Jabalpur Engineering College, Jabalpur

Semester V Credit Based Grading System (CBGS) w.e.f. July 2017

Scheme of Examination

Bachelor of Engineering B.E. (Electrical Engineering)

Subject wise distribution of marks and corresponding credits

Scheme of Examination w.e.f. July-2017 Academic Session-2017-18

S. No.	Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours / week.			Total Credits	Total Marks
			Theory			Practical		Total Marks					
			End Sem	Mid Sem. MST	Quiz, Assignment	End Sem.	Lab Work		L	T	P		
1	**EE5001**	Power Generation	70	20	10	-	-	100	3	1	-	4	
2	**EE5002**	Electrical Machine-II	70	20	10	30	20	150	3	1	2	6	
3	**EE5003**	Power Electronics	70	20	10	30	20	150	3	1	2	6	
4	**EE5004**	Instrumentation	70	20	10	30	20	150	3	1	2	6	
5	**EE5005**	Elective-I	70	20	10	-	-	100	3	1	-	4	
6	**EE5006**	Departmental Lab-II (Electrical Software Lab-I)	-	-	-	30	20	50	-	-	2	2	
7	**EE5007**	Management Skill Development	-	-	-	-	50	50	-	-	2	2	
8	**EE5008**	Evaluation of Industrial Training (Internal Assessment)	-	-	-	-	50	50	-	-	2	2	
Total			**350**	**100**	**50**	**120**	**180**	**800**	**15**	**5**	**12**	**32**	**800**

MST: Minimum of two mid semester tests to be conducted.

L: Lecture **T: Tutorial** **P: Practical**

Elective-I	
Subject Code.	**Subject Name**
EE5005A	Electromagnetic Theory
EE5005B	Advance Digital Electronics & Logic Design
EE5005C	Power System Economics
EE5005D	Renewable & Non-Conventional Energy System

B.E.CBGS V SEMESTER
POWER GENERATION

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Power Generation	EE5001	Min. "D"	Min. "D"	5.0

Unit –I: General consideration on various sources of energy, energy conversion employing steam, energy conversion using water gas turbine

a) MHD generation
b) Solar generation
c) Wind power station
d) Geothermal power generation.

Unit-II: Thermal, nuclear and gas power station

Block diagram of thermal power station, selection of site .Different types of auxiliaries used in thermal power station .Nuclear Power Station: Different types of reactors and fuels, safety methods, waste disposal.

Gas Power Station: Block diagram, gas cycles, combined cycle power plants. Comparison between these power stations.

Unit-III: Hydro Power Station

Choice of site, block diagram including surge tank and penstock, Hydrographs, flow duration curve .Types of turbines, base load and peak load power station.

Unit-IV: Economic aspects of power plant operations

Definitions, load factor, demand factor and Diversity factor. Calculation of cost of generation, fixed charges, interest and depreciations. Methods of Depreciation. Tariffs: different types of tariffs, power factor improvement.

Unit-V: Economic Scheduling of Power Stations

Economic operation of power system, criteria of loading of power plants with and without transmission loss, load dispatching in power system, co-generation and coordination of power plants.

Books References :

1. Nagpal," Power Plant Engineering", Khanna publisher
2. Desh pandey,"Modern Design of Power Station".

B.E.CBGS V SEMESTER
ELECTRICAL MACHINE-II

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Electrical Machine-II	EE5002*	Min. "D"	Min. "D"	5.0

*** This Syllabus is only valid for B.E. (EE) batch 2017-18.**

Unit –I: DC Machine I:

Constructional features, emf equation, classification on the basis of excitations, armature winding, lap winding, wave winding, operation as generator, operating characteristics, armature reaction & commutation, compensating winding, losses efficiency, power output equation.

Unit –II: DC Machines II:

Operation as motor, torque equation, operating circuits of motor, types of DC motors, starting and speed control, ward Leonard method, solid state control, Swinburn's test, Hopkinson's test, braking. Applications of DC machines.

Unit – III: Polyphase Synchronous Machine (Alternator)

Constructional details, advantages of rotating field, excitation system, EMF equation, armature winding coil span/pitch factor, distribution or breadth factor, armature leakage reactance, armature reaction in synchronous machine. Synchronous impedance, equivalent circuit and phasor & equivalent Ckt. diagram of synchronous generator, voltage regulation, emf method, mmf method, ZPFC/potier delta method, two reaction theory, torque angle characteristic of salient pole synchronous machine determination of Xd & Xq, parallel operations of alternator, process of synchronization, significance of synchronizing power coefficient, transient condition of alternator, SCR cooling of synchronous machine.

Unit – IV: Polyphase Synchronous Machine (Motor)

Construction, principle of operation, main features of synchronous motor, torque developed, power flow equation for synchronous motor, phasor diagram, effect of varying field current, V & inverted V curves, starting of Synchronous motor, Hunting or phase swinging, application of synchronous motor.

Unit – V: Special Electric Motors:

Switch reluctance motor, linear induction motor, stepper motor, AC series motor hysteresis motor their industrial application.

Books References:

1. Electrical Machines by Nagrath & Kothari, TMH Publication
2. Electrical Machinery by P.S. Bhimbra, Khanna Pub.
3. AC Machine by Langsdorf, TMH Pub.
4. Electrical Technology by H.Cotton, CBS Pub.
5. Electrical Machines by Ashfaq Hussain, Dhanpat Rai Pub.

*** This Syllabus is only valid for B.E. (EE) batch 2017-18.**

ELECTRICAL MACHINE-II

List of Experiments:

1. To perform speed control of DC shunt motor using armature and field control.
2. To determine magnetization characteristics of DC generator.
3. To determine η of DC motor by using Swinburn's test.
4. To perform lord test on Dc generator.
5. To determine regulation of Alternator using synchronous impedance method
6. To determine regulation of Alternator using Potier method.
7. To synchronize an incoming alternator to Busbar using bright & dark lamp method.
8. To determine V & inverted V curves of synchronous motor
9. Study of stepper motor.
10. Study of PMBLDC motor
11. Study of Switch Reluctance motor.

B.E.CBGS V SEMESTER
ELECTRICAL MACHINE-II

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Electrical Machine-II	EE5002	Min. "D"	Min. "D"	5.0

Unit – I: Basic Principles of Three Phase Induction Motor:

Constructional details, types – squirrel cage, slip ring, principle of operation, production of rotating magnetic field, speed / slip, rotor current and voltage, torque developed, condition for max. torque, torque/slip and torque/speed characteristics, induced emf in stator and rotor winding.

Unit – II: Performance Analysis of Three Phase Induction Motor:

Rotor circuit model, stator circuit motor, complete equivalent circuit, referred to stator, approximate equivalent circuit, power flow diagram, circle diagram, no load & block rotor test, starters used with three phase induction motor- DOL, auto-transformer, star delta starter, effect of space harmonics on performance of three phase induction motor, cogging and crawling, different methods of speed control, pole changing, stator voltage control, variable frequency control.

Unit – III: Polyphase Synchronous Machine (Alternator)

Constructional details, advantages of rotating field, excitation system, EMF equation, armature winding coil span/pitch factor, distribution or breadth factor, armature leakage reactance, armature reaction in synchronous machine. Synchronous impedance, equivalent circuit and phasor & equivalent Ckt. diagram of synchronous generator, voltage regulation, emf method, mmf method, ZPFC/potier delta method, two reaction theory, torque angle characteristic of salient pole synchronous machine determination of Xd & Xq, parallel operations of alternator, process of synchronization, significance of synchronizing power coefficient, transient condition of alternator, SCR cooling of synchronous machine.

Unit – IV: Polyphase Synchronous Machine (Motor)

Construction, principle of operation, main features of synchronous motor, torque developed, power flow equation for synchronous motor, phasor diagram, effect of varying field current, V & inverted V curves, starting of Synchronous motor, Hunting or phase swinging, application of synchronous motor.

Unit – V: Special Electric Motors:

Switch reluctance motor, linear induction motor, stepper motor, AC series motor hysteresis motor their industrial application.

Books References:

1. Electrical Machines by Nagrath & Kothari, TMH Publication
2. Electrical Machinery by P.S. Bhimbra, Khanna Pub.
3. AC Machine by Langsdorf, TMH Pub.
4. Electrical Technology by H.Cotton, CBS Pub.
5. Electrical Machines by Ashfaq Hussain, Dhanpat Rai Pub.

ELECTRICAL MACHINE-II

List of Experiments:

1. To perform load test on 3-phase induction motor & determine torque, output power, input power, efficiency, p.f. & slip.
2. To perform No-Load & Block rotor test on 3-phase induction motor
3. To determine regulation of Alternator using synchronous impedance method
4. To determine regulation of Alternator using Potier method.
5. To synchronize an incoming alternator to Busbar using bright & dark lamp method.
6. To determine V & inverted V curves of synchronous motor
7. Study of stepper motor.
8. Study of PMBLDC motor
9. Study of Switch Reluctance motor.

B.E.CBGS V SEMESTER
POWER ELECTRONICS

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Power Electronics	EE5003	Min. "D"	Min. "D"	5.0

Unit -I :Power Semiconductor Devices

Power Diodes, transistors, power mosfet, IGBT, thyristors, characteristics, two- transistor equivalent model, turn on & off, techniques thyristor performance parameters, protection circuits & thermal design of thyristors, commutation techniques-forced and natural.

Unit – II: Controlled Rectifiers

Principle of phase controlled converter operation, single-phase half wave, and Full wave and semi converters. Three phase half wave, Full wave and semi converters Dual converters, power factor improvement, Symmetrical angle control, pulse width modulation control, effects of load and source inductance, Design of converter circuits, regulated DC power supplies.
Cyclo Converter: Principles of operation of single and three phase cyclo converters.

Unit –III: AC Voltage Controllers

Principle of phase control, single phase AC Voltage controllers with resistive and inductive loads. Three phase AC voltage controllers with resistive & inductive loads, Industrial applications of AC controllers. Unity power factor controller, design of AC controller.

Unit- IV: DC Chopper

Principles of step down & step up choppers, operation with R-L load, four quadrants choppers, thyristor chopper circuit, impulse commutation, effects of source inductance, chopper circuit design, switched mode power suppliers, and regulators.

Unit –V: Inverter Circuits

Principle of operation of inverter, single phase & three phase voltage source, inverter magnitude of voltage & harmonics control. forced commutation techniques, current source inverters, inverter circuit design.

Books Reference Book:

1. M.H.Rashid," Power Electronics Circuit, Devices & Applications", Person publication, 1993.
2. M.Ramsmoorthy, "An Introduction to transistor their Applications", affiliated East-West Press.
3. P.C.Sen "Power Electronics", TMH publication.
4. M.D.Singh, K.B.Khanchandani," Power Electronics", TMH, Delhi 2001.
5. Chakravarti A.," Fundamental of Power Electronics and Drives", Dhanpat Rai & Co.
6. Dr P.S. Bhimra," Power Electronics", Khanna Publication.
7. Vedam Subramanyam," Power Electronics" New Age International Revised II ed.2006.
8. Randal Shaffer, "Fundamental of Power Electronics with MATLAB learning" 2008.

POWER ELECTRONICS

List of Experiments:

1. SCR characteristics
2. TRIAC characteristics.
3. MOSFET characteristics
4. IGBT characteristics
5. To study the different triggering circuits for thyristor.

a. Resistor triggering circuit.
b. R-C triggering circuit
c. UJT triggering circuit.

6. AC voltage control by using TRIAC & DIAC
7. Study of 1-pulse & 2-pulse converter with R and L load.
8. Study of three phase semi converter & full converter with R and R-L load.
9. Study of single phase dual converter.
10. Study of single phase cycloconverter.
11. Study of Impulse commutated chopper.
12. Series & parallel inverter
13. Speed control of single phase induction motor.

B.E.CBGS V SEMESTER
INSTRUMENTATION

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Instrumentation	EE5004	Min. "D"	Min. "D"	5.0

Unit-I: Cathode Ray Oscilloscope (CRO)

Different parts of CRO, Block diagram, Electrostatic focusing, Electrostatic deflection, post deflection acceleration, Screen for CRTs, Graticule, Vertical & Horizontal deflection system, Time base circuit, Oscilloscope probes, Application of CROs: Measurement of phase, frequency and other application, Special purpose CROs- Multi input, Dual trace, Dual beam, Sampling, Storage (Analog & Digital) Oscilloscopes.

Unit-II: A.C. Bridges:

Maxwell's bridge, (Maxwell's inductance & inductance capacitance) Hays bridge, Schering Bridge, High Voltage & relative permittivity) Weins bridge, Wagner's Earth detector, Impedance measurement by Q meter.

Unit-III: Non Electrical Quantities (Transducers):

Classification of Transducers, strain gauge, Displacement Transducer (LVDT) & (RVDT) ,(RTD) Thermistor, Thermocouple, Piezo- -Electric transducers, Optical Transducer, photo emissive, Photoconductive, photo voltaic, Photo diode, Photo Transistor, Nuclear Radiation Detector, Capacitive Transducer.

Unit –IV: Wave analyzer

(Frequency selective and Heterodyne) Harmonic Distortion Analyzer, Spectrum Analyzer Network analyzer, Single and Function Generators, sweep frequency generator, pulse and square wave Generator, Beat Frequency Oscillator Digital display system and indicators, instruments used in computer controlled instrumentation RS 232 & IEEE 488, GPIB electric interface.

Unit-V: Digital Measurement and Instruments:

Advantages of Digital instruments over analog instruments, Digital to analog conversion (DAC) Variable resistive type R-2R Ladder Type, Binary ladder, Weighted converter using op amp and transistor, Practical DAC. Analog to digital conversion (ADC) ramp Technique, Dual slope Integrating Type, Integrating Type (voltage to frequency) Successive Approximations, digital voltmeters and multi-meters, Resolution and sensitivity of digital meter, PLC structure, Principal of operation, response time and application Digital panel meter, Data acquisition system.

Books Reference :

1. H.S. Kalsi : Electronics Instrumentation TMH
2. K.Sawhney: Instrumentation and Measurements, Dhanpat Rai and Co.
3. Helfric and Cooper: Modern Electronic Instrumentation and Measurement Techniques Pearson.

INSTRUMENTATION

List of Experiments:

1. Measurement of inductance of a coil using Hay's bridge.
2. Measurement of inductance of a coil using Anderson Bridge.
3. Measurement of inductance and capacitance using Maxwell's inductance-capacitance bridge.
4. Measurement of capacitance of a capacitor using Schering bridge.
5. Measurement of capacitance of a capacitor using Wein's bridge.
6. Measurement of Displacement using LVDT.
7. Measurement of speed of a Motor using photoelectric transducer.
8. Temperature measurement & Control using thermo couple & using thermistor.
9. Study of CRO.
10. Study of strain gauge.
11. Study of Piezo-electric Transducer.

B.E.CBGS V SEMESTER
(ELECTIVE-I) ELECTROMAGNETIC THEORY

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	(Elective -I) Electromagnetic Theory	EE5005A	Min. "D"	Min. "D"	5.0

Unit – I :

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

Unit – II :

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

Unit – III :

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

Unit – IV :

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

Unit – V : Electro Magnetic Waves :

Uniform plane wave in time domain in free space, sinusoidal time varying uniform plane wave in free space, wave equation and solution for material medium, Uniform plane wave in dielectrics and conductors. Poynting vector theorem, instantaneous, average and complex pointing vector, power loss in a plane conductor, energy storage. Polarization of waves. Reflection by conductors and dielectric – normal & oblique incidence. Reflection at surface of conducting medium surface impedance, transmission line analogy.

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

Books References:

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

B.E.CBGS V SEMESTER
(ELECTIVE-I) ADVANCE DIGITAL ELECTRONICS AND LOGIC DESIGN

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	(Elective -I) Advance Digital Electronics and Logic Design	EE5005B	Min. "D"	Min. "D"	5.0

Unit- I:

Specification of sequential systems: Characterizing equation & definition of synchronous sequential machines. Realization of Floatable from verbal description, Mealy and Moore model machines state table and transition diagram. Minimization of the flow table of completely and incompletely specifies sequential machines

Unit -II:

High level description and specification of standard combinational & sequential modules and introduction to VHDL Programming. Concept of iterative arrays.

Unit –III:

Secondary state assignments in sequential machine; parallel & serial decomposition of sequential machines. Introduction to asynchronous sequential machine, races and hazards. Information loss-less machine.

Unit- IV:

Algorithmic state machine and fundamental concept of hardware / firmware algorithms. Controllers and data system designing.

Unit –V:

Concept of PROM, PLE and FPLA. PALASM / XYLINGS software applications. Other PLD devices like EPLA, GAL, PHEEL, Mega PAL and Hard Array Logic.

Books References:

1. Z. Kohavi "Switching & Finite Automata Theroy" TMH.
2. S. C. See "Digital Circuits and Logic Design" PHI,
3. M.K. Ercegovac & T. Lang, "Digital Systems and Hardware/Firmware Algorithms" John Wiley.
4. Stefan Sjoholm & Lennart Lind "VHDL for Designers" Prentice-Hall.
5. P.J. Ashenden "The Designers Guide to VHDL" Harcourt Asia PTE Ltd. M. Ercegovac et.al " Introduction to Digital.Systems"
6. M. Mano "Digital Design" John Wiley & Sons, PHI.
7. P.K. Lala "Digital System Design using Programmable logic Devices" BS Publication
8. K.L.Short "Microprocessors and Programmed Logic" PHI.
9. Z. Navatri " VHDL Analysis & Modeling of Digital Systems" Mc-Graw Hill.

B.E.CBGS V SEMESTER
(ELECTIVE-I) POWER SYSTEM ECONOMICS

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	(Elective -I) Power System Economics	EE5005C	Min. "D"	Min. "D"	5.0

Unit -I Basic Concepts from Economics:

Conditions and problems with Deregulating Electricity, Problems with Regulation, Unit Commitment and Congestion Management. System Security And Ancillary Services: Needs for Obtaining Ancillary Services, Buying and selling Ancillary Services.

Unit -II Competition for Electrical Energy:

Competition and its Models (Monopoly, Purchasing agency, Wholesale competition, Retail competition), Competition and privatization, The Efficiency of Perfect Competition, Short- and Long-Run Equilibrium Dynamics.

Unit -III Market Architecture:

Fundamentals of Markets, Types of Markets (Spot market, Forward contracts and forward markets, Future contracts and futures markets), Market efficiency, Markets with Imperfect Competition, The Need for a Managed Spot Market, Open Electrical Energy Markets (Bilateral trading, Electricity pools), The Two-Settlement System, Day-Ahead Market Designs, Market Power, monopoly in power auction, market power on demand side.

Unit- IV Participating In Markets For Electrical Energy:

The Consumer's Perspective (Retailers of electrical energy), The Producer's Perspective (Perfect competition, The production versus purchase decision, Imperfect competition), Perspective of Plants with Very Low Marginal Costs, The Hybrid Participant's Perspective.

Unit- V Transmission Pricing:

Cost-Based Transmission Expansion, Value-Based Transmission Expansion, Power Transmission And Losses, Congestion Pricing Fundamentals, Congestion Pricing Methods, Pricing Losses On Lines, Pricing Losses At Nodes, Transmission Rights.

Books References:

1. Fundamentals Of Power System Economics By Daniel Kirschen and Goran Strbac, John Wiley & Sons, Ltd
2. Power System Economics-Designing Markets for Electricity by S t e v e n S t o f t, IEEE / Wiley.
3. Power Generation, Operation and Control by A.J. wood and B.F. Wollenberg John Wiley & Sons Inc. 1984.

B.E.CBGS V SEMESTER
(ELECTIVE-I) RENEWABLE & NON-CONVENTIONAL ENERGY SYSTEMS

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	(Elective -I) Renewable & Non-Conventional Energy Systems	EE5005D	Min. "D"	Min. "D"	5.0

Unit – I: Renewable Energy Systems:

Energy Sources, Comparison of Conventional and non-conventional, renewable and non-renewable sources. Statistics of world resources and data on different sources globally and in Indian context. Significance of renewable sources and their exploitation. Energy planning, Energy efficiency and management.

Unit – II: Wind Energy System:

Wind Energy, Wind Mills, Grid connected systems. System configuration, working principles, limitations. Effects of wind speed and grid conditions. Grid independent systems - wind-battery, wind- diesel, wind-hydro biomass etc. wind operated pumps, controller for energy balance. Small Hydro System Grid connected system, system configuration, working principles, limitations. Effect of hydro potential and grid condition. Synchronous versus Induction Generator for stand-alone systems. Use of electronic load controllers and self-excited induction generators. Wave Energy System: System configuration: grid connected and hybrid systems.

Unit – III:

Solar Radiation: Extraterrestrial solar radiation, terrestrial solar radiation, Solar thermal conversion,

Solar Photonics System: Solar cell, Solar cell materials, efficiency, Characteristics of PV panels under varying insulation. PV operated lighting and water pumps, characteristics of motors and pumps connected to PV panels.

Biomass Energy System: System configuration, Biomass engine driven generators, feeding loads in stand-alone or hybrid modes, Biomass energy and their characteristics.

Unit – IV:

Energy from oceans: Ocean temperature difference, Principles of OTEC, plant operations,

Geothermal Energy: Electric Energy from gaseous cells, Magneto-hydro generated energy, Non hazardous energy from nuclear wastes, Possibilities of other modern non-conventional energy sources.

Unit – V:

Electric Energy Conservation: Energy efficient motors and other equipment. Energy saving in Power Electronic controlled drives. Electricity saving in pumps, air-conditioning, power plants, process industries, illumination etc. Methods of Energy Audit.

Measurements systems; efficiency measurements. energy regulation, typical case studies, various measuring devices analog and digital, use of thyristers.

Books References:

1. John Twidell & Toney Weir, Renewable Energy Resources, E & F N Spon.
2. El-Wakil, Power Plant Technology, McGraw Hill.
3. Rai G D, Non-conventional Energy Resources, Khanna.
4. F. Howard E. Jordan, "Energy-Efficient Electric Motor & their Application-II", Plenum Press, New York, USA.
5. Anna Mani, "Wind Energy Resource Survey in India-Ill", Allied Publishers Ltd., New Delhi
6. S. P. Sukhatme: Solar Energy, TMH-4e,
7. Dr. A. Ramachandran, Prof B.V Sreekantan & M F.C. Kohli etc, "TERI Energy Data Directory & Year book 1994-95", Teri Tata Energy Research Institute, New Delhi.

B.E.CBGS V SEMESTER
DEPARTMENTAL LAB-II (ELECTRICAL SOFTWARE LAB-I)

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Departmental Lab-II (Electrical Software Lab-I)	EE5006	Min. "D"	Min. "D"	5.0

List of Experiments (Ng-Spice):

1. Response of RC, RL circuits.
2. Responses of RLC (Series & Parallel) circuits
3. Input & Output characteristic of BJT and MosFET and Calculation of Vth for MosFET from its characteristic.
4. Simulation of Op-Amp circuits.
5. Simulation of Ring Oscillator and calculation of oscillating frequency.

List of Experiments (Mat lab):

1. Plot of different geometry in MATLAB for given equation (Straight Line, Circle, Parabola, Ellipse, Hyperbola, Spiral, Sin(x), Cos(x), Tan(x) and polynomials).
2. Plot torque slip characteristic for 3 phase induction motor.
3. Design a calculator for Star Delta transformation.
4. Solve differential equation using Runge - Kutta method.
5. Minor project based on above experiments.