BACHELOR OF ENGINEERING (FOUR YEARS DEGREE COURSE)

FACULTY OF ENGINEERING & TECHNOLOGY

COURSE AND EXAMINATION SCHEME WITH CHOICE BASED CREDIT SYSTEM

V - SEMESTER B.E. ELECTRICAL (ELECTRONICS & POWER) ENGINEERING

Subject Code	Subject	Teaching Scheme				Examination Scheme									
		Hours per week			No. of Credits	Theory						Practical			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks	Max. Marks Sessional		Total	Min. Passing Marks	Max. Marks	Max. Marks	Total	Min. Passing Marks
							ESE	MSE	IE			TW	POE		
5BEEE01	Electrical Machines – II	3	1	-	4	3	80	10	10	100	40	-	-	-	-
5BEEE02	Microprocessors & Microcontroller	3	0	-	3	3	80	10	10	100	40	-	-	-	-
5BEEE03	Analog & Digital Circuits	3	0	-	3	3	80	10	10	100	40	-	-	-	-
5BEEE04	Electrical Power System – I	3	0	0	3	3	80	10	10	100	40	-	-	-	-
5BEEE05	Program Elective – I (PE-I)	3	0	0	3	3	80	10	10	100	40				
5BEEE06	Industrial Economics & Management	**3**	**0**	**0**	**3**	**3**	**80**	**10**	**10**	**100**	**40**	-	-	-	-
Laboratories/ Practical															
5BEEE07	Electrical Machines – II	-	-	2	1	-	-	-	-	-	-	25	25	50	25
5BEEE08	Microprocessors & Microcontroller	-	-	2	1	-	-	-	-	-	-	25	25	50	25
5BEEE09	Analog & Digital Circuits	-	-	2	1	-	-	-	-	-	-	25	25	50	25
TOTAL		18	01	06	22		600					150			
		25			**22**		**750**								

Program Elective - I : 1) Digital Signal processing 2) Optimization Technique

BACHELOR OF ENGINEERING (FOUR YEARS DEGREE COURSE)

FACULTY OF ENGINEERING & TECHNOLOGY

COURSE AND EXAMINATION SCHEME WITH CHOICE BASED CREDIT SYSTEM

VI - SEMESTER B.E. ELECTRICAL (ELECTRONICS & POWER) ENGINEERING

Subject Code	Subject	Teaching Scheme				Examination Scheme									
		Hours per week			No. of Credits	Theory						Practical			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks	Max. Marks Sessional		Total	Min. Passing Marks	Max. Marks	Max. Marks	Total	Min. Passing Marks
							ESE	MSE	IE			TW	POE		
6BEEE01	High Voltage Engineering	4	0	-	4	3	80	10	10	100	40	-	-	-	-
6BEEE02	Control Systems - I	3	1	-	4	3	80	10	10	100	40	-	-	-	-
6BEEE03	Electrical Power System – II	4	0	0	4	3	80	10	10	100	40	-	-	-	-
6BEEE04	Design of Electrical Machines	3	0	0	3	3	80	10	10	100	40	-	-	-	-
6BEEE05	Program Elective – II (PE-II)	3	0	0	3	3	80	10	10	100	40				
6BEEE06	Business Communication	-	3	0	-	AUDIT COURSE *									
Laboratories/ Practical															
6BEEE07	High Voltage Engineering	-	-	2	1	-	-	-	-	-	-	25	25	50	25
6BEEE08	Control Systems - I	-	-	2	1	-	-	-	-	-	-	25	25	50	25
6BEEE09	Minor Project & Seminar *	-	-	2	1	-	-	-	-	-	-	25	25	50	25
	TOTAL	17	04	06	21		500					150			
		27			**21**		**650**								

Program Elective – II: 1) Energy Audit and Management 2) Electrical Installation and Costing

***The marks allotted for TW shall be granted on the basis of work carried out by the candidate in pursuing the Minor Project, its results & the Seminar delivered on the same topic. However, the POE marks shall be granted on the basis of viva voce, conducted as per University norms. Each GROUP of Minor Project shall comprise of NOT MORE THAN THREE students.**

GONDWANA UNIVERSITY, GADCHIROLI

COURSE: B.E. V SEMESTER (ELECTRICAL/ E&P/EEE), With Choice Based Credit System

Course Code: 5BEEE01 **Title of Course: ELECTRICAL MACHINES-II**

Lectures	Tutorial(s)	Practical	Total periods/week (each of 60 minutes duration)	Credits
03	01	02	03+01+02=06	03+01+01=05

Evaluation System						
Theory				Practical		
MSE	IE	ESE	TOTAL	TW	POE	TOTAL
10	10	80	100	25	25	50

UNIT	CONTENTS	HOURS
I	Starting, Breaking, Speed Control of Three Phase Induction Motor and Single Phase Induction Motor Starting - Direct on line, Autotransformer, Star-Delta and Rotor resistance starting Breaking – Regenerative braking, Plugging, Dynamic braking. Speed control - by pole changing, frequency control, Varying Rotor resistance and reactance, Varying supply voltage Single Phase Induction Motor -Double field revolving theory, equivalent circuit, split phase motor, shaded pole motor, Torque – slip characteristics. No load & block rotor tests	10
II	**Basics of Synchronous Machines** Constructional features of salient and cylindrical pole rotor machine, Principle of generator and motor, armature and field windings, starting of motor, EMF equation, Torque equation, distribution factor, pitch factor, harmonics in the induced EMF	10
III	**Cylindrical Pole Synchronous Machines** Cylindrical Pole Machines - Phasor diagrams and Equivalent circuits of motor and generator, armature reaction, OC & SC tests, SCR, Voltage regulation: synchronous impedance method, Potier's triangle method, synchronous condenser. Salient Pole Machines - Two reaction theory, Phasor diagrams and Equivalent circuits of motor and generator, determination of direct and quadrature axis reactances by slip test.	10
IV	**Steady State Analysis of Synchronous Machines** Power flow equations and power angle characteristic of cylindrical and salient pole machines, losses and efficiency, V & Inverted V -curves, hunting & damper winding, parallel operation of alternator	10
V	**Transient Analysis of Synchronous Machines and Special Motors** Sudden 3- phase short circuit. Transient, sub- transient reactances and their measurements, Time constants and equivalent circuit diagram. Sequence reactances and their measurement. Special motors : Schrage motor, Universal motor, AC series motor, Reluctance motor, Repulsion motor, Hysteresis motor (Only elementary aspects are expected).	10
		50

Text Books

1. Electric Machines, By I.J.Nagrath and D.P.Kothari, Tata McGraw Hill
2. Electrical machinery by Dr.P. S. Bimbhra, Khanna Publisher
3. Generalized Theory of Electrical Machines by Dr.P. S. Bimbhra, Khanna Publisher
4. Electrical Machines by Dr. P.K. Mukherjee & S. Chakravarti , Dhanpat Rai and Sons

Reference Books

1. Electric Machinery by A.E. Fitzgerald, C.Kingsley Jr and Umans, McGraw Hill
2. Performance & Design Of AC Machines By M.G Ray, CBS Publishers & Distributors
3. Fundamentals of Electrical Machines, by B.R. Gupta & Vandana Singhal,New Age International

(Minimum Eight practical based on above syllabus)

GONDWANA UNIVERSITY, GADCHIROLI

COURSE: B.E. V SEMESTER (ELECTRICAL/ E&P/EEE), With Choice Based Credit System

Course Code : 5BEEE02 Title of Course: MICROPROCESSORS & MICROCONTROLLER

Lectures	Tutorial(s)	Practical	Total periods/week (each of 60 minutes duration)	Credits
03	00	02	05	03+01 = 04

Evaluation System						
Theory				Practical		
MSE	IE	ESE	TOTAL	TW	POE	TOTAL
10	10	80	100	25	25	50

UNIT	CONTENTS	HOURS
I	**8 Bit Microprocessor** 8085 Microprocessor: Architecture and its operations, Register structure, Pin configuration, Address/Data bus, Timing, control & status signals. Addressing Modes Instruction Cycle: Fetch Operation, Execute operation, Machine cycle & state, Instruction & Data flow. Timing Diagrams	08
II	**Instruction Set & Programming Of 8085** Classification, Instruction & Data format, Assembly Language Programming of 8085, Counters & time delays, Stack & subroutines.	12
III	**Memory Mapping & Interrupts Of 8085** Memory mapped I/O and I/O mapped I/O, Address decoding techniques. Interrupt system of 8085 (Software & Hardware Interrupts), Data transfer schemes, Serial data transfer through SOD & SID line.	08
IV	**Interfacing Devices & Applications** **I**nternal architecture & programming of PPI 8255, A/D & D/A (0800/0808) convertors. Applications: 7 segment LED display, Stepper Motor, Traffic Signal Controller, Measurement of Electrical Quantities – Frequency, Phase angle, Power factor, Voltage, Current.	10
V	**Microcontroller** Introduction to microcontroller: 8051 architecture, 8051 Internal resources, pin diagram, I/O pins, ports and their internal logic circuits, counters, serial ports, Interrupt structure, SFRs and their addressing, internal code memory, data memory, stack pointer, flags, bit addressable memory.	12
		50

Text Books

1. Microprocessor Architecture Programming and Applications with the 8085 by R. S. Gaonkar
2. Fundamentals of Microprocessor and Microcontrollers by B. Ram
3. Introduction to Microprocessors by Aditya P. Mathur
4. Introduction to Microprocessor for Engineers and Scientist by P. K. Ghosh and P. R. Sridhar

Reference Books

1. Microprocessors Principals and Applications by Gilmore
2. Microprocessors – Theory ad Applications by M. Rafiquzzaman
3. Microprocessors and Microcontrollers by Krishna Kant
4. Microprocessor and Interfacing and applications by Renu Singh & B. P. Singh

(Minimum Eight practical based on above syllabus)

GONDWANA UNIVERSITY, GADCHIROLI

COURSE: B.E. V SEMESTER (ELECTRICAL/ E&P/EEE), With Choice Based Credit System

Course Code: 5BEEE03 **Title of Course: ANALOG & DIGITAL CIRCUITS**

Lectures	Tutorial(s)	Practical	Total periods/week (each of 60 minutes duration)	Credits
03	00	02	05	03+01 = 04

Evaluation System						
Theory				Practical		
MSE	IE	ESE	TOTAL	TW	POE	TOTAL
10	10	80	100	25	25	50

UNIT	CONTENTS	HOURS
I	**Introduction to Combinational logic** Standard representation for logic functions, Karnaugh Map representation for logic functions, Simplification of sum of products and product of sums, minimization of logical functions for minterms & maxterms [up to 4 variables], Don't care conditions, Design Examples: Arithmetic Circuits, BCD to seven segment decoders, Code converters, Adders, Subtractors, (Half & Full), Look ahead carry, ALU, Digital comparator, Parity generator , Parity checker, Multiplexers and Demultiplexers and their use in combinational logic design, Decoders, Encoders.	09
II	**Introduction to Sequential logic** One bit memory cell , Introduction to Latches, Concept of clock, Flip-Flops: SR,JK,D,T, Master slave JK Flip-Flop, Use of reset and clear terminals , Characteristics table , Excitation tables Conversion of one type of Flip-Flop to another type of Flip-Flop, applications of Flip-Flops.	07
III	**Basic Operational Amplifier** Block Diagram of Operational Amplifier, Operational Amplifier characteristics [ideal and non-ideal], Operational Amplifier Transfer characteristics, Study of IC uA 741, Offset nulling, I/P bias current, I/P offset voltage, O/P offset voltage, Slew rate, CMRR, SVRR, Unity gain bandwidth, Thermal Drift, Gain Bandwidth Product, Error measurement of various parameters.	09
IV	**Linear Applications of Operational Amplifier** Inverting, non-inverting Amplifier, Voltage Follower, Summing amplifiers, Integrator, differentiator, Differential amplifier, Bridge amplifiers, Instrumentation amplifiers, Precision rectifiers, Voltage to current converter, Current to voltage converter.	09
V	**Non-linear Applications of operational amplifiers &Timer circuits** OP-AMP circuits for clipping, clamping, Comparator, Log amplifier, Antilog amplifier, Schmitt Trigger, Astable, monostable & bistable multivibrators using OP-AMP & 555 Timer IC, Wein Bridge Oscillator, RC phase shift Oscillator, Active filters Butterworth filter up to 4th order.	11
		45

Recommended Books

1. Modern Digital Electronics, R.P. Jain, Tata McGraw Hill, 3rd Edition
2. Fundamentals of Digital Circuits, A. Anand Kumar, Prentice Hall India,

3. Op-Amps and Linear Integrated Circuits, Ramakant A. Gayakwad, Prentice Hall India, 3rd Edition.
4. Design with op-amp and Analog integrator circuits, Sergio Franco, Tata McGraw Hill, 3rd Edition.
5. Operational Amplifier & Linear Integrated Circuits, Robert F. Coughlin, Fredrick F. Driscoll, Prentice Hall, 3rd Edition.
6. Digital Design, Moris Mano, Prentice Hall India, 2nd Edition.
7. Digital Principles & Applications, A.P. Malvino, D.P. Leech, Tata McGraw Hill, 4th Edition.

GONDWANA UNIVERSITY, GADCHIROLI

COURSE: B.E. V SEMESTER (ELECTRICAL/ E&P/EEE), With Choice Based Credit System

Course Code: 5BEEE04 **Title of Course: ELECTRICAL POWER SYSTEM-I**

Lectures	Tutorial(s)	Practical	Total periods/week (each of 60 minutes duration)	Credits
03	--	--	03	03

Evaluation System						
Theory				Practical		
MSE	IE	ESE	TOTAL	TW	POE	TOTAL
10	10	80	100	--	--	--

UNIT	CONTENTS	HOURS
I	**Supply System & Substations Supply Systems:** Modern structure of a power system, Generation, transmission and distribution voltage, Comparison of Overhead & Underground System, Choice of transmission voltage. Transmission line configurations, type of conductors, Bundle & Composite conductors, resistance of line, skin & proximity effects. Primary and secondary distribution systems, feeder, distributor and service mains. Connection schemes of distribution system, Radial system, Ring main system, Interconnected systems, AC & DC distribution calculations. Substations: Classification of substations, Indoor & outdoor Substations, Major equipments used in Substation	10
II	**Parameters of Transmission line Resistance & Inductance** :Calculation of resistance & inductance for single phase and three phase lines, Bundled & Composite conductor lines, single and double circuit lines, Transposition of conductors, concept of GMD & GMR, symmetrical and asymmetrical conductor configuration with and without transposition Capacitance : Calculations of Potential difference between two conductors of a group of parallel conductors, capacitance of a two wire line, three phase line with equilateral spacing, three phase line with unsymmetrical spacing, single and double circuit lines, effect of ground on capacitance ,Numerical Problems	10
III	**Per Unit System & Performance of Short & Medium transmission lines Per Unit System**: Representation of power system components Single phase solution of balanced three phase networks. Per Unit reactance diagram. Per unit (PU) system, representation of loads. Numerical problems. Performance of Short & Medium length transmission lines: Classification of Transmission Lines - Short, medium and long line and their model representations - Nominal-T, Nominal-Pie and A, B, C, D Constants & Phasor representations. Numerical Problems. Mathematical Solutions to estimate regulation and efficiency of all types of lines - Numerical Problems	9

IV	**Performance of Long Transmission Lines & Introduction to Load Flow Studies** **Performance of Long Transmission Lines**: Long Transmission Line-Rigorous Solution, evaluation of A,B,C,D Constants, Interpretation of the Long Line Equations, Representation of Long Lines - EquivalentT and Equivalent Pie network models (numerical problems). Ferranti effect. Power flow through a transmission line. Receiving and sending end power circle diagrams, methods of voltage control and power factor improvement, analytical and graphical methods. Introduction to Load Flow Studies : Load flow problem, classification of buses, network modeling, Y -bus and Z-bus matrices, load flow equation.(Numerical are not expected)	9
V	**Overhead Lines Insulators & Underground Cables Overhead Line Insulators :** Types of insulators and their applications, potential distribution over a string of insulators, methods of equalizing the potential .String efficiency and Methods for improvement, Numerical Problems - voltage distribution, calculation of string efficiency, Capacitance grading and Static Shielding. Underground Cables: Construction and classification of cables for single and three phase service, Insulation resistance, capacitance and dielectric stresses in cable, Reduction of maximum stresses. Most economical conductor size in cables, Grading of cables, capacitance grading and inter-sheath grading, Capacitance of three core cable and measurements of capacitances.	9
		47

TEXTBOOKS

1. Power System Engineeriong, J Nagrath and D P Kothari, Tata McGraw Hill
2. Power System Analysis and Design, B R Gupta, Wheelers Publishers
3. Electrical Power Systems, Ashfaq Hussain, CBS publishers and distributor
4. Elements of Power system analysis: W.D.Stevenson (MGH).

Reference Books

1. Electric power system: B.M.Weedy , John Wiley and sons.
2. Transmission & distribution of electrical Engg. : H.Cotton .
3. Transmission & distribution of electrical Engg : Westing house and Oxford University Press , New Delhi.
4. Power System Analysis, N.V.Ramana, Pearson education, 2010 5. Power System Analysis, Arthur R. Bergen, Vijay Vittal, 2nd Edition,2009, PEARSON Education 6. Course in Electrical Power: Gupta, Soni and Bhatnagar (Dhanpat rai and sons).

GONDWANA UNIVERSITY, GADCHIROLI

COURSE: B.E. V SEMESTER (ELECTRICAL/ E&P/EEE), With Choice Based Credit System

Course Code: 5BEEE05 (Program Elective –I)

Title of Course: 1) DIGITAL SIGNAL PROCESSING

Lectures	Tutorial(s)	Practical	Total periods/week (each of 60 minutes duration)	Credits
03	00	00	03	03

Evaluation System						
Theory				Practical		
MSE	IE	ESE	TOTAL	TW	POE	TOTAL
10	10	80	100	--	--	--

UNIT	CONTENTS	HOURS
I	Review Of Discrete time systems, Z transform & properties, DFT its properties, radix 2 decimation in time FTT and IFFT, radix 2 decimation in frequency FFT & IFFT	10
II	**Structure of FIR filters:** Structures for realization of discrete time systems, basic structures for fir systems: Direct form, cascade form, lattice structure, frequency sampling structure. Basic structure for IIR systems direct forms I, II, cascade, parallel forms, lattice and lattice-ladder structures, transposed forms.	10
III	**FIR Filters:** Introduction of FIR filters, linear phase filters symmetric and anti symmetric filters, Window method, frequency sampling method. Design FIR filters using Kaiser Window. Comparison of design methods for linear phase fir filters.	9
IV	**IIR Filters:** Introduction to IIR filters, Butterworth approximation, Chebyshev approximation, Design of IIR filter: impulse invariance method, bilinear transformation, approximation derivative method, Frequency transformations: low pass to high pass, band pass, band reject. Comparison between FIR and IIR filters	9
V	**Multirate Digital Signal Processing** : Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Implementation of sampling rate conversion, Applications of multi rate signal processing, Introduction to digital filter banks	9
		47

Text Books

1. "Digital Signal Processing, Principles, Algorithms and Applications", by Proakis J. G and D. G. Manolakis Pearson Education, PHI.
2. "Introduction to Digital Signal Processing" by Johnson J. R, , PHI publications .
3. "Digital Signal Processing" by P. Ramesh Babu , Sci- Tech Publications.
4. Digital Signal Processing by S Salivahanan, C Gnanapriya, TMH ,Publications

Reference Books

1. “Digital Signal Processing: A Computer based Approach”, by S. K. Mitra, TMH, 2001.
2. “Discrete Time Signal Processing” by Oppenheim A. V and R. W. Schafer, Person Education, India
3. “Theory and Applications of Digital Signal Processing”, by Rabnier, Gold , TMH. Publications

GONDWANA UNIVERSITY, GADCHIROLI

COURSE: B. E. V SEMESTER (ELECTRICAL/ E&P/EEE), With Choice Based Credit System
Course Code : 5BEEE05 (Program Elective –I)
Title of Course : (2) OPTIMIZATION TECHNIQUE

Lectures	Tutorial(s)	Practical	Total periods/week (each of 60 minutes duration)	Credits
03	00	00	03	03

Evaluation System						
Theory				Practical		
MSE	IE	ESE	TOTAL	TW	POE	TOTAL
10	10	80	100	--	--	--

Unit	Contents	Periods
I	**Introduction** Historical Development, Engineering applications of optimization, statement of an optimization problem, Formulation of optimization problem, classification of optimization techniques. Classical optimization techniques – single and multivariable optimization without constraints (necessary and sufficient conditions – without proof), Multivariable optimization with equality constraints – Lagrange multiplier method, Optimization with calculus – Karush-Kuhn-Tucker (KKT) conditions	09
II	**Linear programming – I** Graphical method, simplex method, revised simplex method	09
III	**Linear programming – II** Duality in linear programming, Dual simplex method. Balanced and unbalanced transportation problems – north west corner method, least cost method and Vogel's approximation method for finding initial basic feasible solution, stepping stone method to find optimum solution. Assignment problem – Hungarian method for finding optimum solution	09
IV	**Non linear programming** Unimodal function, One dimensional minimization – unrestricted search (search with fixed step size and accelerated step size), Fibonacci search method and Golden section method, Unconstrained optimization – direct search method (simplex method), descent methods (steepest descent method and conjugate gradient method), Constrained optimization – sequential quadratic programming method	09
V	**Integer Programming** Introduction, integer linear programming – Gomory's method (for all integer programming and mixed integer programming), branch-and-bound method. Introduction to integer non-linear programming	09
	Total	**45**

TEXT BOOKS

1. S. S. Rao, Engineering Optimization – Theory and Practice, 4th edition, John Wiley & Sons Inc., 2009

2. J. K. Sharma, Operations Research – Theory and Applications, 3rd edition, Macmillan India Ltd., New Delhi, 2009

REFERENCE BOOKS

1. F. S. Hiller, G. L. Lieberman, B. Nag and P. Basu, Introduction Operations Research, 9th edition, Tata Mc-Graw Hill Pub. Co., New Delhi, 2012

2. H. A. Taha, Operations Research – An Introduction, 10th edition, Pearson Education Inc., 2017

3. K. Deb, Optimization for Engineering Design – Algorithms and Examples, Prentice-Hall of India Pvt. Ltd., New Delhi, 1995

GONDAWANA UNIVERSITY, GADCHIROLI

COURSE: B.E. V SEMESTER (ELECTRICAL/ E&P/EEE), With Choice Based Credit System
Course Code: 5BEEE06 Title of Course: INDUSTRIAL ECONOMICS AND MANAGEMENT

Lectures	Tutorial(s)	Practical	Total periods/week (each of 60 minutes duration)	Credits
03	01	--	03	03

Evaluation System						
Theory				Practical		
MSE	IE	ESE	TOTAL	TW	POE	TOTAL
10	10	80	100	NA	NA	NA

UNIT	CONTENTS	HOURS
I	Demand, Utility and Indifference curves, Approaches to analysis of demand, Elasticity of demand and its measures, Factors of production, Advertising elasticity, Marginalism	09
II	Functions of Central and commercial banks, direct and indirect taxes, monetory and fiscal policy of goernment, liberalization, globalization and privatization;	09
III	Concept of Industrial management and its scope, Development of scientific management, Principles of Frederick Taylor and Henry Fayol, Functions of management such as planning, organizing, directing, controlling, motivating etc.	09
IV	Introduction to marketing manaqgement, Concepts of marketing, marketing mix, channels of distribution, advertising, sales promotion, pricing of the product	09
V	Meaning, nature and scope of finanacial management, brief outline of profit and loss account, balance sheet, budgets and their importance, ratio analysis, principles of costing.	09
		45

Recommended Books

1. Modern Economics – By H.L.Ahuja
2. Modern Economic Theory – By K.K.Dewett
3. Industrial management – By I. K. Chopde
4. Industrial Engg. and Organization Management – By S.K.Sharma

GONDWANA UNIVERSITY, GADCHIROLI

COURSE: B.E. VI SEMESTER (ELECTRICAL/ E&P/EEE), With Choice Based Credit System

Course code: 6BEEE01 **Title of Course: High Voltage Engineering**

Course Scheme					Course Scheme Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
04	00	02	06	04+01=05	3	10	10	80	100

Unit	Contents	Hours
UNIT I	**Breakdown in Gases & Liquid Dielectrics:** Properties of Insulating materials, Breakdown voltage and Dielectric strength, Ionization process, Townsend's criteria for B.D., Breakdown in electro-negative gases, SF6 as a dielectric, Stremer Theory, Paschen's Law, Time Lag, Vacuum Insulation. Classification and Properties of Liquid Dielectric, Breakdown in Pure and Commercial Liquids, Purification and Reconditioning of Liquid-Dielectrics	09
UNIT II	**Breakdown in Solid Dielectrics & Lightning & Switching Over Voltage & Protection:** Factors Affecting the Breakdown of Solid, Intrinsic breakdown, Electromechanical breakdown, Thermal breakdown, Treeing and Tracking, Partial Discharge. Mechanism of lightning,, Mechanism of Lightning strokes, types of strokes. Origin of Switching surges, Characteristics of switching surges, Power frequency over voltages, Control of over voltages due to switching. Protection of lines by ground wires, Tower Footing resistance, Protection by lightning arrester, gap type and gapless L.A., Selection and ratings of L.A., Surge Absorbers.	09
UNIT III	**Generation of High voltages & Current:** Generation of High D.C. voltages by rectifiers, Voltage doubler Circuits and multiplier circuits (Derivations of expression not required). Electrostatic Machines, Generation of high A.C. Voltages by Cascade Transformers, Resonant transformers. Generation of High-Frequency A.C. High Voltages, Generation of Impulse Voltages: Standard Impulse Wave shapes, Circuits for producing Impulse Waves, Marx Circuit, Generation of Switching Surges, Generation of Impulse Current.	09
UNIT IV	**Measurement of High Voltages & Current:** Measurement of high AC and DC voltages by micro ammeter, generating voltmeters, resistance and capacitance potential divider, Series impedance voltmeter, CVT, Magnetic type potential transformers, Electrostatic voltmeter, Peak reading AC voltmeter, Sphere Gap arrangement. Measurement of Impulse voltage by potential dividers and peak reading voltmeters. Measurement of high AC, DC currents, measurement of high frequency and impulse current by resistive shunts (Bifiliar strip shunt only)	09
UNIT V	**Non-Destructive & High Voltage Testing:** Non-destructive testing: Measurement of DC Resistivity, Measurement of Dielectric constant and loss- factor (low and power frequency only), Schering bridge for high charging circuits, for high dissipation factor, Transformer ratio arm bridges. Partial discharge measurements by balance detectors. High Voltage Testing: Testing of insulators, bushings, isolators, circuit breakers, cables transformers, lightning arresters and power capacitors.	09
	Total	45

Course Outcome:

Upon completion of this course, the student will be able to:

1. To prepare the students for successful career in industry, research and teaching institutions.
2. To develop the ability to estimate and analyze overvoltage's in power system.
3. To develop the ability to design and test High Voltage power apparatus

Text Books -

1. High Voltage Engineering by M. S. Naidu and V. Kamaraju, Tata McGraw Hill
2. Fundamentals of High Voltage Engineering by S. K. Singh, Dhanpat Rai & Co.
3. High Voltage engineering by C.L. Wadhawa, Wiley Eastern Ltd.

Reference Books -

1. High Voltage Engineering by M. P. Chaurasia, Khanna Publishers.
2. An Introduction to High Voltage Engineering by Subir Ray, Prentice Hall of India.
3. High Voltage Engineering - Theory & Practice by M. Khalifa, Marcel Dekker

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(Minimum Eight practical based on above syllabus)

GONDWANA UNIVERSITY, GADCHIROLI

COURSE: B.E. VI SEMESTER (ELECTRICAL/ E&P/EEE), With Choice Based Credit System

Course code: 6BEEE02 **Title of Course: Control System- I**

Course Scheme					Course Scheme Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
03	01	02	06	04+01=05	3	10	10	80	100

Course Objective:

Learner can able to apply his fundamental knowledge gained related to control system, time response analysis, stability in time domain and frequency domain, and used this for design of controller.

Unit	Contents	Hours
UNIT I	**Systems and their Representation:** Basic elements in Control Systems, Open loop and Closed loop Systems, Electrical analogy of Mechanical and Thermal Systems, Transfer Function, Block diagram reduction technique, Signal flow graph, Effect of feedback on sensitivity to parameter variation and reduction of the noise.	**09**
UNIT II	**Time Response Analysis:** Time response, Time domain specification, Types of test inputs, First and Second order system response, Error coefficient, Generalized error series , Steady State Error, P,PI,PID modes of feedback control .	**09**
UNIT III	**Stability of Control System:** Stability of control system, location of roots in S plane for stability, characteristics equation, Routh- Hurwitz criterion, Special cases for determining relative stability, Root locus construction, Root location and its effect on time response, Effect of pole-zero addition on proximity of imaginary axis.	**09**
UNIT IV	**Frequency response methods:** Frequency response of linear system, Logarithmic frequency response (Bode) plots from transfer function for various systems, Polar plots for various systems, Estimation of approximate transfer function from the frequency response, Stability analysis from Bode plots, Nyquist criterion, Nyquist Plots and stability analysis	**09**
UNIT V	**State Space Analysis of Control System:** State variable method of analysis, Characteristics of system state, Choice of state variables, representation of vector matrix differential equation, Standard form, relation between transfer function and state variable.	**09**
	Total	**45**

Course Outcome:

Upon successful completion of course student will be able to,

1) Apply various conventional techniques for Block diagram reduction technique, Signal flow graph, Parameter reduction and sensitivity analysis
2) Understand Transfer function and Block diagram reduction technique, Students is able to find the transfer function of any electrical systems and mechanical system
3) Expose the general issues concerning the design, principle of operation and characteristics of control system and electrical system.
4) Understand the modeling and analysis of different types of Control system hence Students will able to use the knowledge of mathematics and engineering. to find the stability of system
5) Develop skills for drawing time response and frequency response plot of different types of systems for various conditions
6) Study steady state and transient behavior of various systems. using conventional and state space technique It will encourage the students to work in core electrical engineering field like testing, maintenance, installations etc

Text Books -

1) Automatic Control Systems (with MATLAB Programs) by S.Hasan Saeed, S.K.Kataria & Sons.
2) Control System Engineering by Nagrath I.J.Gopal M, Wiley Eastern.
3) Modern Control Systems by Ogata K,Prentice Hall of India.
4) Linear Control Systems by B.S.Manke, Khanna Publication.

Reference Books -

1) Analysis and Design of Control Systems using MATLAB by Rao.V.Dukkipati,New Age.
2) Modern Control System by Richard Dorf,Robert Bishop, IIth edition 2008.

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(Minimum Eight practical based on above syllabus)

GONDWANA UNIVERSITY, GADCHIROLI

COURSE: B.E. VI SEMESTER (ELECTRICAL/ E&P/EEE), With Choice Based Credit System

Course code: 6BEEE03 **Title of Course: Electrical power system -II**

Course Scheme					Course Scheme Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
04	00	0	04	04	3	10	10	80	100

Course Objectives

Students will understand the various aspects of electrical power systems such as stability, analysis of symmetrical components, various faults, economic scheduling and different methods of earthling

Unit	Contents	Hours
UNIT I	**Symmetrical Component transformation**: Three phase power in unbalanced circuit in terms of symmetrical component. Sequence impedances of Generator. Transformer Transmission line & Passive loads. Phase shift in Y/ delta three phase transformer.	**08**
UNIT II	**Symmetrical and Unsymmetrical fault analysis:** Symmetrical fault analysis: - Transient on transmission line. Short circuit of a synchronous machine (on no load). Short circuit of a loaded synchronous machine. Selection of circuit breakers. Current limiting reactors. Unsymmetrical fault analysis: - Single line to ground, line to line, double line to ground and open conductor faults analysis using symmetrical components.	**10**
UNIT III	**Stability of power system:** Steady state, dynamic and transient stability definition. Dynamics of a synchronous machine, swing equation, Power angle equation, Steady state stability studies. Transient stability studies: - Swing curve. Equal area criteria for transient stability. Application of equal area criteria for different disturbances. Solution of swing equations by point- by-point method. Methods of improving transient stability. 1	**10**
UNIT IV	**Economic Operation of power system:** Introduction Distribution of loads between units within the plant. Optimal unit commitment. Optimum generation scheduling considering transmission losses. Representation of transmission loss using loss formula co-efficient. Derivation of loss formula co-efficient. Simulation of co-ordination equation on digital computer.	**10**
UNIT V	**Neutral grounding in power system and Compensation:** Methods of neutral ground, advantages of grounding the neutral of the power system. Shunt and series compensation: - Generalized equation, shunt reactor compensation of very long line with intermediate switching station, series capacitor compensation at line centre, shunt reactors at both ends and series capacitor in the middle of line. Elementary idea of sub-synchronous resonance problem and counter measures.	**07**
	Total	**45**

Course Outcomes (CO'S):

Upon successful completion of course student will be able to,

1) understand the basics of power system.
2) analyze and solve problems on symmetrical & unsymmetrical fault.
3) understand the stability of Power systems.
4) understand economy of operation.
5) get familiar with types of grounding in the Power system.

Text Books

1) I.J.Nagrath,D.P.Kothari, “Power System Engineering”, Tata Mc Graw Hill
2) W.B.Stevensen, “Elements of Power System Analysis”, McGraw Hill
3) C.L.Wadhwa, “ Electrical Power Systems” New Age International
4) Ashfaq Husain “ Electrical Power Systems”, CBS publication.

Reference Books

1) B.M.Weedy, “Electrical Power Systems”, John Willey & Sons.
2) Sony Gupta Bhatnagar “Course in Electrical Power”, Dhanpat rai & Sons.
3) E.W.Kimbark, “Power System Stability”, vol.1, John Willey & Sons
4) P S R Murty, “Operation and Control in Power System”, BS Publication

GONDWANA UNIVERSITY, GADCHIROLI

COURSE: B.E. VI SEMESTER (ELECTRICAL/ E&P/EEE), With Choice Based Credit System

Course code: 6BEEE04 **Title of Course: Design of Electrical Machines**

Course Scheme					Course Scheme Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
03	-	-	03	03	3	10	10	80	100

Course Objective:

1. Learner can able to apply his fundamental knowledge gained related to design of machine based on their applications.

Unit	Contents	Hours
UNIT I	**General concept of Design of Electrical Machines:** Review of materials used in construction of electrical machines, classification of insulating materials based on permissible temperature rise, Properties of Transformer oil, Ratings & specifications of the Machines, Heating & Cooling characteristics, Calculation for losses	**09**
UNIT II	**Transformer Design:** Types of Transformers, Output equations of single phase & three phase transformers, Voltage per turn for winding, Need of stepped core, Necessity of tap changers, Optimum design, Specific loading, Window space factor & window dimension, Main dimension, core, yoke, windings	**09**
UNIT III	**Operating Characteristics of Transformer :** Evaluation of resistance, leakage reactance of windings, no load current, estimation of loses, regulation, different methods of cooling in transformer, design of cooling tanks, Different mechanical forces acting on transformer	**09**
UNIT IV	**Induction Machine Design:** Output equations, specific electrical & magnetic loadings, turns per phase, number of stator slots, calculation of main dimensions and stator design parameters, various stator slots used in induction motor, choice of number of slots, winding design, slot combination for rotor of cage rotor and wound rotor design, current and other performance from characteristics for design data.	**09**
UNIT V	**Synchronous Machine**: Air gap length methods of obtaining sinusoidal o/p voltage, field coil design for salient pole machine and for turbo generator rotor, ventilation of synchronous generator, cooling air circuit, closed ventilation /quantity of cooling medium hydrogen and water as cooling media.	**09**
	Total	**45**

Course Outcome:

Upon successful completion of course student will be able to,

1) Acquire knowledge to carry out the importance of design of machine based on their applications.
2) Acquire knowledge to carry out design of a transformer and provide the information required for the fabrication of the same along with an estimate of various performance indices.
3) Acquire knowledge to carry out a detailed design of induction machine and provide the information required for the fabrication of the same along with an estimate of various performance indices.
4) Acquire knowledge to carry out a detailed design of synchronous machine and provide the information required for the fabrication of the same along with an estimate of various performance indices.
5) Acquire knowledge to carry out the importance of materials used for the designs of machines.

TEXT BOOKS

1) A course in Electrical Machine Design By AK Sawhney, Dhanpatrai& Sons
2) Theory, performance & Design of AC Machines by MG Say, ELBS London
3) Principles of Electrical Machine Design with computer programs by SK Sen, Oxford & IBH Company, ND
4) Principles of Electrical Machine Design by RK Agrawal, SK Kataria&SonsREFERENCE BOOKS

REFERENCE BOOKS

1) A textbook of Electrical Engineering Drawingby KL Narang, SatyaPrakashan, ND
2) Electrical Machine Design by A. Shanamugasundaram&Gangadharan, Wiley Eastern
3) Computer aided design for electrical machines by Vishnu Murti, BS Publications

GONDWANA UNIVERSITY, GADCHIROLI

COURSE: B.E. VI SEMESTER (ELECTRICAL/ E&P/EEE), With Choice Based Credit System
Course code: 6BEEE05 (Program Elective-II)
Title of Course: 1) Energy Audit & Management

Course Scheme					Course Scheme Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
03	-	-	03	03	3	10	10	80	100

Unit	Contents	Hours
UNIT I	Basic Principles of Energy Audit and management Energy audit, Definitions, Concept, Types of audit, Energy index, Cost index, Pie charts, Sankey diagrams, Load profiles, Energy conservation schemes and energy saving potential, Principles of energy management, Initiating, planning, controlling, promoting, monitoring, reporting, Energy manager, Qualities and functions, Language, Questionnaire, Check list for top management.	**09**
UNIT II	Lighting Modification of existing systems, Replacement of existing systems, Priorities: Definition of terms and units, Luminous efficiency, Polar curve, Calculation of illumination level, Illumination of inclined surface to beam, Luminance or brightness, Types of lamps, Types of lighting, Electric lighting fittings (luminaries), Flood lighting, White light LED and conducting Polymers, Energy conservation measures.	**09**
UNIT III	Power Factor and energy instruments Power factor, Methods of improvement, Location of capacitors, Power factor with non linear loads, Effect of harmonics on Power factor, Energy Instruments, Watt hour meter, Data loggers, Thermocouples, Pyrometers, Lux meters, Tong testers, Power analyser	**09**
UNIT IV	Space Heating and Ventilation, Ventilation, AirConditioning (HVAC) and Water Heating: Introduction Heating of buildings Transfer of Heat Space heating methods, Ventilation and air conditioning, Insulation, Cooling load, Electric water heating systems, Energy conservation methods	**09**
UNIT V	Economic Aspects and Analysis, Economics Analysis, Depreciation Methods, Time value of money, Rate of return, Present worth method, Replacement analysis, Life cycle costing analysis, Energy efficient motors (basic concepts), Computation of Economic Aspects Calculation of simple payback method, Net present worth method, Power factor correction, Lighting, Applications of life cycle costing analysis, Return on investment.	**09**
	Total	**45**

COURSE OUTCOMES (CO'S):

Upon successful completion of course student will be able to,

1) Understand the concept of energy audit & energy management.
2) Understand the lighting Modification of existing systems.
3) Understand the power factor & power factor improvement methods.
4) Understand the space heating & ventilation & its conservation methods.
5) Understand the economic aspects & computation of economic aspects.

Text Books

1) Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications. 2012
2) Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd., 2nd edition, 1995

Reference Books

1) Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.
2) Energy management by Paul of Callaghan, McGraw Hill Book company1st edition, 1998.
3) Energy management hand book by W.C.Turner, John wiley and sons.
4) Energy management and conservation by k v Sharma and pvenkata seshaiah-I K International Publishing House pvt.ltd,2011.
5) http://www.energymanagertraining.com/download/Gazette_of_IndiaP artIISecI-37_25-08-2010.pdf

GONDWANA UNIVERSITY, GADCHIROLI

COURSE: B.E. VI SEMESTER (ELECTRICAL/ E&P/EEE), With Choice Based Credit System
Course code: 6BEEE05 (Program Elective-II)
Title of Course: 2) Electrical Installation & Costing

Course Scheme					Course Scheme Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
03	-	-	03	03	3	10	10	80	100

Course Objective:

Learner can able to apply his fundamental knowledge gained related to Indian electricity act 2003, electrical installation & costing of various loads.

Unit	Contents	Hours
UNIT I	**Standards and Procedures:** Project Procedures, Regulations and Standards, Power Company Network, Coordination with Local Power Company, Load Estimates, and Revenue and Check Metering.	**08**
UNIT II	**Selection of Network:** Basic Principles, Residential System Networks, Commercial System Networks, Industrial System Networks, Overhead Power Distribution, Pole-mounted Substation, Outdoor High-voltage Switchyard, Space Planning, Storage and Installation, Rooms and Areas Containing Electrical Equipment, Installation in Hazardous Areas, Installation in Wet Areas, Cable Installation and Support Systems.	**10**
UNIT III	**Earthing:** Earthing Systems and Principles, Earthing of Equipment in Distribution System, Outdoor Switchyard Earthing, Lightning Protection of Buildings and Structures, Lightning Protection of Outdoor Switchyard and Lines, Over Voltage Protection of Equipment. Testing and Handover: Factory Testing, Labels and Signs, Site Testing and Commissioning, As-Built Documentation and Training.	**10**
UNIT IV	**The Estimating Process:** Components of an Estimate, Types of Estimates, Before Starting the Estimate, The Quantity Takeoff, Pricing the Estimate, Direct Costs , Indirect Costs , The Unit Price, Project Overhead Summary, and Estimate Summary Sheets, Pre bid Scheduling, Bidding Strategies, Project Cost Control and Analysis.	**07**
UNIT V	**Indian Electricity Act 2003:** Definitions, , National Electricity Policy And Plan, Generation Of Electricity, Licensing, Transmission Of Electricity, Distribution Of Electricity, Tariff, Works, Central Electricity Authority, Regulatory Commissions, Appellate Tribunal For Electricity, Investigation And Enforcement, Reorganisation Of Board, Offences And Penalties, Special Courts, Dispute Resolution, Miscellaneous.	**10**
	Total	**45**

COURSE OUTCOMES (CO'S):

Upon successful completion of course student will be able to,

1) comfortably understand standards & procedures.
2) study & analysis capital cost estimate
3) study Indian electricity act 2003
4) study & learn Selection of network
5) study & learn Earthing System & Testing & Handover

Text Books

1) Residential, Commercial and Industrial Electrical Systems: Network and Installation, Volume- 2 by Hemant Joshi, McGraw Hill Education (India) Private Limited
2) Residential, Commercial and Industrial Electrical Systems: Protection, Testing and Commissioning, Volume-3 by Hemant Joshi, McGraw Hill Education (India) Private Limited

3) Electrical Estimating Methods by Wayne J. Del Pico, 4th Edition, ISBN: 978-1-118-76698-9, John Wiley & Sons, Inc.
4) Indian Electricity Act 2003
5) *www.cea.nic.in/reports/electricity_act2003.pdf*

REFERENCE BOOKS

1) Electric Power Distribution system by pabla
2) Electrical Power System Design By M.V. Deshpande TMI
3) Electrical Engineering Hand book - Wadhwa

GONDWANA UNIVERSITY, GADCHIROLI

COURSE: B.E. VI SEMESTER (ELECTRICAL/ E&P/EEE), With Choice Based Credit System

Course code: 6BEEE06 **Title of Course: Business Communication**

Course Scheme					Course Scheme Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
--	03	00	03	--	Audit Course				

Course Objective:

To develop the students ready for good communication, effective public speaking, face the interview and ready for some business activities.

Unit	Contents	Hours
UNIT I	**Nature & Scope of Communication** Introduction, Functions of Communications, Roles of a Manager, Communication Basics & Networks, Internal Communication, Tips for effective Internal Communication, Miscommunication, Effectiveness in Managerial Communication, Strategies for improving Organizational Communication	05
UNIT II	**Business Presentation & Public Speaking** Introduction, Business Presentations & Speeches, Introduction to a Presentation, Main Body, Conclusion, Controlling nervousness & stage fright	05
UNIT III	**Interviews** Introduction, Fundamental principles & general preparations, Success in an Interview, Types of Interview Questions, Important non-verbal aspects, Types of Interviewing, Styles of Interviewing	15
UNIT IV	**Business Correspondence, Reports & Proposals** Introduction, Important features in Business writing, Basic Principles, Components of Business Letter, Kinds of Business Letters, Effective memo writing skills, Introduction to Technology enabled Business Communication	05
UNIT V	**Group Discussion & Team Presentation** Introduction, Methodology, Guidelines for Group Discussion, Role Functions in GD, Types of non- functional behavior, Improving group performance, Team presentations	10
	Total	40

Course Outcome:

Upon successful completion of course student will be able to,

1) Develop the habit in students to have the communication in English.
2) Debate with the public on any topic.
3) Face the interview
4) To make correspondence, prepare reports and proposal related to business
5) Work with team.

Text Books –

1) Ludlow, Ron & Fergus Panton, "The essence of effective Communication", Prentice Hall of India
2) Prasad P., "Communication Skills", S.K. Kataria & Sons, Delhi
3) Meenakshi Raman & Prakash Singh, "Business Communication", Oxford University Press
4) Stevenson S. and Whitmore, " Strategies for Engineering Communication", John Wiley & Sons

Reference Books -

1) Adair John, " The Effective Communication", Jayco Publishing House, Mumbai
2) Krishna Murali & KVK Prasad, "Placement & Personality Development", Environmental Protection Society, NIEE

3) Lesikar, Raymond V. & M.E. Flately, “Basic Business Communication”, Tata McGraw Hill

Note : The student’s assessment & evaluation may be based on response to Concept Review questions, Critical Thinking Questions, Project & Case Studies