothari. TMH 2007
5. http://www.nptel.iitm.ac.in/
6. www.ocw.mit.edu

EE404 Energy Resources & Generation

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.**	

Thermal and Hydro Power plant: Selection of site, working of various parts: Economizer, air preheater, condenser, cooling tower, coal handling system, ash handling system, Classification of hydro power plant according to available head, nature of load, functions of different components and their working.

Nuclear and Diesel Power plant: Methods of producing nuclear reactions, functions of different components of nuclear plant, functions of different components of diesel plant

Solar Energy and its measurement: Solar constants, solar radiation at earth's surface, solar radiation geometry, solar radiation measurement, estimation of average solar radiation, solar radiation on tilted surface, principle of solar energy conversion in to heat, flat plate collectors, energy balance equation and collector efficiency

Fuel cells: Chemistry applied to fuel cells, principle and operation ,classification and types of fuel cells, performance characteristics of fuel cells, classification of fuel cells system

Wind Energy: Basic principle of wind energy conversion, wind data and energy estimation, selection of site, basic components of wind energy conversion system (WECS), classification of WEC systems, generating system, energy storage, application of wind energy.

Ocean and tidal energy: Ocean energy resources, ocean energy routes, ocean thermal energy conversion, progressive wave, wave data collection, Basic principle of tidal power, components of tidal power plants, operation methods of utilization of tidal energy, estimation of power and energy in simple single basin tidal system

Other non- conventional energy resources: Operating principle of energy from biomass, energy from biogas, geothermal energy, MHD power generation, energy from urban and rural waste, mini and micro hydroelectric power generation, principle and operation of fuel cells, classification and types of fuel cells, performance characteristics of fuel cells.

Textbooks:

1. Conventional Energy Technology — ByS.B.Pandya, — Tata Mc-GrawHill 2005
2. Non Conventional Energy Resources — ByG.D.Rai, — Khanna Publishers 2001

Reference book:

1. Energy and Atmosphere — By I.M.Campbell, — Wiley, New York 2006
2. Solar Energy — By S.P.Sukhatme, — Tata Mc-GrawHill 2006
3. Conventional Energy Resourses — By B.H.Khan, — Tata Mc-GrawHill 2003
4. http://www.nptel.iitm.ac.in/
5. www.ocw.mit.edu

EE405 Numerical Methods

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.**	

Solution of Algebraic and Transcendental Equations : Bracketing Methods : Bisection and False Position Methods ,Open Methods : Newton Raphson method, Secant method and Successive approximation method. Comparison of different iterative methods. Implementation of these methods in MATLAB.

Solution of Simultaneous Algebraic Equations : Iterative Methods : Jacobi's method and Gauss-Seidel method. Direct Methods : Gaussian elimination method and matrix inverse method. Finding eigen values of a matrix, determination of largest eigen value.
Implementation of these methods in MATLAB.

Interpolation: Evenly spaced points: Formation of forward & backward difference table, Newton's forward and backward difference interpolation formulae.
Unevenly spaced points: Divided difference table and Newton's divided difference interpolation formula, Lagrange's method. Implementation of these methods in MATLAB.

Numerical Differentiation and Integration: Numerical Differentiation: Taylor's series method, Richardson extrapolation method, numerical differentiation using interpolation polynomial (first & second derivative near the beginning & end of the table).

Numerical Integration: Trapezoidal rule, Simpson's rules, Romberg method, Gaussian quadrature method. Implementation of these methods in MATLAB.

Solution of ordinary differential equations : Initial value problem : Taylor's series method, Runge-Kutta methods – second and fourth order, Euler's method, Euler's modified method. Solution of simultaneous and higher order differential equations using Runge-Kutta fourth order method.

Boundary Value problem: Finite-difference method and Cubic-spline method.
Implementation of these methods in MATLAB.

Solution of Partial Differential Equations : Finite difference approximation, elliptical equation (Laplace equation) Jacobie's and Gauss-Seidel method, parabolic equations – explicit and implicit method, hyperbolic equation.

Text Books :

1. Numerical Methods for Engineers 4/e. By Chapra S. S. and Canale R. P, McGraw Hill 2004.

Reference Books :

1. Introductory Methods of Numerical Analysis 4/e By Sastry S. S Prentice Hall. 2002
2. Numerical Methods using MATLAB 4/e By J.H.Mathews & Kurtis D. F. Pearson Education.
3. Applied Numerical Methods in C By Nakamura S Prentice Hall. 2000
4. Computer oriented Numerical Methods By Rajaraman V, Prentice Hall. 1998
5. Numerical Methods with Programming in C and C++ By Veerarajan T. and Ramachandran T Tata McGraw Hill 2006
6. Numerical Methods By Balagurusamy E Tata McGraw Hill. 2007
7. Numerical Methods", 7/e By Faires and Burden Thomson Learning 2000
8. http://www.nptel.iitm.ac.in/
9. www.ocw.mit.edu

EE406 Pulse & Digital Circuits 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 EE402 Pulse & Digital Circuits. Representative list is as follows

1. To study diode as a clipper.
2. To study diode as a clamper.
3. To study RC high pass filter.
4. To study RC low pass filter.
5. To study passive integrator.
6. To study passive differentiator. .
7. To study Transistorized Astable Multivibrator
8. 8)To verify different logic gates.
9. Realization of half adder using gates.
10. Realization of half substractor using gates.
11. Implementation of full Adder circuit using gates.
12. To study Flip-Flops.
13. To Study counters.

EE407 Electrical Machines –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 EE403 Electrical Machines –I Representative list is as follows

1. To identify and understand the functions of various parts of d.c. machines.
2. To plot the OCC of d.c. generator.
3. To find the critical speed of the d.c. generator.
4. To perform and verify the speed control method of d.c. shunt motor
5. To perform the Swinburn test on d.c. machine.
6. To perform the load test on d.c. series generator
7. To perform the load test on d.c. series motor
8. To perform the load test on d.c. shunt generator
9. To perform the load test on d.c. shunt motor
10. To perform the load test on d.c. compound generator
11. To perform the load test on d.c. compound motor
12. To perform the test/tests on d.c. machine to separate the losses at constant speed.
13. To perform the Hopkinson's Test on d.c. machines.
14. To perform the Field test on the d.c. machines
15. To perform the Sumpner's Test on single phase transformer.
16. To identify and understand the functions of various parts of the three phase transformer
17. To perform the OC and SC test on three phase transformer
18. To perform the direct loading test on three phase transformer.
19. To perform the various connections of three phase transformer.
20. To study the scott connection of transformer.

EE408 Numerical Methods Lab

Teaching Scheme : 02 P Total 02 **Credit : 01**
Evaluation Scheme : 25 Internal + 25 External **Total Marks :50**

Minimum twelve programming assignments in C/ MATLAB covering complete syllabus. Students shall write and test the programs and submit the report. Representative list is as follows.

1. To obtain root of equation using False Position Method
2. To obtain root of equation using Successive Approximation method
3. To obtain solution of given set of equations using Gauss Seidel method
4. To obtain solution of given set of equations using matrix inversion technique
5. To form Newton's forward difference table and calculate value of variable
6. To form Newton's divide difference table and calculate value of variable
7. To for getting value of variable using Lagrange's method
8. To obtain differentiation using Richardson Extrapolation technique.
9. To obtain differentiation using difference table
10. To obtain integration using Simpson's $1/3^{rd}$ rule
11. To obtain integration using Gaussian quadrature technique
12. To obtain solution of differential equation using Euler's method
13. To obtain solution of differential equation using 4^{th} order RK method
14. To obtain solution of partial differential equation using Jacobi's method

EE409 Lab Practice - II

Teaching Scheme : 02 P Total 02 **Credit : 02**
Evaluation Scheme : 50 Internal + 50 External **Total Marks :100**

This laboratory course is intended to extend the concepts studied in various courses. The students are expected to use Matlab for following topics

- Ordinary linear constant coefficient differential equations.
- Graphical solution of differential equations
- Matrix and linear algebra problems
- Solution of system of linear equations with Matlab
- Laplace transform and Fourier analysis
- Partial differential equations
- Probability and statistics
- Detailed study of symbolic Math toolbox

The term work for this laboratory course will consist of at least 50 programs covering the wide range of topics above.