



Rajiv Gandhi Technological University, Bhopal (MP)
B.E. (EX) Electrical & Electronics Engineering
 Revised 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				
				L	T	P	C	Theory	Practical	Internal Assessment		Total
										MST	TW	
1.	BS-5	BE301	Mathematics-III	3	1	0	4	100	-	20	-	120
2.	HS-2	EC/EX.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	EX304	Electronic Devices & Circuits - I	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	EX306	Java	0	0	4	4	-	50	-	50	100
7.	NECC-1	EX307	Self Study	0	0	1	1	-	-	-	30	30
8.	NECC-2	EX308	Seminar/Group Discussion etc.	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. (EX) Electrical & Electronics Engineering
 Revised 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				
				L	T	P	C	Theory	Practical	Internal Assessment		Total
										MST	TW	
1.	DC-5	EX/EE 401	Electromagnetic Theory	3	1	0	4	100	-	20	-	120
2.	DC-8	EX402	Electrical and Electronics Materials	3	1	0	4	100	-	20	-	120
3.	DC-7	EX403	Digital Electronics Logic Design – I	3	1	2	6	100	50	20	30	200
4.	DC-6	EX404	Electro Mechanical Energy Conversion I	3	1	2	6	100	50	20	30	200
5.	DC-4	EX405	Electronic Devices and Circuits-II	3	1	2	6	100	50	20	30	200
6.	IT-3	EX406	Software lab Matlab	0	1	4	5	-	50	-	50	100
7.	NECC-3	EX407	Self Study	0	0	1	1	-	-	-	30	30
8.	NECC-4	EX408	Seminar/Group Discussion etc.	0	0	1	1	-	-	-	30	30
Total				15	7	12	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 (± 3) σ 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 Min Mark-35 Duration-3Hrs
			3	1	0	

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 Min.Marks-35 Duration-3hrs.
			3	1	2	

Unit I Measurement and error, Accuracy and precision, sensitivity resolution, Error & Error analysis, Effect of temperature, Internal friction, Stray field, Hysteresis and Frequency variation & method of minimizing them, Loading effects, due to shunt connected and series connected instruments, calibration curve, Testing & calibration of instruments.

Galvanometers – Theory & operation of ballistic galvanometer, D'Arsonval 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, Electro-dynamometer, 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, Electro-dynamometer 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, Hysteresis 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	Credits-6C			Theory Papers
Departmental Core DC-3	Electronic Devices & Circuits -I	EX 304	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
			3	1	2	

Unit I Semiconductor Diode & Rectifiers: Semiconductor diodes, ideal & practical diode equivalent circuit & frequency response, graphical analysis of diode circuits, diode applications, clipping and clamping circuits, half wave & full wave rectifier circuits with & without filters. Type of diodes and their applications, Signal diodes, Power Diode, Zener diode, Varactor diode, Schottky diode, PIN diode, Tunnel diode, Photo diode. Direct tunneling equivalent circuit, Tunnel diode oscillator; Solar Cell, LED, LEDs specification & geometry of LEDs, Colours of LEDs, LCD, Diffusion and Transition capacitance of P-N junction diode, Simple zener regulators.

Unit II Transistor Characteristics: Construction, principle of operation, V-I characteristics, Symbols, equivalent circuit, parameter calculations, applications, limitations and specifications of BJT, FET, UJT and MOSFET'S (Different configurations of transistors are to be considered), Specifications of BJT, FET, UJT and MOSFET's.

Unit III Amplifiers: Biasing, DC Equivalent Model, criteria for fixing operating point and methods of bias stabilization, thermal runaway and thermal stability, small signal low- frequency transistor amplifier – circuits; h-parameters, representation of transistor, analysis of single stage transistor amplifier using h-parameters, voltage gain current gain, input impedance output impedance, Comparison of BJT & FET. RC coupled amplifier – frequency response, cascaded amplifiers (all configurations of BJT and FET are to be considered). High frequency model of transistor α and β , cut-off frequencies of a transistor, single stage and multi stage amplifiers, Calculation of bandwidth of single and multistage amplifiers, concept of gain bandwidth product. Specifications of amplifiers, effect of cascading on bandwidth, Darlington amplifier, boot strapping, stability and thermal consideration, Noise in BJT.

Unit IV Feedback Amplifiers and Oscillators: Concept of feedback, negative & positive feedback gain & sensitivity, Bandwidth, classification of feedback amplifiers, general characteristics of negative feedback amplifier, effect of feedback on amplifiers characteristics, condition for oscillation, RC and LC type of oscillators, Crystal oscillators, frequency and amplitude stability of oscillations, Generalized analysis of LC oscillators, quartz, Hartley Clapp, R-C Phase shift and Wein Bridge oscillators, UJT oscillator.

Unit V Power Amplifiers and Tuned Amplifiers & Regulator: Classification of power amplifiers, Class A,B,AB and C power amplifiers, Push pull & complementary push pull amplifiers. Design of heat sinks, Power output, efficiency, cross – over distortion and harmonic distortion, Derating curve. Specifications of power amplifiers, single tuned and double tuned voltage amplifiers. Interstage design, Stability consideration, Class B and Class C tuned power amplifiers and specifications.

References:

1. Nashelsky & Boysted; Electronic Devices and Circuits; PHI
2. Millman Halkias; Electronic Devices and Circuits; McGraw- Hill
3. Millman & Grabel; Micro Electronics; McGraw-Hill
4. Salivahanan; Electronic Devices and Circuits; TMH
5. Cathey; Electronic devices and circuits (Shaum); TMH
6. Bogart; Electronic Devices and Circuits; Universal Book Stall, Delhi
7. Millman & Halkias; Integrated Electronics; McGraw- Hill.
8. Nagrath I.J.; Electronics; 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. Use of UJT as relaxation Oscillator.
6. Design & Analysis of JFET Amplifier.
7. Design & Analysis of MOSFET Amplifier.
8. To study and construct power amplifiers of various classes.
9. Study of various oscillators.

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 SW (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 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 Min. Marks-25 Duration-
			0	0	4	

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 & 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
			L	T	P	
Departmental Core DC-5	Electromagnetic Theory	EX/EE 401	3	1	0	Max.Marks-100 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-4			Theory Papers
Departmental Core DC-8	Electrical & Electronic Material	EX 402	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
			3	1	0	

Unit I Classes of Engineering Materials – Metals & alloys, ceramics, organic polymers and composite material. Classification of solids from electrical Engineering point of view. Conducting material – properties of conductors, characteristics of good conductor material, commonly used conducting materials, conductor materials for overhead lines, types of conductors, conductor for underground cables, conductor materials used for electrical machines winding, resistor materials, types of resistors, materials for bus bar. Thermal conductivity of matter, super conductivity. Materials of MHD generator, Fuel cells, Thermoelectric generators, Thermonic conductors

Unit II Dielectric Materials: Dielectric strength, factors affecting dielectric strength, dielectric loss, dissipation factor, factors affecting dielectric loss, permittivity & polarization, charging and discharging of dielectric, conduction through dielectric. Application of dielectric, different types of capacitors and materials used for them. Insulating materials, their properties – thermal, chemical, mechanical & electrical. Insulating materials like ceramic, mica, glass, rubber, resins, wax varnishes, Class of Insulation. Transformer oils & their testing. Piezoelectricity & Ferro electricity.

Unit III Applications of semi conductor materials: type of semi conductors, working and applications of semiconductors, Temperature sensitive elements, photoconductive cells, photo voltaic cells; Varistor, Hall effect generator, LCD, Light dependent resistors, LEDs, piezo – electric materials, semiconductor laser and its characteristics, photo conductors – photo diodes, avalanche photo diode, photo transistors.

Unit IV Classification of magnetic materials: Dia-magnetism, Para magnetism, Ferro- magnetism, magnetisation curve, hysteresis loop, Magnetostriction, Factors affecting permeability and hysteresis, Anti – ferromagnetism, Ferrimagnetism, Magnetic resonance, B-H curve for different magnetic materials, loss of magnetism, impurities in ferromagnetic materials, soft and hard magnetic materials, ferrites. Fiber optic materials, lasers Special Purpose materials – Thermo couple, soldering, fuse, contact, refractory, fluorescent & phosphorescent, galvanizing and impregnation.

Unit V IC Fabrication: planar process – Fabrication of BJT, FET, & CMOS devices, Monolithic diodes – Contacts – IC resistor & Capacitors - IC packaging – characteristic of IC components.

References:

1. TTTI Madras; Electrical Engineering Materials; TMH.
2. C. S. Indulkar and S. Thruvengadem; Electrical Engineering Materials; S. Chand.
3. A.J. Dekkor; Electrical Engineering Materials; PHI.
4. John Allison; Electrical Engineering Material s & Devices; TMH.
5. Kasap; Electronic Materials and devices; TMH
6. V. Raghvan; Material Science & Engineering; PHI.
7. Milman & Grabe; Micro Electronics; TMH
8. S.P. Seth & P.V. Gupta; Electrical Engineering Materials; Dhanpat Rai.

Course Contents

Category	Title	Code	Credits-6			Theory Papers
Departmental Core DC-7	Digital Electronics Logic Design I	EX-403	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
			3	1	2	

Unit I Number Systems and Codes : Digital number systems, base conversion, Binary, Decimal, octal, Hexadecimal, number system with radix r, Gray codes.

Alphanumeric codes – ASCII code and EBCDIC codes, Hollerith code, concept of parity, complement r's & (r-1)'s, subtraction with complements, signed Binary numbers, Error Detecting & Correcting codes. Basic Theorems & Properties of Boolean Algebra: AND, OR, NOT operators, laws of Boolean Algebra, Demorgan's theorem, Boolean expression & logic diagram. Negative logic, Alternate logic gate representation (concept of bubbled gates) canonical and standard Forms (Minterms & Maxterms), sum of minterms & product of maxterms, conversion between canonical forms. Truth table & maps, 2,3,4,5 and 6 variable maps, Solving digital problems using Maps, Don't care conditions, Tabular minimization. Sum of product & product of sum reduction, Exclusive OR & Exclusive NOR circuits, Parity generator & checkers.

Unit II Combinational Circuits : Design procedure, Adders (half and Full), subtractor (half and full) code convertors, Analysis of design, Universal building blocks, Implementation of any logic circuit with only NAND gates or with only NOR gates, Binary serial adder, parallel adder, serial/parallel adder, look ahead carry generator, BCD adder, Binary multiplier, Magnitude comparator, Decoder, Demultiplexer, Encoders, priority encoder, Multiplexers & implementation of combinational logic diagram, HDL for combinational circuit.

Unit III Sequential Logic Circuit : Latches, SR latch with NAND & NOR gates, D latch, edge triggered flip flop, J-K flip flop, T flip flop, Master slave flip flop, Analysis of clocked sequential circuit, state table, state diagram, state reduction state equations, state assignments, flip flop excitation table & characteristic equations, Design procedure for sequential circuits, Design with state reduction, Applications of flip flop.

Unit IV Registers and Counters : Asynchronous and Synchronous counter, counters with MOD numbers, Down counter, UP/DOWN counter, propagation delay in ripple counter, programmable counter, Pre-settable counter, BCD counter, cascading, counter applications, Decoding in counter, Decoding glitches, Ring Counter, Johnson counter, Rotate left & Rotate right counter, Registers – Buffer, Shift left, shift right, shift left/Right registers, parallel in parallel out, serial in serial out, parallel in serial out, serial in parallel out registers.

Unit V Random Access Memory, Timing waveform, Memory Decoding, Internal Construction, Coincident decoding, Address multiplexing, Read only memory – Combinational circuit implementation, Type of ROMs, combinational PLDs, Programmable Logic Array (PLA), Programmable Array Logic (PAL), sequential programmable device. Analog to digital conversion – Ramp type, dual slope, integration, successive approximation, parallel conversion, parallel/ serial conversion, convertor specifications, Digital to Analog convertors – Binary weighted & R/2R D to A convertors.

References:

1. Mano; Digital design; Pearson Education Asia
2. Thomas Blakeslee; Digital Design with standard MSI and LSI; Wiley Interscience
3. Jain RP; Modern digital electronics; TMH
4. -M.Mano; Digital logic & Computer Design; PHI
5. Tocci ; Digital Systems Principle & applications; Pearson Education Asia
6. Gothmann; Digital Electronics; PHI

7. R.H.Gour; Digital Electronics and Micro Computer - (Dhanpat Rai)
8. –Malvino, Leech; Digital Principles and applications–(TMH)
9. Floyad; Digital Fundamentals (UBS)
10. Nripendra N. Biswas; Logic Design Theory (PHI)
11. D.C. Green; Digital Electronics (Pearson Education Asia)

List of Experiments (Expandable):

1. Verification of all the logic gates.
2. Design of BCD to Excess-3 code converter.
3. Implementation of NAND & NOR as Universal gate.
4. Design of RS, JK, T & D Flip flop.
5. Multiplexer /Demultiplexer based boolean function
6. Design of combinational circuit for the
 - (i) Half adder
 - (ii) Full adder
 - (iii) Half subtractor
 - (iv) Full subtractor
7. Design various A-D & D-A convertors.

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-6			Theory Papers
DC-6	Electro Mechanical Energy Conversion –I	EX/EE404	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
			3	1	2	

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, Ferroresonance, 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 Induction Motor Testing, Losses and Efficiency, effect of unbalanced supply, Induction generators.

References:

1. Nagrath and Kothari; Electrical Machines; TMH
2. Langsdorf; A.C. Machines; TMH
3. Kothari; Electric machines (Sigma series); TMH
4. Dr.P.S.Bimbhra; Electrical Machines; Khanna Publisher
5. Ashfaq Hussain; Electrical Machines; Dhanpat Rai Publication
6. Bhattacharya; Electrical machines; TMH
7. M. G. Say; Alternating Current Machines', (5th Ed.) ELBS, 1986.
8. M.G.Say and E.O.Taylor; Direct Current Machines Second Ed., ELBS, 1985.
9. V.Del Toro; Electrical Machines & Power Systems, 1985, Prentice-Hall, Inc., Englewood Cliffs.
10. 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	Credits-6			Theory Papers
Departmental Core DC-4	Electronic Devices & Circuits II	EX 405	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
			3	1	2	

Unit I Operational Amplifiers: Design aspects of Monolithic OpAmps, ideal characteristics, specifications, offset voltages and currents, frequency compensation techniques, measurement of op-amp parameters, applications of op-amp inverting, non inverting amplifiers, integrators, function generator, logarithmic amplifier, instrumentation amplifiers, signal conditioning circuits, multi-vibrators, square wave generator, rectifiers, peak detectors & voltage regulator.

Unit II Filters: Active filters, LPF, HPF, BPF, BEF, All pass filter, higher order filters & their design, switched capacitor filters, 555 timer and its applications, 556 function generator IC and its applications, phase locked ICs (PLL) 565 and their applications. IC 1496 (Balanced modulator applications).

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

Unit IV Microwave: Generation of microwave by tubes, limitation of conventional tubes, Klystron amplifiers, reflex Klystron oscillator, magnetrons, traveling wave tube (TWT), backward wave oscillator (BWO), high frequency limitation of transistor, microwave transistor, Manley Rowe relations, parametric amplifiers and frequency multipliers, Gun effect, Gun diode oscillator, Avalanche effect, IMPATT & TRAPATT, BARRITT, TUNNETT, MITATT, microwave field effect transistors, MASER, LASER, Microwave Integrated Circuits (MICs) diode, Schottky barrier and backward diodes, PIN diode and their applications.

Unit V Logic Families: DTL, ITL, ECL, TTL, MOS Logic Families, parameters and their comparison, transistor logic, interfacing of logic families, Integrated transistor, FET and MOS as switches, switching speed of integrated diode, transistor, FET devices, comparison between TTL and DTL, multi emitter transistor, Characteristics of TTL with Schottky devices, transfer characteristics of ECL, Fan in and Fan out speed of operation, logic versatility of ECL gates, temperature compensated bias MOS, CMOS and their transfer characteristics, MOS invertors, CMOS inverter, rise and fall time in CMOS gates, interfacing BIT and CMOS gates.

References:

1. Tobby; OP- Amps their design and Application
2. Gaikward RA; OP- Amp and linear Integrated circuits; PHI
3. Salivahanan; Linear Integrated Circuits; TMH
4. Kennedy J; Principles of communications; TMH
5. R.G.Gupta; Audio and Video System; TMH
6. Linear Integrated Circuits :D. Raychowdhary and Shail Jain
7. Introduction to System Design using Integrated ckt: B.S. Sonde (New Age Pub.).
8. Micro Electronics :Jacob Millman (ISE)
9. Integrated Circuits :Botkar (Khanna)
10. Applications of linear Integrated circuits :Clayton
11. Microwave Design and Circuits :S.L. Liao (PHI)
12. Microwaves and Radar :A.K. Maini (Khanna)

List of Experiments (Expandable):

1. Char. of Op-Amp (input offset voltage, slew rate CMRR, BW, Input bias current)
2. Linear application of OP-Amp (voltage follower, inverting and non-inverting amplifier and their frequency response adder subtractor differential amplifier, integrator and differential frequency response)
3. Study of Op-Amp as a comparator
4. Design of Schmitt trigger
5. Design of monoastable & astable multivibrator
6. To construct and plot frequency response of low & high pass filter.

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 SW (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-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.