G. PULLA REDDY ENGINEERING COLLEGE (Autonomous): KURNOOL
Department of Electrical and Electronics Engineering
Accredited by NBA of AICTE and NAAC of UGC
Affiliated to JNTUA, Ananthapuramu.

Scheme – 2013
(Scheme and Syllabus of III - VIII Semesters)

Department of Electrical and Electronics Engineering
G.Pulla Reddy Engineering College (Autonomous): Kurnool
Accredited by NBA of AICTE and NAAC of UGC
Affiliated to JNTUA, Ananthapuramu

G. PULLA REDDY ENGINEERING COLLEGE (Autonomous) : KURNOOL

Four year B.Tech Course (Scheme – 13)

Scheme of instruction and Examination
(Effective from 2013-14)
Proposed Course Structure for III – VIII Semesters for Scheme 2013

Course numbering Scheme:

M	E	1	0	5

ME - Code for the department offering the course CE,ME,EC,EE,CS,BS,HU
1 - Level of the course 1,2,3,4 for UG 8&9 for PG
05 - Specific code for the course

List of Courses:

S No	Course No	Course Title
		Core Courses
1	EE201	Electrical Circuits
2	EE202	Electrical Machines – I
3	EE203	Electrical Measurements
4	EE204	Electrical Measurements Lab
5	EE205	Electromagnetic Fields
6	EE206	Electrical Machines – II
7	EE207	Power Systems – I
8	EE208	Electrical Circuits Lab
9	EE209	Electrical Machines-I Lab
10	EC202	Electronic Devices and Circuits
11	EC206	Analog Electronic Circuits
12	EC212	Electronic Devices and Analog Circuits Lab
13	CE216	Fluid Mechanics and Hydraulic Machinery
14	CE217	Fluid Mechanics and Hydraulic Machinery Lab
15	EE301	Electrical Machines - III
16	EE302	Power Systems – II
17	EE303	Power Electronics - I
18	EE304	Linear Control Theory

19	EE305	Network Theory & Signals and Systems
20	EE306	Electrical Machines-II Lab
21	EE307	Power Systems – III
22	EE308	Power Electronics - II
23	EE309	Instrumentation
24	EE310	Power Electronics Lab
25	EE311	Control and Automation Systems Lab
26	EC316	Pulse and Digital Circuits
27	EC317	Pulse and Digital Circuits Lab
28	EC308	Microprocessors and Microcontrollers
29	EC318	Integrated Circuits and Applications
30	EC319	IC and Microprocessors Lab
31	EE401	Power Systems – IV
32	EE402	Drives and Static Control
33	EE403	Elements of Digital Signal Processing
34	EE404	High Voltage Engineering
35	EE405	Power Systems Lab
36	EE406	LabVIEW & Controllers Laboratory (LVCP)
37	EE407	Project Work Preliminary
38	EE408	Utilization of Electric Power
39	EE409	HVDC and FACTS
40	EE410	Drives & Static Control Lab
41	EE411	Project Work
Professional Elective-I		
1	EE412	Non-Conventional Sources of Energy
2	EE413	EHV AC Transmission
3	EE414	Electrical Distribution Systems
4	EE415	Power Quality
Professional Elective-II		
5	EE416	Electrical Estimation and Costing
6	EE417	Substation Engineering
7	EE418	Programmable Logic Controllers
8	EE419	Embedded Applications to Electrical Engineering
Professional Electives-III		
9	EE420	Modern Control Theory
10	EE421	VLSI
11	EE422	Electrical Drawing & CAD
12	EE423	Biomedical Engineering
Interdisciplinary Electives		
1	IDE301	Optimization Techniques
2	IDE302	Remote Sensing and GIS
3	IDE303	New and Renewable Energy Systems
4	IDE304	Artificial Intelligence and Expert Systems
5	IDE305	Nanotechnology

6	IDE306	Introduction to Information Systems
7	IDE307	Mechatronics
8	IDE308	Control and Automation
9	IDE309	Web Development Programme
10	IDE310	Environmental and Water Resources Engineering
Global Electives		
1	GE401	Introduction to Psychology
2	GE402	Research Methodology
3	GE403	Entrepreneurship Development
4	GE404	Intellectual Property Right and Patent Filing
5	GE405	Constitution of India
6	GE406	Ethical Hacking
7	GE407	Information Security and Cyber Laws
8	GE408	Foreign Languages
Mandatory Learning Courses		
1	ML201	Quantitative Aptitude
2	ML202	Soft Skills
3	ML203	Business English and Technical Writing
Basic Science Courses		
1	BS202	Complex Variables and Special Functions
Humanities and Social Science Courses		
1	HU202	Managerial Economics & Principles of Accountancy

Scheme of Instruction and Examination
(Effective from 2013-14)

Third Semester

S.No.	Course No.	Course Title	Credits	Scheme of Instruction periods / week			Scheme of Examination		
				L	T	P	End Exam Marks	Internal Assessment Marks	Total Marks
1	EE201	Electrical Circuits	4	3	1	-	70	30	100
2	BS202	Complex Variables and Special Functions	3	3	-	-	70	30	100
3	EE202	Electrical Machines – I	4	4	-	-	70	30	100
4	EC202	Electronic Devices and Circuits	3	3	-	-	70	30	100
5	EE203	Electrical Measurements	3	3			70	30	100
6	CE216	Fluid Mechanics and Hydraulic Machinery	3	2	1	-	70	30	100
7	ML201	Quantitative Aptitude	2	1	1	-	-	100	100
8	EE204	Electrical Measurements Lab	2	-	-	3	70	30	100
9	CE217	Fluid Mechanics and Hydraulic Machinery Lab	2	-	-	3	70	30	100
			26	19	3	6	560	340	900

EE201-ELECTRICAL CIRCUITS (EC)
(For B.Tech III Semester)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
3	1	-	4

Course Outcomes:

CO1: Understand circuit reduction techniques, mesh and nodal analysis and network topology concepts for electrical circuits.

CO2: Understand the concept of dual networks, coupled circuits and locus diagrams of electrical circuits.

CO3: Understand the three phase balanced and unbalanced star and delta connected systems, measurement of real and reactive power.

CO4: Understand the concepts of series and parallel resonance.

CO5: Apply network theorems to DC and AC circuits

CO6: Determine the network parameters, initial conditions and transient response of electrical circuits.

Unit: I

Review of DC and AC Circuits:

Star-delta transformation, Complex Power, Analysis of series and parallel circuits, Super Mesh and Super Node Analysis.

Network Topology: Network graph, concept of tree, branch, links, incident matrix, tieset and cutset.

Unit: II

Dual Networks: Principle of Duality and Construction of Dual Networks.

Coupled Circuits: Concept of self and mutual inductance, co-efficient of coupling, dot convention dot rule, conductively coupled and inductively coupled equivalent circuits.

Locus Diagrams: Current locus diagrams of series & parallel circuits – their applications.

Unit: III

Polyphase Circuits: Generation of three Phase voltages ,currents and power, phase sequence, Relation between Line & Phase quantities in Star and Delta Connection, Analysis of three Phase balanced and unbalanced circuits with vector diagram. Measurement of three phase power using two wattmeter method, Measurement of reactive power.

Unit: IV

Resonance: Series & Parallel resonance, Resonant Frequency, Voltage Magnification, Q-Factor, Band-Width, Half-Power Frequencies, Maximum voltage drop across L and C.

Network Theorems: Superposition Theorem, Reciprocity, Thevinin's, Norton's, Maximum power transfer, Millmans, Tellegens and Compensation theorems. (DC & AC circuits)

Unit: V

Network Parameters: Two port network parameters, Impedance parameters, admittance parameters, ABCD (transmission) parameters, inverse ABCD parameters, hybrid parameters,

Inverse hybrid parameters, relation between parameter, Equivalent T & π networks. (Both Independent & Dependent sources)

Unit: VI

Initial Conditions: Initial conditions in the network & their representation, evaluation of initial conditions.

Transients: Transient response of RL, RC & RLC circuits for DC & AC excitations using Differential equations and Laplace transforms.

Text Books:

1. Hayt & Kimmerly (2004), "Engineering Circuit Analysis" TMH
2. Joseph Edminister (1983) , "Electric Circuits", 2nd Edition, Schaum's Series , TMH
3. Ajith Chakravarthy (2006), "Circuit Theory", 5th Edition, Dhanpat Rai & Sons
4. R.P.Punagin , (1994) "Electrical Circuit Analysis", Interline Publishers, Bangalore.
5. Sivanaga Raju, G. Kishor and C. Srinivasa Rao (2010) , "Electrical Circuit Analysis", Cengage Learning

Reference Books:

1. Vanvalken Berg (2004) ,"Network Analysis" 3rd Edition, PHI
2. Sudhakar & Shyam Mohan (2007), "Circuits & Network", 5th Edition, TMH
3. Roy Chowdary (2007), "Networks & Systems" , New Age .
4. R.L.Boylstad, (1994) "Introductory Circuit Analysis" , McMillan Publishers, 7th Edition.

NOTE:

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

BS202-COMPLEX VARIABLES AND SPECIAL FUNCTIONS

(Common to B.Tech III Semester ECE & EEE)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
3	0	0	3

Course outcomes:
CO1: Apply complex techniques in the area of transmission lines, control systems, signal processing and electromagnetic field theory.
CO2: Apply numerical solutions in engineering, science and also in many branches of applied mathematics.
CO3: Understand and apply Bessel and Legendre functions in solving electrical engineering problems.
CO4: Understand and apply Statistics in many fields of learning such as physical sciences and engineering.

Unit - I

Complex Variables: Analytic functions, Cauchy-Riemann equations, sufficient condition for analyticity, Harmonic function, Method to find the Conjugate function, Milne – Thomson method. Conformal Mapping (e^z , z^2 , sinz, cosz) , Bilinear Transformation.

Unit – II

Complex Integration & Series : Simple and Multiple Connected regions, Cauchy's Integral theorem, Cauchy's integral formula, Generalized Integral formula. Taylor's series, Maclaurin's series and Laurent's series. Residue theorem, Method of finding residues. Evaluation of real integrals by contour integration, Integration round the unit circle and in the interval (- ∞ , ∞).

Unit-III

Interpolation : Operators, relation between the operators**.** Newton's forward and backward interpolation formulae. Lagrange's and Inverse Lagrange's interpolation formulae. Cubic Spline interpolation.

Unit - IV

Bessel Functions: Solution of Bessel's equation**,** Recurrence relations for $J_n(x)$, Generating function, Jacobi series, Orthogonality of Bessel's function.

Unit – V

Legendre Functions: Solution of Legendre's equation, Rodrigue's formula, Legendre polynomials, Generating function, Recurrence relations for $P_n(x)$, Orthogonality of Legendre polynomials.

Unit – VI

Numerical Methods & Statistics: Solution of first order Differential equations. Taylor's method, Picard's method, Euler's and modified Euler's methods. Runge-Kutta methods of second and forth order. Normal distribution, properties. Correlation coefficient, Lines of regression.

Text Books:

1. B.S. Grewal, " Higher Engineering Mathematics", Khanna Publishers, New Delhi, 2005
2. T.K.V Iyengar, et.al. "A Text book of Engineering Mathematics", Vol-3 S. Chand&co.2011
Reference Books:
1. S.S.Sastry, "Introductory Methods of Numerical Analysis", PHI, 2010
2. Erwin Kreyszig "Advanced Engineering Mathematics", John Wiley and Sons 8th Edition,2008

NOTE:
End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

EE202-ELECTRICAL MACHINES – I (EMC 1)
(For B.Tech III Semester)

Scheme   : 2013
Internal Assessment : 30
End Exam   : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
4	-	-	4

Course Outcomes:

CO1: Understand the laws of magnetic circuits and calculations.
CO2: Understand the concept of electromechanical energy conversion principles.
CO3: Understand the constructional aspects, operation and working of separately excited and self-excited dc generators and dc motors.
CO4: Understand the performance characteristics of Self and Separately excited dc generators and dc motors.
CO5: Select a proper dc motor for particular application.
CO6: Discuss about speed control methods of self-excited dc motors.

Unit – I
Electro mechanical Energy Conversion:
Laws of Magnetic Circuit, Magnetic Circuit Calculations, Comparisons between magnetic circuits and electric circuits, Forces and Torque in Magnetic field Systems, Energy balance, Energy and Force in singly excited magnetic field system, Determination of Magnetic force and Torque from Co-energy, multiply excited Magnetic field Systems, numerical problems.

Unit – II
DC Generators: Constructional details, Principle of Operation, action of Commutator, constructional features, armature windings-simplex lap and wave windings, use of laminated armature, EMF equation. Armature reaction and its effects – cross magnetizing and De magnetizing AT/pole, Methods of improving armature reaction, commutation – reactance voltage – methods of improving Commutation, numerical problems.

Unit – III
Types of DC Generators and their characteristics: Methods of excitation – separately excited and self excited generators, build up of EMF and causes for failure, open circuit characteristics – critical field resistance and critical speed. Load characteristics of separately excited and self excited generators, parallel operation DC generators – use of equalizer bar – load sharing, numerical problems.

Unit – IV
DC Motors: Principle of operation, back emf, torque equation, characteristics of separately excited and self excited motors, various applications of DC motor.

Unit-V

Speed control of DC motors using armature control, flux control and Ward-Leonard control, braking of dc motors – dynamic, plugging and regenerative. Motor starters – 3-point and 4-point starters - protective devices – calculation of starter steps, numerical problems.

Unit – VI

Testing of DC Machines: Losses–constant and variable losses, efficiency – condition for maximum efficiency, direct (brake test), indirect (Swinburne's test) and regenerative testing (Hopkinson's test), retardation test, separation of stray losses test, Field's test, numerical problems.

TEXT BOOKS:
1. P.S. Bimbhra, (2009) "Electrical machinery", 7th Edition, Khanna Publishers.
2. I.J. Nagrath & D.P. Kothari, (2004), "Electric Machines", 3rd Edition, Tata McGrawhill Publishers.
3. A.E. Fitzgerald, C. Kingsley and S. Umans (2003) "Electric Machinery", 6th Edition, Tata McGraw-Hill Companies.
4. P.S. Bimbhra, (2002), "Generalized Theory of Electrical machines", 5th Edition, Khanna Publishers.

REFERENCE BOOKS:
1. H. Cotton, (2003) "Electrical Technology", 7th Edition, CBS Publishers.
2. Mukherjee and Chakravarthy, (2001), "Electrical Machines", 2nd Edition, Dhanpat Rai Publishers.
3. Ashfaq Hussain, "Electrical Machines" Second Edition, Dhanpat Rai Publishers.
4. Clayton and Hancock, (2004) "The Performance and Design of Direct Current machines", 3rd Edition, CBS Publishers.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

EC 202: ELECTRONIC DEVICES AND CIRCUITS (EDC)

(Common to B.Tech. III Semester ECE & EEE)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
3	0	0	3

Course Outcomes:
CO 1: Understand the operating principles of basic electronic devices like p-n Diode, Zener diode and BJT.
CO 2: Understand and analyze the design of BJT amplifier and to design amplifiers.
CO 3: Analyze & the FET amplifier and its biasing techniques and able to design FET amplifiers
CO 4: Analyze and design CE, CB and CC amplifiers in single stage as well as in multistage.

Unit-I
Review of Semiconductor Physics & Transistor: Energy band diagram- Fermi-level, Drift and diffusion concepts, Continuity equation, Minority carrier injection, and Potential variation within graded semiconductor, Contact potential difference, p-n junction diode & Zener diode characteristics, Rectifiers with filters, Eber"s moll model and small signal model of bipolar junction transistor, Graphical determination of h parameters.

Unit-II Transistor Biasing: Need for biasing, Operating point, DC and AC load lines, Bias stabilization techniques: fixed bias, collector to base bias, self-bias, Stabilization against variations in Ico, VBE and β for the self bias circuit, Bias compensation techniques, Thermal runaway and thermal stability.

Unit-III Junction Field Effect Transistor (JFET): Principle of operation, Characteristics of JFET, FET small signal model, Graphical determination of gm , rd and μ, FET as Voltage Variable Resistor (VVR),Advantages of FET over BJT.

Unit-IV FET Biasing: Biasing techniques: Fixed bias, Source self-bias, Voltage divider bias
MOSFETS: Depletion and enhancement types of MOSFETs.

Unit-V Single Stage Amplifiers : Transistor as an amplifier, Transistor Low frequency hybrid Model, Analysis of a transistor amplifier circuit using h-Parameters, Comparison of CB, CC and CE amplifier configurations, Emitter Follower, Linear analysis of transistor amplifier circuits, Miller"s Theorem and its Dual.

Unit-VI Multistage Transistor Amplifiers: Types of coupling – RC coupled, Direct coupled, Analysis of two cascaded amplifier stages, Approximate CE, CB and CC models, CE amplifier with emitter resistance, Darlington, Bootstrap and Cascade amplifiers, Frequency response of an amplifier at Low and High frequencies, Bandwidth of cascaded amplifier stages.

Text Books:
1. J.Milliman, C.Halkias & Satyabrata Jit, "Electronic Devices and Circuits", 2nd Edition, TMH,2007.
2. J. Milliman & C.Halkias, "Integrated Electronics" –TMH, 2007
3. Robert Boylestad & Lowis Nashelsky, "Electronic Devices and Circuit Theory", 5th Edition PHI, 1993 4. Allen Mottershed, "Electronics devices and circuits", PHI

Reference Books:
1. Ben.G.Streetman , "Solid state electronic devices", PHI
2. David .A. Bell , "Electronic devices and circuits", 4th Edition, PHI, 1999.
3. Nagrath, "Analog and Digital Circuits", TMH

NOTE:
End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

EE203-ELECTRICAL MEASUREMENTS (EM)
(For B. Tech III Semester)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
3	0	0	3

Course Outcomes:
CO1: Identify suitable electrical measuring instruments.
CO2: Understand the operation of analog instruments for the measurement of voltage, current, frequency, power and energy.
CO3: Understand the principle and operation of instruments used for measuring high voltages and currents, power, energy, power factor, frequency and position
CO4: Understand the significance and working of bridges used for measurement of electrical quantities like resistance, inductance and capacitance.

Unit – I
Units Standards & Errors: S.I. units, Absolute standards (International, Primary, Secondary & Working Standards), True Value, Errors (Gross, Systematic, Random); Static Characteristic of Instruments (Accuracy, Precision, Sensitivity, Resolution & threshold).
Measuring System Fundamentals: Classification of Instruments (Absolute & Secondary Instruments; Indicating, Recording & Integrating instruments; Based upon Principle of operation), Three forces in Electromechanical indicating instrument (Deflecting, controlling & damping forces).

Unit – II
Measuring Instruments: Construction, operating principle, Torque equation, Shape of scale, use as Ammeter or as Voltmeter (Extension of Range), Use on AC/DC or both, Advantages & disadvantages, Errors (Both on AC/DC) of PMMC types, Electro dynamic Type, Moving iron type (attraction, repulsion & combined types)

Unit – III
Instrument transformers: CT and PT – Ratio and phase angle errors – design considerations Type of P.F. Meters – dynamometer and moving iron type – 1-ph and 3-ph meters – Frequency meters –synchroscopes.

Unit – IV
Measurement of Power: Single phase dynamometer wattmeter, expression for deflecting and control torques, Principle and operation of Double element dynamometer wattmeter– Measurement of active and reactive powers in balanced systems.
Measurement of Energy: Single phase induction type energy meter – driving and braking torques – errors and compensations – testing by phantom loading test. Principle and operation of Three phase energy meter, maximum demand meter.

Unit – V
Potentiometers: Principle and operation of D.C. Crompton's potentiometer –Measurement of unknown resistance, current, voltage.
A.C. Potentiometers: Principle and operation of polar and coordinate types– applications.
Resistance Measurements: Method of measuring low, medium and high resistance – sensitivity of Wheatstone's bridge , Kelvin's double bridge for measuring low resistance, measurement of high resistance

Unit – VI
A.C. Bridges: Measurement of inductance, Quality Factor - Maxwell's bridge, Hay's bridge, Anderson's bridge.
Measurement of capacitance and loss angle - Desauty bridge. Wien's bridge – Schering Bridge.

TEXT BOOKS:
1. E.W. Golding and F.C. Widdis (2009), "Electrical Measurements and measuring Instruments", fifth Edition, Wheeler Publishing.
2. A.K.Sawhney (2010), "Electrical & Electronic Measurement & Instruments", Dhanpat Rai & Co. Publications.
3. J. B. Gupta: "A Course in Electrical and Electronic Measurements and Instrumentation", 13th Edition, S.K Kataria & Sons, 2009.

REFERENCE BOOKS:
1. Buckingham and Price, "Electrical Measurements", Prentice – Hall
2. Harris, "Electrical Measurements"
3. Reissland, M.U, "Electrical Measurements: Fundamentals, Concepts, Applications", New Age International (P) Limited, Publishers.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

CE 216: FLUID MECHANICS & HYDRAULIC MACHINERY (FM & HM)
(For B.Tech III Semester)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
2	1	0	3

Course Outcomes:

CO1: Understand the basic knowledge on fluid properties and fluid statics.
CO2: Understand the fundamentals of fluid flow and convergent with various aspects of fluid kinematics and fluid dynamics.
CO3: Analyze fluid flow problems with the application of the momentum and energy equations.
CO4: Analyze the various types of turbines based on their applications.
CO5: Understand the knowledge of schematic diagram and working principle of hydro electric power plant
CO6: Analyze the working principle of centrifugal and reciprocating pumps and their applications.

Unit – I
Fluid Properties: Definition of a fluid – Density – Specific Gravity – Specific volume – Ideal Fluid – Real Fluid – Vapour pressure - Compressibility – Surface tension and capillarity – Viscosity.
Fluid Statics: Absolute pressures, Guage and Atmospheric Pressure, Pressure Head – Pressure Measurement and Manometers – hydro – static Forces on Vertical, Inclined Planes and Curved Surfaces.
Unit – II
Fluid Kinematics: Types of Fluid flow – Continuity equation - Continuity equation in Differential for Three-Dimensional Flow – Velocity – Acceleration – Velocity Potential and Stream Function.
Fluid Dynamics: Euler's equation of motion - Bernoulli's equation from Euler's equation – Practical Applications of Bernoulli's equation – Venturi Meter – Orifice Meter.

Unit – III
Momentum equation: Impulse Momentum Equation and its Applications
Flow Measurement : Velocity measurements Pitot Tube – Pitot Static Tube, Volume Flow Rate – Measurement, Flow Through Pipes: Regimes of Flow, Reynolds Number – Hagen Poiseuille Equation – Darcy Weisbach Equation – Minor Energy losses – Energy Gradient and Hydraulic Gradient Line.

Unit - IV
Basics of Turbo machinery: Hydrodynamic Force of Jets on Stationary Vertical and Inclined Flat Plates, Moving Vertical and Inclined Flat Plates, and Curved Vanes.

Hydraulic Turbines : General layout of Hydroelectric Power Plant – Definition of Heads and Efficiencies of a Turbine – Classification of Hydraulic Turbines – Pelton Wheel – Francis Turbine – Kaplan Turbine – Unit and specific quantity characteristic curves, governing of turbines, selection of type of turbine.

Unit – V
Power Station : Introduction – Hydroelectric Power Development – Comparison of Thermal and Hydroelectric Power – Assessment of available power – Storage and Pondage – Flow duration curve and mass curve – Type of Hydro power plants – firm (primary) and Secondary Power – Load factor – Utilization factor and capacity factor – Components of Hydro power plants.

Unit –VI
Centrifugal Pumps: Components – Work Done – Definitions of Heads and Efficiencies – Priming – Cavitation – Performance Characteristics
Reciprocating Pumps : Classification of Reciprocating pumps – Main components and working principle – Discharge, Work done and Power required to drive reciprocating pump – Coefficient of discharged and slip.

Text Books:
1. P.N. Modi & S.M. Seth, "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House, New Delhi.
2. R.K.Bansal, "A text book of Fluid Mechanics and Hydraulic machinery", Laxmi Publications (P) Ltd.
3. S.C. Gupta [2007], "Fluid Mechanics and Hydraulic Machines", Pearson Publications, New Delhi.

Reference Books:
1. Jagadish Lal, "Hydraulic Machines", Metropolitan Book Company Pvt. Ltd.
2. Nachleba, "Hydraulic Turbines", Tata Mc Graw Hill Publishing Co. Ltd, New Delhi.

NOTE:
End Exam: The question paper for end examination shall consist of one compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ML201: QUANTITATIVE APTITUDE (QA)

(Common for all branches of Third Semester)

Scheme : 2013
Internal Assessment : 100

L	T/D	P	C
1	2	0	2

Course Outcomes:
CO1: Solve quantitative aptitude problems on number systems, Coordinate Geometry, Stocks, shares, Bankers discounts, etc.
CO2: Interpret data using bar graphs, pie charts, line graphs.
CO3: Apply reasoning and logic to solve various puzzles and brain teasers.

Numerical Ability
Number Systems, HCF and LCM, Decimal Fractions, Square Roots and Cube Roots, Linear and Quadratic Equations Averages, Mixtures & Allegations, Ages, Ratios, Proportions and Variations, Percentages, Profit and Loss Time, Speed and Distance, Time and Work Permutations and Combinations, Probability, Clocks and Calendars

Introduction to concepts of Reasoning
Cubes, Series and sequences, Odd man out, Coding and decoding

General Mental Ability
Puzzles and Teasers

References Books:
1. Arun Sharma, "How to Prepare for Quantitative Aptitude", TMH Publishers, New Delhi.

2. R.S. Aggarwal, "Quantitative Aptitude", S.Chand Publishers, New Delhi.

3. Sharon Weiner-Green, Ira K.Wolf, Barron's GRE, Galgotia Publications, New Delhi.

4. Ethnus, Aptimithra, McGraw Hill Publishers

5. R.S Aggarwal , "Verbal and Non-Verbal Reasoning", S.Chand Publishers, New Delhi.

6. Shakuntala Devi, "Puzzles to Puzzle You", Orient Paper Backs Publishers, New Delhi.

7. Shakuntala Devi, "More Puzzles", Orient Paper Backs Publishers, New Delhi.

8. Ravi Narula, "Brain Teasers", Jaico Publishing House, New Delhi.

9. George J Summers, "Puzzles and Teasers", Jaico Publishing House, Mumbai.

DISTRIBUTION AND WEIGHTAGE OF MARKS

There shall be four objective type (Paper / PC based) tests, carrying 25 marks each, during the semester. The sum of the marks scored in all these four tests shall be the final score.

EE204-ELECTRICAL MEASUREMENTS LAB (EM (P))
(For B. Tech III Semester)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
0	0	3	2

Course Outcomes:

CO1: Understand the concepts of extension of range of ammeter and voltmeter
CO2: Measure real & reactive power in a 3phase circuit
CO3: Apply the concept of calibrating % error of 1phase energy meter with direct & indirect methods
CO4: Measure the low, medium resistance values using Kelvin's & Wheatstone's bridges
CO5: Measure the capacitance & inductance values using De-Sauty bridge, Schering Bridge
CO6: Understand the concept of calculating power & power factor in 1phase AC circuits

List of Experiments:

1. Wheat stone bridge & Kelvin's Double Bridge
2. Maxwell's Bridge, Anderson Bridge
3. De-Sauty bridge, Schering Bridge
4. Calibration of Single phase energy meter
5. Measurement of Real and Reactive Power
6. Measurement of Power using 3-voltmeter and 3-ammeter methods
7. Extension of range of Ammeter and Voltmeter
8. C.T.Testing by Silsbee's method-measurement of % ratio error and phase angle of given C.T.by comparison
9. Calibration of Energy meter by Phantom load testing
10. Calibration of Power factor meter

Note: A minimum of **eight** experiments should be conducted

CE217-FLUID MECHANICS & HYDRAULIC MACHINERY LAB
(FM & HM (P))

Scheme   **: 2013**
Internal Assessment : 30
End Exam   **: 70**
End Exam Duration : 3 Hrs

L	T/D	P	C
0	0	3	2

Course Outcomes:

CO1: Measure the rate of flow in pipes using Venturimeter
CO2: Determine coefficient of discharge of the given orifice and reactangulat notch
CO3: Determine head losses in fluid flows due to friction and other reasons
CO4: Determine the force exerted by of water on fixed vane
CO5: Understand Working and performance of hydraulic machines like turbines and pumps

List of Experiments:

Flow Experiments:
1. Determination of coefficient of discharge, velocity and contraction for a small orifice by 'Constant head method'.
2. Calibration of a rectangular notch.
3. Losses in pipe lines due to bends and elbows (Minor losses).
4. Determination of friction factor for a given pipe.
5. Calibration of Venturimeter.

Pumps:
1. Impact of jet on vanes.
2. Performance test on single stage centrifugal pump.
3. Performance test on submersible pump.
4. Performance test on reciprocating pump.

Turbines:
1. Performance and specific speed test on Pelton wheel.
2. Performance and specific speed test on Francis turbine.
3. Performance and specific speed test on Kaplan turbine.

FOURTH SEMESTER

S.No.	Course No.	Course Title	Credits	Scheme of Instruction periods/week			Scheme of Examination		
				L	T	P	End Exam Marks	Internal Assessment Marks	Total Marks
1	EC206	Analog Electronic Circuits	3	3	-	-	70	30	100
2	HU202	Managerial Economics & Principles of Accountancy	3	3	-	-	70	30	100
3	EE205	Electromagnetic Fields	3	2	1	-	70	30	100
4	EE206	Electrical Machines – II	3	3	-	-	70	30	100
5	EE207	Power Systems – I	3	2	1	-	70	30	100
6	ML203	Business English and Technical Writing	2	1	2	-	-	100	100
7	EE208	Electrical Circuits Lab	2	-	-	3	70	30	100
8	EE209	Electrical Machines-I Lab	2	-	-	3	70	30	100
9	EC212	Electronic Devices and Analog Circuits Lab	2	-	-	3	70	30	100
			23	**14**	**4**	**9**	**560**	**340**	**900**

EC 206: ANALOG ELECTRONIC CIRCUITS (AEC)
(For B.Tech IV Semester ECE & EEE)

Scheme : **2013**
Internal Assessment : 30
End Exam : **70**
End Exam Duration : 3 Hrs

L	T/D	P	C
3	0	0	3

Course Outcomes:

CO1: Understand the frequency response of amplifiers, employing BJT and FET, at high frequencies, using their equivalent models.
CO2: Understand the basic operation of differential amplifier and its characteristics.
CO3: Analyze and design amplifiers with negative feedback and positive feedback.
CO4: Understand basic concepts and operation of large signal amplifiers and tuned amplifiers.
CO5: Understand the construction and principle of operation of special purpose electronic devices – Tunnel diode, Photo diode, varactor diode, UJT, LED, LCD and thyristors.

Unit-I
Transistor at High Frequencies: Hybrid-π model, Hybrid-π conductances, and capacitances, CE short circuit current gain, Parameters and fT, Current gain with resistive load, Single stage CE transistor amplifier frequency response, Gain-bandwidth product (GBW).

Unit-II
FET Amplifiers: FET small signal analysis, Low frequency CS and CD amplifiers, CS and CD amplifiers at high frequencies. **Differential Amplifiers:** Ideal differential amplifier, CMRR, Emitter-coupled differential amplifier, Differential amplifier supplied with constant current, Practical considerations, Transfer characteristics of differential amplifiers.

Unit-III Feedback Amplifiers:
Classification of amplifiers, Concept of feedback, Transfer gain with feedback, General characteristics of negative feedback amplifiers- Gain, Bandwidth, Input resistance, Output resistance & Noise, Method of analysis of feedback amplifier, Analysis of feedback (Voltage & Current series, Voltage & Current shunt) amplifiers.

Unit-IV
Oscillators: Barkhausen criterion, RC Phase shift oscillator using FET & BJT, General form of LC oscillator circuit, Hartley and Colpitts oscillators, Wien-bridge oscillator and Crystal oscillator its significance.

Unit-V
Large Signal Amplifiers: Classes of operation, Class A amplifiers (Series-fed, Transformer coupled, Push pull), Class B amplifiers (Push pull, Complementary-symmetry), Crossover distortion and Class AB operation, Class C amplifiers and efficiency.

Unit-VI

Tuned Amplifiers: Need of tuned amplifiers, Analysis of single stage capacitive coupled tuned amplifier.

Special semiconductor devices: Principle of operation, Characteristics and applications of- Tunnel diode, Varactor diode, Photo Diode, Photo transistor, UJT, SCR, DIAC and TRIAC,LCD, LED.

Text Books:
1. Millman and Halkias, "Integrated Electronics", 2nd Edition, TMH 2010.
2. Allen Mottershed, "Electronic Devices and Circuits", 28th Edition, PHI 2006.
3. Donald A.Neamen, "Eletcronic Circuit Analysis and Design"*, 2nd Edition,* Mc Graw Hill 2001. 4. G. K. Mithal, "Electronic Devices and Circuits", 23rd Edition, Khanna pub. 2006

Reference Books:
1. Bogart Theodore, "Electronic Devices and Circuits", 6th Edition, PE 2008.
2. Millman and Grabel, "Microelectronics", 2nd Edition, TMH 2003.
3. Henry Zanger, "Semiconductor Devices and Circuits", John wiley 1984.

NOTE:

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

HU202-MANEGERIAL ECONOMICS & PRINCIPLES OF ACCOUNTANCY (MEPA)
(Common to B.Tech IV Semester CE & EEE)

Scheme   : 2013
Internal Assessment : 30
End Exam   : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
3	0	0	3

Course Outcomes:

CO1: Understand the nature and scope of managerial economics and the role of managers in firms.
CO2: Understand the demand conditions and various factors influencing demand elasticity.
CO3: Understand various elements of demand forecasting and its techniques.
CO4: Understand the concepts of production and cost analysis and the concept of equilibrium price and output in different market situations.
CO5: Understand different forms of business organizations and the significance of capital, factors determining the requirement of working and fixed capital and their sources.
CO6: Understand the principles and problems of accountancy.

Unit-I
Introduction to Managerial Economics & Demand Analysis:
Managerial Economics: Definition of Managerial Economics, Characteristics and Scope, Managerial Economics and its Relation with other subjects and its Uses, Role and Responsibilities of Managerial Economist
Demand Analysis: Meaning, Types of Demand, Demand Determinants, Law of Demand – Its assumptions and exceptions, Law of Diminishing Marginal Utility

Unit-II
Elasticity of Demand and Demand Forecasting:
Elasticity of Demand: Definition, Types of Elasticity of Demand, Practical Significance of price elasticity of demand, Measurement of Price Elasticity of Demand
Demand forecasting – Importance, Factors, Purposes of Demand Forecasting, Methods of Demand Forecasting.

Unit-III
Theory of production & cost analysis and Market Structures
Production Analysis: Meaning of production function, Isoquants & Isocosts, The law of diminishing Marginal Returns, Law of Returns to Scale, Internal and External Economies of scale.
Cost Analysis – Cost concepts, Cost output relationship for Short Run and Long Run, Break Even Analysis – Its Importance, Limitations and Managerial uses
Market Structures: Types and Features of different Competitive situation–Perfect Competition – Monopoly – Monopolistic and Oligopolistic Competition, Price output determination in case of perfect competition and Monopoly.

Unit-IV
Types of Business Organizations & Capital and its Significance:
Types of Business Organizations: Features and Evaluation of Sole Proprietorship, Partnership, Joint Stock Company.
Capital and its Significance: Types of Capital – Estimation of fixed and working capital requirements – Methods and sources of raising fixed and working capital

Unit-V
Introduction to Financial Accountancy

Principles of Accountancy: Introduction to Accountancy, Double Entry System of Book Keeping-Meaning – Scope – Advantages, Journal Entries, Ledger, Preparation of Trial Balance.

Unit-VI
Final Accounts

Preparation of Final Accounts: Trading Account, Profit & Loss Account, Balance Sheet with adjustments, Final Accounts problems.

Text Books:
1. Varshiney and Maheswari, "Managerial Economics", Sultan Chand & Co, New Delhi
2. Y.K Bhushan, "Business Organization & Management", S Chand & Co., New Delhi.
3. S.P Jain and K.L Narang, "Financial Accounting", B.com First Year AndhraPradesh Universities, Kalyani Publishers, New Delhi.

Reference Books:
1. Shukla & Grewal, "Advanced Accountancy", S.Chand& Co., New Delhi
2. M.C Shukla, "Business Organization and Management", S.Chand& Co., New Delhi.

NOTE:

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

EE205: ELECTROMAGNETIC FIELDS (EMF)

(For B. Tech IV Semester)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
2	1	0	3

Course Outcomes:

CO1: Understand the principles of vector calculus.
CO2: Understand the laws of electric and magnetic fields Coulomb's law, gauss law, Biot-savart's law and Ampere circuit law.
CO3: Understand the interrelation between electromagnetic parameters with the help of vector calculus.
CO4: Understand the properties like inductance and capacitance in different media.
CO5: Understand the modification of Maxwell's equation for time-varying fields by extending the knowledge of static field theory.
CO6: Apply the electromagnetic concepts to electrical machines and transformers.
CO7: Understand the conduction, convection and displacement current densities.

Unit – I
Co-ordinate systems: Cartesian coordinates, Circular cylindrical coordinates, Spherical coordinates & their transformations. Differential length, area and volume in different coordinate systems**,** Physical interpretation of gradient, divergence and curl- Numerical problems
Unit – II
Electrostatic Fields: Electrostatic Fields – Coulomb's Law – Electric Field Intensity (EFI) – EFI due to a line and a surface charge – Work done in moving a point charge in an electrostatic field – Electric Potential – Properties of potential function – Potential gradient – Guass's law – Application of Guass's Law – Maxwell's first law, div(D) = ρ_v,Laplace's and Poison's equations and its solution. Electric dipole – Dipole moment – potential and EFI due to an electric dipole – Torque on an Electric dipole in an electric field.
Unit – III
Conductors, Dielectric & Capacitance: Behavior of conductors in an electric field – Conductors and Insulators. Electric field inside a dielectric material – polarization – Dielectric – Conductor and Dielectric – Dielectric boundary conditions, Capacitance – Capacitance of parallel plate and spherical capacitors – Energy stored and energy density in a static electric field – Current density – conduction and Convection current densities – Ohm's law in point form – Equation of continuity

Unit – IV
Magneto Statics: Static magnetic fields – Biot-Savart's law ,Magnetic field intensity (MFI) – MFI due to a straight current carrying filament – MFI due to circular, solenoid current Carrying wire –Maxwell's second Equation, div(B)=0. Ampere's circuital law and its applications– Point form of Ampere's circuital law – Maxwell's third equation, Curl (H)=Jc.

Unit – V
Force in Magnetic fields: Magnetic force - Moving charges in a Magnetic field – Lorentz force equation – force on a current element in a magnetic field – Force on a straight, long current and two straight long and parallel current carrying conductors – Magnetic dipole and dipole moment– Torque on a current loop placed in a magnetic field.

Self-inductance and mutual inductance- Neumans's formulae – determination of self-inductance of a solenoid, toroid and mutual inductance between a straight long wire and a square loop wire in the same plane – energy stored and density in a magnetic field.

Unit – VI
Time Varying Fields: Time varying fields – Faraday's laws of electromagnetic induction – Its integral and point forms – Maxwell's fourth equation, $Curl(E) = -\dfrac{\delta B}{\delta t}$ Statically and Dynamically induced EMFs – Simple problems -Modification of Maxwell's equations for time varying fields – Displacement current – Poynting Theorem and Poynting vector.

TEXT BOOKS:
1. William H. Hayt & John. A. Buck (2006), "Engineering Electromagnetics", Mc. Graw-Hill Companies, 7th Editon.
2. S.Sivanagaraju ,C.Srinivasa Rao (2008), "Electromagnetic Fields", New Age publishers, India.
3. K.A. Gangadhar (2003), "Field Theory", 15th Edition, Khanna Publications.

REFERENCE BOOKS:
1. Umesh Sinha (1995), "Electromagnetic theory", 6th Editin, Satya publications.
2. Joseph Edminister (2004), "Electromagnetic", 2nd Edition, Schaum's outline series TMH.
3. J.D.Kraus (2003), "Electromagnetics with Applications",5th Edition, Mc Graw-Hill Inc. 5th edition .

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

EE206-ELECTRICAL MACHINES – II (EMC 2)
(For B. Tech IV Semester)

Scheme   : 2013
Internal Assessment : 30
End Exam   : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
3	-	-	3

Course Outcomes:

CO1: Understand the constructional aspects and operation of 1-phase, auto transformer and poly phase transformers.
CO2: Analyze the performance characteristics of 1-phase, auto transformer and poly phase transformers through different testing methods.
CO3: Understand the principle and operation of 3-phase and 1-phase induction motor.
CO4: Analyze the performance characteristics of 3-phase and 1-phase induction motors**.**
CO5: Understand methods of starting and speed control employed for induction machines.

Unit – I
Single-Phase Transformers operation and testing: Operation on no-load and load, phasor diagrams, Equivalent circuit, Losses and efficiency, Per unit system, Regulation, All-day efficiency, Effect of variations of frequency & supply voltage on Iron losses. Open circuit and short circuit tests, Sumpner's test, Predetermination of efficiency and regulation, separation of losses test-numerical problems, parallel operation of transformers.

Unit – II
Autotransformer and Polyphase Transformers: Autotransformers-equivalent circuit-comparison with two-winding transformers numerical problems. Polyphase transformer connections, third harmonics in phase voltages, three-winding transformers, tertiary windings, transients in switching, off-load and on-load tap changing transformers, Scott connection, numerical problems.

Unit – III
Three-phase Induction motor characteristics : Basic principles, rotor reactance, rotor current and power factor at standstill and during operation, phasor diagram, Rotor input, Losses and power flow diagram, Torque equation-expressions for maximum torque and starting torque, torque - slip characteristics, crawling and cogging, double-cage and deep-bar rotors, No-load and blocked-rotor tests, equivalent circuit & Circle diagram & predetermination of performance, numerical problems.

Unit – IV
Starting & Speed control of Induction motors: Types of starters-direct online starting, stator reactor starting, autotransformer starting, star-delta starting, rotor resistance starter and starting

current and starting torque calculations, Speed control – change of frequency, change of poles-methods of consequent poles–cascade connections, rotor resistance method, injection of an emf into rotor circuit (qualitative treatment only), induction generator (qualitative treatment only), numerical problems.

Unit –V
Single phase Induction motors: Single phase induction motor-constructional features, double revolving field theory, Cross field revolving theory, equivalent circuit, performance calculations of single phase induction motor, determination of equivalent circuit parameters – numerical problems.

Unit-VI
Types of Single Phase Induction motors:
Starting methods and types - split-phase induction motors, capacitor motors, capacitor start motors, two value capacitor motors, permanent split capacitor (PSC) motor, shaded pole induction motor, speed control methods.

TEXT BOOKS:
1. P.S. Bimbhra, (2009) "Electrical machinery", 7th Edition, Khanna Publishers.
2. I.J. Nagrath & D.P. Kothari, (2004), "Electric Machines", 3rd Edition, Tata McGrawhill Publishers.
3. P.S. Bimbhra, (2002), "Generalized Theory of Electrical machines", 5th Edition, Khanna Publishers.
4. M.G.Say, (2002), "The Performance and Design of Alternating Current Machines", 3rd Edition, CBSPublishers.
5. Ashfaq Hussain, "Electrical Machines" Second Edition, Dhanpat Rai Publishers.
REFERENCE BOOKS:
1. Langsdorf, (2002) "Theory of Alternating Current Machinery", TMH Publishers,2nd edition.
2. A.E. Fitzgerald, C. Kingsley and S. Umans (2003) "Electric Machinery", 6th Edition, Tata McGraw-HillCompanies.
3. E. Openshaw Taylor , "The performance and design of A.C. commutator motors" , Ah Wheeler & Co Ltd,

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

EE207-POWER SYSTEMS – I (PS1)
(For B. Tech IV Semester)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
2	1	-	3

Course Outcomes:

CO1: Understand the operation of conventional thermal and hydro power plants.
CO2: Understand the operation of Gas and Nuclear power stations.
CO3: Understand the estimation of electric power and able to plot the power demand in the form of load curve.
CO4: Apply the tariff methods and the Depreciation methods for economic aspect.
CO5: Understand the importance of power factor improvement and Voltage control.
CO6: Understand the electrical design and classification of transmission lines in terms of transmission line parameters.

Unit: I
THERMAL AND HYDEL POWER STATIONS
Line diagram of Thermal Power Station (TPS) showing paths of coal, steam, water, air,ash and flue gasses - Brief description of TPS components: Economizers, Boilers, Super heaters, Turbines, Condensers, Chimney and Cooling towers.
Hydro – Electric Power stations: Arrangement and location of hydro electric station, principle of working of a hydro electric plants, components, Advantages and disadvantages.

Unit: II
GAS AND NUCLEAR POWER STATIONS
Gas Power Stations: Principle of Operation and Components (Block Diagram Approach Only)
Nuclear Power Stations: Nuclear Fission and Chain reaction.- Nuclear fuels.-Principle of operation of Nuclear reactor.-Reactor Components: Moderators, Control rods, Reflectors and Coolants.-Radiation hazards: Shielding and Safety precautions.- Types of Nuclear reactors and brief description of PWR,BWR and FBR.

Unit: III
ECONOMIC ASPECTS OF POWER GENERATION
Load curve, load duration and integrated load duration curves-load, demand, diversity, capacity, utilization and plant use factors- Numerical Problems.
Tariff Methods: Costs of generation and their division into Fixed, Semi-fixed and Running Costs. Desirable Characteristics of a Tariff Method.-Tariff Methods: Flat Rate, Block-Rate, two-part, three –part, and power factor tariff methods, Types of Depreciation and Numerical Problems.

Unit: IV
POWER FACTOR AND VOLTAGE CONTROL:
Causes of low p.f -Methods of Improving p.f -Phase advancing and generation of reactive KVAR using static Capacitors-Most economical p.f. for constant KW load and constant KVA type loads, Numerical Problems.

Unit: V
TRANSMISSION LINE PARAMETERS: Electrical design of Overhead Transmission Lines – Calculation of Line constants of Single phase, 3-phase system of symmetrical, unsymmetrical and transposed configurations –Calculation of Line constants of stranded conductor, double circuit three phase system using GMD and GMR Concepts.
Introduction to dc & ac distribution systems (theoretical concepts only)

Unit : VI
PERFORMANCE OF TRANSMISSION LINES: Classification of Transmission Lines - Short, medium and long line and their model representations - Nominal-T, Nominal-π and A, B, C, D Constants for symmetrical networks, Numerical Problems and solutions for estimating regulation and efficiency of all types of lines. – Numerical Problems.
Text Books:
1. M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti (1999), "A Text Book on Power System Engineering", Dhanpat Rai & Co. Pvt. Ltd.
2. C.L. Wadhawa (1997), "Electrical Power Systems", New age International (P) Limited, Publishers.
3. B.R.Gupta (2002), "Generation of Electrical Energy", Eurasia Publishing House (pvt.) Ltd.New Delhi.

Reference Books:
1. M.V. Deshpande (1991), "Elements of Power Station design and practice", Wheeler Publishing.
2. S.N.Singh (2003), "Electrical Power Generation, Transmission and Distribution", PHI.
3. PP Wals, P.Fletcher (2004), "Gas turbine performance", Blackwell Publisher.
4. V.K Mehta and Rohit Mehta (2004), "Principles of Power Systems", S.Chand & Company, New Delhi.

NOTE:
End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.
Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ML203: BUSINESS ENGLISH AND TECHNICAL WRITING

(Common to B.Tech IV Semester CIVIL, EEE & ME and
V Semester ECE & CSE Branches)

Scheme   **: 2013**
Internal Assessment : 100
Duration of Exam   **: 3hours**

L	T/D	P	C
1	2		2

The purpose of this course is to help the students enhance their proficiency in oral and written communication in English to enable them to use English effectively at the corporate workplaces with global presence.

Course Outcomes: At the end of the course students will be able to

     CO1:   Use grammatically acceptable English
     CO2:   Demonstrate all aspects of language skills for a successful professional career
     CO3:   Use English effectively in interpersonal and professional contexts
     CO4:   Write and deliver technical content effectively
     CO5:   Handle business correspondence effectively

Course Work

To achieve the objectives, the following course content is prescribed for the Business English and Technical Writing Laboratory Sessions.

Contents

- Revision of grammar and vocabulary:
  - articles, prepositions, tenses, concord
  - voices, reported speech, sentence types
  - synonyms, antonyms, one word substitutes, idioms, collocations
  - word making, affixes, commonly used foreign words, words often confused
  - jumbled sentences and jumbled paragraphs
  - common errors in English pertaining to both grammar and vocabulary (TOEFL type)

- Reading Comprehension – practice tests

- Listening Comprehension – practice tests

- Speaking skills with focus on correct pronunciation

- Writing Cover Letters for Job Applications/ Resume Preparation/ Statement of Purpose for Internships, Apprenticeships, Admissions in Universities, etc.

- Writing Technical Reports/ Proposals/Formats of Research Articles, Journal Papers, Project Reports

- Email writing

- Writing Business Letters/ Formats of Letters, Block Letters/Memos

References

1. Raj N Bakshi, "English Grammar Practice", Orient Longman.
2. Sangeeta Sharma & Binod Mishra, "Communication Skills for Engineers and Scientists", PHI Learning Private Limited.
3. Marilyn Anderson, Pramod K.Naya and Madhucchanda Sen, "Critical Reasoning, Academic Writing and Presentation Skills", Pearson Publishers.
4. M. Ashraf Rizvi, "Effective Technical Communication", Tata McGraw-Hill Publishing Company Ltd., 2005.
5. Raymond V. Lesikar, Marie E. Flatley, "Basic Business Communication: Skills for Empowering the Internet Generation", 11th Edition, Tata McGraw-Hill. 2006.
6. Dr A. Ramakrishna Rao, Dr G.Natanam & Prof S.A.Sankaranarayanan, "English Language Communication: A Reader cum Lab Manual", Anuradha Publications, Chennai, 2006.
7. Dr. Shalini Verma, "Body Language- Your Success Mantra", S.Chand, 2006.
8. Andrea J. Rutherford, "Basic Communication Skills for Technology", 2nd Edition, Pearson Education, 2007.

DISTRIBUTION AND WEIGHTAGE OF MARKS

Business English and Technical Writing Examination
For Business English and Technical Writing subject, there shall be continuous PC based evaluation during the semester for 80 marks and viva voce to be conducted by an external examiner for 20 marks.

EE208-ELECTRICAL CIRCUITS LAB (EC (P))
(For B. Tech EEE - IV Semester)

Scheme   : 2013
Internal Assessment : 30
End Exam   : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
-	-	3	2

Course Outcomes:

CO1:   Understand the theorems
CO2:   Analyze the effect of series and parallel resonance
CO3:   Analyze the impedance, Admittance and Transmission Line parameters
CO4:   Analyze the loci of RL and RC circuits.
CO5:   Analyze parameters of Air Core Transformer.

LIST OF EXPERIMENTS:

1. Verification of KCL & KVL through (a) experiment (b) simulation

2. Verification of Maximum Power Transfer Theorem through (a) experiment (b) simulation

3. Verification of superposition and Reciprocity theorem through (a) experiment (b) simulation

4. Verification of Thevenin's theorem through (a) experiment (b) simulation

5. Verification of Norton's theorem through (a) experiment (b) simulation

6. Determination of Self Inductance, Mutual Inductance and Co-efficient of Coupling of an air-core transformer

7. Series and Parallel Resonance

8. Determination of Impedance and Admittance Parameters

9. Determination of transmission line Parameters

10. Locus diagrams on RL and RC circuits

Note: A minimum of **eight** experiments should be conducted.

EE209-ELECTRICAL MACHINES – I LAB (EMC1 (P))
(For B. Tech EEE - IV Semester)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
-	-	3	2

Course Outcomes:

CO1: Obtain the performance characteristics of DC shunt machines under no load and for varying loads.
CO2: Perform tests on self excited DC Motor-Generator Sets.
CO3: Obtain the characteristics of dc compound machines.
CO4: Conduct the speed control test and Separate the losses test on dc shunt motor.

LIST OF EXPERIMENTS:

1. Open circuit characteristic (OCC) of DC shunt generator
2. Load test on DC shunt generator
3. Brake test on DC compound motor
4. Swinburne's test on DC machine
5. Brake test on DC shunt motor.
6. Hopkinson's test.
7. Field's test.
8. Speed control of DC shunt motor.
9. Separation of losses of DC shunt motor.
10. Load test on DC compound generator.

Note: A minimum of **eight** experiments should be conducted

EC212: ELECTRONIC DEVICES & ANALOG CIRCUITS LAB (ED&AC (P))
(For B.Tech EEE IV-Semester)

Scheme   : 2013
Internal Assessment : 30
End Exam   : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
0	0	3	2

Course Outcomes:

CO1: Understand the V-I characteristics of pn diode, zener diode, BJT and FET

CO2: Understand the application of pn diode as a rectifier and zener diode as a voltage regulator

CO3: Analyze the effect cascading in amplifiers

CO4: Analyze the effect negative feedback on amplifier characteristics

CO5: Generate a signal using RC phase shift oscillator

Electronics Workshop Practice (2 lab sessions)

1. Identification, specifications and testing of R, L, C components (colour codes), potentiometers, Bread boards, CDS, PCB.

2. Identification, specifications and testing of active devices : Diodes, BJT, FET, SCR, & UJT

3. Study and operation of Multimeters, Function generators, Regulated power supplies CRO & DSO

List of Experiments:

1. Forward and reverse bias characteristics of PN junction diode

2. Zener diode characteristics and Zener diode as voltage regulator.

3. Half Wave Rectifier with and without filters.

4. Full Wave Rectifier with and without filters.

5. Input and output characteristics of BJT in CB Configuration.

6. Input and output characteristics of BJT in CE Configuration.

7. FET Characteristics.

8. Two stage RC Coupled Amplifier

9. Boot Strap Emitter Follower

10. Darlington Emitter Follower

11. Common Source FET Amplifier

12. CE Amplifier (with & without Feedback)
    i)   Current Series Feedback

13. Voltage Shunt Feedback

14. RC Phase Shift Oscillator

Note: A minimum of **Ten** experiments should be conducted

FIFTH SEMESTER

S No	Course No	Course Title	Credits	Scheme of Instruction periods/week			Scheme of Examination		
				L	T	P	End Exam Marks	Internal Assessment Marks	Total Marks
1.	EE301	Electrical Machines – III	3	3	-	-	70	30	100
2.	EE302	Power Systems – II	3	3	-	-	70	30	100
3.	EE303	Power Electronics-I	3	3	-	-	70	30	100
4.	EE304	Linear Control Theory	3	2	1	-	70	30	100
5.	EC316	Pulse and Digital Circuits	3	3	-	-	70	30	100
6.	EE305	Network Theory & Signals and Systems	3	2	1		70	30	100
7.	ML202	Soft Skills	2	1	2	-	-	100	100
8.	EE306	Electrical Machines - II Lab	2	-	-	3	70	30	100
9	EC317	Pulse and Digital Circuits Lab	2	-	-	3	70	30	100
			24	18	2	6	560	340	900

EE301: ELECTRICAL MACHINES – III (EMC-3)
(For B. Tech EEE - V Semester)

Scheme   : 2013
Internal Assessment : 30
End Exam   : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
3	-	-	3

Course Outcomes:

CO1: Understand the constructional aspects, working principle and armature windings of synchronous machines.
CO2: Analyze the performance characteristics of salient and non salient pole synchronous alternators.
CO3: Discuss about synchronization, parallel operation and load sharing, effect of change of excitation and mechanical power input of alternators.
CO4: Analyze the performance characteristics of synchronous motor, methods of starting and its applications.
CO5: Understand the performance of AC series, Universal, Stepper motor, Switched Reluctance Motor, Permanent magnet BLDC motor and their applications.

Unit – I
Alternators : constructional features, types, Principle of operation, Armature windings, integral slot and fractional slot windings, Distributed, concentrated and chorded windings, distribution, pitch and windings factors, EMF equation, Harmonics in generated emf, slot harmonics and suppression of harmonics, numerical problems.

Unit – II
Characteristics of Alternators: Armature reaction, leakage reactance, synchronous reactance and impedance, experimental determination of synchronous reactance, phasor diagrams, load characteristics, Regulation of Alternators: Regulation of alternator by synchronous impedance method, M.M.F. method and Z.P.F method, two reaction analysis, experimental determination of X_d and X_q, phasor diagrams, regulation of salient pole alternators, numerical problems.

Unit – III
Parallel operation of Alternators: Synchronization of alternators with infinite bus bars , synchronizing power, parallel operation and load sharing, effect of change of excitation and mechanical power input, transient & sub-transient reactances and time constants, numerical problems.

Unit – IV
Synchronous motors : Theory of operation, phasor diagram, variation of current and power factor with excitation, synchronous condenser, mathematical analysis for power developed, numerical problems.

Unit – V
Excitation and power circles, hunting and its suppression, methods of starting, synchronous induction motor, numerical problems.

Unit – VI
Special machines:
Principle, performance and applications of AC Series motor, Universal motor, stepper motor and Switched reluctance motor. Permanent magnet brushless DC motor, Principle of operation, Types, EMF and torque equations, Motor characteristics and control. Permanent magnet synchronous motors, Principle of operation, EMF and torque equations, Reactance, Phasor diagram, Torque speed characteristics.

TEXT BOOKS:
1. P.S. Bimbhra, "Electrical machinery", 7th Edition, Khanna Publishers. 2009
2. I.J. Nagrath & D.P. Kothari,, "Electric Machines", 3rd Edition, Tata McGrawhill Publishers. 2004
3. P.S. Bimbhra, "Generalized Theory of Electrical machines", 5th Edition, Khanna Publishers. 2002
4. M.G.Say, "The Performance and Design of Alternating Current Machines", 3rd Edition, CBS Publishers. 2002
5. E.O.Taylor, "The Performance and Design of AC commutator Machines", 3rd Edition, CBS Publishers. 1997

REFERENCE BOOKS:
1. Langsdorf, "Theory of Alternating Current Machinery", Tata McGraw-Hill Companies, 2nd edition. 2002
2. A.E. Fitzgerald, C. Kingsley and S. Umans "Electric Machinery", 6Th Edition, Tata McGraw-Hill Companies, 2003

NOTE:

Internal Assessment: The question paper for sessional examination shall have one *Compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions

End Exam: The question paper for end examination shall consist of One *Compulsory* question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

EE 302: POWER SYSTEMS – II (PS-2)
(For B. Tech EEE - V Semester)

L	T/D	P	C
3	-	-	3

Scheme   : 2013
Internal Assessment : 30
End Exam   : 70
End Exam Duration : 3 Hrs

Course Outcomes:

CO1: Understand various types of insulators based on their applications.
CO2: Analyze the transmission line sag and tension for equal, unequal heights of towers.
CO3: Understand the construction and types of underground cables.
CO4: Analyze per unit quantities, changing the base of per-unit quantities, per unit analysis of power systems.
CO5: Analyze the system performance when there is a fault and also calculate the corresponding fault current.
CO6: Understand types of stability of power system by various methods.

Unit – I
Performance of Factors affecting the Transmission line: Skin and Proximity effects, Ferranti effect, Charging Current - Corona - factors affecting corona, critical voltages and power loss.
Overhead Line Insulators: Types of Insulators, String efficiency and Methods for improvement, voltage distribution, calculation of string efficiency, Numerical Problems.
Unit –II
Sag and Tension Calculations: Sag and Tension Calculations with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor, Stringing chart, Numerical Problems.
Underground Cables: Types of Cables, Construction, Types of Insulating materials, Calculations of Insulation resistance and stress in insulation, Numerical Problems. Capacitance of Single and 3-Core belted cables, Numerical Problems. Grading of Cables, Capacitance grading, Inter-sheath grading, Numerical Problems.
Unit – III
Short Circuit Analysis-I: Per-Unit System, Per-Unit equivalent reactance network of a three phase Power System, Numerical Problems.
Symmetrical fault Analysis: Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors, Numerical Problems.
Unit – IV
Short Circuit Analysis-II: Symmetrical Component Theory, Symmetrical Component Transformation, Positive, Negative and Zero sequence components of Voltages, Currents and Impedances.
Sequence Networks: Positive, Negative and Zero sequence Networks, Numerical Problems.
Unsymmetrical Fault Analysis: LG, LL, LLG faults with and without fault impedance, Numerical Problems.

Unit –V
Power System Steady State Stability Analysis: Elementary concepts of Steady State, Dynamic and Transient Stabilities. Steady State Stability Power Limit, Transfer Reactance, Synchronizing Power Coefficient, Power Angle Curve and Determination of Steady State Stability and Methods to improve Steady State Stability.

Unit –VI
Power System Transient State Stability Analysis: Derivation of Swing Equation. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Critical Clearing Angle Calculation- Solution of Swing Equation using Point-by-Point Method, Methods to improve transient Stability.

TEXT BOOKS:
1. M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarthy, "A Text Book on Power System Engineering", Dhanpat Rai & Co Pvt. Ltd. 1999.
2. C.L.Wadhwa, "Electrical power systems", New Age International (P) Limited, Publishers, 1998.
3. W.D.Stewenson, "Elements of power system analysis" McGraw-Hill, 1982.
4. B.R.Gupta, "Power System Analysis and Design", S.chand Publishing. 1998.
5. I.J.Nagarath and D.P.Kothari, "Modern Power System Analysis", Tata McGraw Hill, 2nd Edition. 2004

REFERENCE BOOKS:

1. John J Grainger William D Stevenson, "Power system Analysis", TMC Companies, 4th edition, 2004
2. Hadi Saadat, "Power System Analysis", TMH Edition. 2002

NOTE:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

EE 303: POWER ELECTRONICS-I (PEL-1)
(For B. Tech EEE - V Semester)

Scheme   : 2013
Internal Assessment : 30
End Exam   : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
3	-	-	3

Course Outcomes:

CO1: Understand the representation, structure, characteristics of power semi conductor devices like diode, SCR, TRIAC, MOSFET & IGBT.
CO2: Understand the turn on and turn off methods of SCR, design features of driver circuit
CO3: Understand the performance of half wave, full wave, half controlled and fully controlled 1-Φ and 3-Φ bridge rectifiers for R and RL loads
CO4: Understand the effect of source inductance, power factor improvement schemes of 1-Φ controlled rectifiers.
CO5: Understand the four quadrant operation of 1-Φ and 3-Φ dual converters in circulating and non-circulating current modes.
CO6: Understand the operation of 1-Φ to 1-Φ, 3-Φ to 1-Φ and 3-Φ to 3-Φ cyclo converters for R and RL loads.

Unit – I
Power Semiconductor Devices: Introduction, advantages and applications of power electronics, Classification of Semiconductor Devices, Basic theory of operation and characteristics of Power diodes, Power BJT, Power MOSFET, IGBT, TRIAC, Dynamic and gate characteristics of SCR. Protection of SCRs - Snubber circuit.
Unit – II
Triggering methods: Principle and features of firing circuits, simple R and RC triggering circuits, UJT pulse firing circuit, Firing circuit using ramp control scheme for SCR. Role of pulse transformer in firing circuits, Driver circuit for IGBT/ MOSFET.
Thyristor Commutation Techniques: Line commutation, load commutation, forced commutation and external pulse commutation, simple problems.
Unit –III
1-Phase Controlled Rectifiers: principle of phase control technique, single phase half wave, half controlled and fully controlled rectifiers, Bridge configurations with R and RL loads with and without freewheeling diode, derivations of rms and average values, active and reactive power inputs, input power factor, Simple problems.
Unit – IV
3-Phase Controlled Rectifiers: 3-phase half controlled and fully controlled rectifiers, Bridge and mid-point configurations with R and RL loads, derivations of r.m.s and average values, simple problems.

Unit – V
Power factor improvement schemes for 1-Phase rectifiers- Extinction angle control, symmetric angle control, pulse width modulation control. Effect of source inductance on single-phase controlled rectifiers.

Unit – VI
Dual converters: 1-phase and 3-phase dual converters with circulating and non-circulating current operation, four-quadrant operation, simple problems.

Cycloconverters : Basic principle of operation, 1-phase to 1-phase cyclo converters with R and RL loads, output voltage equation. 3-phase to 1-phase, 3-phase to 3-phase cyclo converter circuits (Principle of operation only),

TEXT BOOKS:
1. M.D. Singh and K.B. Khanchandani , "Power Electronics", 2nd Edition, Tata McGraw Hill Publishers. 2002.
2. P.S. Bimbhra , "Power Electronics", 4th Edition, Khanna publishers. 2010.
3. P.C. Sen, , "Power Electronics", 35th Reprint, Tata McGraw Hill Publishers. 2010.
4. Ashfaq Ahmed, , "Power Electronics for Technology" First Indian Reprint, Pearson Education Publishers. 2003.
5. O.P.Arora, "Power Electronics Laboratory", Narosa publications 2012

REFERENCE BOOKS:
1. Vedam Subrahmanyam , "Power Electronics", New age international publishers. 1996.
2. J.Vithayathil , "Power Eletronics: Priciples and Applications", 2nd Edition reprint, Tata McGraw Hill Publishers. 2010.
3. M.H. Rasheed , "Power Electronics Circuits Devices and applications", 3rd Edition, PHI publishers. 2004.
4. Loganathan Umanand, "Power Electronics: Essentials and applications" Wiley India Pvt. Limited, 2009.

NOTE:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

EE 304: LINEAR CONTROL THEORY (LCT)
(For B. Tech. EEE – V Semester)

Scheme   : 2013
Internal assessment : 30
End Exam Marks   : 70
End Exam duration : 3 hrs

L	T/D	P	C
2	1	-	3

Course Outcomes:

CO1: Understand the behavior of open loop and closed loop systems and analyze the mathematical model of a system.
CO2: Determine transfer function of complex control system using block diagram reduction technique and signal flow graph using mason's gain formula.
CO3: Determine the transient and steady state performance of second order control systems.
CO4: Analyze the stability of a control system through analytical and graphical techniques in time and frequency domain.
CO5: Able to realize the compensators for control systems.
CO6: Estimate the state model, controllability and observability of control systems.

Unit – I
Modeling of Linear Systems: Open-loop and closed-loop systems, control system components, servomotors, tachometer, synchros, position control systems, Transfer functions, equations of electrical and mechanical systems.
Unit – II
Block Diagrams: Block diagram representation and manipulation, signal flow graphs-mason's gain formula to determine overall system gain.
Feedback Characteristics of Control Systems: Feedback and non-feedback systems, effects of feedback, regenerative feedback.
Unit – III
Time Response: Types of input, transient response of second order system for step input, time-response specifications, steady state error and error constants, proportional, derivative and integral controls.
Concept of Stability: Stability of systems, Routh Hurwitz criterion, Relative stability.
Unit – IV
Root Locus: Definition of Root Locus, construction Procedure, properties of typical systems analyzed by root locus techniques.
Frequency Response: Co-relation between time and frequency response, frequency domain specifications, resonant peak (Mp) and resonant frequency(Wp) for a second order system, relative stability-gain margin(GM) and phase margin (PM),
Unit – V
Frequency Plots: Bode plots, Polar plots, Nyquist criterion for open loop stable system, M and N circles,

Unit – VI

Compensation (Without Design): The necessity of compensation, series and parallel compensation, Realization of basic lead, lag and lead-lag compensators.

State Variable Analysis: Introduction, concepts of state, state variables, state-space representation using phase variable and physical variables, state model, state model of linear systems, state transition matrix, solution of state equations, Concepts of Controllability and Observability.

TEXT BOOKS:

1. Nagrath and Gopal "Control systems Engineering", New Age International Publications,2003
2. B.C.Kuo , "Automatic Control Systems", Oxford,2003
3. K. Ogata , "Modern control Engineering", Pearson,2003
4. Naresh - K.Sinha , "Control Systems", New Age International Publishers,1998
5. B.S.Manke , "Linear Control Systems".1996

REFERENCE BOOKS:

1. Madan Gopal , "Control Systems", TMH. 2003
2. Dorf, Bishop , "Modern Conrtol systems", Addison Wesley,1998
3. (Shaum's out line series) , "Feedback control systems", TMH,1986.
4. R.C.Shukla, "Control Systems", Dhanpat Rai, 2004.
5. Ashok Kumar, "Control Systems", TMH, 2006.

NOTE:

Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

EC 316: PULSE AND DIGITAL CIRCUITS (PDC)
(For B.Tech EEE V Semester)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
3	0	0	3

Course Outcomes:

CO1: Understand and design passive and active wave shaping circuits.
CO2: Examine the switching operations of diode, transistor, digital circuit building blocks (multivibrators).
CO3: Understand the basic concepts of number systems, boolean algebra, logic gates & combinational circuits.
CO4: Understand and design of sequential circuits

Unit-I
Linear Wave Shaping: High pass, Low pass RC circuits, Their response for sinusoidal, Step, Pulse, Square and ramp inputs, RC network as differentiator and integrator.
Unit-II
Non Linear Wave Shaping: Diode clippers, Clipping at two independent levels, Transfer characteristics of clippers, Clamping operation, Clamping circuits using diode with different inputs, Clamping circuit theorem.
Unit-III
Switching Characteristics of Diode and Transistor: Diode as a switch, Piecewise linear diode characteristics, Transistor as a switch, Saturation parameters of Transistor and their variation with temperature, Transistor-switching times, Design of transistor switch**.**

Multivibrators: Design and Analysis of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using transistors.
Unit-IV
Number Systems: Binary, Octal, Decimal, Hexadecimal systems, Conversion of number systems, Weighted and non-weighted codes, Digital Data Representation: Fixed - Signed magnitude, 1's complement, 2's complement, Floating point – Biased exponent, Binary arithmetic, Hamming code, Error detection and correction.

Logic Gates and Simplification of Boolean Expressions: OR, AND, NOT, NAND, NOR, EX-OR and EX-NOR gates, Boolean theorems, Switching functions: types, Sum of products, Product of sum, Canonical forms, Minimization of Boolean functions using K-maps and tabulation methods.
Unit-V
Combinational Circuits: Binary adders and Subtractors using signed magnitude, 1's complement, 2's complement, Carry look-ahead adders (fast adders), BCD adders and Subtractors, Decoders, Encoders, multiplexers, De-multiplexers, Parity generator and checker, Code conversion circuits, Magnitude comparator.

Unit-VI

Sequential Circuits : Finite state model of sequential circuits, Flip-flops, shift registers, Asynchronous and Synchronous counters, Ring and Johnson counters, Design of non-binary counters, Synthesis of synchronous sequential circuits, Melay and Moore machines, Minimization of states.

Text Books:

1. Milliman and Taub, "*Pulse, Digital and Switching Waveforms*", McGraw-Hill.
2. M. Moris Mano, Charles R.Kime, "*Digital Logic and Computer Design Fundamentals*", 2nd Edition, Pearson Ed.
3. Zvi Kohavi, "*Switching and Finite Automata Theory*", TMH.
4. R.P.Jain, "*Modern Digital Electronics*", 3rd Edition, TMH.

Reference Books:

1. David .A. Bell, "*Solid State Pulse Circuits*", 4th Edition, PHI.
2. Wakerly, "*Digital Design- Principles and Practices*", 4th Edition, PHI.

NOTE:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

EE 305: NETWORK THEORY & SIGNALS AND SYSTEMS
(For B. Tech EEE - V Semester)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
2	1	-	3

Course Outcomes:

CO1: Understand the basics of network functions and their testing.

CO2: Outline different network realizations for the given transfer function.

CO3: List out continuous-time and discrete time systems and perform the basic operations.

CO4: Analyze the response for different electrical networks using Fourier transform.

CO5: Illustrate transient response of various electrical networks using Laplace transform.

CO6: Analyze the Z- transform for continuous time varying signals.

Unit-I
Network Functions:
Poles & Zeros of network function, Significance of poles and zeros, Elements of realisability, Hurwitz polynomial, positive real functions, testing, strum's test.

Unit-II
Elements of Network Synthesis:
Synthesis of one port LC networks, Foster and Cauer methods, Synthesis of RL, RC and LC one port networks using Foster and Cauer forms.

Unit-III
Introduction to Signals:
Basic continuous and discrete time signals, systems and their properties, classification of signals, analogy between vector and signal, principles of least squares, Orthogonality and completeness, trigonometric and exponential Fourier series, convergence Direchlets conditions, Sampling theorem.

Unit-IV
Fourier Transform Representation:
Fourier Transforms and properties, Fourier Transform of periodic signals, Perseval's theorem, Fourier transform of some common signals, circuit analysis using Fourier series.

Unit-V
Laplace Transform and Applications:
Introduction , Properties, Laplace transform of some common signals, Laplace transform of periodic signals, Inverse Laplace transform, Application of Laplace transform Methods of Analysis, Response of RL, RC, RLC Networks to Step, Ramp, and impulse functions.

Unit-VI

Z-Transforms: Introduction, Distinction between Laplace, Fourier and Z-Transforms, Region of convergence in Z-Transforms, properties of ROC, properties of Z-Transforms, Z-transform of some common signals, Inverse Z-Transform.

Text Books:

1. Joseph Edminister , "*Electric Circuits*", 2nd Edition, Schaum's Series , TMH 1983
2. Sivanaga Raju, G. Kishor and C. Srinivasa Rao , "*Electrical Circuit Analysis*", 2010 Cengage Learning
3. Roy Chowdary , "*Networks & Systems*" , New Age . 2007
4. Simon Haykin , "*Communication systems*", Wiley-Eastern. 2002
5. B.P.Lathi , "*Communication Systems*", Wiley Eastern. 2001

Reference Books:

1. I. Nagrath,S. Sharan,R Ranjan, " *Signals & Systems*",TMH., 2010
2. Vanvalken Berg ,"*Network Analysis*" 3rd Edition, PHI,2004
3. B.Kumar, "*Signals and Systems*", New Age International, 2011
4. L.Ravi Kumar, "*Signals and Systems*", Phi Leraning, 2009

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

ML202: SOFT SKILLS (SS)
(Common to B.Tech IV Semester ECE & CSE and
V Semester CE, EEE & ME Branches)

Scheme   : 2013
Internal Assessment : 100

L	T/D	P	C
1	2	0	2

Course Outcomes:

CO1: Demonstrate the competence to use grammar with an understanding of its basic rules.
CO2: Communicate effectively and enhance their interpersonal relationship building skills with renewed self confidence.
CO3: Work together in teams and accomplish objectives in a cordial atmosphere
CO4: Face interviews, GDs and give presentations
CO5: Understand and develop the etiquette necessary to present themselves in a professional setting

Course Work

- To achieve the objectives, the following course content is prescribed.

Contents

- Revision and reinforcement of language skills – grammar – vocabulary
- Communication Skills – Barriers to Communication – Strategies to overcome the barriers
- Non Verbal Communication – Body Language – Proxemics – Kinesics
- Emotional Quotient – self analysis of emotional responses
- Group Discussions – understanding the objective and skills tested in a GD – types of GDs – roles in a GD – dos and don'ts in a GD
- Team Work – importance of team work – team vs group – attributes of a successful team – working with groups – dealing with people – group decision making
- Goal Setting – importance of goal setting – difference between goals and dreams – importance of writing goals – SMART goals – short term goals – long term goals
- Time Management – scheduling – how to delegate effectively – plugging time leaks – learning to say "No"
- Presentation Skills – Oral Presentations – PPTs – Prepared Speeches – Extempore
- General Awareness & Current affairs
- Business Etiquette – telephone and email etiquette – dining etiquette – dos and don'ts in a formal setting

References

1. Stephen R. Covey, "The Seven Habits of Highly Effective People", Pocket Books Publishers, London
2. Infosys Campus Connect Portal –//http::campusconnect.infosys.com//
3. Shiv Khera, "You Can Win", MacMillan India Publishers, New Delhi
4. Stephen R. Covey, A. Roger Merrill and Rebecca R. Merril, "First Things First", Pocket Books Publishers, London
5. Gloria J.Galanes, Katherine Adams, John K Brillhart, "Effective Group Discussion: Theory and Practice".
6. Priyadarshani Patnaik, "Group Discussion and Interview Skills with VCD", Foundation Books.
7. Sangeeta Sharma & Binod Mishra, "Communication Skills for Engineers and Scientists", PHI Learning Private Limited.
8. Dr. Shalini Verma, "Body Language- Your Success Mantra", S.Chand, 2006.
9. Andrea J. Rutherford, "Basic Communication Skills for Technology", 2nd Edition, Pearson Education, 2007.
10. Krishna Mohan and Meera Bajerji, "Developing Communication Skills", MacMillan India Ltd.

DISTRIBUTION AND WEIGHTAGE OF MARKS

For the Soft Skills subject there shall be continuous tests for 50 marks and viva-voce for 50 marks.

EE306-ELECTRICAL MACHINES – II LAB (EMC-2 (P))
(For B. Tech EEE - V Semester)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
-	-	3	2

Course Outcomes:

CO1: Obtain the performance characteristics of 1-phase Transformers under no load and for varying loads.

CO2: Obtain the performance characteristics of 3-phase and 1-phase Induction machines under no load and for varying loads.

CO3: Perform tests on synchronous machine to obtain performance characteristics.

CO4: Perform tests on 1-phase transformers to verify 3-phase to 2-phase conversion and separate the losses.

LIST OF EXPERIMENTS

1. OC, SC and Load tests on 1-phase transformer

2. Sumpner's test on two identical single phase transformers.

3. Scott connection (3phase to 2phase conversion) of Transformer.

4. Polyphase connection of transformers

5. Separation of losses in a single phase transformer.

6. No – load test and Rotor blocked tests on single phase induction motor.

7. No – load test and Rotor blocked tests on three phase squirrel-cage induction motor

8. Brake test on three phase squirrel-cage induction motor.

9. Regulation of alternator using synchronous impedance and ZPF methods.

10. a. Synchronization of alternator and V & $\wedge$ curves of synchronous motor.

   b. Slip test on alternator to determine the X_d and X_q reactances.

Note: A minimum of **eight** experiments should be conducted

EC317: PULSE AND DIGITAL CIRCUITS LAB (PDC (P))
(For B.Tech. EEE - V Semester)

Scheme   : 2013
Internal Assessment : 30
End Exam   : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
0	0	3	2

Course Outcomes:
CO1: Design and analyze Linear and Non-linear wave shaping circuit characteristics.
CO2: Study and analyze the operation of Monostable, Bistable, Astable and Schmitt-trigger multivibrators.
CO3: Realize Boolean expressions using logic gates and design Half-adder and Full adder circuit.
CO4: Design and realize the truth tables for Multiplexer and Shift register.
CO5: Design and realize the truth tables of BCD-to Excess 3 and Decade counter.

List of Experiments :

1. Linear Wave Shaping.
2. Non-Linear Wave Shaping Clippers.
3. Non –Linear Wave Shaping Clampers.
4. Transistor as a Switch.
5. Astable Multivibrator.
6. Monostable Multivibrator.
7. Bistable Multivibrator.
8. Schmitt Trigger.
9. Sampling Gates.
10. Study of Logic Gates (Using Discrete Components) .
11. Verification of Logic Gates and Adders.
12. BCD to Excess-3 Code Converter.
13. Multiplexer & Decoder.
14. Shift Register and Ring Counter.
15. Asynchronous Decade Counter Equipment Required for the Lab.

Note: A minimum of 12 experiments should be conducted.

SIXTH SEMESTER

S. No.	Course No.	Course Title	Credits	Scheme of Instruction periods/week			Scheme of Examination		
				L	T	P	End Exam Marks	Internal Assessment Marks	Total Marks
1	EC308	Microprocessors and Microcontrollers	3	2	1	-	70	30	100
2.	EE307	Power Systems – III	3	3	-	-	70	30	100
3.	EE308	Power Electronics - II	3	3	-	-	70	30	100
4.	EC318	Integrated Circuits and Applications	3	3	-	-	70	30	100
5.	EE309	Instrumentation	3	3	-	-	70	30	100
6.		Interdisciplinary Elective	3	3	-	-	70	30	100
7.	EE310	Power Electronics Lab	2	-	-	3	70	30	100
8.	EC319	IC and Microprocessors Lab	2	-	-	3	70	30	100
9	EE311	Control and Automation Systems Lab	2	-	-	3	70	30	100
			24	**17**	**1**	**9**	**630**	**270**	**900**

EC308 : MICROPROCESSORS AND MICRCONTROLLERS (MP&MC)
(For B.Tech. ECE & EEE - VI Semester)

Scheme   : 2013
Internal Assessment : 30
End Exam   : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
2	1	-	3

Course Outcomes:
CO 1: Understand the definition, features and comparisons of 8 & 16 bit Microprocessors and 8 bit Microcontrollers.
CO 2: Understand the architecture of 16 bit processor Intel 8086 & 8 bit controller Intel 8051.
CO 3: Understand the addressing modes, instruction set and assembler directives of 8086 microprocessor and 8051 microcontrollers respectively.
CO 4: Use the programming model of 8086 microprocessor and the 8051 microcontroller for assembly language programs respectively.
CO 5: Understand the memory and peripherals interface with 8086 microprocessor
CO 6: Understand the memory and peripherals interface 8051 microcontroller.

Unit-I
Introduction of Microprocessors: 8-bit, 16-bit microprocessors. 8086: 8086 CPU architecture, segmented memory, Maximum mode and Minimum mode. Addressing modes,8086 instruction set.
Unit-II
8086 Programming model: Simple programs on Arithmetic operations Sorting, Searching, Code conversions, String manipulations. Assembler directives, Assembly language programming using MASM / TASM. Procedures & Macros.
Unit-III
8086 Interfacing: Memory Interfacing: Interfacing of Static memory and Dynamic memory.
I/O Interfacing: 8255 (Programmable Peripheral Interface), 8255 applications – Stepper Motor interfacing, DAC interfacing Waveform generation and ADC interfacing.
Unit-IV
Peripheral Interfacing: 8254(Programmable Timer / Counter), 8251(USART), 8257 (DMA Controller), 8259 (Programmable Interrupt Controller).
Unit-V
Introduction to MCS51 family: 8051 Micro controller Architecture, Input / Output ports and circuits, External memory, counters and Timers, Serial data input/output, interrupts.
Unit-VI
Programming and Interfacing: Instruction set, Programming with 8051 Micro controller. Interfacing LCD, LEDs, Stepper Motor.

Text Books:
1. A K Ray, K M Bhurchandi, *Advanced Microprocessors and Peripherals*, 2nd Edition, Tata McGraw Hill Education Private Ltd, 2010.
2. Mazidi Muhammad Ali, Mazidi Janice Gillespie & McKinlay Rolin D, *The 8051 Microcontroller and Embedded Systems*, 2nd Edition, Pearson Education, 2008.

Reference Books :
1. John Uffenbeck, *The 8086/8088 Family: Design, Programming, and Interfacing*, 3rd Edition, Pearson Ed, 2006.
2. Barry B. Brey, *The Intel Microprocessors-Architecture, Programming and Interfacing*, 8th Edition, Princeton Hall India,2009.
3. Kenneth J. Ayala, *The 8051 Microcontroller*, Penram International Publication Ltd, 2006.
4. Gaonkar Ramesh, *Microprocessors Architecture, Programming & Applications with 8085/8080A*, 5th Edition, Penram International publication Ltd, 2010.
5. N. Senthil Kumar, M. Saravanan, S. Jeevananthan, *Microprocessors and Microcontrollers*, 3rd Edition, Oxford University Press, 2010.
6. N. Senthil Kumar, M. Saravanan, S. Jeevananthan, *Microprocessors and Interfacing,* OUP India, 2012.
NOTE:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
3	-	-	3

Course Outcomes:

CO1: Understand the basic causes and effects of over voltages
CO2: Understand the principle of operation of circuit breakers
CO3: Understand protective relays against over currents and over voltages.
CO4: Design the protection schemes employed for transformers, alternators and bus bars.
CO5: Understand the concepts of lightning arresters

Unit – I
Power System Transients: Types of System Transients, travelling wave Phenomena, Attenuation, Distortion, Reflection and Refraction Coefficients, Termination of lines with different types of conditions - Open Circuited Line, Short Circuited Line, T-Junction (Numerical Problems).

Unit – II
Circuit Breakers: Elementary principles of arc interruption, Restriking and Recovery voltages, Restriking Phenomenon, Average and Max. RRRV, Numerical Problems. Current Chopping and Resistance Switching, CB ratings and Specifications, Numerical Problems. Auto reclosures.
Description and Operation of the following types of circuit breakers: Oil Circuit breakers, Air Circuit Breakers, Vacuum and SF_6 circuit breakers, advantages and disadvantages.

Unit – III
Electromagnetic and Static Relays: Principle of Operation and Construction of Attracted armature, Balanced Beam, induction Disc and Induction Cup relays.
Relays Classification: Over current& under voltage relays, Direction relays, Differential Relays and Percentage Differential Relays.
Distance relays: Universal torque equation, Impedance, Reactance, Mho and Off-Set Mho relays, Characteristics of Distance Relays and Comparison.
Static Relays: Static Relays, advantages and disadvantages.

Unit – IV
Generator Protection: Protection of generators against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection. Numerical Problems.
Transformer Protection: Protection of transformers: Percentage Differential Protection, Protection against magnetizing inrush currents, Buchholz relay Protection. Numerical Problem

Unit –V
Feeder and Bus-Bar Protection: Protection of Lines: Over Current, Three-zone distance relay protection using Impedance relays. Translay Relay.
Protection of Bus bars, Differential protection.

Neutral Grounding: Grounded and Ungrounded Neutral Systems.- Effects of Ungrounded Neutral on system performance. Methods of Neutral Grounding: Solid, Resistance, Reactance - Arcing Grounds and Grounding Practices.

Unit – VI

Protection against over voltages: Causes for over voltages in power systems. Protection against Lightning Over Voltage, Valve type and Zinc-Oxide Lighting Arresters , Insulation Coordination -BIL, Impulse Ratio, Standard Impulse Test Wave, Volt-Time Characteristics.

TEXT BOOKS:

1. Paithankar and S.R.Bhide , *"Fundamentals of Power System Protection"*, PHI 2003
2. Badari Ram , D.N Viswakarma, "*Power System Protection and Switchgear*", TMH Publications 2005

REFERENCE BOOKS:

1. Sunil S Rao , "*Switchgear and Protection*", Khanna Publlishers,1995
3. C R Mason , "*Art & Science of Protective Relaying*", Wiley Eastern Ltd. 1991
4. C.L.Wadhwa , "*Electrical Power Systems*", 3rd edition New Age international (P) Limited, Publishers, 2010
5. B.L.Soni, Gupta, Bhatnagar, Chakrabarthy , "*A Text book on Power System Engineering*", Dhanpat Rai & Co., 2006

NOTE:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

EE 308: POWER ELECTRONICS-II (PEL-2)
(For B. Tech EEE - VI Semester)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
3	-	-	3

Course Outcomes:.

CO1: Understand the operation of 1-Φ and 3-Φ AC voltage controllers for R and RL loads.
CO2: Understand the basic differences between VSI and CSI, working/operation of line commutated, load commutated and forced commutated inverters.
CO3: Determine the performance of 1-Φ voltage source inverter with Single, Multiple, Sine PWM techniques.
CO4: Understand control strategies and multi-quadrant operation of DC-DC converters.
CO5: Understand the operation of single stage (Buck, Boost and Buck-Boost), two stage (fly back, push pull, half bridge and full bridge) DC-DC converters.
CO6: Understand the operation of power electronics applications like UPS, Fan Regulator and simple battery charging circuits.

Unit – I
AC Voltage controllers : 1-phase AC Voltage regulators with R and RL loads, 3-phase AC voltage regulators with R-load, derivation of rms load voltage, current and power factor, wave forms, simple problems.

Unit – II
Single-Phase Inverters: Classification of single-phase inverters, basic series and parallel inverters, single-phase half and full-bridge inverters with R and RL Loads. Pulse Width Modulation schemes for inverters- single, multiple, sinusoidal PWM techniques, principle and operation of 1-phase current source inverters (CSI), simple problems.

Unit – III
Three-phase inverters: principle and operation of 3-phase VSI with 180° and 120° modes of operations, comparison of two conducting modes, voltage control of three-phase VSI using PWM techniques, Harmonic reduction by PWM methods, principle and operation of three-phase CSI, comparison of VSI and CSI, simple problems.

Unit – IV
DC–DC converters-I: Principle of operation of choppers, control strategies- time ratio control and current limit control, multi quadrant (two and four quadrant) choppers, time domain analysis of step down chopper, simple problems.

Unit – V
DC–DC converters-II: Buck converter, boost converter, buck- boost converter, Introduction to Resonant Converters, Zero current and zero voltage switching resonant converters.

Unit – VI

Switched Mode Power Supplies: The basic configuration of fly back, push pull, half bridge and full-bridge SMPS.

Applications: Uninterruptable Power Supplies (UPS), Fan regulator, simple battery charger. (Theoretical aspects only)

TEXT BOOKS:
1. M.D. Singh and K.B. Khanchandani , "*Power Electronics*", 2nd Edition, Tata McGraw Hill Publishers. 2002
2. P.S. Bimbhra , "*Power Electronics*", 4th Edition, Khanna publishers. 2010
3. P.C. Sen, , "*Power Electronics*", 35th Reprint, Tata McGraw Hill Publishers. 2010
4. Ashfaq Ahmed,, "*Power Electronics for Technology*" First Indian Reprint, Pearson Education Publishers. 2003
5. Harish C Rai , "*Industrial and Power Electronics*" 5th Edition, Galgotia Publishers. 1993

REFERENCE BOOKS:
1. Vedam Subrahmanyam , "*Power Electronics*", New age international publishers. 1996
2. J.Vithayathil ,"*Power Eletronics: Priciples and Applications*", 2nd Edition reprint, Tata McGraw Hill Publishers. 2010
3. M.H. Rasheed , "*Power Electronics Circuits Devices and Applications*", 3rd Edition, PHI publishers. 2004
4. O.P.Arora, "*Power Electronics Laboratory*", Narosa publications 2012
5. Loganathan Umanand, "*Power Electronics: Essentials and applications*" Wiley India Pvt. Limited, 2009

NOTE:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

EC 318: INTEGRATED CIRCUITS AND APPLICATIONS (ICA)
(For B.Tech EEE - VI Semester)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
3	-	-	3

Course outcomes:
CO1: Understand AC & DC characteristics of operational amplifier
CO2: Understand applications of Op-amps
CO3: Understand 555 timer, PLL & Voltage regulators
CO4: Understand A/D, D/A converters and logic families

Unit-I
Op-Amp Fundamentals: Differential amplifier concept, op-amp ideal characteristics, Practical inverting and non-inverting op-amp, Study of typical IC op-amp and its different stages, Features of 741 op-amp, dc characteristics: i/p bias current, i/p offset current, Offset voltages, Offset balance, Thermal drift, ac characteristics: frequency response, stability of op-amp, Frequency compensation, Slew rate, op-amp parameters.

Unit-II
Op-amp Applications-I : Summing amplifier, difference amplifier, Current to voltage and voltage to current converters, Instrumentation amplifier, clippers and clampers, Precision AC to DC converters, Integrator, Differentiator, Log & antilog amplifier, Sample and hold circuits.
Op-amp Applications-II
Comparators and active filters: Comparators, window detector, Schmitt trigger, Pulse, Square and triangle wave generators, Active filters (Butterworth filters up to second order only).

Unit-III
Timers & Waveform Generators: 555 Timer: Astable and Monostable modes, Applications, waveform generators: IC 566 and IC 8038.
Phase Locked Loops: Principle of operation, Lock and capture ranges, Detailed study of different blocks of PLL, IC 565 PLL, Applications of PLL.

Unit-IV
IC Regulators: General form of series Regulators, Fixed voltage regulator, IC 723 voltage regulator, Switching regulators (SMPS).

Unit-V
D/A and A/D Converters : DACs, Weighted resistor, R-2R ladder type and inverted R-2R ladder, ADCs: Parallel comparator type, Successive approximation and dual slope types, over sampling ADC, Specifications of converters.

Unit-VI
Logic Families: Specifications of logic gates, DTL, HTL, TTL, ECL, MOS and CMOS circuits, CMOS bilateral switch, Comparison of logic families, TTL driving CMOS and CMOS driving TTL.

Text Books:
1. Roy Choudhury & Shail B.Jain, *"Linear Integrated Circuits"*, 4/e, New Age Int. Pub. 2010.
2. Ramakanth A. Gayakwad, *"Op-Amps & Linear ICs"*, 4/e, PHI, 2003.
3. Moris Mano, *"Digital Logic and Computer Design"*, Pearson Ed., 2011.

Reference Books:
1. S. Salivahanan, V.S.K. Bhaaskaran, *"Linear Integrated Circuits",* TMH, 2008.
2. Anand Kumar, *"Pulse and digital Circuits",* PHI, 2/e, 2010.
3. R.P. Jain, *"Modern Digital Electronics"*, TMH, 3/e, 2003.

NOTE:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

EE 309: INSTRUMENTATION (INS)
(For B. Tech EEE - VI Semester)

Scheme : 2013
Internal assessment : 30
End Exam Marks : 70
End Exam duration : 3 hrs

L	T/D	P	C
3	-	-	3

Course Outcomes:

CO1: Understand the concept of electromechanical system, fluidic system & heat transfer in the design of process control systems.
CO2: Understand the classification of transducer.
CO3: Understand the determination of strain, torque, displacement, velocity, angular velocity, temperature, pressure and vaccum using transducer.
CO4: Understand the concept of measuring frequency, phase with oscilloscopes.
CO5: Understand the concept of digital voltmeters and wave analyzer.
CO6: Understand the concept of recording devices and industrial testing methods like surge and insulation testing.

Unit – I
Dynamic Characteristics of Instruments: Generalized performance of Systems, Zero, First, Second order systems. Choice of instruments. Electromechanical Systems, Thermal systems, Fluidic systems,Liquid Manometer System, Pneumatic System, A Flapper Nozzle system.
Unit – II
Transducers: Transducers, Advantages of Electrical Transducers, Classification of transducers, Resistor, Inductor & Capacitor transducers. Strain Gauge, types , Measurement of Strain, Gauge Factor , Gauge sensitivity. Thermistor, Thermocouples, LVDT, Synchros.
Unit-III
Measurement of Non –Electrical Quantities: Temperature compensation, load cell Vacuum Gauges. Torque measurement, Strain Guage torque meters, Inductive Torque transducers, Digital methods, Magnetostrictive transducers. Measurement of Angular Velocity using Tachometers and Digital methods LVDT type Accelerometer.
Unit-IV
Electronics Measurements and Instrumentation-I : Study of CRO, Measurement of Frequency, Lissajous method, spot wheel method, gear wheel method, Measurement of Phase, Storage oscilloscopes, Analog ,Digital, Sampling oscilloscope.
Unit – V
Electronics Measurements and Instrumentation-II: Digital Voltmeters, Ramp Type, Integrating, Continuous Balance, Successive approximation. Digital frequency meter, Digital phase angle meter. Wave analyzers, Basic wave analyzer, Frequency Selective wave analyzer, Heterodyne wave analyzer, Harmonic Distortion wave analyzer, Spectrum analyzer. Vector impedance meter, Q-meter.

Unit – VI

Industrial Instrumentation : Surge (impulse) testing, Testing of insulating Materials, Testing of electric strength of insulating oils. Electronic Recording devices, Types, Null Balance type, LVDT Type, XY recorders.

TEXT BOOKS:
1. DVS Murthy , *"Transducers & Instrumentation"*, PHI. 2013
2. C.S.Rangan,G.R.Sarma and Mani , *"Instrumentation: Devices & systems"*, TMH. 2002
3. A.D.Helfrick & W.D.Cooper, *"Modern Electronic Instrumentation & Measurement Techniques"*, PHI. 1992

REFERENCE BOOKS:
1. D.O.Doeblin, *"Measurement Systems, Applications & Design"*, TMH. 1990
2. A.K.Sawhney , *"Electrical & Electronics Measurements & Instrumentation"*, Danpat Rai & Sons. 2004
3. J. B. Gupta , *"Electrical & Electronics Measurements & Instrumentation"*, Kataria. 2014
4. C.Johnson , *"Process Control Instrumentation Technology"*, PHI.1982
5. A.S. Morris , *"Principles of Measurement & Instrumentation"*, PHI. 2003

NOTE:

Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

EE310 -POWER ELECTRONICS LAB (PE (P))
(For B. Tech EEE VI-Semester)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
-	-	3	2

Course Outcomes:

CO1: Draw the V-I characteristics of SCR, MOSFET, IGBT and turn on SCR using analog and digital firing circuits by conducting suitable experiment.

CO2: Analyze the effect of firing angle control on output voltage of full and semi converters by doing simulation and experimentation.

CO3: Understand to vary AC output voltage for a given AC input by doing simulation and experimentation on 1-ϕ, 3-ϕ AC voltage controller and 1-ϕ cyclo converters.

CO4: Analyze the effect of Single, Multiple, Sine, Trapezoidal PWM on output voltage of 1-ϕ bridge inverter through simulation and experimentation

CO5: Apply forced commutation technique, duty cycle variation on a step down chopper and observe output voltage through experimentation.

List of experiments:

1. Steady state characteristics of SCR, IGBT and MOSFET.
2. Analog and digital firing methods for SCR (Single phase half wave rectifier). (Simulation and hardware).
3. Full converter and semi converter. (Simulation and hardware).
4. Single-phase cycloconverter. (Simulation and hardware).
5. Single phase full bridge PWM inverter. (Simulation and hardware).
6. Single-phase AC voltage controller with unidirectional and bidirectional switches. (Simulation and hardware).
7. Three-phase AC voltage controller. (Simulation and hardware).
8. Forced commutated step down chopper.
9. Step up and step down chopper. (Simulation and hardware).
10. Dual converter (Simulation and hardware).

Note: A minimum of EIGHT experiments should be conducted.

EC319: IC AND MICROPROCESSORS LAB (IC&MP (P))
(For B.Tech. EEE - VI Semester)

Scheme   : 2013
Internal Assessment : 30
End Exam   : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
0	0	3	2

Course Outcomes:

CO1: Understand the behaviour of various analog circuits using IC741.
CO2: Analyze the Assembly language programs using 8086 Microprocessors
CO3: Able to design the small applications using OP-amps
CO4: Acquire knowledge about Microcontrollers, LCD and LED interfacing in real time peripherals.

List of Experiments :

IC Applications Experiments:
1. Summing and differential amplifier.
2. Integrators and differentiators.
3. Precision Rectifiers
4. Square and Triangle Wave Generator.
5. Active Filters – II Order LPF
6. Digital to Analog Converter.
7. 723 Low Voltage and High Voltage Regulator

Microprocessors Experiments:
Introduction to Assembly Language Programs Using 8086 Kits
8. Arithmetic Programs
9. Searching and Sorting
10. Factorial and Fibonacci Series generation
Interfacing Experiments:
11. Stepper Motor Interfacing
12. Programming 8253 and Relay Interfacing
Microcontroller Experiments:
Introduction to microcontroller programming and usage of system programming board
13. Interfacing an LED and a Switch to 89S52
14. Program on Dancing LEDs using 89S52
15. LCD Interfacing to 89S52
16. Stepper Motor Interfacing to 89S52

   Note: A minimum of EIGHT experiments should be conducted.

EE311: CONTROL AND AUTOMATION SYSTEMS LAB (CAS LAB)
(For B. Tech EEE - VI Semester)

Scheme : 2013
Internal assessment : 30
End Exam Marks : 70
End Exam duration : 3 hrs

L	T/D	P	C
-	-	3	2

Course Outcomes:

CO1: Understand the behavior of second order control systems and Servo motors.

CO2: Analyze the stability of a control system in time and frequency domain using MATLAB programming.

CO3: Determine the steady state errors and maximum peak over shoot of Second order control system using PID controller.

CO4: Able to design the compensators for control systems.

CO5: Acquire knowledge about automation systems and PLC ladder programming.

1. Characteristics of A.C.Servo & D.C.Servo Motor
2. Linear System Simulator & Stepper Motor Control
3. PID controller & Synchros
4. DC Position Control Systems & Compensation Design
5. Root Locus plot, Bode plot, Polar plot, Nyquist plot using MATLAB
6. Programmable logic controller – Study and verification of truth tables of logic gates, and application of speed control of DC motor.
7. Traffic light control
8. Automatic water level control
9. Automatic water filling system
10. Automatic temperature monitoring and control system
11. Automatic induction motor speed control by analog reference
12. Automatic fault detection and protection of induction motor using PLC

NOTE: A minimum of **eight** experiments should be conducted.

SEVENTH SEMESTER

S. No.	Course No.	Course Title	Credits	Scheme of Instruction periods/week			Scheme of Examination		
				L	T	P	End Exam Marks	Internal Assessment Marks	Total Marks
1.	EE401	Power Systems – IV	3	3	-	-	70	30	100
2.	EE402	Drives and Static Control	3	2	1	-	70	30	100
3.	EE403	Elements of Digital Signal Processing	3	3	-	-	70	30	100
4.	EE404	High Voltage Engineering	3	2	1	-	70	30	100
5.		Global Elective	2	2	-	-	70	30	100
6.		Professional Elective - I	3	2	1		70	30	100
7.	EE405	Power Systems Lab	2	-	-	3	70	30	100
8.	EE406	LabVIEW & Controllers Laboratory (LVCP)	2	-	-	3	70	30	100
9	EE407	Project Work Preliminary	2	-	-	3	50	50	100
			23	14	3	9	610	290	900

EE 401: POWER SYSTEM – IV (PS-4)
(For B. Tech EEE - VII Semester)

Scheme   : 2013
Internal Assessment : 30
End Exam   : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
3	-	-	3

Course Outcomes:

CO1: Understand the formulation of impedance and admittance bus matrices for a power system network.
CO2: Understand the importance of power flow studies
CO3: Analyze the load flow studies using Gauss-Seidel and Newton-Raphson method.
CO4: Understand the economic aspects of power system.
CO5: Develop mathematical models for turbine, generator and governing mechanisms
CO6: Analyze load frequency control of single area and two-area systems

Unit - I
Power System Network Matrices-1: Graph Theory: Definitions, Incidence Matrices, Y_{bus} formation by Singular Transformation Methods, Numerical Problems.
Power System Network Matrices-2: Formation of Z_{Bus}: Concept of primitive network, Partial network, Addition of a branch from a primitive network to the partial network, Addition of a link to the partial network, Algorithm for the Modification of $Z_{Bus,}$ and simple problems (maximum 3-Buses).
Unit – II
Power flow Studies-1: Necessity of Power Flow Studies, Load flow solution using Gauss Seidel Method, Load flow solution with and without P-V buses, Numerical Load flow Solution for Simple Power Systems (Max. 3-Buses)
Unit – III
Power flow Studies-2: Newton Raphson Method in Rectangular and Polar Co-Ordinates: Load Flow Solution with and without PV Busses- Derivation of Jacobian Elements, Algorithm and Flowchart. Decoupled and Fast Decoupled Methods, Comparison of Different Methods.
Unit – IV
Economic Operation of Power Systems: Optimal operation of Generators in Thermal Power Stations,, heat rate Curve, Cost Curve, Incremental fuel and Production costs, input-output characteristics, Optimum generation allocation with line losses neglected.Optimum generation allocation considering transmission line losses, Loss Coefficients, General transmission line loss formula.
Unit –V
Load Frequency Control: Modeling of Turbine, Generator and Load, Necessity of keeping frequency constant, Nature of control problems, Automatic Voltage and frequency control. Basic concepts of governing mechanism: speed governing system model, turbine model, generator load model, Definitions of Control area , Single area control, Block diagram representation of an isolated power system

Unit – VI

Single Area Load Frequency Control: Analysis of Load Frequency Control of an Isolated Power System, Steady state analysis, Dynamic response, Controlled and Uncontrolled case, Integral Control of Single area system

Two-Area Load Frequency Control: Load frequency control of two-area system, uncontrolled case and controlled case, tie-line bias control

TEXT BOOKS:

1. M.A.Pai , *"Computer Techniques in Power System Analysis"*, TMH Publications. 1979
2. I.J.Nagrath & D.P.Kothari, *"Modern Power system Analysis"*, Tata McGraw-Hill Publishing company, 3rd edition,2003
3. C.L. Wadhwa , *"Electrical Power Systems"*, New Age International (P) Ltd. 2006
4. L.P. Singh , *" Advanced Power System Analysis and Dynamics"*, New Age International (P) Ltd. 2006
5. P.S.R. Murthy, *"Modeling of Power System Components"*, B.S Publications. 2004
6. Stagg & E.L. Abiad, *"Computer Methods in Power System Analysis"*, International Student Edition.1987
7. *S.S.Wadhera , "Power system analysis & stability"*, Khanna Publishers. 2002

REFERENCE BOOKS:

1. Grainger and Stevenson , *"Power System Analysis"*, Tata McGraw Hill. 2008
2. A.R.Bergen , *"Power System Analysis"*, 2nd edition, Prentice Hall, Inc. 2001
3. Hadi Saadat , *"Power System Analysis"*, TMH Edition. 2009
4. B.R. Gupta, *"Power System Analysis & Design"*, 3rd edition, Wheeler Publications 2003

NOTE:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

EE 402: DRIVES & STATIC CONTROL (DSC)
(For B. Tech EEE- VII Semester)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
2	1	-	3

Course Outcomes:.

CO1: Understand conventional methods for the control of electric motors, components and working of electric drive systems.

CO2: Understand the performance of 1-Φ and 3-Φ, single and multi-quadrant bridge rectifiers with DC motor.

CO3: Understand the performance of multi-quadrant DC-DC converters with DC motor.

CO4: Understand stator control methods for induction motor using single stage and two stage AC-AC converters.

CO5: Apply slip power recovery schemes for the control of induction motor.

CO6: Understand operation of the synchronous motor control using AC-AC converters.

Unit – I
Introduction: Concept and classification of electrical drives, Advantages of electrical drives, Dynamics of electrical drives: Different types of loads, four quadrant operation of drive, transient and steady state stability of electric drive, Review of speed torque characteristics of d.c. and a.c. motors, conventional speed control methods, braking methods.

Unit – II
Control of DC motors by Phase Controlled Converters: Single Phase, Three phase semi and fully controlled converters connected to DC separately excited and DC series motors under continuous current operation – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque Characteristics- Problems on Converter fed dc motors, closed loop operation (block diagram only), simple problems.

Unit - III
Control of DC motors by Choppers: Single quadrant, Two –quadrant and four quadrant chopper fed dc separately excited and series excited motors under continuous current operation – Output voltage and current wave forms – Speed torque expressions – speed torque characteristics-time domain analysis of step-down chopper fed DC motor drive – Problems on Chopper fed dc Motors – Closed Loop operation (Block Diagram Only), simple problems.

Unit – IV
Control of Induction from Stator side: Variable voltage control of induction motor through the AC voltage controllers – speed torque characteristics. Variable frequency constant voltage and basic principle of v/f control of Induction motor – speed torque characteristics, simple problems. V/f control of induction motor by VSI, CSI and cycloconverters, PWM control, Comparison of VSI and CSI operations – Speed torque characteristics, simple problems, closed loop operation of v/f controlled induction motor drives (Block Diagram Only).

Unit – V
Control of Induction motor from Rotor side: Static rotor resistance control, Slip power recovery schemes–Static Scherbius drive, Static Kramer Drive, their performance and speed

torque characteristics–advantages applications, simple problems, variable speed constant frequency systems (theoretical aspects only).

Unit – VI
Control of Synchronous Motors: Separate control & self control of synchronous motors, Operation of self controlled synchronous motors by load commutated inverter, operation and waveforms, advantages and simple problems, variable frequency control through VSI and cycloconverter, closed loop control of synchronous motor drives (Block Diagram Only).

TEXT BOOKS:
1. G.K. Dubey , *"Power Semiconductor controlled drives"*, Prentice-Hall, Englewood Cliffs, Publishers. 1989
2. Vedam Subrahmanayam , *"Electrical drives concepts and applications"*, Tata McGraw Hill publishers. 2008
3. G.K. Dubey , *"Fundamentals of Electrical drives"* 2nd Edition, Narosa Publishers. 2001
4. S.B. Dewan, G.R. Slemon and A. Starughen, *"Power Semiconductor Drives"* Wiley India Pvt. Ltd.Publishers. 2009
5. P.C.Sen , *"Thyristor dc drives"*, Wiley Interscience publications. 1981

REFERENCE BOOKS :
1. B.K.Bose , *"Modern Power electronics and ac drives"*, Pearson Education Publishers. 2003
2. Vedam Subrahmanyam, *"Thyristor control of electric drives"*, Tata McGraw Hill publishers. 2008
3. S.K. Pillai , *"A course in Electrical drives"*, New Age International Publishers. 2005
4. W. Leonard , *"Control of Electrical Drives"*, 3rd Edition, Springer Publishers. 2003

NOTE:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

EE403: ELEMENTS OF DIGITAL SIGNAL PROCESSING (EDSP)
(For B. Tech. EEE – VII Semester)

Scheme : 2013
Internal assessment : 30
End Exam Marks : 70
End Exam duration : 3 hrs

L	T/D	P	C
3	-	-	3

Course Outcomes:
CO1: Understand the basic concepts of digital signal processing
CO2: Apply Discrete Fourier transformation techniques to digital signals
CO3: Apply Fast Fourier transform techniques to digital signals.
CO4: Design IIR digital filters using Butterworth, Chesbyshev and transformation methods
CO5: Design FIR digital filters using Fourier series and window techniques.
CO6: Understanding the structure of IIR and FIR digital filters in Direct form, cascaded, Parallel form
CO7: Understand the basic concepts of TMS320C67XX digital signal processor.

Unit – I
Introduction: Introduction to Digital Signal Processing: Discrete time signals & sequences, Static & dynamic systems, linear shift invariant systems, stability, and causality. Linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems. Discrete Time Fourier Transforms (DTFT).

Unit – II
Discrete Fourier Transforms: DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear convolution of sequences using DFT, Computation of DFT.

Unit – III
Fast Fourier Transforms: Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT, and FFT for composite N

Unit – IV
IIR Digital Filters: Analog filter approximations –Design of Butter worth and Chebyshev, Analog-Digital transformations -Design of IIR Digital filters from analog filters.

Unit – V
FIR Digital Filters: Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques, Frequency Sampling technique, Comparison of IIR & FIR filters.

Realization Of Digital Filters: Basic structures of IIR systems-Direct form I & II , Cascade, parallel forms. Basic structures of FIR systems.

Unit – VI
Introduction to DSP Processors: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator (MAC), Modified Bus Structures and Memory Access schemes. Pipelining,On-Chip Peripherals.

Architecture of TMS 320C67XX- Internal architecture, addressing modes, external memory access, peripherals.

TEXT BOOKS:

1. John G. Proakis, Dimitris G. Manolakis , *"Digital Signal Processing, Principles, Algorithms, and Applications"*, Pearson Education / PHI. 2007
2. A.V.Oppenheim and R.W. Schaffer, *"Discrete Time Signal Processing"*, PHI.
3. B.Venkataramani, M. Bhaskar , *"Digital Signal Processors – Architecture, Programming and Applications"*, TATA McGraw Hill. 2002

REFERENCE BOOKS:

1. Andreas Antoniou , *"Digital Signal Processing"*, TATA McGraw Hill. 2006
2. MH Hayes, Schaum's Outlines , *"Digital Signal Processing"*, TATA Mc-Graw Hill. 2007
3. *DSP Primer* - C. Britton Rorabaugh, Tata McGraw Hill, 2005.
4. Robert J. Schilling, Sandra L. Harris, *"Fundamentals of Digital Signal Processing using Matlab"*, Thomson,. 2007
5. Alan V. Oppenheim, Ronald W. Schafer, *"Digital Signal Processing"*, PHI Ed. 2006

NOTE:
Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

EE 404: HIGH VOLTAGE ENGINEERING (HVE)
(For B. Tech. EEE – VII Semester)

Scheme   : 2013
Internal Assessment : 30
End Exam   : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
2	1	-	3

Course Outcomes:

CO1: Understand the properties of solid and fluid dielectric materials.
CO2: Understand breakdown mechanisms in dielectrics.
CO3: Analyze generation and measuring methods of high voltages and currents.
CO4: Evaluate the parameters of high voltage generating and measuring circuits.
CO5: Apply a suitable high voltage testing method for switchgear equipments.

Unit – I
Introduction To High Voltage Technology And Applications: Electric Field Stresses, Gas / Vacuum as Insulator, Liquid Dielectrics, Solids and Composites, Estimation and Control of Electric Stress, Numerical methods for electric field computation, Surge voltages, their distribution and control, Applications of insulating materials in transformers, rotating machines, circuit breakers, cable power capacitors and bushings.

Unit – II
Break Down In Fluid Dielectrics: Gases as insulating media, collision process, Ionization process, Townsend's criteria of breakdown in gases, Paschen's law. Liquid as Insulator, pure and commercial liquids, breakdown in pure and commercial liquids.

Unit – III
Break Down In Solid Dielectrics: Intrinsic breakdown, electromechanical breakdown, thermal breakdown, breakdown of solid dielectrics in practice, Breakdown in composite dielectrics, solid dielectrics used in practice.

Unit – IV
Generation Of High Voltages And Currents: Generation of High DC Voltages, Generation of High AC voltages, Generation of Impulse Voltages, Generation of Impulse currents, Tripping and control of impulse generators.

Unit – V
Measurement Of High Voltages And Currents: Measurement of High Direct Current voltages, Measurement of High Voltages alternating and impulse, Measurement of High Currents-direct, alternating and Impulse, Oscilloscope for impulse voltage and current measurements.

Over Voltage Phenomenon And Insulation Co-Ordination: Natural causes for over voltages, Lightning phenomenon, Over voltages due to switching surges, system faults and other abnormal conditions, Principles of Insulation Coordination on High voltage and Extra High Voltage power systems.

Unit – VI

Non-Destructive Testing Of Material And Electrical Apparatus: Measurement of D.C Resistivity, Measurement of Dielectric Constant and loss factor, Partial discharge measurements.

High Voltage Testing Of Electrical Apparatus: Testing of Insulators and bushings, Testing of Isolators and circuit breakers, Testing of cables, Testing of Transformers, Testing of Surge Arresters, Radio Interference measurements.

TEXT BOOKS:

1. *"High Voltage Engineering"* by M.S. Naidu and V. Kamaraju – TMH Publications, 3rd Edition
2. *"High Voltage Engineering: Fundamentals"* by E .Kuffel, W.S. Zaengl, J. Kuffel by Elsevier, 2nd Edition.

REFERENCE BOOKS:

1. C.L. Wadhwa , *"High Voltage Engineering"*, New Age Internationals (P) Limited. 1997
2. Ravindra Arora, Wolfgang Mosch , *"High Voltage Insulation Engineering"*, New Age International (P) Limited. 1995

NOTE:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

EE 405: POWER SYSTEMS LAB (PSP)
(For B. Tech EEE - VII Semester)

Scheme : 2013
Internal assessment : 30
End Exam Marks : 70
End Exam duration : 3 hrs

L	T/D	P	C
-	-	3	2

Course Outcomes:

CO1: Analyze the power system network for different conditions.

CO2: Analyze the sequence impedances of synchronous machines and transformers.

CO3: Analyze solutions for the numerical problems related to synchronous machine dynamics.

CO4: Analyze the characteristics of different types of electromagnetic and numeric relays.

CO5: Apply modern Engineering tools like ETAP for solving Power System problems.

LIST OF EXPERIMENTS
1. IDMT Over Current Relay And Micro processor based IDMT Over current relay
2. Inverse Time Over Current Relay And Micro processor percentage Differential relay
3. 220 KV-180KM EHV-AC Long Transmission Line Simulator(Voltage regulation and determination of surge impedance)
4. (a) Study of oil testing kit and determination of dielectric strength
   (b) Simulation of string insulators for the determination of voltage distribution and string efficiency.
5. Simulation of faults on a 3-phase unloaded alternator
6. Determination of +ve, -ve and zero sequence impedances of 3-phase alternator
7. Determination of +ve, -ve and zero sequence impedances of 3-phase Transformer And Measurement of Earth resistance
8. Directional IDMT over current Relay And Micro controller Based over current Relay
9. Load Flow Analysis using MIPower.
10. Short Circuit Analysis using MIPower.
11. Load Flow Analysis using etap .
12. Short Circuit Analysis using etap.
13. Detection of Harmonic currents and filter design using etap.
14. Determination of Transient Stability (Equal Area Criterion and Swing Equation) using etap.
15. Optimal Power flow and Relay coordination using etap.

Note: A minimum of **eight** experiments should be conducted.

EE406: LabVIEW & CONTROLLERS LAB (LVC(P))
(For B. Tech EEE - VII Semester)

Scheme   : 2013
Internal assessment   : 30
End Exam Marks   : 70
End Exam duration   : 3 hrs

L	T/D	P	C
-	-	3	2

Course Outcomes:
At the end of the course students will able to

CO1: Apply the fundamentals of Embedded C programming of MSP 430 microcontroller using Code Composer Studio.
CO2: Use MSP430 real time interfaces including GPIO, serial ports, digital-to-analog converters and analog-to-digital converters.
CO3: Troubleshoot interactions between software and hardware.
CO4: Use standard test and measurement equipment to evaluate digital interfaces.
CO5: Understand and practice simulation and implementation of virtual instruments.
CO6: Develop virtual instruments (virtual voltmeters, oscilloscope etc.) by using myDAQ.

1.   Learn and understand how to configure MSP-EXP430G2 Launch pad digital I/O pins.
      Write a program for configuration of GPIO ports for MSP430 (blinking LEDs).
      a) Modify the delay with which the LED blinks.
      b) Modify the code to make the green LED blinks.
      c) Modify the code to make the green and red LEDs blink: i) Together ii) Alternately

2.   Write a program for configuration of GPIO ports of MSP430 for pushbuttons interface.
      a) Turn the LED ON when the button is pressed and OFF when it is released.
      b) Turn the red LED ON when the button is pressed and the green LED ON when
      the button is released.

3.   Write a program for configuration of GPIO ports of MSP430 for blinking Array of LEDs.
      a) Turn on the LEDs to display a hexadecimal number equivalent values from 00 to FF.
      b) Turn on the ALL LEDs ones and then one by one with delay.

4.   Write a program for configuration of GPIO ports of MSP430 for variable duty cycle
      PWM. (Without and with timer)

5.   a) Write a program for configuration of GPIO ports of MSP430 for driving a DC Motor.

      b) Write a program for configuration of GPIO ports of MSP430 for driving a stepper
      Motor.

6.   Write a program for reading room temperature with MSP430.

7.   Write a program to regulate the output based on the variable input status.

8.   a) Write a program for configuration of GPIO ports of MSP430 for generation of Ramp signal at DAC port.

         b) Write a program for configuration of GPIO ports of MSP430 for generation of Triangle signal at DAC port.

9.   a) Write a program for configuration of GPIO ports of MSP430 for generation of Sine Wave at DAC port.

         b) Write a program for configuration of GPIO ports of MSP430 for generation of Square Wave at DAC port.

10.   a) Building a simple VI & Working with controls and indicators.
         b) Building a VI of a simple calculator.
         c) Implementing Digital Logic Circuits.
         d) Simulation of level measurement in a tank.

11.   a) Building a VI to switch between generation of a sine wave and a square wave, using case structure.
         b) Simulate a triangular wave using sequence structure.
         c) Simulation of Speed Control of DC motor.

12.   a) To build a VI to perform simple data acquisition using NI DAQ.
         b) To develop a virtual voltmeter by using DAQ (Data Acquisition) cards.
         c) To develop a virtual signal generator using DAQ card.

Note: A minimum of **EIGHT** experiments should be conducted

EIGHTH SEMESTER

S. No.	Course No.	Course Title	Credits	Scheme of Instruction periods/week			Scheme of Examination		
				L	T	P	End Exam Marks	Internal Assessment Marks	Total Marks
1.	EE408	Utilization of Electrical Power	3	3	-	-	70	30	100
2.	EE409	HVDC and FACTS	3	3	-	-	70	30	100
3.		Professional Elective – II	3	2	1	-	70	30	100
4.		Professional Elective - III	3	2	1	-	70	30	100
5.	EE410	Drives & Static Control Lab	2	-	-	3	70	30	100
6.	EE411	Project Work	6	-	-	6	50	50	100
			20	**10**	**2**	**9**	**400**	**200**	**600**

EE 408: UTILIZATION OF ELECTRICAL POWER (UEP)
(For B.Tech EEE - VIII Semester)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
3	-	-	3

Course Outcomes:

CO1: Understand various methods of air conditioning system.
CO2: Understand the concepts of electrical heating and welding.
CO3: Understand the principle and working of Discharge lamps and Filament
CO4: Design suitable illumination schemes for better lighting system.
CO5: Understand the principles of electric traction.

Unit – I
Refrigeration and air conditioning: Introduction, types of refrigeration, vapour compression cycle, operational features of absorption and refrigeration process, household refrigerator, air conditioning, types of air conditioning systems, room air conditioner, water cooler.
Unit – II
Electric Heating: Advantages and methods of electric heating, resistance heating, induction heating and dielectric heating.
Unit – III
Electric Welding: Electric welding, resistance welding and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.
Unit – IV
Illumination Fundamentals: Introduction, terms used in illumination, laws of illumination, polar curves, photometry, sources of light.
Various Illumination Methods: Discharge lamps, Mercury Vapour and Sodium Vapour lamps, comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of lighting and flood lighting.
Unit – V
Electric Traction – I: System of electric traction and track electrification. Review of existing electric traction systems in India. Special features of traction motor. Mechanics of train movement. Speed-time curves for different services,trapezoidal and quadrilateral speed time curves.
Unit – VI
Electric Traction – II: Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and braking retardation adhesive weight and coefficient of adhesion.

TEXT BOOKS:
   1. E. Openshaw Taylor , *"Utilisation of Electric Energy"*, Orient Longman. 1995

2. Partab , *"Art & Science of Utilization of electrical Energy"*, 3 *rd edition* Dhanpat Rai & Sons. 2004
3. J.B.Gupta , *"Utilisation of Electric Power & Electric Traction"*, S.K. Kataria & Sons Publishers. 1997

REFERENCE BOOKS:
1. N.V.Suryanarayana , "*Utilization of Electrical Power including Electric drives and Electric traction*", New Age International (P) Limited, Publishers. 1996
2. C.L. Wadhwa , "*Generation, Distribution and Utilization of electrical Energy*", New Age International (P) Limited, Publishers. 1997
3. Gupta and Bhatnagar , "*A Course in Electrical Power*", By Soni, , Dhanpat Rai & sons. 2009
4. G.C. Garg , "*Utilization of Electric Power*", Khanna Publishers. 2008

NOTE :
Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

EE 409: HVDC AND FACTS (HVDC & FACTS)
(For B.Tech EEE - VIII Semester)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
3	-	-	3

Course Outcomes:

CO1: Understand the significance of DC transmission over AC transmission system, types and application of HVDC links.
CO2: Analyze characteristics of 6 and 12 pulse converter for power flow control.
CO3: Understand the converter faults and protection in HVDC system.
CO4: Represent DC system in p.u and develop model for load flow analysis.
CO5: Understand the importance of controllable parameters and role of FACTS controllers in AC system
CO6: Understand the significance of shunt, series compensation for the improvement of System stability.

Unit – I
Basic concepts: Economics and terminal equipment of HVDC transmission systems, Types of HVDC links, Apparatus required for HVDC systems, Comparison of AC and DC Transmission , Application of DC Transmission System, Planning and Modern trends in D.C.Transmission.
HVDC Converters: Choice of converter configurations, Analysis of Graetz circuit, characteristics of 6-pulse and 12-pulse converters, principle of DC link control
Unit – II
Converter control: Converter control characteristics, firing angle control,current and extinction angle control, effect of source inductance on the systems.
Unit – III
Converter faults & protection: Converter faults, Protection against over currents & over voltages in converter station, surge arresters, smoothing reactors, DC breakers, Effects of proximity of AC & DC transmission lines.
Unit – IV
Power flow analysis in AC/DC systems: Modeling of DC Links, solution of DC load flow, P.U.system for d.c quantities.
Unit – V
FACTS concept and General System considerations: Transmission Interconnections- Flow of power in an AC system- What limits the loading capability? power flow and dynamic stability considerations of a transmission interconnection – relative importance of controllable parameters- basic types of FACTS controllers- Brief description and definitions of FACTS controllers.

Unit – VI

Static Shunt Compensation: Objectives of shunt compensation – Mid point voltage Regulation for Line segmentation – end line voltage support to prevent voltage Instability – Improvement of Transient Stability – Power Oscillation Damping.

Static Series Compensation: Objectives of series compensation – Concept of series capacitive compensation – voltage stability - Improvement of Transient Stability – power oscillation Damping – sub synchronous Oscillation Damping.

TEXT BOOKS:
1. K.R. Padiyar , *" HVDC Power Transmission Systems"*, NewAge Publishers. 1992
2. Hingorani   , *"Understanding Facts Concepts"*, IEEE Publications 2000

REFERENCE BOOKS:

1. S.Kamakshiah,Kamaraju.V *" HVDC Transmission"*, McGraw Hill Education India Ltd.

NOTE:
Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

EE410: DRIVES & STATIC CONTROL LAB (DSCP)
(For B. Tech EEE - VIII Semester)

Scheme : **2013**
Internal assessment : **30**
End Exam Marks : **70**
End Exam duration : **3 hrs**

L	T/D	P	C
-	-	3	2

Course Outcomes:

CO1: Understand speed control of squirrel cage induction motor from stator side.
CO2: Understand speed control of slip ring induction motor from rotor side.
CO3: Understand speed control of separately excited dc motor.
CO4: Understand speed control of PMDC motor.

LIST OF EXPERIMENTS

1. Speed control of induction motor using rotor resistance control
2. Speed control of induction using emf injection method (static Kramer's drive)
3. Speed control of induction motor using three phase AC voltage controller.
4. Speed control of permanent magnet DC motor using three phase rectifier.
5. Microcontroller based control of separately excited DC motor.
6. dSPACE based scalar control of induction motor using DC link converter.
7. DSP based scalar control of induction motor using DC link converter
8. MSP 430 based speed controller of DC motor drive (using chopper step)
9. Speed control of BLDC motor using DC link converter.
10. Speed control of DC motor using 4 quadrant Chopper

Note: A minimum of **EIGHT** experiments should be conducted.

List of subjects under Professional Elective – I

1. EE412   Non-Conventional Sources of Energy

2. EE413   EHV AC Transmission

3. EE414   Electrical Distribution Systems

4. EE415   Power Quality

EE 412: NON–CONVENTIONAL SOURCES OF ENERGY (NCSE)
(Professional Elective-I, For B.Tech EEE-VII Semester)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
3	-	-	3

Course Outcomes:

CO1: Understand the basics of Solar Energy for the production of Electrical Energy

CO2: Understand different types of Solar Collectors and their applications.

CO3: Understand the basic principles of Wind and Biomass energies for Electrical Energy production.

CO4: Understand the methods to harness Electrical Energy from Geo-Thermal and Ocean energies.

CO5: Apply Direct Energy Conversion principle for Fuel cells and MHD generators.

Unit – I
Principles Of Solar Radiation: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

Unit – II
Solar Energy Collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.
Solar Energy Storage And Applications: Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- Solar heating/cooling techniques. Solar distillation and drying, photovoltaic energy conversion.

Unit – III
Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria
Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

Unit – IV
Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.

Unit – V
Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants and their economics.

Unit – VI

Direct Energy Conversion: MHD generators, principles, dissociation and ionization, Hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems. Fuel cells, principle. Faradays laws, thermodynamic aspects, selection of fuels and operating conditions.

TEXT BOOKS:

1. G.D. Rai , *"Non-Conventional Energy Sources"*. 2011
2. Ramesh & Kumar, *"Renewable Energy Technologies"*, Narosa. 1997

REFERENCE BOOKS:

1. Tiwari and Ghosal , *"Renewable energy resources"*, Narosa.2005
2. Ashok V Desai, *"Non-Conventional Energy"*, Wiley Eastern.1990
3. K Mittal *,"Non-Conventional Energy Systems"*, Wheeler. 1997
4. Sukhatme, *"Solar Energy"*. TMH, 2008

NOTE:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

EE 413: EHV AC TRANSMISSION (EHV AC)
(Professional Elective-I, For B.Tech EEE-VII Semester)

Scheme   : 2013
Internal Assessment : 30
End Exam   : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
3	-	-	3

Course outcomes:
CO1: Understand the necessity, merits and demerits of EHVAC transmission and mechanical aspects.
CO2: Evaluate the Inductance and capacitance of two conductor and multi conductor lines.
CO3: Analyze the effect of corona, electrostatic field of EHVAC lines.
CO4: Analyze the surface gradient on two conductor and bundle with more than 3 sub conductors.
CO5: Design SVC schemes and voltage controlling devices.

Unit – I
Preliminaries: Necessity of EHV AC transmission, advantages and problems, power handling capacity and line losses, mechanical considerations, resistance of conductors, properties of bundled conductors, bundle spacing and bundle radius, Examples.
Line and ground reactive parameters: Line inductance and capacitances, sequence inductances and capacitances, modes of propagation, ground return, Examples

Unit – II
Voltage gradients of conductors: Electrostatics, field of sphere gap, field of line changes and properties, charge, potential relations for multi-conductors, surface voltage gradient on conductors, distribution of voltage gradient on sub-conductors of bundle, Examples.

Unit – III
Corona effects – I: Power loss and audible noise (AN), corona loss formulae, charge voltage diagram, generation, characteristics, limits and measurements of AN, relation between 1-phase and 3-phase AN levels, Examples.
Corona effects – II: Radio interference (RI), corona pulses generation, properties, limits, frequency spectrum, modes of propagation, excitation function, measurement of RI, RIV and excitation functions, Examples.

Unit – IV
Electro static field: Electrostatic field: calculation of electrostatic field of EHV/AC lines, effect on humans, animals and plants, electrostatic induction in un energised circuit of double-circuit line, electromagnetic interference-Examples.

Unit – V
Traveling wave theory: Traveling wave expression and solution, source of excitation, terminal conditions, open circuited and short-circuited end, reflection and refraction coefficients, Lumped parameters of distributed lines, generalized constants, No load voltage conditions and charging current.

Unit – VI

Voltage control: Power circle diagram and its use, voltage control using synchronous condensers, cascade connection of shunt and series compensation, sub synchronous resonance in series capacitor, compensated lines, static VAR compensating system.

TEXT BOOKS:

1. R. D. Begamudre, *"EHVAC Transmission Engineering"*, New Age International (p) Ltd., 2007

REFERENCE BOOKS:

1. S. Rao, *"EHV AC and HVDC Transmission and Distribution Engineering",* Khanna Publishers

NOTE:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

EE 414: ELECTRICAL DISTRIBUTION SYSTEMS (EDS)
(Professional Elective-I, For B.Tech EEE-VII Semester)

Scheme   : 2013
Internal Assessment : 30
End Exam   : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
3	-	-	3

Course Outcomes:

CO1: Understand the basic concepts radial and loop feeders for distribution lines
CO2: Understand the importance of power factor and voltage regulation in distribution systems
CO3: Analyze the power loss and voltage loss for uniform and non uniform loads.
CO4: Understand the concepts of substation and its protection.
CO5: Understand the concepts of power factor improvement and voltage control in distribution systems

Unit – I
General Concepts: Introduction to distribution systems, Load modeling and characteristics. Coincidence factor, contribution factor loss factor, Relationship between the load factor and loss factor. Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.

Unit – II
Distribution Feeders: Design Considerations of Distribution Feeders: Radial and loop types of primary feeders, voltage levels, feeder loading; basic design practice of the secondary distribution system.

Unit – III
Substations: Location of Substations: Rating of distribution substation, service area within primary feeders. Benefits derived through optimal location of substations.

Unit – IV
System Analysis : Voltage drop and power-loss calculations: Derivation for voltage drop and power loss in lines, manual methods of solution for radial networks, three phase balanced primary lines.

Unit – V
Protection: Objectives of distribution system protection, types of common faults and procedure for fault calculations. Protective Devices: Principle of operation of Fuses, Circuit Reclosures, line sectionalizes, and circuit breakers.
Coordination: Coordination of Protective Devices: General coordination procedure.

Unit – VI
Compensation For Power Factor Improvement: Capacitive compensation for power-factor control.Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched),Power factor correction, capacitor allocation - Economic justification - Procedure to determine the best capacitor location.

Voltage Control: Voltage Control: Equipment for voltage control, effect of series capacitors, effect of AVB/AVR, line drop compensation.

TEXT BOOKS:

1. Turan Gonen, *"Electric Power Distribution system, Engineering"*, Mc Graw-hill Book Company.
2. A.S. Pabla , *"Electric Power Distribution"*, Tata Mc Graw-hill Publishing company, 4th edition. 1997

REFERENCE BOOKS:

1. S. Sivanagaraju, V.Sankar, *"Electrical Power Distribution and Automation"*, Dhanpat Rai & Co. 2006
2. V. Kamaraju, *"Electrical Power Distribution Systems"*, Right Publishers.

NOTE:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

EE 415: POWER QUALITY
(Professional Elective-I, For B.Tech EEE-VII Semester)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
3	-	-	3

Course Outcomes:

CO1: Understand the concepts of power quality.
CO2: Understand the long interruption and short interruption.
CO3: Understand the voltage sag and its characterization.
CO4: Understand the power quality considerations in industrial power systems
CO5: Understand the mitigation methods, wiring and grounding.

Unit – I
Introduction: Introduction of the Power Quality (PQ) problem, Terms used in PQ: Voltage, Sag, Swell, Surges, Harmonics, Over voltages, Spikes, Voltage fluctuations, Transients, Interruption, Overview of power quality phenomenon - Remedies to improve power quality - Power quality monitoring

Unit – II
Long Interruptions: Interruptions-Definition, Difference between failure, outage, Interruptions, causes of Long Interruptions, Origin of Interruptions, Limits for the Interruptions frequency, Limits for the interruption duration, costs of Interruption, Overview of Reliability evaluation to power quality, Comparison of observations and reliability evaluation.

Unit – III
Short Interruptions: Short interruptions, Definition, origin of short interruptions, basic principle, fuse saving, voltage magnitude events due to re-closing, Voltage during the interruption, monitoring of short interruptions, Difference between medium and low voltage systems, Multiple events, single phase tripping, Voltage and current during fault period, voltage and current at post fault period, Stochastic prediction of short interruptions.

Unit – IV
Voltage sag – Characterization – Single phase: Voltage sag, Definition, causes of voltage sag, voltage sag magnitude, monitoring, Theoretical calculation of voltage sag magnitude, voltage sag calculation in non-radial system, Meshed systems, Voltage sag duration

Unit – V
PQ considerations in Industrial Power Systems: Voltage sag, Equipment behavior of Power Electronics loads, Induction motors, Synchronous motors, Computers consumer electronics, adjustable speed AC drives and its operation, Mitigation of AC Drives, Adjustable speed DC drives and its operation Mitigation methods of DC drives

Unit –VI
Mitigation of Interruption and Voltage Sags:
Overview of mitigation methods – from fault to trip - reducing the number of faults, reducing the fault clearing time changing the power system - installing mitigation equipment - improving equipment immunity - different even and mitigation methods

Wiring and grounding:
Reason for grounding - typical wiring and grounding problems - solution of wiring and grounding problems.

Text Books:
1. *"Understanding Power Quality Problems"*- by Math H J Bollen, IEEE Press, 1999
2. *"Electrical power quality"* –R C Dugan, M.F,M Granghar, H.W.Beaty-TMH. 1993

Reference Books:
1. Arindam Ghosh and Gerard Ledwich*,"Power Quality Enhancement using custom power devices"*- Kulwer academicpublishers. 2002
2. *"Power system harmonics"* –A.J. Arrillga 2003
3. *"Power quality"*- C.Sankaran, CRC Press 2002

Note:
Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

List of subjects under Professional Elective – II

1. EE416   Electrical Estimation and Costing

2. EE417   Substation Engineering

3. EE418   Programmable Logic Controllers

4. EE419   Embedded Applications to Electrical Engineering

EE 416: ELECTRICAL ESTIMATION AND COSTING (EEC)
(Professional Elective-II, For B.Tech EEE- VIII Semester)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
3	-	-	3

Course Outcome:

CO1: Understand the basic principles of estimation and costing for residential and commercial electrification.
CO2: Understand the detailed estimation and costing of residential building electrification.
CO3: Understand the detailed estimation and costing of commercial electrification.
CO4: Understand method of installation, estimation and testing of underground and overhead service connections
CO5: Understand detail estimate and costing of a overhead transmission line and underground distribution system
CO6: Understand the design and estimation of a substation and its switchgear installations.

UNIT I:
General Principles Of Estimation: Introduction to estimation & costing, Electrical Schedule. Catalogues, Market Survey and source selection. Recording of estimates, Determination of quantity of material required Labor conditions. Determination of material cost and labor Contingencies. Overhead charges, Profit, Purchase system, Purchase enquiry and selection of appropriate purchase mode. Comparative statement, Purchase orders, Payment of bills. Tender form, General idea about IE rule, Indian Electricity Act and major applicable I.E rules

UNIT II :
Residential Building Electrification: General Rules guidelines for wiring of residential installation and positioning of equipments, Principles of circuit design in lighting and power circuits Procedures for designing the circuits and deciding the number of circuits, Method of drawing single line diagram. Selection of type of wiring and rating of wires and cables Load calculations and selection of size of conductor, selection of rating of main switch Distribution board, protective switchgear ELCB and MCB and wiring accessories, Earthing of residential Installation, Sequence to be followed for preparing estimate, Preparation of detailed estimates and costing of residential installation

UNIT III :
Electrification Of Commercial Installation: Concept of commercial installation, Differentiate between electrification of residential and commercial installation. Fundamental considerations in planning an electrical installation system for commercial building. Design considerations of electrical installation system for commercial building, Load calculation and selection of size of service connection and nature of supply. Deciding the size of the cables, bus bar and bus bar chambers, Mounting arrangements and positioning of switchboards, distribution boards main switch etc,Earthing of the electrical installation, Selection of type wire, wiring system and

layout, Sequence to be followed to prepare estimate, Preparation of detailed estimate and costing of commercial installation.

UNIT IV:

Service Connection, Inspection And Testing Of Installation : Concept of service connection, Types of service connection and their features, Method of installation of service connection, Estimates of underground and overhead service connections, Inspection of internal wiring installations, Inspection of new installations, testing of installations, testing of wiring installations, reason for excess recording of energy consumption by energy meter.

UNIT V:

Design And Estimation Of Overhead Transmission & Distribution Lines: Introduction: Typical AC electrical power system, Main components of overhead lines, Line supports. Factors governing height of pole, Conductor materials, Determination of size of conductor for overhead transmission line, Cross arms, Pole brackets and clamps, Guys and Stays, Conductors configuration spacing and clearances, Conductors configuration spacing and clearances, Span lengths, Overhead line insulators, Insulator materials, Types of insulators, Lightning Arrestors, Phase plates, Danger plates, Anti climbing devices, Bird guards, Beads of jumpers. Anti climbing devices, Bird guards, Beads of jumpers. Muffs, Points to be considered at the time of erection of overhead lines, Erection of supports, setting of stays, Fixing of cross arms, Fixing of insulators, Conductor erection, Repairing and jointing of conductor, Dead end clamps, Positioning of conductors and attachment to insulators Jumpers, Tee-offs, Earthing of transmission lines. Guarding of overhead lines, Clearances of conductor from ground Spacing between conductors, Testing and commissioning of overhead distribution lines, some important specifications

UNIT VI:

Design And Estimation Of Substations: Introduction, Classification of substation, Indoor substations, Outdoor substations, Selection and location of site for substation, Main Electrical Connections, Graphical symbols for various types of apparatus and circuit elements on substation main connection diagram. Key diagram of typical substations. Equipment for substation and switchgear installations, Substation auxiliaries supply, Substation Earthing

Text Books:
1. *"Electrical Installation Estimating & Costing"*,.J.B.Gupta,VIII Edition ,K. Katria & Sons New Delhi
2. *"Electrical Estimating and Energy Management"* K.R Gangadhara Rao,Sapna. Publications

Reference Books :
1. *"Electrical Design Estimating and Costing"*,K.B.Raina S.K.Bhattacharya,New Age International
2. *"Electrical Wiring Estimating and Costing",* S.L.Uppal , G.C Garg ,Khanna Publishers,New Delhi

NOTE:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the

multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

EE 417: SUBSTATION ENGINEERING (SE)
(Professional Elective-II For B.Tech EEE- VIII Semester)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
2	1	-	3

Course outcomes:

CO1: Understand the basics of outdoor switchyard design and its protection.
CO2: Understand single, double, main and transfer bus bar arrangements.
CO3: Understand the protection schemes of single, double, main and transfer arrangements.
CO4: Understand the operating principles of Power Line Carrier Communication
CO5: Understand the operating principles of digital relay protection and its coordinated control.
CO6: Understand the issues related to advanced metering, cyber security and electrical energy storages in a smart grid.

Unit – I
Outdoor Switchyard Design Basics: Various equipment, Electrical Clearances, Earth-mat design, Lightning Protection.
Unit – II
Busbar Arrangements& Layout : Single Busbar system, Main and Transfer Bus Arrangement, Duplicate Bus-bar Arrangement or Double Bus-bar Arrangement, Busbar Arrangements Double Main and Transfer Bus, Mesh Bus-bar Arrangement, Breaker and a Half Arrangement.
Unit – III
Protection Schemes: Tripping logics for Single Busbar system, Main and Transfer Bus Arrangement, Duplicate Bus-bar Arrangement or Double Bus-bar Arrangement.
Unit – IV
Power Line Career Communication Basics: PLCC equipment, Operating principle, PLC modem, Modulation and Superimposition, Technical parameters, PLCC in meter reading.
Unit – V
Digital Relays: General Introduction, Principles of Digital numeric relays, Fault locators, Protection and coordinated control.
Unit – VI
Introduction to Smart Grid Solutions: Advanced Metering Infrastructure, Demand Response, Distributed generation. Home Area Network, Communication, Cyber Security, Electric Vehicles, Electric Energy Storages (EES).
Text Books:
1. T.S.M. Rao, *"Digital/numerical relays"* Tata McGrah Hill, First Edition, 2013.
2. *"Power Engineers handbook"* TNEB Engineers Association, 2013.
Reference Books:
1. *"Electrical Transmission and Distribution Reference book"*, ABB Electric Systems Technology Institute, 1997.
2. *"Network Protection and Automation Guide"* by PRAG

NOTE:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

EE 418: PROGRAMMABLE LOGIC CONTROLLERS (PLC)
(Professional Elective-II For B.Tech EEE- VIII Semester)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
3	-	-	3

Course Outcomes: After completion of the course the students will be able to

CO1: Demonstrate an ability to program Programmable Logic Controllers using ladder logic and other programming standards

CO2: Understands Characteristics of Registers and module addressing.

CO3: Understand PLC timer functions and counter functions.

CO4: Demonstrate Analog PLC operation with PID control functions.

CO5: Describe the advantages, use and applications of Programmable Logic Controllers (PLC"s).

Unit – I
PLC Basics: PLC system, I/O modules and interfacing, CPU processor, programming Equipment, programming formats, construction of PLC ladder diagrams, Devices connected to I/O modules.
Unit – II
PLC Programming: Input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill press operation.
Unit – III
Digital logic gates, programming in the Boolean algebra system, conversion examples
Ladder Diagrams for process control: Ladder diagrams & sequence listings, ladder diagram construction and flowchart for spray process system.
Unit – IV
PLC Registers: Characteristics of Registers, module addressing, holding registers, Input Registers, Output Registers.
PLC Functions: Timer functions & Industrial applications, counters, counter function industrial applications, Arithmetic functions, Number comparison functions, number conversion functions
Unit – V
Data Handling functions: SKIP, Master control Relay, Jump, Move, FIFO, FAL, ONS, CLR & Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two-axis & three axis Robots with PLC, Matrix functions.
Unit – VI
Analog PLC operation: Analog modules& systems, Analog signal processing, Multi bit Data Processing, Analog output Application Examples, PID principles, position indicator with PID control, PID Modules, PID tuning, PID functions.

TEXT BOOKS:
1. John W. Webb & Ronald A. Reiss, *"Programmable Logic Controllers- Principles and Applications"* Fifth Edition, PHI

REFERENCE BOOKS:
1. JR. Hackworth & F.D. Hackworth Jr. , *"Programmable Logic Controllers- Programming Method and Applications"*, Pearson. 2004

Note:
Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

EE 419: EMBEDDED APPLIICATIONS TO ELECTRICAL ENGINEERING (EAEE)
(Professional Elective-II For B.Tech EEE- VIII Semester)

Scheme   : 2013
Internal Assessment : 30
End Exam   : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
3	-	-	3

Course Outcomes:
CO 1: Understand the definition and characteristics of Embedded Systems.
CO 2: Describe the special requirements that are imposed on embedded systems.
CO 3: Understand the architectures of ARM Processors.
CO 4: Understand the functionalities of operating system.
CO 5: Understand the Kernel operations.
CO 6: Design programming model to various embedded control applications.

UNIT I
Introduction: Characteristics of Embedding Computing Applications,Concept of Real time Systems,Challenges in Embedded System Design, Design Process, Requirements, Specifications, Architecture Design, Designing of Components and System Integration
UNIT II
Embedded System Architecture: Instruction Set Architecture, CISC architecture [8051] and RISC instruction set architecture [ARM processors], DSP Processors, Harvard Architecture-PIC. Coprocessors and Hardware Accelerators, Processor Performance Enhancement, Pipelining, Super, scalar Execution, CPU Power Consumption, Memory System Architecture-, Caches, Virtual Memory, Memory management unit and address Translation.
UNIT III
Designing Embedded Computing Platform: Designing with Processors, System Architecture, Hardware Design, Implementation, Development Environment, Debugging Techniques, Manufacturing and Testing. Design Using CPU Bus: Bus Protocols, Bus Organization, I/O Device Interfacing, Interfacing Protocols-GPIB, FIREWIRE, USB, Watchdog Timers. 133 EE-Engg&Tech-SRM-2013
UNIT IV
Operating Systems-I: Kernel Features: Real, time Kernels, Polled Loops System, Co-routines, Interrupt driven System, Multi-rate System, Processes and Threads, Context Switching, Cooperative Multi-tasking, Pre-emptive Multi-tasking.
UNIT V
Operating Systems-II: Scheduling, Rate-Monotonic Scheduling, Earliest, Deadline First Scheduling, Task Assignment, Fault, Tolerant Scheduling. Inter-process Communication, Real-time Memory Management: Stack Management, Dynamic Allocation, Evaluating and Optimizing Operating System Performance, Response.
UNIT VI
Embedded Control Applications: Open-loop and Closed Loop Control Systems, Application Examples, Washing Machine, Automotive Systems, Auto-focusing digital camera, Air-conditioner, Elevator Control System, ATM System.

TEXT BOOKS
1. Raj Kamal, *"Embedded Systems"*, TMH,first edition, 2004.
2. David E. Simon, *"An Embedded Software Primer"*, Pearson Education, 1999.

REFERENCES
1. Wayne wolf, *"Computers as components"*, Morgan Kaufmann publishers, 2nd Edition, 2008.
2. Ayala. K.J. *"The 8051 Microcontroller"*, Penram International, 1991.
3. Dr. Prasad, *"Embedded Real Time System"*, Wiley Dreamtech, 2004.
4. Jean J.Labrosse, *"Embedded system building blocks"*, CMP books, 2nd Edition, 1999.
5. Arnold berger, *"Embedded system design"*, CMP books, 1st Edition, 2001.
6. Narayan and gong, *"Specifications and design of embedded systems"*, Pearson education, 2nd Edition, 1999.

NOTE:
Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

List of Subjects under Professional Elective – III

1. EE420   Modern Control Theory

2. EE421   VLSI

3. EE422   Electrical Drawing & CAD

4. EE423   Biomedical Engineering

EE420: MODERN CONTROL THEORY (MCT)
(Professional Elective-III, B. Tech. EEE – VIII Semester)

Scheme : 2013
Internal assessment : 30
End Exam Marks : 70
End Exam duration : 3 hrs

L	T/D	P	C
2	1	-	3

Course Outcomes:

CO1: Understand the state space representation and state model of a continuous system.
CO2: Understand the transfer function, controllability and observability for continuous, discrete, and time invariant systems
CO3: Apply Jordan and pole placement techniques for testing controllability and observability for a SISO systems
CO4: Understand the behavior of non-linear system
CO5: Understand the stability and optimal control of non-linear system.

Unit – I
Review of state space representation of continuous time systems and their solution. State models for discrete time systems described as difference equations and transfer functions.

Unit – II
Transfer function from state model. State transition matrix and solution of state equation for discrete time systems. Adjoint systems – state space representation of sampled data systems.
Controllability and Observability: Concepts of controllability and Observability, Controllability tests for continuous time, discrete time, time invariant systems, Observability tests for continuous time and discrete time, time invariant systems, controllability and Observability modes in state.

Unit – III
Jordon's canonical form, controllable and observable companion forms for single input single output systems. Pole placement by state feed back. State observer.

Unit – IV
Nonlinear systems: Behaviour of non-linear systems, Jump resonance, sub-harmonic oscillation, limit cycles, common physical non linearities, singular points, phase plane method.
Construction of phase plane trajectories, isocline method, delta method, computation of time.

Unit – V
Stability: Liapunov's stability criteria, Theorems. The direct method of Liapunov for linear systems. Methods of constructing Liapunov function Krasovski's method, variable gradient method.

Unit – VI
Optimal Control – Formulation of optimal control problem, calculus of variations, Minimisation of functionals. Formulation of variational calculus using Hamiltonian method.

TEXT BOOKS:
1. Gopal M , *"Modern Control System Theory"*, New Age International Publishers. 1993
2. Nagrath I.J and Gopal M., *"Control System Engineering"*, Wiley Eastern Publishers. 1982

REFERENCE BOOKS:
1. K.Ogata , *"Modern Control Engineering"*, PHI. 1992
NOTE:
Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
3	0	0	3

Course Outcomes:
CO1: Understand in the field of VLSI design and technology, basic electrical properties of active devices involved.
CO2: Expose the VLSI basic circuit design with the help of stick diagrams, design rules and layout configurations.
CO3: Expose basic gate level design, electrical properties, physical dimensions and driving capabilities of the gates.
CO4: Design simple subsystem like adders, shifters, ALU, multiplier, comparators, counters, memory elements for mathematical computations.
CO5: Design and Synthesize standard cells PLD'S, FPGA for VLSI design.
CO6: Analyze basic CMOS testing principles and system level techniques.

Unit-I
Introduction to VLSI and Basic Electrical Properties: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS &BiCMOS technologies- Oxidation, Lithography, Diffusion, Ion implantation, Metallization, Encapsulation.
Basic Electrical Properties of MOS and BiCMOS Circuits: $I_{ds}V_sV_{ds}$relationships, MOS transistor threshold Voltage, g_m, g_{ds}, Figure of merit, Pass transistor, NMOS Inverter, Various pull ups and Pull downs, CMOS Inverter analysis and design, Bi-CMOS Inverters.

Unit-II
VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2μ CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling.

Unit-III
Gate Level Design: Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Basic circuit concepts, Sheet Resistance(R_S) concept and Sheet Resistance R_S in MOS, Area Capacitance Units, Calculations Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out, Choice of layers

Unit-IV
Subsystem Design: Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Counters, High Density Memory Elements.

Unit-V
Semiconductor IC Design and VHDL Synthesis: PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic(PLA'S), Design Approach. VHDL Synthesis, Circuit Design Flow, Circuit Synthesis, Simulation, Layout, Design capture tools, Design Verification Tools, Test Principles.

Unit-VI

CMOS Testing : CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chip level Test Techniques, System-level Test Techniques, Layout Design for improved Testability.

Text Books:
1. Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, *"Essentials of VLSI circuits and systems"*,PHI, 2005 Edition.
2. Weste and Eshraghian, *"Principles of CMOS VLSI Design"*, Pearson Education, 1999.

Reference Books:
1. John .P. Uyemura, *"Introduction to VLSI Circuits and Systems"*, JohnWiley, 2003.
2. John M. Rabaey, *"Digital Integrated Circuits"*, PHI, EEE, 1997.
3. Wayne Wolf, "Pearson Education", *Modern VLSI Design*, 3rd Edition, 1997.
4. S.M. SZE, *"VLSI Technology"*, 2nd Edition, TMH, 2003.

NOTE:

Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc. for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

EE 422: ELECTRICAL DRAWING & CAD (ED&CAD)
(Professional Elective-III, For B.Tech EEE- VIII Semester)

Scheme : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
2	1	-	3

Course Outcomes:

Students are able to develop various symbols, notations and different types
CO1: of windings DC machines according to standard practices using CAD software.
CO2: of windings AC machines according to standard practices using CAD software.
CO3: of components of DC machine assembly according to standard practices using CAD software.
CO4: of components of AC machine assembly according to standard practices using CAD software.
CO5: of windings and components of transformers assembly according to standard practices using CAD software.
CO6: generating stations and substations and representation of various electrical Apparatus using CAD software.

Unit-I
Introduction: Single and two layer windings, Closed and Open windings. Developed winding diagrams of D.C. machines: Coils and Coil sides, Numbering scheme, coil span, Types of DC windings, winding pitches, back pitch, front pitch, winding pitch, commutator pitch, simplex lap winding, simplex lap winding with more than one coil sides per slot, simplex wave winding, dummy coils in wave winding, equalizer connections, multiplex wave winding, double layer Lap and Wave windings, Problems.

Unit-II
Developed winding diagrams of A.C. machines, General Terms Related to AC windings, Terminals and Connections, Phases and Phase Spread, Concentric windings, hemitropic and whole coil windings, Integral and Fractional slot double layer Lap and Wave windings. Single layer windings, Un-bifurcated 2 and 3 tier windings, mush windings, Bifurcated 2 and 3 tier windings. tappings and openings

Unit-III
D.C. machine Assembly: sectional views of yoke, field system, armature and commutator dealt Separately.

Unit-IV
A.C Machine Assembly: Synchronous machines, Salient pole and Non-Salient pole machines, Asynchronous Machines , Cage and Slip Ring induction machine, Problems.

Unit-V
Transformers Assembly: Sectional View and Elevation of Transformers, Core sectional details of Transformers, single and three phase core and shell type transformers.

Unit-VI
Single line diagrams of generating stations and substations, pole and Plinth mounted substations, Receivieng stations, and representation of various electrical Apparatus, problems

TEXT BOOKS:
1. *"Performance & Design of Alternating Current machines",* M. G. Say, CBS publishers,3rd Edition,2002.
2. *"The Performance & Design of DC machines"* A.E Clayton & N.N.Hancock CBS Publication,3rd Edition,2004.
3. "*Electrical Machine Design",* A.K. Sawhney, Danpathi Rai and Co., 2005.
4. *"Computer Aided Electrical Drawing",* Yogesh.M, Naga Raja. B.S, Nandan.N, PHI India.

REFERENCE BOOKS:
1. *"Electrical Drawing"*- K.L. Narang
2. *"Electrical Drafting"*- S.F. Devalapur
3. *"Electrical Engineering. Drawing"* – S.K. Bhattacharya

NOTE:
Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

EE 423: BIO-MEDICAL ENGINEERING
(Professional Elective-III, For B.Tech EEE- VIII Semester)

Scheme   : 2013
Internal Assessment : 30
End Exam : 70
End Exam Duration : 3 Hrs

L	T/D	P	C
2	1	-	3

Course Outcome:

Students are able to
CO1: Understand basics concepts of Biomedical Engineering
CO2: Understand concepts of measurement of Non Electrical Parameters
CO3: Understand concepts of measurement of certain important electrical parameters acquisition
CO4: Understand the basic principles in imaging techniques
CO5: Understand the basic principles in life assisting and therapeutic devices
CO6: Understand the basic principles Patient Safety Techniques

UNIT I
Fundamentals Of Biomedical Engineering: Cell and its structure, Resting and Action Potential, Nervous system and its fundamentals, Basic components of a biomedical system, Physiological systems of the body, Cardiovascular systems, Respiratory systems, Kidney and blood flow, Physiological signals and transducers, Transducers, Piezo electric, ultrasonic transducers, Temperature measurements.

UNIT II
Non Electrical Parameters Measurement And Diagnostic Procedures : Measurement of blood pressure, Cardiac output, Heart rate, Heart sound, Pulmonary function measurements, Blood Gas analysers, pH of blood, measurement of blood pCO_2, pO_2, finger-tip oxymeter.

UNIT III
Electrical Parameters Acquisition And Analysis : Electrodes, Limb electrodes, floating electrodes, pregelled disposable electrodes, Micro, needle and surface electrodes, Amplifiers, Preamplifiers, differential amplifiers, chopper amplifiers, Isolation amplifier, ECG, EEG, EMG, ERG, Lead systems and recording methods, Typical waveforms.

UNIT IV
Imaging Modalities And Analysis: Radio graphic and fluoroscopic techniques, Computer tomography, MRI, Ultrasonography, Endoscopy, Thermography, Different types of biotelemetry systems, Retinal Imaging, Imaging application in Biometric systems, Analysis of digital images.

UNIT V
Life Assisting, Therapeutic Devices : Pacemakers, Defibrillators, Ventilators, Nerve and muscle stimulators, Diathermy, Heart, Lung machine, Audio meters, Dialysers, Lithotripsy.

UNIT VI
Patient Safety Techniques: Electrical safety in medical environment, shock hazards – leakage current-Instruments for checking safety parameters of biomedical equipments.

Text Books:
1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice hall of India, New Delhi,2007.
2. Joseph J.carr and John M. Brown, "Introduction to Biomedical Equipment Technology", John Wiley and sons, New York, 4th Edition, 2012.
3. Khandpur R.S, "Handbook of Biomedical Instrumentation", , Tata McGraw-Hill, New Delhi, 2nd Edition, 2003.

References Books:

1. John G. Webster, *"Medical Instrumentation Application and Design"*, John Wiley and sons, New York, 1998.
2. Duane Knudson, *"Fundamentals of Biomechanics"*, Springer, 2nd Edition, 2007.
3. Suh, Sang, Gurupur, Varadraj P., Tanik, Murat M., *"Health Care Systems, Technology and Techniques"*, Springer, 1st Edition, 2011.
4. Ed. Joseph D. Bronzino, *"The Biomedical Engineering Hand Book"*, Third Edition, Boca Raton, CRC Press LLC, 2006.
5. M.Arumugam, *"Bio-Medical Instrumentation"*, Anuradha Agencies, 2003.

NOTE:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

List of Interdisciplinary Electives

1	IDE301	Optimization Techniques
2	IDE302	Remote Sensing and Geographic Information System
3	IDE303	New and Renewable Energy Systems
4	IDE304	Artificial Intelligence and Expert Systems
5	IDE305	Nanotechnology
6	IDE306	Introduction to Information Systems
7	IDE307	Mechatronics
8	IDE308	Control and Automation
9	IDE309	Web Development Programming
10	IDE310	Environmental and Water Resources Engineering

IDE 301: OPTIMIZATION TECHNIQUES (OT)
(Interdisciplinary Elective for B. Tech. – VI Semester)

Scheme : 2013
Internal assessment : 30
End Exam Marks : 70

L	T/D	P	C
3	-	-	3

Course outcomes :

CO1: Develop mathematical models from the verbal description of the real system.
CO2: Understand the importance of mathematical modeling in solving practical problems in industry.
CO3: Suggest proper deployment of scarce resources and provide optimum solution.

Unit- I
Introduction : Definition, Nature and Significance of Operations Research , Models in Operations Research, Application Areas of Operations Research in Management.
Linear Programming: Model Formulation, Graphical solution of L.P.P, Slack, Surplus and Artificial variables, Simplex method, Big M method, Degeneracy in L.P.P, Dual linear programming problem, Solution of the Primal problem from the solution of the Dual Problem.
Unit – II
Transportation Problems: Balanced and unbalanced Transportation problems, Initial basic feasible solution using N-W corner rule, least cost entry method and Vogel's approximation method, Optimal Solution, Degeneracy in Transportation Problem.
Assignment Problems: The Assignment Algorithm (Hungarian Assignment method), Balanced and Unbalanced Assignment Problems, Travelling Salesman Problem as an Assignment Problem
Unit- III
Game Theory : Definitions and Terminology, Two Person Zero Sum Games, Pure Strategy Games (with Saddle Point), Principal of Dominance, Solution for Mixed Strategy Games (Game without Saddle Point),
Queuing Theory: Introduction, single channel - poission arrivals - exponential service times with infinite population, Multi channel - poisson arrivals - Exponential service times with infinite population.

Unit – IV
Project Management: Phases of project management, guidelines for network construction, critical path, forward and backward pass, floats and their significance, crashing for optimum duration.
Sequencing Models :Introduction, General assumptions, processing n jobs through 2 machines, processing 'n' jobs through m machines, Processing 2 jobs through m machines.
Unit - V
Dynamic Programming: General Concept of Dynamic Programming, Problems related to general allocation and capital investment decisions.

Unit – VI

Inventory Control: Definition, Costs associated with inventory, Basic EOQ model, Inventory control systems – P System, Q System, ABC analysis, VED analysis

Simulation: Introduction, Advantages of Simulation, Generation of Random numbers, Simulation Languages, Monte Carlo Simulation, Application of Simulation to queuing theory, inventory control

Text Books *:*

1. Hamdy, A. Taha, *Operations Research-An Introduction*, Prentice Hall of India Pvt. Ltd.,
2. S.D. Sharma, *Operations Research*, Kedarnath, Ramnath & Co., Meerut,
3. R. Paneer Selvam, *Operations Research* , PHI Learning Pvt. Ltd., New Delhi.

Reference Books:

1. Hillier / Libernam, *Introduction to Operations Research* , Tata McGraw Hill Edition
2. J.K. Sharma, *Operations Research*-Problems and Solutions, Macmillan India Ltd.
3. Billy E Gillett, *Introduction to Operations Research A Computer Oriented Algorithmic Approach*, Tata McGraw Hill Edition.

NOTE:

Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

IDE 302 Remote Sensing And Geographic Information System (RS&GIS)
(Interdisciplinary Elective for B. Tech – VI Semester)

Scheme   : 2013
Internal Assessment : 30
End Exam Marks   : 70

L	T/D	P	C
3	-	-	3

Course Outcomes:

CO1: Understand the principles and applications of Remote Sensing and various types of platforms used in Remote Sensing.
CO2: Understand the applications of GIS.
CO3: Understand GIS data types and input techniques.

UNIT – I
Introduction To Remote Sensing:
Concept and Scope of Remote Sensing: Definitions, Process and Characteristics of Remote Sensing System, Advantages and limitations.
Concept of Electromagnetic Radiation (EMR): Wavelength-frequency-energy relationship of EMR, EMR Spectrum and its properties, EMR wavelength regions and their applications, Interaction of EMR with matter, Spectral signatures.
Energy Interaction in the atmosphere and with Earth Surface Features: Scattering, absorption, transmission, atmospheric windows Spectral Reflectance Curve, Concept of signatures.
UNIT – II
Platforms and Sensors:
Introduction: Sensor materials, Sensor System - Framing and Scanning System, Whiskbroom scanners, Push-broom scanners, Side Looking scanner.
Types and Characteristics of Sensor: Imaging and non-imaging sensors, Active and passive sensors, Resolution of Sensors - Spectral, Spatial, Radiometric & Temporal, Scale, Mapping unit, Multi-band concepts and False Colour Composites.
Remote Sensor Platforms and Satellite Orbits: Ground, Airborne and Space borne Platforms, Orbital Characteristics – Coverage, Passes, Pointing Accuracy, Geostationary, Sun synchronous, shuttle orbit.
Space Imaging Satellites: Early history of space imaging; Multispectral and Hyperspectral sensors, Radar, Lidar; Specification of some popular satellites – IRS, Landsat and SPOT series; High resolution satellites – IKONOS, Cartosat, Quickbird, OrbView, GeoEye, Pléiades, WorldView; Other latest earth resource satellites.
UNIT – III
Remote Sensing Applications:
Scope of Remote Sensing Applications - Potentials and Limitations. Applications in land use and land cover analysis.Resource evaluation **-** Soils, minerals forest and agriculture.
Water Resource Applications- Mapping, monitoring of surface water bodies, tanks, lakes/ reservoirs.Environmental applications.

UNIT – IV
Geographic Information System:
Basic Concepts: Definition of GIS, Components of GIS, Variables - points, lines, polygon, Functionality of GIS, Areas of GIS application, Advantage and Limitation of GIS
UNIT – V
GIS Data: Spatial and Attribute Data, Information Organization and Data Structures - Raster and Vector data structures, Data file and database
Creating GIS Database: GIS Software's, file organization and formats, Geo-database, Rectification, Digitization and Map Composition
UNIT – VI
GIS Data Input & Editing: Nature and Source of data, Method of spatial and Attribute data capture - Primary and Secondary, digitization and scanning method, Techniques and procedure for digitizing, Errors of Digitization and rectification, Re-projection, Transformation and Generalization, Edge matching and Rubber sheeting, Topology.

Text Books:

1. M. Anji Reddy; *Text Book of Remote Sensing and Geographic Information System*, BS Publication.
2. Lo C.P. & Yeung A.K.W., (2004). *Concepts and Techniques of GIS*, Prentice-Hall of India, New Delhi.

Reference Books:
1. B.Bhatta; *Remote sensing and Geographic Information System*, Oxford Publications.
2. Siddiqui, M.A.; 2006, *Introduction to Geographical Information System*, Sharda Pustak Bhavan, Allahabad.
3. Curran, Paul J; 1985, *Principles of Remote Sensing*, Longman, London.
4. NRSA, IRS, *Data User Handbook*, Hyderabad

NOTE:

Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

IDE 303: NEW AND RENEWABLE ENERGY SYSTEMS (NRES)
(Interdisciplinary Elective for B. Tech. – VI Semester)

 Scheme : 2013
Internal Assessment : 30
End Exam Marks : 70

L	T/D	P	C
3	-	-	3

Course outcomes:

CO1: Analyze the various renewable energy sources like wind, solar, biomass, Ocean energy, Fuel cells and MHD systems

CO2: Get exposure on biomass gasification and combustion, Theory of flat plate collectors, photo voltaic, thermal applications and limitations of solar energy are also provided.

Unit - I
Introduction and Energy Conservation: Classification of energy sources-Importance of renewable energy sources and energy chain-Principles of energy conservation –Energy conservation opportunities
Fundamentals of Solar Energy: Extra terrestrial and terrestrial radiation- Solar constant and solar radiation geometry-Solar time and day length-Estimation of monthly average daily total radiation on horizontal surface and tilted surface-Measurements of radiation data.
Unit - II
Solar Collecting Devices : Flat plate collector- Losses associated with collector-Method of determination of top loss, side loss and bottom loss coefficient -Performance parameters affecting the collector performance-Efficiency of flat plate collector-selective surfaces- Air collectors- Classification of concentrating collector-Tracking of CPC collector
Solar Thermal Systems: Methods of storing solar energy-Solar water heating-Solar refrigeration system – Solar thermal power generation-Solar distillation-Solar space heating
Unit - III
Solar Voltaic Systems & Emerging Technology: Basic principle of PV cell-Arrangements of PV cell-classification of PV cell-Principle of magneto hydro dynamics-thermo electric and thermionic conversion, Introduction to Fuel cell.
Unit - IV
Wind Energy: Origin of wind-Application of wind power –Betz limit-Components of Horizontal axis wind turbine-Types of blades- Classification of vertical axis turbine
Unit - V
Biomass Energy: Photosynthesis process- Biomass conversion technologies- Biogas production - Types of digester- Factors affecting the digester performance
Geothermal Energy: Types of geothermal energy resources-Energy conversion through geothermal energy resources-Environmental consideration
Unit - VI
Ocean Thermal Energy Conversion: Principle of OTEC- Anderson and Claude cycles
Tidal energy: Introduction- tidal energy conversion methods,
Wave energy: Introduction, conversion methods

Text Book:
1. B.H.Khan , *Non-conventional Energy Sources*, TMH Publishers, New Delhi. 2003
Reference Books:
1. G.D Rai , *Non-conventional Energy Sources*, Khanna Publishers, New Delhi. 1989
2. S.Rao and Paulekar, *Energy Technology*, Khanna Publishers, New Delhi. 2000
3. W.R.Murphy& G.Mckay , *Energy Management*, Butterworth & Co. Publishers, New Delhi. 2001
4. B.Sreenivasa Reddy & K.Hemachandra Reddy , *Thermal data hand book*, IK International Publishers, Bangaloore 2007

NOTE:

Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

IDE 304: ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS (AIES)
(Interdisciplinary Elective for B. Tech. – VI Semester)

Scheme   : 2013
Internal Assessment : 30
End Exam Marks   : 70

L	T/D	P	C
3	0	0	3

Course Outcomes:
CO1: Understand how foundations laid for Artificial Intelligence.
CO2: Understand the nature, Structure and Behavior of agents in the Environment.
CO3: Solving agent's problems by using Breadth, Depth, Uniform, Depth- limited, Iterative Deepening, Bidirectional Search Strategies.
CO4: Apply Greedy, A *, Memory bounded heuristic search strategies, heuristic functions for Solving agent's problems.
CO5: Apply Hill-climbing, simulated annealing, Local Beam Search, Genetic Algorithms (Local search problems) for Agent's Problems.
CO6: Understand features and working of expert system.

Unit:I
Introduction: What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence.
Unit: II
Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.
Unit: III
Solving Problems by Searching: Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies.
Unit: IV
Informed (Heuristic) Search Strategies- Greedy best-first search, A* search, Memory-bounded heuristic search, Learning to search better. Heuristic Functions.
Unit: V
Beyond Classical Search: Local Search Algorithms and Optimization Problems, Local Search in Continuous Spaces, Searching with Partial Observations.
Unit: VI
Introduction to Expert System: What are Expert Systems, Features of Expert system, Features of good expert system, Role of human in Expert system, Expert system organization, Difference between expert system and conventional program, Basic activities of expert system and the areas in which they solve problems, Prospector system features, working.

Text Books:
1. Stuart Russell and Peter Norvig, *"Artifcial Intelligence: A Modern Approach"* Third Edition, 2010. Pearson Education.
2. Donald A.Water man, *"A Guide to expert systems"*, Addison Wesley publishing company.

Reference Books:
1. Judea Pearl, *"Probabilistic Reasoning in Intelligent Systems"*, Morgan Kaufmann, 1988.
2. Tom Mitchell, *"Machine Learning"*, McGraw Hill, 1997.

NOTE:

Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

IDE 305: NANO TECHNOLOGY
(Interdisciplinary Elective for B. Tech. – VI Semester)

Scheme : 2013
Internal Assessment : 30
End Exam Marks : 70

L	T/D	P	C
3	0	0	3

Course Outcomes:
CO1: Acquire the knowledge about the basics of nano technology and materials
CO2: Understand some applications and designs on nano carbons and spntronics

Unit I
Basics of nanoelectronics – capabilities of nanoelectronics – physical fundamentals of nanoelectronics – basics of information theory – the tools for micro and nano fabrication – basics of lithographic techniques for nanoelectronics.

Unit II
Quantum electron devices – from classical to quantum physics: upcoming electronic devices – electrons in mesoscopic structure – short channel MOS transistor – split gate transistor – Electron wave transistor – Electron spin transistor – quantum cellular automate – quantum dot array – Principles of Single Electron Transistor (SET) – SET circuit design – comparison between FET and SET circuit design.

Unit III
Nanoelectronics with tunneling devices and superconducting devices – tunneling element technology - RTD: circuit design – Defect tolerant circuits - Molecualr electronics – elementary circuits – flux quantum devices – application of Superconducting devices – Nanotubes based sensors, fluid flow, gas, temperature, Strain – oxide nanowire, gas sensing (ZnO, TiO, SnO, WO), LPG sensor (SnO powder)- Nano 2 2 3 2 designs and Nanocontacts - metallic nanostructures.

Unit IV
A survey about the limits – Replacement Technologies – Energy and Heat dissipation – Parameter spread as Limiting Effect – Limits due to thermal particle motion – Reliability as limiting factor – Physical limits – Final objectives of integrated chip and systems.

Unit V
Memory devices and sensors – Nano ferroelectrics – Ferroelectric random access memory – Fe-RAM circuit design – ferroelectric thin film properties and integration – calorimetric sensors – electrochemical cells – surface and bulk acoustic devices – gas sensitive FETs – resistive semiconductor gas sensors –electronic noses – identification of hazardous solvents and gases – semiconductor sensor array.

Unit VI

Sensor Characteristics And Physical Effects: Active and Passive sensors – Static characteristic - Accuracy, offset and linearity – Dynamic characteristics - First and second order sensors – Physical effects involved in signal transduction- Photoelectric effect – Photo dielectric effect – Photoluminescence effect – Electroluminescence effect – chemiluminescence effect – Doppler effect – Barkhausen effect – Hal effect – Ettinshausen effect – Thermoelectric effect – Peizoresistive effect – Piezoelectric effect – Pyroelectric effect –Magneto-mechanical effect (magnetostriction) – Magneto resistive effect

Text Books
1. K.Goser, P.Glosekotter & J.Dienstuhl, "Nanoelectronic and Nanosystems – From Transistors to Molecular Quantum Devices" Springer, 2004
2. Rainer Waser, "Nanoelectronics and Information Technology: Advanced Electronic Materials Novel and Devices" Wiley VCH, 2005.
3. Kourosh Kalantar – Zadeh, Benjamin Fry, "Nanotechnology- Enabled Sensors", Springer , 2008
4. H.Rosemary Taylor, "Data acquisition for sensor systems", Chapman & Hall, 1997

Refrence Books:
1. W. Roy VCH, *Nano Electronics and Information Technology*, 2nd Edition, Rainen waser 2005
2. Chonles P.Pook Jr., Frank. J. Owens, *Introduction to Nano technology*, 1 st Edition, Wiley Interscience, 2003
3. T. Pradeep, *Nano: The essentials*, , 1 st Edition, Tata McGraw Hill, 2007
4. Mark Ratne, Danill Ratne, *Nano Technology*, 1 st Edition Pearson education, 2006
5. W.R. Fahrner, "Nanotechnology and Nanoelectronics: Materials, Devices, Measurement Techniques", Springer, 2010.
6. Branda Paz, "A Handbook on Nanoelectronics", Vedams books, 2008.

NOTE:
Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

IDE306: INTRODUCTION TO INFORMATION SYSTEMS (IIS)
(Interdisciplinary Elective for B. Tech. – VI Semester)

Scheme   : 2013
Internal Assessment : 30
End Exam Marks   : 70

L	T/D	P	C
2	2	--	3

Course Outcomes:
CO1: Understand the functionalities of operating system, linkers, loaders, assemblers and compilers.
CO2: Describe the steps involved in the life cycle of a software project.
CO3: Illustrate linear search, binary search, bubble sort, selection sort and insertion sort using the concepts of C language.
CO4: Summarize the steps of E-R Modeling for library system, university database and banking scenarios.
CO5: Discuss the need for 1NF, 2NF, 3NF and BCNF.
CO6: Explain the working of DDL, DML and DCL statements using Oracle 10g.

Unit-I
Fundamentals of Computers & Computer Architecture: Introduction, Organization of a small computer, Central Processing Unit, Execution cycle, Instruction categories, measure of CPU performance Memory, Input/output devices, BUS, addressing modes
System Software: Assemblers, Loaders and linkers, Compilers and interpreters.
Unit-II
Operating System: Introduction, Process Management, CPU scheduling, Memory Management Schemes, Page replacement algorithms.
Software Engineering: Introduction to software engineering, Life cycle of a Software Project, Software Development Models.
Unit-III
Coding Standards and Best Practices: Introduction to C Programming, Basics of C Language, Data Types in C, Functions, arrays, pointers, structures.
Sorting and Searching Techniques: Searching Algorithms – Linear Search, Binary Search, Sorting Algorithms – Bubble Sort, Selecting Sort and Insertion Sort.
Unit-IV
Relational Database Management System: Introduction to DBMS, the database technology, data models. Database Users.
Entity Relationship (E-R) Modeling: Introduction, Notations, Modeling E-R Diagrams, Case Study1,2 & 3, Merits and Demerits of E-R modeling.

Unit-V
Normalization: Introduction, Need for Normalization, Process Normalization, Types of Normal Forms (1 NF, 2 NF, 3 NF & BCNF), Merits and Demerits of Normalization.

Unit-VI
Structured Query languages (SQL): History of SQL, Data Types, Data Definition Language Statements (DDL), Data Manipulation Language (DML), Data Control Language (DCL), writing simple queries.

Text Books:
1. Campus Connect Foundation Program – *Computer Hardware and System Software Concepts,Programming Fundamentals*- Vol. – 1, INFOSYS**.**
2. Campus Connect Foundation Program – *Relational Database management System, Client Server Concepts, Introduction to Web Technologies* - Vol. – 2, INFOSYS
3. Campus Connect Foundation Program – *Object Oriented Concepts – System Development Methodology, User Interface Design* - Vol. – 3, INFOSYS
4. Yashwant Kanetkar**,** *Let us ''C''* - bpb Publications 8th ed., 2007.

Reference Books:
1. Andrew S. Tanenbaum, *Structured Computer Organization*, PHI, 3rd ed., 1991
2. Silberschatz and Galvin, *Operating System Concepts*, 4th ed., Addision-Wesley, 1995
3. Wilbert O. Galitz, *Essential Guide to User Interface Design*, John Wiley, 1997
4. Alex Berson, *Client server Architecture*, Mc Grew Hill International, 1994
5. Henry F Korth, Abraham Silberschatz, *Database System Concept*, 2nd Edition, McGraw-Hill International editions, 1991
6. Roser S. Pressman, *Software Engineering-A Practitioners approach*, McGraw Hill, 5th ed., 2001

NOTE:

Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

IDE 307: MECHATRONICS (MT)
(Interdisciplinary Elective for B. Tech. – VI Semester)

Scheme : 2013
Internal assessment : 30
End Exam Marks : 70

L	T/D	P	C
3	-	-	3

Course Outcomes:
CO1: Analyze electrical and mechanical systems and their interconnection.
CO2: Analyze the concept of electronic devices used for industrial automation
CO3: Design of mechatronic systems for a set of specifications.
CO4: Understand and choose different controllers for various industrial automation processes

UNIT-I
Introduction: Definition of Mechatronics, Mechatronics in manufacturing, Products, and design. Comparison between Traditional and Mechatronics approach.

UNIT-II
Review of fundamentals of electronics. Data conversion devices, sensors, microsensors, transducers, signal processing devices, relays, contactors and timers. Microprocessors controllers and PLCs.

UNIT-III
Drives: stepper motors, servo drives. Ball screws, linear motion bearings, cams, systems controlled by camshafts, electronic cams, indexing mechanisms, tool magazines, transfer systems.

UNIT-IV
Hydraulic systems: flow, pressure and direction control valves, actuators, and supporting elements, hydraulic power packs, pumps. Design of hydraulic circuits.

UNIT-V
Pneumatics: production, distribution and conditioning of compressed air, system components and graphic representations, design of systems. Description

UNIT-VI
Description of PID controllers. CNC machines and part programming. Industrial Robotics.

TEXT BOOKS:
1. HMT ltd. Mechatronics, Tata Mcgraw-Hill, New Delhi, 1988.
2. G.W. Kurtz, J.K. Schueller, P.W. Claar . II, Machine design for mobile and industrial applications, SAE, 1994.
3. T.O. Boucher, Computer automation in manufacturing - an Introduction, Chappman and Hall, 1996.

REFERENCE BOOKS:
1. R. Iserman, Mechatronic Systems: Fundamentals, Springer, 1st Edition, 2005
2. Musa Jouaneh, Fundamentals of Mechatronics, 1st Edition, Cengage Learning, 2012.

NOTE:

Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

IDE308: CONTROL AND AUTOMATION (CA)
(Interdisciplinary Elective for B. Tech. – VI Semester)

Scheme : 2013
Internal assessment : 30
End Exam Marks : 70

L	T/D	P	C
3	-	-	3

Course Outcomes: At the end of the course the students will be able to

CO1: Understand the behavior of open loop and closed loop systems and analyze the mathematical model of a system.
CO2: To determine transfer function of complex control system using block diagram reduction technique and signal flow graph using mason's gain formula.
CO3: Determine the transient and steady state performance of second order control systems.
CO4: Analyze the stability of a control system through analytical and graphical techniques in time and frequency domain.
CO5: Demonstrate an ability to program Programmable Logic Controllers using ladder logic and other programming standards
CO6: Describe the advantages, use and applications of Programmable Logic Controllers (PLC's).

Unit – I
Modeling of Linear Control Systems: open-loop and closed-loop systems, control system components, Advantages, disadvantages & Applications of automated control system. Servo motors, position control systems, Transfer functions, equations of electrical and mechanical systems.

Unit – II
Block Diagrams: block diagram representation and manipulation, signal flow graphs-mason's gain formula to determine overall system gain.
Feedback Characteristics of Control Systems: Feedback and non-feedback systems, effects of feedback.

Unit – III
Time Response: Types of input, transient response of second order system for step input, time-response specifications, steady state error and error constants, proportional, derivative and integral controls.
Concept of Stability: Stability of systems-Routh Hurwitz criterion.
Compensation (Without Design): The necessity of compensation, series and parallel compensation. Realization of basic lead, Lag and lead-Lag compensators.

Unit – IV
Root Locus: Definition of Root Locus, construction Procedure, properties of typical systems analyzed by root locus techniques. Bode Plot

Unit – V
PLC Basics: PLC system, I/O modules and interfacing, CPU processor, programming Equipment, programming formats, construction of PLC ladder diagrams, Devices connected to I/O modules.
PLC Programming: Input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill press operation
Unit – VI
Digital logic gates: Programming with logic gates, programming in the Boolean algebra system, conversion examples
PLC Functions: Timer functions & Industrial applications, counters, counter function industrial applications, Arithmetic functions, Number comparison functions, number conversion functions

TEXT BOOKS:
1. Nagrath and Gopal , *"Control systems Engineering"*, New Age International Publications. 2003
2. B.C.Kuo, *"Automatic Control Systems"*, Oxford. 2003
3. K. Ogata , *"Modern control Engineering"*, Pearson 2003
4. Naresh - K.Sinha , *"Control Systems"*, New Age International Publishers. 1998
5. B.S.Manke , *"Linear Control Systems"*. 1996
6. John W. Webb & Ronald A. Reiss, *"Programmable Logic Controllers- Principles and Applications"* Fifth Edition, PHI

REFERENCE BOOKS:

1. Madan Gopal , *"Control Systems"*, TMH. 2003
2. Dorf, Bishop , *"Modern Conrtol systems"*, Addison Wesley 1998
3. (Shaum's out line series) , *"Feedback control systems"*, TMH 1986
4. R.C.Shukla, *"Control Systems"*, Dhanpat Rai.
5. Ashok Kumar, *"Control Systems"*, TMH.
6. JR. Hackworth & F.D. Hackworth Jr. , *"Programmable Logic Controllers- Programming Method and Applications"*, Pearson. 2004

NOTE:
Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

IDE 309: WEB DEVELOPMENT PROGRAMMING (WDP)
(Interdisciplinary Elective for B. Tech. – VI Semester)

Scheme   : 2013
Internal Assessment : 30
End Exam Marks   : 70

L	T/D	P	C
2	2	-	3

Course Outcomes:

CO1: Develop the skill & knowledge of Web page design.
CO2: Understand to function either as an entrepreneur or can take up jobs in the multimedia and web site development studio and other Information technology sectors.

Uni1-1
Introduction To The Web: Understanding The Internet And World Wide Web, History Of The Web, Protocols Governing The Web, Creating Websites For Individuals And The Corporate World, Web Applications, Writing Web Projects, Identification Of Objects, Target Users, Web Team.

Unit-2
Planning and process development: Planning And Process Development, Web Architecture, Major Issues In Web Solution Development, Web Servers, Web Browsers, Internet Standards, TCP/IP Protocol Suite, IP Addresses, Cyber Laws.

Unit-3
Hypertext Transfer Protocol: Introduction, Web Servers And Clients, Resources, URL And Its Anatomy, Message Format, Persistent And Non Persistent Connections, Web Caching, Proxy.

Unit-4
Hypertext Markup Language (HTML): History Of HTML And W3C, Html and Its Flavors , Html Basics, Elements Attributes And Tags, Basic Tags, Advanced Tags, Frames, Images, Meta Tag, Planning Of Web Page, Model And Structure For A Website, Designing Web Pages, Multimedia Content Frames.

Unit-5
Cascading Style Sheet(CSS): Introduction, Advantages, Adding CSS, Browser Compatibility, CSS and Page Layout, Selectors.

Unit-6
Hosting And Promoting Websites: Structure of Websites, Web Development Tools, Web Files Using Microsoft Word, Microsoft Front Page, Adobe Dreamweaver, GIF Animator, Hosting Websites, Getting A Domain Name, Redirectors On The Web, Server Software, Submitting For Search Engines, Visitor Analysis And Statistics, Website Promoting Methods.

Text books:
1. Utam K.Roy, *"Web Technologies"*, Oxford Higher Education.
2. K.L.James, *"The Internet- A User Guide"*, 2nd Edition, PHI Publications.

Reference books:
1. Kognet Learning Solutions inc., *"HTML5 in Simple Steps"*. Dreamtech press.
2. Steven M.Schafer, *"HTML,XHTML and CSS Bible 5th Edition"*, Wiley India.

NOTE:

Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

IDE 310 ENVIRONMENTAL AND WATER RESOURCES ENGINEERING
(Inter disciplinary Elective for B. Tech. – VI Semester)

	L	T/D	P	C
Scheme : 2013	3	-	-	3

Scheme : 2013
Internal Assessment : 30
End Exam Marks : 70

Course Outcomes:

CO1: Identify the source of waste water and solid waste
CO2: Identifying the physical, chemical and biological properties of waste water
CO3: Understand India's water budget, Irrigation methods and fundamentals of Hydro power development.

Unit – I
Water Supply System: Need for protected water supply system – Objectives of Water supply system – Routine water analysis for physical, chemical and bacteriological characteristics and their significance – Standards for drinking water – Water borne diseases and their control.

Unit – II
Sanitation: Aim and objectives of sanitation – Conservancy and water carriage systems – Classification of sewerage systems – Separate, combined and partially combined systems – disposal of domestic waste water.

Unit – III
Urban Solid Waste Management: Types, sources, quantity and composition of urban solid waste – Collection, transportation, recovery & reuse – Disposal methods such as composting, incineration, sanitary land fill.

Unit – IV
Hydrology: Hydrologic cycle – Global water budget – India's water budget – Practical applications of Hydrology – Climate and weather seasons of India – Floods – Flood management.

Unit – V
Water Resources Development: Planning for WRD – Purposes of WRD project multipurpose project – Functional requirements – Financial analysis of a project – Irrigation methods – Ground water – Geological formations – other sources of ground water – Water wells.

Unit – VI

Water Power Engineering: Sources of energy – Classification – Types of power planning for water power development – History – Advantages – Comparison – Layout of hydro power plant – Economics of Hydro power development.

Text Books:

1. Santosh Kumar Garg [1992], *Environmental Engineering Vol.1*, Khanna Publications.
2. P. Jaya Rami Reddy, *A Text book of Hydrology (3rd Edition*, 2011), Laxmi Publications, New Delhi.
3. Dr. P.N. Modi [2014], *Irrigation and water Resources Engineering*, Standard Book House

Reference books:

1. S.K.Hussain [1994], *Water supply and sanitary Engineering*, Oxford & IBH.
2. H.M. Raghunath [2009], *Groundwater*, Wiley Eastern Ltd
3. K.Subramanya, *Engineering Hydrology*, Tata Mc Graw Hill Publishing Co. Ltd, New Delhi.
4. M.M. Dandekar and K.N. Sharma [2010], *A Text Book of Water Power Engineering*, Vikas Publications.
5.R.K.Sharma and T.K.Sharma [2003], *A Text book of Water Power Engineering including Dams, Engg. Hydro & Fluid Power Engg.*, S. Chand Company Ltd., New Delhi–110 055

NOTE:

Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

List of Global Electives

1	GE401	Introduction to Psychology
2	GE402	Research Methodology
3	GE403	Entrepreneurship Development
4	GE404	Intellectual Property Right and Patent Filing
5	GE405	Constitution of India
6	GE406	Ethical Hacking
7	GE407	Information Security and Cyber Laws
8	GE408	Foreign Languages

GE401: INTRODUCTION TO PSYCHOLOGY (IPY)
(Global Elective for B. Tech. – VII Semester)

Scheme   **: 2013**
Internal assessment : 100

L	T/D	P	C
2	-	-	2

Course Outcomes:

CO1: Articulate the general history of psychology by explaining depth and breadth of the field from the field from the perspective of a future educator or researcher.

Unit – I
Introduction: Defining Psychology & Behavior-Branches and fields of Psychology, Utility of Psychology
Methods of Psychology: Introspection Method, Naturalistic observation, Experimental Method-Differential Method, Clinical Method, Psycho Physical Methods
Unit – II
Physiological Basis of Behavior: The Neuron-Central Nervous system, Brain and localization of Brain functions, Spinal chord Influence of Nervous system on human behaviour, Endocrine system and it's impact, The role of heredity and environment in the development of personality
Unit – III
Instincts, Emotions Senses and Sensitivity: Instincts and Reflex actions-Emotion & it's characteristics-Physiology of Emotions-Sensation and Sensitivity
Unit – IV
Thinking, Reasoning and Problem solving : Nature of thinking-Elements of thoughts, Tools of Thinking, Rigidity, Types of thinking, Reasoning & types, Problem solving and it's methods
Unit – V
Motivation and Behavior & Attention & Learning: Biological and socio psychological Needs, Drives and Incentives, Motives and Types of Motives, Types & Effect of attention, Types of Learning, Problem Solving, Mechanism of Memorization
Unit – VI
Intelligence**,** Aptitude**,** Personality : Nature of Intelligence-Concept of Metal age and IQ-Constantly of IQ-IQ Classification, Aptitude Ability & Achievement, Measurement of Aptitude, Features and Characteristics of Personality, Personality Assessment, Walters social Learning Theory
TEXT BOOKS:
1. S.K. Mangal, *"General Psychology"*, Sterling Publishers Private Limited
REFERENCE BOOK:
1. Saundra K.Ciccarelli&Gkenn E.Meyer, *"Psychology"*, Dorliing Kindersley (I) Pvt Limited

NOTE:
INTERNAL ASSESSMENT: Two Internal Examinations will be conducted for 50 Marks each. The Question paper consists of SIX questions. The FIRST question is compulsory. It consists of 10 questions of two marks each. Four questions to be answered from the remaining five questions and each question carries 7.5 marks.

END EXAM: There is no End Examination for this subject.

GE402: RESEARCH METHODOLOGY (RM)
(Global Elective for B. Tech. – VII Semester)

Scheme   **: 2013**
Internal assessment : 100

L	T/D	P	C
2	-	-	2

Course Outcomes:

CO1: Understand the objective, types, methodologies and process of Research.

CO2: Understand the need, types, principles and characteristics of research design.

CO3: Understand the various data collection techniques for good research design.

CO4: Apply the different methods of research with innovative data collection and its processing.

CO5: Analyze the sampling fundamentals, techniques for interpretation and report preparation mechanisms.

Unit – I
Research Methodology: Introduction –Meaning-Objectives & Motivation of Research-Types & Significance of Research-Research Methods (Vs) Methodology.
Researching process-Technique involved in defining a problem- Definition of a Hypothesis
Role of Hypothesis-Types of Hypothesis-Criteria of Good Hypothesis.

Unit – II
Research Design and Sampling Design: Need for Research Design-Features of good Design-Concepts Related to Research Design-Different research designs-Basics Principles of Experimental Designs-Steps in sampling design-Characteristics of good sample design-Various types of sample designs-Complex Random sampling designs

Unit-III
Measurement and Scaling Techniques: Errors in Measurement, Tests of Sound Measurement, Scaling and Scale Construction Techniques, Forecasting Techniques, Time Series Analysis, Interpolation and Extrapolation.

Unit – IV
Data Collection and Processing:
Primary Data: Data Collection through observation method & Interview Method-Data Collection through Questionnaires & schedules- Comparison of data collection methods- -Collection of Secondary data.
Processing: Measures of Central Tendency-Measures of Dispersion-Measures of Asymmetry - Measures of Relationship-Simple Regression Analysis-Chi-square Test for comparing valiance

Unit – V
Correlation and Regression Analysis: Method of Least Squares, Regression Vs. Correlation, Correlation Vs Determination, Types of Correlation and Their Specific Applications.

Sampling Fundamentals: Central Limit Theorem-Sampling Theory-Concept of standard error-Estimating population Mean-Sample size & Determination

Unit – VI
Interpretation of Data and Report Writing: Meaning-Technique & precautions of Interpretation Significance of Report writing, Steps- Layout of a Research report, -Types of Reports-Mechanics of writing a Research Report- Precautions of Report Writing.

TEXT BOOKS:
1. C.R. Kothari, *"Research Methodology (Methods & Techniques)"*, New Age International Publishers.

REFERENCE BOOKS:
1. R. Cauvery, V. K. Sudha Nayak, M. Girija, *"Research Methodology"*, S. Chand Publications.

NOTE:
INTERNAL ASSESSMENT: Two Internal Examinations will be conducted for 50 Marks each. The Question paper consists of SIX questions. The FIRST question is compulsory. It consists of 10 questions of two marks each. Four questions to be answered from the remaining five questions and each question carries 7.5 marks.

END EXAM: There is no End Examination for this subject.

GE403: ENTREPRENEURSHIP DEVELOPMENT (ED)
(Global Elective for B. Tech. – VII Semester)

Scheme   **: 2013**
Internal assessment : 100

L	T/D	P	C
2	-	-	2

Course Outcomes:
CO1: Build on personal as well as external resources with a view to successfully launching and subsequently managing their enterprises.

Unit - I
Introduction: Concept of an entrepreneur; Definition of an entrepreneur; Types of entrepreneurs; Characteristics of an entrepreneur.
Entrepreneurship: Definitions; Theories of entrepreneurship; Key elements of entrepreneurship; Six important segments of entrepreneurship environment; Advantages of entrepreneurship; Barriers to entrepreneurship; Role of entrepreneurship in economic development.

Unit – II
Rural Entrepreneurship: Meaning; Need; Retrospection of rural industrialization in India; Problems of rural entrepreneurship; Development plan for rural entrepreneurship.
Small Enterprises : Definition of SSI; Types, Characteristics of SSI; Role of SSI in economic development; Problems faced by SSI.

Unit – III
Project Planning: Project Identification; Project Selection; Project Report – Contents & Formulation; Methods of Project Appraisal.
Unit – IV
Ownership Structures: Sole Proprietorship; Partnership; Company; Co-operative; Selection of appropriate ownership structure.

Unit – V
Institutional Finance: Commercial banks; Other Financial Institutions – IDBI, IFCI, ICICI, IRBI, SFC, SIDC,
SIDBI & EXIM Bank.

Unit – VI
Institutional Support: Need; Support to Small Entrepreneurs – NSIC, SIDO, SSIB, SSIDC, SISI, DICs

TEXT BOOKS:
1. Prof. Satish C. Ailawadi & Mrs. Romy Banerjee, *"Principles of Entrepreneurship"*, Everest Publishing HousePub.
REFERENCE BOOKS:
1. S.S. Khanka, *"Entrepreneurial Development"*, S. Chand & Company Ltd. Pub.

NOTE:

INTERNAL ASSESSMENT: Two Internal Examinations will be conducted for 50 Marks each. The Question paper consists of SIX questions. The FIRST question is compulsory. It consists of 10 questions of two marks each. Four questions to be answered from the remaining five questions and each question carries 7.5 marks.

END EXAM: There is no End Examination for this subject.

GE404: INTELLECTUAL PROPERTY RIGHT & PATENT FILING (IPPF)
(Global Elective for B. Tech. – VII Semester)

Scheme   **: 2013**
Internal assessment : 100

L	T/D	P	C
2	-	-	2

Course Outcomes:
CO1: Acquire fundamental competencies with regard to intellectual property rights.

Unit – I
Basics of IPR: Introduction to intellectual property right (IPR) -Need for IPR in India-Systems-Benefits of IPR-Various Types of IPR-Violation of IPR

Unit – II
Patents: Introduction to Patents-Various kinds of Patents-Patenting Process-Patent and kind of inventions protected by patent- Patent documents- How to protect your inventions? -Granting of patent Rights of a patent -How extensive is patent protection-Searching a patent -Drafting of a patent

Unit – III
Copy Right: What is copyright?- What is covered by copyright?- Fair use of copyrighted works (e.g., for classroom use)-Contributory copyright infringement -Rights covered by copyright?-Critical differences between patent and copyright protection-Copyright infringement distinguished from plagiarism- Remedies against Infringement

Unit – IV
Method of Designing Registrations: Designing Registrations-How Chart for Registration-Trade Mark-Geographical Indications Integrated Circuits-Trade Secrets

Unit – V
IPR Policy: IP in various sectors like Government and Nation-R &D organizations-IT, Media,Entertainment.

Unit – VI
Management of Intellectual Property Rights-Trademarks, Geographical Indications and Domain Names-Chemical Engineering & Services Sector-Industries & Small Scale Industry

TEXT BOOKS:
1. *"Intellectual Property Rights: Key to New Wealth"*, National Research Development Corporation
2. Prabuddha Ganguli , *" Intellectual Property Rights"*, TMH

REFERENCE BOOKS:
1. P. Narayanan; *"Law of Copyright and Industrial Designs"* ;Eastern law House, Delhi , 2010

NOTE:
INTERNAL ASSESSMENT: Two Internal Examinations will be conducted for 50 Marks each. The Question paper consists of SIX questions. The FIRST question is compulsory. It consists of 10 questions of two marks each. Four questions to be answered from the remaining five questions and each question carries 7.5 marks.

END EXAM: There is no End Examination for this subject.

GE405: CONSTITUTION OF INDIA (CI)
(Global Elective for B. Tech. – VII Semester)

Scheme : 2013
Internal assessment : 100

L	T/D	P	C
2	-	-	2

Course Outcomes:
CO1: Understand the formation and principles of Indian Constitution.
CO2: Understand structure and functions of Union government and State executive. Duties of President, Vice president, Prime Minister, Governor, Chief Minister cabinet and State legislature.
CO3: Understand constitutional amendments of 42, 44,74,76,86 and 91. Central-State relations, President rule.
CO4: Understand Indian social structure and languages in India. Rights of women, SC, ST and then weaker section.
CO5: Understand the structure of Judiciary, Role and functions of Supreme Court, High court and Subordinate courts, Judicial review.

Unit – I
Historical back ground,Significance of Constitution, Making of the constitution, Role of the constituent Assembly, Salient features, the Preamble, Citizenship, procedure for amendment of Constitution Fundamental rights-Derivative principles of state policy-Elections in India.

Unit – II
Union Executive: Structures of Union Government & Functions, President, Vice President, Prime Minister, Cabinet Parliament-Supreme Court of India

Unit – III
State Executive: Structures and Functions, Governor, Chief Minister, Cabinet, State Legislature, High Courts & Sub ordinate courts

Unit – IV
Central, State Relations, President's Rule, Constitutional Amendments [42, 44, 74, 76, 86 & 91]-Constitutional functionaries, Working of Parliamentary system in India

Unit – V
Nature, Meaning & Definition, Indian Social Structure, Language in India-Political Parties & Presume groups, Right of Women-S.C's, S.T's & other weaker sections.

Unit – VI
Judiciary: Structure, Organisation of Judiciary, independence of the Judiciary, role and functions of Supreme Court, Judicial Review.

TEXT BOOKS:
1. Durga Das Basu, *"Introduction to the Constitution of India"*, Wedwe & Company
2. Macivel, Page, *"An Introduction Analysis"*, Society
3. M.V. Pylee, *"Indian Constitution"*, S. Chand Publications
4. Subhash C Kashyao : *"Our Constitution"*,National Bank,Trust, India.

REFERENCE BOOKS:
1. Durga Das Basu, *"Introduction to the Constitution of India"*, Wedwe & Company
2. Macivel, Page, *"An Introduction Analysis"*, Society

NOTE:
INTERNAL ASSESSMENT: Two Internal Examinations will be conducted for 50 Marks each. The Question paper consists of SIX questions. The FIRST question is compulsory. It consists of 10 questions of two marks each. Four questions to be answered from the remaining five questions and each question carries 7.5 marks.

END EXAM: There is no End Examination for this subject.

GE 406: ETHICAL HACKING (EH)
(Global Elective for B. Tech. – VII Semester)

Scheme   : 2013
Internal assessment   : 100

L	T/D	P	C
2	-	-	2

Course Outcomes:

CO1:   Understand Ethical Hacking Terminologies.
CO2:   Classify Types of Attacks and Commandments present in Ethical Hacking.
CO3:   Interpret how Ethical Hackers think like Malicious users.
CO4:   Demonstrate how to Gather Public information and map it with networks for finding Vulnerabilities.
CO5:   Understand the ways of cracking passwords using kinds of tools
CO6:   Summarize the ways of hacking Accounts, Laptops, Mobiles, Systems Passwords using Command Prompt and Tools.

UNIT I:
Introduction To Ethical Hacking : Basic Terminology, Defining Hacker, Defining Malicious User, Recognizing How Malicious User Beget Ethical Hacker, Ethical Hacking Vs Auditing, Policy Considerations, Compliance And Regulatory Concerns, Understanding The Need To Hack Your Own Systems, Understanding The Dangers Your Systems Face, Non Ethical Attacks, Network Infrastructure Attacks, Operating System Attacks, Application And Other Specialized Attacks.

UNIT II:
Attacks And Ethical Hacking Commandments: Non Ethical Attacks, Network Infrastructure Attacks, Operating System Attacks, Applications And Other Specialized Attacks, Working Ethically, Respecting Privacy, Not Crashing Your Systems, Using The Ethical Hacking Process, Formulating Your Plan, Selecting Tools, Executing The Plan, Evaluating Results.

UNIT III:
Cracking The Hackers Mindset And Ethical Hacking Plan : Think Like Bad Guys, Who Breaks Into Computer Systems, Why They Do It, Planning And Performing Attacks, Maintaining Anonymity, Establishing Your Goals, Determining Which System Hack, Creating Testing Standards, Timing, Running Specific Tasks, Blind Vs Knowledge Assessments, Picking Your Location, Respond The Vulnerabilities, Selecting Security Assessment Tools.

UNIT IV:
Hacking Methodology : Setting The Stage For Testing, Gathering Public Information, Mapping The Networks, Scanning Systems, Determining What's Running On Open Ports, Assessing Vulnerabilities.

UNIT V:
Passwords: Understanding Password Vulnerabilities, Organizational Password Vulnerabilities, Technical Password Vulnerabilities, Cracking Passwords, Cracking The Passwords The Old Fashioned Way, Cracking The Passwords With High-Tech Tools, Cracking Password Protected

Files, Understanding Other Ways To Crack Passwords, General Password Cracking Countermeasures.

UNIT VI:

Mobile Devices: Cracking Laptop Passwords, Cracking Phones And Tablets, Cracking ios Passwords.

Text Books:

    1. Kevin Beaver, *"Hacking for dummies"*, 4th Edition, Wiley India Pvt.Ltd.

Reference Books:

    1. Rafay Baloch *"A Beginners guide to ethical hacking"*, www.hacking-book.com.

NOTE:

INTERNAL ASSESSMENT: Two Internal Examinations will be conducted for 50 Marks each. The Question paper consists of SIX questions. The FIRST question is compulsory. It consists of 10 questions of two marks each. Four questions to be answered from the remaining five questions and each question carries 7.5 marks.

END EXAM: There is no End Examination for this subject.

GE 407: INFORMATION SECURITY AND CYBER LAWS (ISCL)
(Global Elective for B. Tech. – VII Semester)

Scheme : 2013
Internal Assessment : 100

L	T/D	P	C
2	0	0	2

Course Outcomes:
CO1: Understand Basics, importance and threats related   to information systems.
CO2: Explains Intrusion Monitoring and Detection for securing networks
CO3: Understand firewall and VPN techniques
CO4: Understand about the security flaws in Databases system , Email's
CO5: Understand Methodologies, framework for Information system security and the Role of Operating System in Information system.
CO6: States about cyber laws, patents and copyright

Unit: I
Information Systems in Global Context: Basics and importance of Information Systems, Changing Nature of Information Systems, Global Information Systems: Role of Internet and Web Services.
Threats to Information Systems: New Technologies Open Door to the Threats, Information-Level Threats versus Network-Level Threats, Threats and Attacks, Classifications of Threats and Assessing Damages, Protecting Information Systems Security.
Unit: II
Building Blocks of Information Security: Principles of Information Systems Security, Three Pillars of Information Security.
Intrusion Detection for Securing the Networks: Intrusion Monitoring and Detection, Intrusion Detection for Information Systems Security.
Unit: III
Firewalls for Network Protection: Firewalls, Demilitarized Zone (DMZ), Need and Protection provided by Firewalls, Proxy Servers, Topologies for Different Types of Firewalls.
Virtual Private Networks for Security: VPN, Need and Role of a VPN for an Enterprise, Working of VPN, VPN Architecture.
Unit: IV
Security of Electronic Mail Systems: Today's Email Usage Scenario, Email System Mechanism, Security Threats posed by Emails, Protection from Threats, Governance for Emails Systems.
Security of Databases: Database Security Issues, Federated Databases: Need and Security Issues, Securing the Mobile Databases, Securing Connectivity with Enterprise Databases, Data Integrity as a parameter for security, Database Security Policy.
Unit: V
Security of Operating Systems: Operating Systems role in Information Systems Application, Operating System Types, Functions and Tasks, Network Operating Systems and Security, Host Security and OS Hardening, Patched Operating System, OS hardening fundamentals.
Security Models, Frameworks, Standards and Methodologies: Terminology, Methodologies for Information Systems Security.

Unit: VI

Introduction To Cyber Laws: Introduction to Indian Cyber Law, Objective and Scope of the IT Act, 2000, Intellectual Property Issues, Overview of Intellectual-Property- Related Legislation in India, Patent, Copyright, Law Related to Semiconductor Layout and Design, Software License

Text Books:
1. Nina God bole, *"Information Systems Security: Security Management, Metrics, Frameworks and Best Practices"*, Wiley India Pvt.Ltd., 2013.
2. Surya Prakash Tripati, Ritendra Goel, Praveen Kumar Shukla *"Introduction To Information Security And Cyber Laws"*, Wiley India Pvt.Ltd.,2014.

Reference Books:
1. Michael E. Whitman and Hebert J Mattord, *"Principles of Information Security"*, 4th edition Ed. Cengage Learning 2011

NOTE:

INTERNAL ASSESSMENT: Two Internal Examinations will be conducted for 50 Marks each. The Question paper consists of SIX questions. The FIRST question is compulsory. It consists of 10 questions of two marks each. Four questions to be answered from the remaining five questions and each question carries 7.5 marks.

END EXAM: There is no End Examination for this subject.