Rajiv Gandhi Technological University, Bhopal (MP)

B.E. (EE) Electrical Engineering

Syllabus and Scheme of Examination effective from July 2007

THIRD SEMESTER

S.No	Course Category	Course Code (New)	Subject	Period Per Week				Distribution of Marks				
								Theory	Practical	Internal Assessment		Total
				L	T	P	C			MST	TW	
1.	BS-5	BE 301	Mathematics - III	3	1	0	4	100	-	20	-	120
2.	HS-2	EE 302	Energy Environment Ethics & Society	3	1	0	4	100	-	20	-	120
3.	DC-1	EX/EE 303	Electrical Instrumentation	3	1	2	6	100	50	20	30	200
4.	DC 3	EE 304	Semiconductor Devices and circuits	3	1	2	6	100	50	20	30	200
5.	DC-2	EX/EE 305	Net Work Analysis	3	1	2	6	100	50	20	30	200
6.	IT-2	EE 306	Java	0	0	4	4	-	50	-	50	100
7.	NECC-1	EE 307	Self Study	0	0	1	1	-	-	-	30	30
8.	NECC-2	EE 308	Seminar/Group Discussion.	0	0	1	1	-	-	-	30	30
		Total		15	5	12	32	500	200	100	200	1000

BS	Basic Sciences	HS	Humanity Sciences
DC	Department Core	DID	Department Inter Disciplinary
IT	Information Technology subjects	NECC	Non Exam Credit Course
MST	Mid Semester Test	TW	Term Work (Session/ Practical)
C	Credits	L	Lecture Hrs
P	Practical Hrs	T	Tutorial Hrs

Rajiv Gandhi Technological University, Bhopal (MP)

B.E. (EE) Electrical Engineering

Syllabus and Scheme of Examination effective from July 2007

FOURTH SEMESTER

S.No	Course Category	Course Code (New)	Subject	Period Per Week				Distribution of Marks				
								Theory	Practical	Internal Assessment		Total
				L	T	P	C			MST	TW	
1.	DC-5	EX/EE 401	Electro-Magnetic Theory	3	1	0	4	100	-	20	-	120
2.	DC-4	EE 402	Electrical Engg. Materials	3	1	0	4	100	-	20	-	120
3.	DC-7	EE 403	Power System	3	1	2	6	100	50	20	30	200
4.	DC-6	EX/EE 404	Electro Mechanical Energy Conversion I	3	1	2	6	100	50	20	30	200
5.	DID 1	EE/EI 405	Analog and Digital Communications	3	1	2	6	100	50	20	30	200
6.	IT-3	EE/EX 406	Dot.net	0	1	4	5	-	50	-	50	100
7.	NECC-3	EE 407	Self Study	0	0	1	1	-	-	-	30	30
8.	NECC-4	EE 408	Seminar/Group Discussion etc.	0	0	1	1	-	-	-	30	30
		Total		15	6	14	34	500	200	100	200	1000

BS	Basic Sciences	HS	Humanity Sciences
DC	Department Core	DID	Department Inter Disciplinary
IT	Information Technology subjects	NECC	Non Exam Credit Course
MST	Mid Semester Test	TW	Term Work (Session/ Practical)
C	Credits	L	Lecture Hrs
P	Practical Hrs	T	Tutorial Hrs

COURSE CONTENTS

Category	Title	Code	Credits-4C			Theory Papers
Basic Sciences BS-5	Mathematics-III	BE 301	L	T	P	Max Marks-100
			3	1	0	Min Marks-35
						Duration-3 Hrs

Unit 1 Functions of Complex Variables: Analytic functions, Harmonic Conjugate, Cauchy - Riemann Equations, Line integral, Cauchy's theorem, Cauchy's Integral formula, Singular points, Poles and Residues, Residue theorem, Evaluation of Real Integral, Bilinear Transformation.

Unit 2 Numerical Analysis: Difference operators, Errors and Approximations, Interpolation, Inverse interpolation, Numerical differentiation, Numerical Integration by using Simpson's method, Weddel's rule and Gauss legendre open quadrate formula.

Unit 3 Solutions of algebraic and transcendental equations(Regular False, Newton-Raphson, Iterative, Graffe's root squaring methods), Solutions of simultaneous algebraic equations, Solutions of ordinary differential equations (Tailor's Series, Picard's Method, Modified Euler's method, Runge Kutta Method, Predictor-Corrector Method), Solution of Partial differential equation.

Unit 4 Introduction to optimization by linear programming, only two variable problems solution by graphical and simplex method, concept of degeneracy and duality; simple three variable transport and assignment problems and modeling into LPP.

Unit 5 introduction to Q theory and Markovian process, time independent property of exponential distribution, solution of only M/M/1 (∞/∞/FCFS) Queues; introduction to design of experiments, factorial design, sampling methods, Taguchi Loss Function, robust design methods, variance reduction and six $(\pm 3)\sigma$ outliers in quality.

References:

1. Kreyszig E; Advanced Engineering Mathematics; Wiley Eastern Limited.
2. Ramana BV; Higher Engineering Mathematics; TMH
3. Grewal BS; Higher Engineering Mathematics; Khanna Publisher.
4. Taha H; Operations Research an Introduction; PHI
5. Ross; Taguchi techniques for Quality engineering, TMH
6. Spiegel; Theory and problems of probability and statistics; TMH
7. Chandrasekharaiah DS; Engineering Maths Part II & III; Prism Books Pvt.
8. Johnson; Miller and Freund's Probability and statistics for Engineers; PHI.
9. Jaggi, Mathur; Engineering Mathematics; Khanna Publisher.

COURSE CONTENTS

Category	Title	Code	Credits-4C			Theory Papers
Humanities and Science HS 2	Energy Environment Ethics and Society	CS/IT/EC/ EX/EE/EI/ BM/ 302	L	T	P	Max Mark-100
			3	1	0	Min Mark-35 Duration-3Hrs

Unit 1 Energy: linkage with development, world energy scenario, fossil fuel resource- estimates and duration, India's energy scenario; Finite/ depleting energy resources, coal, oil, gas, nuclear fission, promises and present status of nuclear fusion energy; Renewable energy, solar, hydro, wind, biomass, ocean, tidal, wave and geothermal. Synergy between energy and environment, global environment issues, greenhouse gas emission, global warming, green energy solutions.

Unit 2 Society and environment: exponential growth in population, environmentally optimum sustainable population, free access resources and the tragedy of commons; environment problems and impact of P.A.T (Population, Affluence and Technology), environmentally beneficial and harmful technologies; environment impact assessment policies and auditing interaction between environment, life support systems and socio-culture system.

Unit 3 Ecosystem: definition, concepts, structure, realm of ecology, lithosphere, hydrosphere, biosphere, atmosphere-troposphere-stratosphere; energy balance to earth, matter and nutrient recycling in ecosystems; nitrogen, oxygen, carbon and water cycles, food producers, consumers and decomposers, food chains; biodiversity, threat and conservation of biodiversity. Worldviews and environmentally sustainable economic growth, introduction to Design For Environment (DFE), product lifecycle assessment for environment and ISO 14000; triple bottom-line of economic, environment and social performance; environmental ethics, its world impact and challenges.

Unit 4 (a) Air pollution-primary, secondary; chemical and photochemical reactions, effects of CO, NO, CH and particulates, acid rain, Ozone depletion; monitoring and control of pollutants
(b) Noise pollution-sources and control measures.
(c) Water pollution, analysis and management, heavy metals- and nuclear pollutions; industrial pollution from paper, pharmacy, distillery, tannery, fertilizer, food processing and small scale industries.

Unit 5 Ethics and moral values, ethical situations, objectives of ethics and its study, role morality and conflicts; values, policies and Organization Culture; Non-professional, quasi- and hard- professionals; preventive, personal, common and professional ethics; different ethical value criteria like utilitarian, virtue, right and duty ethics with discussion on the case of priority for improvement of urban (high traffic) or rural (low traffic) intersections causing equal number of fatalities; codes of ethics and their limitations; Institute of engineers code for corporate member, IEEE and ACM professional-code.

References:

1. Miller G. T Jr; Living in the environment; Cengage Publisher.
2. Cunningham W; Principles of Environmental Science: TMH
3. Harris CE, Prichard MS, Rabins MJ, Engineering Ethics; Cengage Pub.
4. Martin; Ethics in Engineering; TMH
5. Govindrajan, Natrajan, Santikumar; Engineering Ethics; PHI pub.
6. Rana SVS;Essentials of ecology and environment; PHI Pub.
7. Gerard Kiely, Environmental Engineering; TMH
8. Khan BH; Non Conventional energy resources; TMH Pub.
9. Raynold G.W. "Ethics in Information Technology; Cengage

COURSE CONTENTS

Category	Title	Code	Credits-6C			Theory Papers
Departmental Core DC-1	Electrical Instrumentation	EX/EE303	L	T	P	Max.Marks-100
			3	1	2	Min.Marks-35 Duration-3hrs.

Unit I Measurement and error, Accuracy and precision, sensitivity resolution, Error & Error analysis, Effect of temperature, Internal friction, Stray field, Hysterisis and Frequency variation & method of minimizing them, Loading effects, due to shunt connected and series connect ed instruments, calibration curve, Testing & calibration of instruments.
Galvanometers – Theory & operation of ballistic galvanometer, D'arsonal galvanometer, galvanometer motion & damping, Sensitivity, Flux meter, Vibration galvanometer, Spot deflection galvanometer.
Definition of analog & digital instruments, Classification of analog instruments, their operating principle, Operating force, Types of supports, Damping, Controlling.

Unit II Different types of Ammeter & Voltmeter – PMMC, MI, Electrodynamometer, Hotwire, Electrostatic, Induction, Rectifier, Ferro dynamic & Electro-thermic, Expression for control & deflection torque, their advantages, disadvantages & error, Extension of range of instruments using shunt & multiplier.

Unit III Instrument transformers: Potential and current transformers, ratio and phase angle errors, testing of instrument transformers, Difference between CT and PT, errors and reduction of errors.
Measurement of power: Power in AC and DC Circuit, Electrodynamometer type of wattmeter, Construction, theory, operation & error, Low power factor & UPF wattmeter, Double element and three element dynamometer wattmeter, Measurement of power in three phase circuit, one, two & three wattmeter method, Measurement of reactive power by single wattmeter, Measurement of power using CTs & PTs.

Unit IV Measurement of Energy: Single phase induction type energy meter – construction & operation – driving and braking torques –errors & compensations – Testing by phantom loading and using R.S.S. meter- Three phase energy meter – Tri-vector meter – Maximum demand meter, Ampere hour meter.
Potentiometer – DC potentiometer standardization – Lab type Crompton's potentiometer, application of DC potentiometer, AC polar type and coordinate type potentiometer, their construction and applications.

Unit V Miscellaneous Instruments & Measurements: Power factor meter, Single phase and three phase Electro-dynamometer type & moving iron type.
Frequency meter – Vibrating reed, Resonance type & Weston type, Synchronoscope, Ohmmeter – series & stunt type, Multi-meter, Megger & Ratio meter.
Resistance Measurement – Classification of low, medium & high resistance – Voltmeter, Ammeter, Wheatstone Bridge, Kelvin's double bridge & loss of charge methods for resistance measurement, **Earth resistance** measurement.
Magnetic Measurement – B-H Curve, Hysterisis Loop determination, Power loss in sheet metal – Lloyd Fischer square for measurement of power loss.

References:

1. E W Golding & F C Widdis; Electrical Measurement & Measuring Instruments; Wheeler Pub.
2. A.K. Sawhney; Electrical & Electronic Measurements & Instrument; Dhanpat Rai & Sons Pub.
3. Buckingham & Price; Electrical Measurements; Prentice Hall

List of experiments (Expandable):

1. Measurement of low resistance using Kelvin's Double bridge
2. Measurement of medium resistance using Wheatstone's bridge
3. Measurement of high resistance by loss of charge method
4. Measurement of Insulation resistance using Megger
5. Measurement of earth resistance by fall of potential method and verification by using earth tester
6. Measurement of power in a single phase ac circuit by 3 voltmeter/ 3 Ammeter method
7. Calibration of a dynamometer type of wattmeter with respect to a standard/Sub Standard wattmeter
8. Calibration of a induction type single phase energy meter
9. Calibration of a dynamometer type of wattmeter by Phantom Loading method
10. Measurements using Instrument Transformers
11. Study of various types of Indicating Instruments
12. Measurement of Power in three phase circuit by one, two & three wattmeters.

Course Contents

Category	Title	code	Credit-6			Theory paper
Department DC 3	Semiconductor Devices and circuits	EE--304	L	T	P	Max. Marks-100 Min. Marks: 35
			3	1	2	Duration: 3 hrs.

Unit I

Semiconductor device, theory of P-N junction, temperature dependence and break down characteristics, junction capacitances, Zener diode, Varactor diode, PIN diode, LED, Photo diode, Transistors BJT, FET, MOSFET, types, working principal, characteristics, and region of operation, load line biasing methods,. transistor as an amplifier, gain, bandwidth, frequency response, Various applications of diode and special diodes.

UINIT II

Small signal analysis of transistor (low frequency) using h-parameters, thermal runaway and thermal stability.

Unit III

Feedback amplifier, negative feedback, voltage-series, voltage shunt ,current series and current shunt feedback , Sinusoidal oscillators, L-C (Hartley-Colpitts) oscillators, RC phase shift, Wien bridge, and Crystal oscillators. Power amplifiers, class A, class B , class A B, C amplifiers , their efficiency and power Dissipation, Pushpull and complimentary pushpull amplifier.

Unit IV

Switching characteristics of diode and transistor, turn ON, OFF time, reverse recovery time , transistor as switch , Multivibrators, Bistable, Monostable, Astable multivibrators. Cllipers and clampers, Differential amplifier, calculation of differential , common mode gain and CMRR using h-parameters, Darlington pair , Boot strapping technique. Cascade and cascade amplifier.

Unit V

Operational amplifier characteristics, slew rate , bandwidth, offset voltage ,basic current, application ,inverting , non inverting amplifier , summer , average, differentiator, integrator, differential amplifier , instrumentation amplifier , log and antilog amplifier , voltage to current and current to voltage converters , comparators Schmitt trigger , active filters, 555 timer and its application.

References:

1. Nashelsky & Boysted; Electronic Devices and Circuits; PHI
2. Millman Halkias; Electronic Devices and Circuits; McGraw- Hill
3. Achuthan MA and Bhatt KN; Fundamentals of semiconductor devices; TMH
4. Neamen Donald; Semiconductor Physics and devices
5. Millman & Grabel; Micro Electronics; McGraw-Hill
6. Bogart; Electronic Devices and Circuits; Universal Book Stall, NDelhi
7. Millman & Halkias; Integrated Electronics; McGraw- Hill.
8. Tobbey; OP- Amps their design and Application
9. R.A. Gaikward; OP- Amp and linear Integreted circuit; PHI
10. D. Raychowdhary and Shail Jain; Linear Integrated Circuits
11. Botkar; Integrated Circuits; Khanna
12. Clayton; Applications of linear Integrated circuits
13. I.J. Nagrath; Electronics -Analog and Digital; PHI

List of experiments (Expandable):

1 V-I Characteristics of different types of Diodes.
2 Applications of diodes and Design of various clipping and clamping circuits.
3 Design half & full wave rectifier
4 Design & Analysis of transistor amplifier in CE, CB & CC configuration.
5 Design & Analysis of JFET Amplifier.
6 Design & Analysis of MOSFET Amplifier.
7 To study and construct power amplifiers of various classes.
8 Study of various oscillators.
9 Char. of Op-Amp (input offset voltage, slew rate CMRR, BW, Input bias current)
10 Linear application of OP-Amp (voltage follower, inviting and non-inverting amplifier and their frequency response adder subtractor differential amplifier, integrator and differential frequency response) .
11 study of Op-Amp as a comparator
12 design of Schmitt trigger
13 Design of monoastable & astable multivibrator

NOTE- All experiments (wherever applicable) should be performed through the following steps. **Step 1**: Circuit should be designed/ drafted on paper. **Step 2**: Where ever applicable the designed/drafted circuit should be simulated using Simulation S/W (TINA-V7/ PSPICE/ Labview/ CIRCUIT MAKER etc.). **Step 3**: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results. **Step 4**: Where ever required the bread board circuit should be fabricated on PCB.

Course Contents

Category	Title	Code	Credit-6			Theory paper
DC-2	Network Analysis	BM/EC/EE/EI /EX 305	L	T	P	Max. Marks-100 Min. Marks: 35 Duration: 3 hrs.
			3	1	2	

Unit I

Introduction to circuit elements R,L,C and their characteristics in terms of linearity & time dependant nature, voltage & current sources controlled & uncontrolled sources KCL and KVL analysis, Nodal & mesh analysis, analysis of magnetically coupled circuits, Transient analysis :- Transients in RL, RC&RLC Circuits, initial conditions, time constants. Steady state analysis- Concept of phasor & vector, impedance & admittance, Network topology, concept of Network graph, Tree, Tree branch & link, Incidence matrix, cut set and tie set matrices, dual networks, Dot convention, coupling co-efficient, tuned circuits, Series & parallel resonance.

Unit II

Network Theorems for AC & DC circuits- Thevenins & Norton's, Superpositions, Reciprocity, Compensation, Substitution, Maximum power transfer, and Millman's theorem, Tellegen's theorem, problems with dependent & independent sources.

Unit III

Frequency domain analysis – Laplace transform solution of Integro-differential equations, transform of waveform synthesized with step ramp, Gate and sinusoidal functions, Initial & final value theorem, Network Theorems in transform domain

Unit IV

Concept of signal spectra, Fourier series co-efficient of a periodic waveform, symmetries as related to Fourier coefficients, Trigonometric & Exponential form of Fourier series.

Unit V

Network function & Two port networks – concept of complex frequency, Network & Transfer functions for one port & two ports, poles and zeros, Necessary condition for driving point & transfer function.
Two port parameters – Z,Y, ABCD, Hybrid parameters, their inverse & image parameters, relationship between parameters, Interconnection of two ports networks, Terminated two port network.

References:

1. M.E. Van Valkenburg, Network Analysis, (PHI)
2. F.F.Kuo, Network Analysis.
3. Mittal GK; Network Analysis; Khanna Publisher
4. Mesereau and Jackson; Circuit Analysis- A system Approach; Pearson.
5. Sudhakar & Pillai; Circuit & Networks- Analysis and Synthesis; TMH
6. Hayt W.H. & J.E. Kemmerly; Engineering Circuit Analysis; TMH
7. Decarlo lin; Linear circuit Analysis; Oxford
8. William D Stanley : Network Analysis with Applications, Pearson Education
9. Roy Choudhary D; Network and systems; New Age Pub
10. Charles K. Alexander & Matthew N.O. Sadiku: Electrical Circuits :TMH
11. Chakraborti :Circuit theory: Dhanpat Rai
12. B.Chattopadhyay & P.C.Rakshit; Fundamental of Electrical circuit theory; S Chand
13. Nilson & Riedel , Electric circuits ;Pearson

List of experiments (Expandable):

1. To Verify Thevenin Theorem.
2. To Verify Superposition Theorem.
3. To Verify Reciprocity Theorem.
4. To Verify Maximum Power Transfer Theorem.
5. To Verify Millman's Theorem.
6. To Determine Open Circuit parameters of a Two Port Network.
7. To Determine Short Circuit parameters of a Two Port Network.
8. To Determine A,B, C, D parameters of a Two Port Network
9. To Determine h parameters of a Two Port Network
10. To Find Frequency Response of RLC Series Circuit.
11. To Find Frequency Response of RLC parallel Circuit.

NOTE- - All experiments (wherever applicable) should be performed through the following steps. **Step 1**: Circuit should be designed/ drafted on paper. **Step 2**: Where ever applicable the designed/drafted circuit should be simulated using Simulation S/W (TINA-V7/ PSPICE/ Labview/ CIRCUIT MAKER etc.). **Step 3**: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results. **Step 4**: Where ever required the bread board circuit should be fabricated on PCB.

Course Contents

Category	Title	Code	Credits-4C			Practical
IT-2	JAVA	CS/CE 306	L	T	P	Max. Marks-50
			0	0	4	Min. Marks-25
						Duration-

UNIT-I Basic Java Features - C++ Vs JAVA, JAVA virtual machine, Constant & Variables, Data Types, Class, Methods, Objects, Strings and Arrays, Type Casting, Operators, Precedence relations, Control Statements, Exception Handling, File and Streams, Visibility, Constructors, Operator and Methods Overloading, Static Members, Inheritance: Polymorphism, Abstract methods and Classes

UNIT–II Java Collective Frame Work - Data Structures: Introduction, Type-Wrapper Classes for Primitive Types, Dynamic Memory Allocation, Linked List, Stack, Queues, Trees,
Generics: Introduction, Overloading Generic Methods, Generic Classes, Collections: Interface Collection and Class Collections, Lists, Array List and Iterator, Linked List, Vector.
Collections Algorithms: Algorithm sorts, Algorithm shuffle, Algorithms reverse, fill, copy, max and min Algorithm binary Search, Algorithms add All, Stack Class of Package java. Util, Class Priority Queue and Interface Queue, Maps, Properties Class, Un-modifiable Collections.

UNIT–III Advance Java Features - Multithreading: Thread States, Priorities and Thread Scheduling, Life Cycle of a Thread, Thread Synchronization, Creating and Executing Threads, Multithreading with GUI, Monitors and Monitor Locks. Networking: Manipulating URLs, Reading a file on a Web Server, Socket programming, Security and the Network, RMI, Networking, Accessing Databases with JDBC: Relational Database, SQL, MySQL, Oracle

UNIT–IV Advance Java Technologies - Servlets: Overview and Architecture, Setting Up the Apache Tomcat Server, Handling HTTP get Requests, Deploying a web Application, Multitier Applications, Using JDBC from a Servlet, Java Server Pages (JSP): Overview, First JSP Example, Implicit Objects, Scripting, Standard Actions, Directives, Multimedia: Applets and Application: Loading, Displaying and Scaling Images, Animating a Series of Images, Loading and playing Audio clips

UNIT–V Advance Web/Internet Programming (Overview): J2ME, J2EE, EJB, XML.

References:

1. Deitel & Deitel, ”JAVA, How to Program”; PHI, Pearson.
2. E. Balaguruswamy, “Programming In Java”; TMH Publications
3. The Complete Reference: Herbert Schildt, TMH
4. Peter Norton, “Peter Norton Guide To Java Programming”, Techmedia.
5. Merlin Hughes, et al; Java Network Programming , Manning Publications/Prentice Hall

List of Program to be perform (Expandable)

1. Installation of J2SDK
2. Write a program to show Concept of CLASS in JAVA
3. Write a program to show Type Casting in JAVA
4. Write a program to show How Exception Handling is in JAVA
5. Write a Program to show Inheritance and Polymorphism
6. Write a program to show Interfacing between two classes
7. Write a program to Add a Class to a Package
8. Write a program to demonstrate AWT.
9. Write a program to Hide a Class
10. Write a Program to show Data Base Connectivity Using JAVA
11. Write a Program to show “HELLO JAVA ” in Explorer using Applet
12. Write a Program to show Connectivity using JDBC
13. Write a program to demonstrate multithreading using Java.
14. Write a program to demonstrate applet life cycle.

Course Contents

Category	Title	Code	Credits-4			Theory Papers
Departmental Core DC-5	Electromagnetic Theory	EX/EE 401	L	T	P	Max.Marks-100
			3	1	0	Min.Marks-35
						Duration-3hrs.

Unit I Cartesian, cylindrical & spherical co-ordinate systems, scalar & vector fields, gradient, divergence & curl of a vector field, Divergence theorem & Stokes's theorem, concept of vectors. Electrostatic Fields – Coulomb's law, electric field intensity due to different charge distribution viz. line charge, sheet charge, Field due to continuous volume – electric potential, properties of potential function, potential gradient equipotential surfaces, line of force, Gauss law, applications of Gauss law, Gauss law in point form, method of images.

Unit II Laplace's & Poisson's equations, solution of Laplace's equation, Electric dipole, dipole moment, potential & electric field intensity due to dipole, Behavior of conductors in an electric field. Conductor & insulator, electric field inside a dielectric, polarization, Boundary value conditions for electric Field, Capacitance & Capacitances of various types of capacitors, Energy stored and energy density in static electric field, Current density, conduction & convection current density ohms law in point form, equation of continuity.

Unit III Static Magnetic Field, Biot-Savart's law, Magnetic Field intensity due to straight current carrying filament, circular, square and solenoidal current carrying wire, Relationship between magnetic flux, flux density & magnetic Field intensity; Ampere's circuital law and its applications, magnetic Field intensity due to infinite sheet and various other configurations, Ampere's circuital law in point form, Magnetic force, moving charge in a magnetic field, Lorentz Force on straight and long current carrying conductors in magnetic field, force between two long & parallel current carrying conductors. Magnetic dipole & dipole moment, a differential current loop as dipole, torque on a current carrying loop in magnetic field, Magnetic Boundary conditions.

Unit IV Scalar magnetic potential and its limitations, Vector magnetic potential and its properties, vector magnetic potential due to different simple configurations; Self and Mutual inductances, determination of self & mutual inductances, self inductance of solenoid, toroid coils, mutual inductance between a straight long wire & a square loop. Energy stored in magnetic Field & energy density, Faraday's Law, transformer & motional EMFs, Displacement current, Maxwell's equations as Generalization of circuit equations, Maxwell's equation in free space, Maxwell's equation for harmonically varying Field, static and steady fields, Maxwell's equations in differential & integral form.

Unit V Electro Magnetic Waves : Uniform plane wave in time domain in free space, Sinusoidally time varying uniform plane wave in free space, Wave equation and solution for material medium, Uniform plane wave in dielectrics and conductors, Pointing Vector theorem, instantaneous, average and complex poynting vector, power loss in a plane conductor, energy storage, Polarization of waves, Reflection by conductors and dielectric – Normal & Oblique incidence, Reflection at surface of a conducting medium, surface impedance, transmission line analogy.

References:

1. Mathew N.O Sadiku; Elements of Electromagnetic; Oxford.
2. P.V. Gupta; Electromagnetic Fields; Dhanpat Rai.
3. N.N. Rao; Element of Engineering Electromagnetic; PHI.
4. William H. Hayt; Engineering Electromagnetic; TMH.
5. John D. Kraus; Electromagnetic; TMH.
6. Jordan Balmian; Electromagnetic wave & Radiating System; PHI.
7. David K. Cheng; Fields and Wave Electromagnetic; Addison Wesley.
8. S.P. Seth; Electromagnetic Field ;Dhanpat Rai & Sons

Note: Field plotting of electromagnetic systems on a PC using standard softwares. Application for low and high frequency devices. Suggested softwares, GEMINI(Infolytica), ANSYS, ANSOFT, NISA.

Course Contents

Category	Title	Code	Credits-4C			Theory Papers
Departmental Core DC-4	Electrical Engineering Materials	EE 402	L	T	P	Max.Marks-100
			3	1	0	Min.Marks-35 Duration-3hrs.

Unit I Conducting Material: Classification and main properties, High resistivity alloy: Constant Mangann, Nichrome, Electrochemical, properties of copper, Aluminum, steel tungsten, Molybdenum, Platinum, Tantalum, Niobium, Mercurry, Nickel, Titanum, Carbon, Lead, thermal, Bitmetals, thermocouple, materials, specific resistance, conductance, variation of resistance with temperature, super conductors.

Unit II Semi Conductor Materials: General conception, variation of electrical conductivity, Elements having semiconductor properties, general application, hall effect, energy levels, conduction in semi-conductors, Intrinsic conduction, impurity conduction, P and N type impurities, electrical change, Neutrality, Drift, Mobility current flow in semi conductors P-N junction formation by alloying, Elasing (forward and reverse) of P-n junction, Reverse separation current, Zener effect, Junction, capacitance, hall defects and hall coeffiecient.

Unit III Magnetic Materials: Details of magnetic materials, reduction between B.H. and μ, soft and hard magnetic materials. Di-magnetic, Para magnetic and Ferromagnetic materials, electrical sheet steel, cast iron. Permanent magnetic materials.
Dynamic and static hysteresis loop. Hysterisis loss, eddy current loss, Magnetisation, magnetic susceptibility, coercive force, core temperature, rectangular hysteresia loop, Magnet rest square loop core materials, iron silicon, Iron alloys.

Unit IV Insulating Materials: General electrical mechanical and chemical properties of insulating material, Electrical characteristics volume and surface resistivity complex permitivity loss, and dielectric loss, equivalent circuits of an imperfect dielectric polarization and polarisability classification of dielectric.

Unit V Mechanical Properties: Classification insulating materials on the basis of temperature rise. General properties of transformer oil, commonly used varnishes, solidifying insulating materials, resins, bituminous waxes, drying oils, Fibrous insulating materials, wood, paper and cardboard, insulating textiles, varnished adhesive tapes, inorganic fibrous material and other insulating materials, such as mica, ceramic, bakelite, ebonite, glass, PVC, rubber, other plastic molded materials.

References:

1. TTTI Madras; Electrical Engineering Materials; TMH.
2. Electrical Engineering Material s & Devices; John Allison ;TMH
3. Materials for Electrical Engineering: B.M. Tareev
4. Anderson; Di-Electrics :
5. Kortisky; Electrical Engineering Materials:
6. Indulkar and S. Thruvengadem; Electrical Engineering Materials; S. Chand
7. Dekkor AK; Electrical Engineering Materials; PHI.

Course Contents

Category	Title	Code	Credits-6C			Theory Papers
Departmental Core DC- 7	Power systems	EE 403	L	T	P	Max.Marks-100
			3	1	2	Min.Marks-35 Duration-3hrs.

Unit I Transmission Systems: Various system of transmission & their comparison, HVDC transmission Converter, inverter, filters & substation layout. Voltage and Reactive Power control.

Unit II Distribution Systems: Primary and secondary distribution systems, concentrated & uniformly distributed loads on distributors fed at one and both ends, ring distribution, sub mains and tapered mains, voltage drop and power loss calculations, voltage regulators, Feeders Kelvin's law and modified Kelvin's law for feeder conductor size and its limitations.

Unit III Overhead Transmission Lines: Types of Conductors, Line Parameters: calculation of inductance and capacitance of single and double circuit transmission lines, three phase lines with stranded and bundle conductors, Generalized ABCD constants and equivalent circuits of short, medium & long lines. Line Performance: circle diagram, regulation and efficiency of short, medium and long lines, Series and shunt compensation, FACTS.

Unit IV Overhead Line Insulators: Types, string efficiency, grading ring, preventive maintenance.
Mechanical Design of Transmission Lines: Different types of tower, sag-tension calculations, sag-template, string charts, vibration dampers, line supports, spacing of conductors and grounds. Corona-corona losses, radio & audio noise, transmission line - communication line interference

Unit V Cables: Classification, Construction and characteristic of different types. Insulation resistance and capacitance, grading (capacitance and inter sheath), laying, jointing and splicing of cables. phenomenon of dielectric losses, dielectric stress and sheath loss in cables.

References:

1. Nagrath IJ and Kothari DP; "Power System Engineering", Tata McGraw Hill
2. John S. Grainger and W. D. Stevenson Jr.," Power System Analysis", McGraw Hill.
3. Deshpande MV; "Electric Power System Design", TMH.
4. Central Electricity Generating Board; "Modem Power System Practice", Vol 1-8, Pergamon Oxfd
5. James J. Burke," Power Distribution Engineering: Fundamentals & Applications"; Marcel Dekker
6. Westinghouse Electric Corp; Electric Transmission & Distribution Reference Book; East Pittsbrg
7. Wadhwa CL; " Electric Power Systems"; Wiley Eastern Limited.
8. Ashfaq Hussain; "Electrical Power System
9. Gupta BR; "Power System Analysis and Design"
10. Ray " Electrical Power System:Concepts, Theory and practice", PHI

List of Experiments (Expandable):

1 Electrical design of transmission line.
2 Mechanical design of transmission line.
3 Drawing of Tower structure.
4 Drawing of insulators

Course Contents

Category	Title	Code	Credits-6			Theory Papers
DC-6	Electro Mechanical Energy Conversion –I	EX/EE 404	L	T	P	Max.Marks-100
			3	1	2	Min.Marks-35 Duration-3hrs.

Unit I Transformer: Review of single phase transformer, Phasor diagram, Equivalent circuits, voltage regulation, short circuit and open circuit tests, Back to back test and performance evaluation, parallel operation and load sharing, Tap changers effect of saturation on magnetizing current, Ferroresenance, 3-phase transformers & their connections , constructional features, winding arrangements, cooling, conservators, breathers, buckhloz relay, Scott connections, Autotransformers, Pulse and high frequency transformers.

Unit II D.C. Machines: Review of constructional features. Methods of excitation, Armature reaction, Commutation, Interpoles & compensating winding, Power, EMF and torque equations,- Operation as generator - Self-excitation principles. Characteristics,

Unit III DC Motor: Operation of D.C. Machines as motor, characteristics. Starting, speed control including solid state controllers, Braking . Losses, Efficiency. Power flow diagram for generator & Motor,Direct testing, Swinburne's test & Hopkinson's Test on DC Machines, applications of dc Machines.

Unit IV: Three phase Induction motor: Constructional details. Production of EMF, steady state analysis, equivalent circuit, Phasor diagram, power flow diagram and torque-speed & power speed characteristics, circle diagram.

Unit V Three phase Induction motor : Starting Methods, Power factor Control. Speed control schemes including solid state. Braking. Effect of space/time harmonics and analysis. Crawling & Cogging, Double cage & Deep bar Indication Motor Testing, Losses and Efficiency, effect of unbalanced supply, Induction generators.

References:

1. Nagrath and Kothari; Electrical Machines; TMH
2. Langs dorf; A.C. Machines.
3. Dr.P.S.Bimbhra; Electrical Machines; Khanna Publisher
4. Ashfaq Hussain; Electrical Machines; Dhanpat Rai Publication.
5. M. G. Say; Alternating Current Machines', (5th Ed.) ELBS, 1986.
6. M.G.Say and E.O.Taylor; Direct Current Machines Second Ed., ELBS, 1985.
7. V.Del Toro; Electrical Machines & Power Systems, 1985, Prentice-Hall, Inc., Englewood Cliffs.
8. V.Del Toro; Electromechanical Devices for Energy Conversion & Control Systems, PHI Pvt. Ltd.

List of Experiments (Expandable):

1. To perform open circuit and short circuit test on 1-phase and 3-phase transformer and determine its equivalent circuit parameters.
2. To perform open circuit and short circuit test on 1-phase and 3-phase transformer and determine its efficiency and regulation at.
   - i Full load at unity power factor.
   - ii Full load at zero power factor lead and lag.
   - iii Half the full load at 0.8 power factor lead and lag.
3. Perform Sumpner's test on 2 Single phase Transformers.
4. To perform the parallel operation of two, 1-phase transformer and observe load sharing.

5. To perform the No load and block rotor test of 3-phase induction motor and to determine its equivalent circuit parameters.
6. To perform the No load and block rotor test of 3-phase induction motor to draw the circle diagram.
7. To perform the load test on 3-phase induction motor and draw its performance characteristic
8. Swinburn's test on D.C. motor & determine its efficiency.
9. To perform speed control of D.C. motor.
10. To plot OCC on a separately excited D.C. Generator.
11. Perform load test on D.C. Generator.

Course Contents

Category	Title	Code	Credit-6C			Theory Paper
DID-1	Analog and Digital Communication	BM/CS/EE/IT 405	L	T	P	Max.Marks-100
			3	1	2	Min.Marks-35
						Duration-3hrs.

Unit-I Time domain and frequency domain representation of signal, Fourier Transform and its properties, Transform of Gate, Periodic gate, Impulse periodic impulse sine and cosine wave, Concept of energy density and power density (Parseval's theorem), Power density of periodic gate and impulse function, impulse response of a system, convolutions, convolution with impulse function, causal and non causal system impulse response of ideal low pass filter, Correlation & Auto correlation.

Unit-II Base band signal, need of modulation, Introduction of modulations techniques,Amplitude modulation, Equation and its frequency domain representation, Bandwidth, Power distribution. AM suppressed carrier waveform equation and frequency domain representation Generation (Balance/Chopper modulator) and synchronous detection technique, errors in synchronous detection, Introduction to SSB and VSB Transmission Angle modulation, Frequency and phase modulation equation and their relative phase and frequency deviations, modulation index frequency spectrum, NBFM and WBFM, Bandwidth comparison of modulation techniques.

Unit-III Sampling of signal, sampling theorem for low pass and Band pass signal, Pulse amplitude modulation (PAM), Time division, multiplexing (TDM). Channel Bandwidth for PAM-TDM signal Type of sampling instantaneous, Natural and flat top, Aperture effect, Introduction to pulse position and pulse duration modulations, Digital signal, Quantization, Quantization error, Pulse code modulation, signal to noise ratio, Companding, Data rate and Baud rate, Bit rate, multiplexed PCM signal, Differential PCM (DPCM), Delta Modulation (DM) and Adaptive Delta Modulation (ADM), comparison of various systems.

Unit-IV Digital modulations techniques, Generation, detection, equation and Bandwidth of amplitude shift keying (ASK) Binary Phase Shift keying (BPSK), Differential phase shift keying (DPSK), offset and non offset quadrature phase shift keying (QPSK), M-Ary PSK, Binary frequency Shift Keying (BFSK), M-Ary FSK Quadrature Amplitude modulation (QAM), MODEM, Introduction to probability of error.

Unit-V Information theory and coding- Information, entropies (Marginal and conditional), Model of a communication system, Mathematical representation of source, channel and receiver characteristics, Mutual information, channel capacity efficiency of noise free channel Binary symmetric channel (BSC) Binary erasure channel (BEC), Repetition of signal, NM symmetric Binary channel, Shannon theorem, Shanon-Hartley theorem (S/N-BW trade off)Source encoding code properties; Shanon, Fano and Huffman coding methods and their efficiency error control coding, Minimum Hamming distance, Linear Block Code, Cyclic code and convolution codes. Line Encoding: Manchester coding, RZ, NRZ coding.

References:

1. Singh & Sapre, Communication System, TMH
2. Taub & shilling, Communication System, TMH
3. Hsu; Analog and digital communication(Schaum); TMH
4. B.P. Lathi, Modern Digital and analog communication system,
5. Simon Haykins, Communication System. John Willy
6. Wayne Tomasi, Electronic Communication system.
7. Martin S. Roden, Analog & Digital Communication System; Discovery Press.
8. Frank R. Dungan, Electronic Communication System, Thomson/Vikas.

List of Experiments(Expandable)

1. Study of sampling process and signal reconstruction and aliasing.
2. Study of PAM PPM and PDM
3. Study of PCM transmitter and receiver.
4. Time division multiplexing (TDM) and De multiplexing
5. Study of ASK PSK and FSK transmitter and receiver.
6. Study of AM modulation and Demodulation techniques (Transmitter and Receiver) Calculate of parameters
7. Study of FM modulation and demodulation (Transmitter and Receiver) & Calculation of parameters
8. To construct and verify pre emphasis and de-emphasis and plot the wave forms.
9. Study of super hetrodyne receiver and characteristics of ratio radio receiver.
10. To construct frequency multiplier circuit and to observe the waveform
11. Study of AVC and AFC.

Course Contents

Category	Title	Code	Credit-4			Practical
IT-3	Dot.Net	CS/IT /EE/EX406	L	T	P	Max. Marks-50 Min. Marks: 25 Duration: 3 hrs.
			-	-	4	

UNIT I Introduction .NET framework, features of .Net framework, architecture and component of .Net, elements of .Net.

UNIT II Basic Features Of C# Fundamentals, Classes and Objects, Inheritance and Polymorphism, Operator Overloading, Structures. **Advanced Features Of C#** Interfaces, Arrays, Indexers and Collections; Strings and Regular Expressions, Handling Exceptions, Delegates and Events.

UNIT III Installing ASP.NET framework, overview of the ASP .net framework, overview of CLR, class library, overview of ASP.net control, understanding HTML controls, study of standard controls, validations controls, rich controls. **Windows Forms:** All about windows form, MDI form, creating windows applications, adding controls to forms, handling Events, and using various Tolls

UNIT IV Understanding and handling controls events, **ADO.NET-** Component object model, ODBC, OLEDB, and SQL connected mode, disconnected mode, dataset, data-reader **Data base controls:** Overview of data access data control, using grid view controls, using details view and frame view controls, ado .net data readers, SQL data source control, object data source control, site map data source.

UNIT V XML: Introducing XML, Structure, and syntax of XML, document type definition (DTD), XML Schema, Document object model, Presenting and Handling XML. xml data source, using navigation controls, introduction of web parts, using java script, Web Services

References:

1. C# for Programmers by Harvey Deitel, Paul Deitel, Pearson Education
2. Balagurusamy; Programming in C#; TMH
3. **Web** Commerce **Technology** Handbook by Daniel **Minoli**, Emma **Minoli** , TMH
4. Web Programming by Chris Bates, Wiley
5. XML Bible by Elliotte Rusty Harold ,
6. ASP .Net Complete Reference by McDonald, TMH.
7. ADO .Net Complete Reference by Odey, TMH

List of Experiments/ program (Expandable):

1. Working with call backs and delegates in C#
2. Code access security with C#.
3. Creating a COM+ component with C#.
4. Creating a Windows Service with C#
5. Interacting with a Windows Service with C#
6. Using Reflection in C#
7. Sending Mail and SMTP Mail and C#
8. Perform String Manipulation with the String Builder and String Classes and C#:
9. Using the System .Net Web Client to Retrieve or Upload Data with C#
10. Reading and Writing XML Documents with the XML Text-Reader/-Writer Class and C#
11. Working with Page using ASP .Net.
12. Working with Forms using ASP .Net
13. Data Sources access through ADO.Net,
14. Working with Data readers , Transactions
15. Creating Web Application.