

PEOPLE'S UNIVERSITY, BHOPAL**(Applicable for Admitted from Academic Session 2021-22 onwards)**

Programme: Bachelor of Technology

Semester –III

Subject Code	Subject Title	Credit			Theory			Practical		
CBEE-301	Electrical Engineering Material	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (Nil)	Internal (Nil)	Total (Nil)
		3	1	-			Min: 40 (D Grade)			

Duration of Theory (Externals): 3 Hours

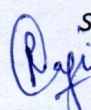
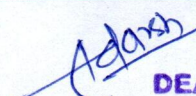
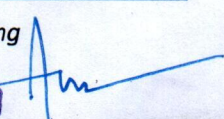
Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: Nil	Lab Performance/ Quiz/Attendance - Max. Marks: Nil	

Pre-Requisite	Knowledge of the basic electrical terminologies.
Course Objective	Impart a basic knowledge of electrical Material with impact of technology.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Analyze the behavior and structure of various elements. 2. Knowledge about the disadvantages of present day materials and their remedies. 3. Knowledge of the Material used in industry, their strengths and drawbacks. 4. Learn about the properties of insulating materials. 5. Classify the insulating materials on basis of thermal properties.

Unit	Contents (Theory)	Marks Weightage
I	Conducting Material: Classification and main properties, High receptivity alloy: Constant Manganin, Nichrome, Electrochemical properties of copper, Aluminum, steel tungsten, Molybdenum, Platinum, Tantalum, Niobium, Mercury, Nickel, Titanium, Carbon, Lead, thermal, thermocouple, materials, specific resistance, conductance, variation of resistance with temperature, super conductors.	14
II	Semi Conductor Materials: General conception, variation of electrical conductivity, Elements having semiconductor properties, general application, hall effect, energy levels, conduction in semiconductors, Intrinsic conduction, impurity conduction, P and N type impurities, electrical change, Neutrality, Drift, Mobility current flow in semi conductors P-N junction formation by alloying, Biasing (forward and reverse) of P-n junction, Reverse separation current, Zener effect, Junction, capacitance, hall defects and hall coefficient	14
III	Magnetic Materials: Details of magnetic materials, reduction Between B, H and μ , soft and hard magnetic materials. Di-magnetic, Para magnetic and Ferromagnetic materials, electrical sheet steel, cast iron. Permanent magnetic materials. Dynamic and static hysteresis loop. Hysteresis loss, eddy current loss, Magnetization, magnetic susceptibility, coercive force, core temperature, rectangular hysteresis loop, Magnet rest square loop core materials, iron silicon, Iron alloys.	14
IV	Insulating Materials: General Electrical Mechanical and chemical properties of insulating materials, Electrical characteristics volume and surface resistivity complex permittivity loss and dielectric loss equivalent circuits of an imperfect dielectric polarization and polarisability classification of dielectric.	14
V	Mechanical Properties: Classification of insulating materials on the basis of temperature rise. General properties of transformer oil, commonly used varnishes, solidifying insulating materials, resins, bituminous waxes, drying oils, Fibrous insulating materials, wood, paper and cardboard, insulating textiles, varnished adhesive tapes, inorganic fibrous material and other insulating materials, such as mica, ceramic, bakelite, ebonite, glass, PVC, rubber, other plastic molded materials.	14

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Department: Electrical Engineering


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Programme: Bachelor of Technology


Semester –III

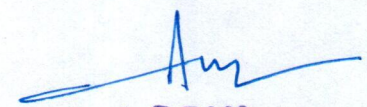
Text Book/References Books/ Websites:-

1. TTTI Madras; "Electrical Engineering Materials"; TMH Publication.
2. S P Seth; A Course In Electrical Engineering Material, Dhanpat Rai Publication.
3. Kortisky; Electrical Engineering Materials: Indulkar and S. Thruvengadem; S.Chand Publication.

Suggested List of Laboratory Experiments :- (Expandable): Nil


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Programme: Bachelor of Technology

Semester –III

Subject Code	Subject Title	Credit			Theory			Practical		
CBEE-302	Principle of Electromagnetism	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (Nil)	Internal (Nil)	Total (Nil)
		3	1	-			Min: 40 (D Grade)			

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: Nil	Lab Performance/ Quiz/Attendance - Max. Marks: Nil	

Pre-Requisite	To understand, develop and design various applications involving electromagnetic fields
Course Objective	Impart a basic knowledge of electro- Magnetism with impact of technology.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Apply vector calculus to static electric-magnetic fields 2. Analyze coulomb and Gauss law and its applications. 3. Analyze the nature of electromagnetic wave propagation in guided medium 4. Analyze Faraday and Maxwell's equation in different forms 5. Understand wave propagation in electromagnetic field.

Unit	Contents (Theory)	Marks Weightage
I	Coordinate System and Vector Fields: Cartesian coordinate system, Cylindrical Coordinate System, Spherical Coordinate System, Transformation of Coordinate system, vector algebra, Line integral, Surface integral and volume integral, Gradient, Divergence, Curl, Green's theorem, Divergence theorem, Stoke's theorem.	14
II	Electrostatic Fields: Coulomb's law, Gauss's law and its application, Electric Field Intensity, Electric Flux Density, Electrostatic Potential and work, Line Charge, Surface Charge, Volume Charge, Poisson's and Laplace's equations, Equation of continuity, Conductors, Dielectrics, Capacitance, Boundary conditions for Electrostatic field.	14
III	Static Magnetic Fields: Biot-Savart Law and its Application, Ampere's Law and its Application, Magnetic Field intensity, Magnetic field due to straight conductor, circular loop, infinite sheet Magnetic Flux Density, Scalar and Vector Potential, Magnetic forces, Magnetic Torque, Magnetic Dipole Moment, Energy stored in Magnetic field, Inductance and Mutual Inductance Boundary conditions for magnetic field.	14
IV	Time Varying Fields and Maxwell's Equations: Faraday's law of electromagnetic, Displacement Current, , Maxwell's equations in Differential and Integral Form, Maxwell's equations in free space, Maxwell's equations for harmonically varying, static and steady field, time-harmonic fields.	14
V	Wave Equation and Plane Waves: Helmholtz wave equation, Solution to wave equations and plane waves, Wave polarization, Poynting vector and Poynting Theorem, power flow in electromagnetic fields, Electromagnetic wave generation and equations – Wave parameters; velocity, intrinsic impedance, propagation constant – Waves in free space, lossy and lossless dielectrics, conductors, skin depth, Plane wave reflection and refraction, Standing Wave, Applications.	14

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Semester –III

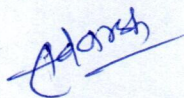
Text Book/References Books/ Websites:-

1. Mathew N. O. Sadiku; Principles of Electromagnetics; Oxford University Press Inc.
2. D. K. Cheng; Field and Wave Electromagnetics; Pearson.
3. Ashutosh Pramanik; Electromagnetism – Theory and Applications; PHI.

Suggested List of Laboratory Experiments :- (Expandable): Nil

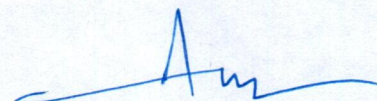

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Programme: Bachelor of Technology

Semester –III

Subject Code	Subject Title	Credit			Theory			Practical		
CBEE-303	Electrical Machine-I	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (35)	Internal (15)	Total (50)
		3	1	1			Min: 40 (D Grade)			Min: 20 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: 15	Lab Performance/ Quiz/Attendance - Max. Marks: 15	

Pre-Requisite	Knowledge of concepts of Physics & basic electrical engineering
Course Objective	Impart a basic knowledge of electrical Machines such as Transformer, DC Generator & Motor, and Induction Motor with impact of technology.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Learn about the basic principle and working of transformers. 2. Learn about connections and applications of the Three Phase Transformer. 3. Acquire knowledge about various types of DC Machines - Generator, Motor etc. 4. Acquire knowledge about various basic principals involved in Electrical Machines. 5. Learn the testing procedure of Dc machines.

Unit	Contents (Theory)	Marks Weightage
I	Transformer-I: Working principle, E.M.F Equation, construction, Phasor diagrams, equivalent circuit, voltage regulation, losses in transformer, efficiency, tests: open circuit and short circuit, load, Sumpner's test, Condition for maximum efficiency and regulation, Power and distribution transformer, all day efficiency, Excitation phenomenon, Autotransformer: working, advantages, its equivalent circuit and Phasor diagram, Harmonics.	14
II	Transformer-II: Three phase transformer: its construction, groups and connections, their working and applications, Scott connection, Parallel operation of Transformers: application, advantages, requirement and load sharing. Tap changers, cooling, conservator and breather. Pulse and high frequency transformers.	14
III	DC Generators: Principle, Construction, Types of DC generators, E.M.F Equation, Characteristics of DC generators, lap & wave windings, Armature reaction, commutation, methods of improving commutations, Demagnetizing and cross magnetizing MMF, Interlopes, parallel operation.	14
IV	DC Motors: Principle and Basic operation of DC motors, back EMF, types, production of torque, armature reaction, Characteristics of shunt, series & compound motor, Speed Control of DC Motor, Ward Leonard method, Starting methods of DC motor- 2point, 3 point and 4 point starter, Harmonics.	14
V	Testing & Breaking of DC Motors:- Methods of Braking, losses and efficiency, direct & indirect test, load test, Swinburne's test, Hopkinson's Test.	14

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1. M. G. Say; "Alternating Current Machines"; (5th Ed.) ELBS, 1986.
2. V. Del Toro; "Electrical Machines & Power Systems"; 1985, Prentice-Hall, Inc., Englewood Cliffs.
3. Nagrath and Kothari, "Electrical Machines", (TMH).
4. Langsdorf; "A.C. Machines"; (McGraw-Hill).
5. Langsdorf; "D.C. Machines"; (McGraw-Hill).
6. Dr. P. S. Bimbhra; "Electrical Machines"; (Khanna).
7. Ashfaq Hussain; "Electrical Machines" (Dhanpat Rai).

Suggested List of Laboratory Experiments :- (Expandable):

1. Perform turn ratio and polarity test on Single phase transformer.
2. Perform load test on a Single-phase transformer and plot its load characteristic.
3. To perform O.C. and S.C. test on a Single-phase transformer and to determine the parameters of its equivalent circuit its voltage regulation and efficiency.
4. To determine the efficiency and voltage regulation of a single-phase transformer by direct loading.
5. Speed control of D.C. shunt motor by:-
 - (a) Field current control method & plot the curve for speed vs. field current.
 - (b) Armature voltage control method & plot the curve for speed vs. armature voltage.
6. Speed control of a D.C. Motor by Ward Leonard method and to plot the curve for speed vs. applied armature voltage.
7. To determine the efficiency of D.C. Shunt motor by loss summation (Swinburne's) method.
8. To determine the efficiency of two identical D.C. Machine by Hopkinson's regenerative test.
9. To plot magnetization characteristic of a separately excited DC generator
10. To perform load test on DC generators.


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Programme: Bachelor of Technology

Semester –III

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (35)	Internal (15)	Total (50) Min: 20 (D Grade)
CBEE-304	Circuit Theory	3	1	1						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: 15	Lab Performance/ Quiz/Attendance - Max. Marks: 15	

Pre-Requisite	Knowledge of Electrical Elements and circuits.
Course Objective	Impart a basic knowledge of electrical quantities such as current, voltage, power, energy, frequency to understand the impact of technology.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Understand the mathematical problems of Electrical circuit. 2. Acquire knowledge about various types of theorems and Network solutions. 3. Acquire knowledge about various types of circuits. 4. Analyze and synthesis of transient response and two port network. 5. Analyze and synthesize the frequency domain analysis and time domain.

Unit	Contents (Theory)	Marks Weightage
I	Basic Circuits Analysis: Ohm's Law – Kirchhoff's laws – DC and AC Circuits Dependent & Independent Sources, Mesh current and node voltage method of analysis for D.C and A.C. circuits, Network topology, concept of Network, graph, Tree, Tree branch & link, Incidence matrix, cut set and tie set matrices, dual networks.	14
II	Network Reduction And Network Theorems for DC and AC Circuits: Network reduction: voltage and current division, source transformation, Star Delta conversion. Thevenin's, Norton Theorem, Superposition Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem.	14
III	Resonance and Coupled Circuits: - Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.	14
IV	Transient Response for AC & DC Circuits:- Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input Two port networks – Two port parameters – Z, Y, ABCD, Hybrid parameters, their inverse & image parameters, relationship between parameters, Interconnection of two ports networks.	14
V	Frequency domain analysis:- Laplace transform solution of Integro-differential equations, transform of waveform synthesized with step ramp, Gate and sinusoidal functions, Initial & final value theorem, Network Theorems in transform domain	14

Text Book/References Books/ Websites:-

1. William H. Hayt Jr & Jack E. Kemmerly and Steven M. Durbin; "Engineering Circuits Analysis"; Tata McGraw Hill publishers, 6 th edition, New Delhi, 2003.
2. Joseph A. Edminister, Mahmood Nahri; "Electric circuits", Schaum's series; Tata McGraw-Hill, New Delhi, 2001.

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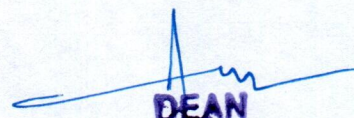
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3. Paranjothi SR; "Electric Circuits Analysis"; New Age International Ltd., New Delhi, (1996).
4. Sudhakar A and Shyam Mohan SP; "Circuits and Network Analysis and Synthesis"; Tata McGraw Hill, (2007).
5. Chakrabati A; "Circuits Theory (Analysis and synthesis); Dhanpat Rai & Sons, New Delhi, (1999).
6. Charles K. Alexander, Mathew N.O. Sadiku; "Fundamentals of Electric Circuits"; Second Edition, McGraw Hill, (2003).

Suggested List of Laboratory Experiments :- (Expandable):

1. To verify Kirchhoff's Voltage Law and Kirchhoff's Current Law in a Passive Resistive Network.
2. To Verify Superposition Theorem
3. To Verify Reciprocity Theorem.
4. To determine and verify Thevenin's and Norton's theorem.
5. To determine and verify Maximum Power Theorem.
6. To calculate and verify 'Z' parameters of two-port network.
7. To calculate and verify 'Y' parameters of two-port network.
8. To calculate and verify 'ABCD' parameters of two-port network.
9. To calculate and verify 'H' parameters of two-port network.
10. Design a RLC resonance circuit & verify the transient response for different values of R, L & C.

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PEOPLE'S UNIVERSITY, BHOPAL**(Applicable for Admitted from Academic Session 2021-22 onwards)**

Programme: Bachelor of Technology

Semester –III

Subject Code	Subject Title	Credit			Theory			Practical		
CBEE-305	Electrical Measurement & Instrumentation	L	T	P	End Sem (35)	Internal (15)	Total (50)	End Sem (35)	Internal (15)	Total (50)
		1	-	1			Min: 20 (D Grade)			Min: 20 (D Grade)

Duration of Theory (Externals): 2 Hours

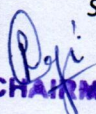
Theory Internal- Max Marks: 15	Best of Two Mid Semester Test – Max Marks: 10	Assignment/Quiz/Attendance - Max. Marks: 05
Practical Internal Max Marks: 15	Lab Performance/ Quiz/Attendance - Max. Marks: 15	

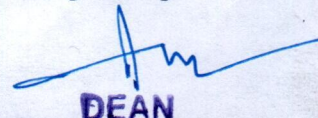
Pre-Requisite	Knowledge about the basic fundamentals of electrical engineering.
Course Objective	The primary objective of the course is to introduce operation principles of instruments, terminology related to measurements and to have an adequate knowledge in measurement techniques for voltage, current, power and energy.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Expected to possess an in-depth understanding and Knowledge of the concepts and principles of measurement of electrical and non electrical viz. 2. About measurement of physical quantities and instruments. 3. Measure Power in single and three phase circuits. 4. Measure energy, and standardization of potentiometers. 5. Measure various electrical quantities.

Unit	Contents (Theory)	Marks Weightage
I	Measurement and error, Accuracy and precision, sensitivity resolution, Error & Error analysis, Effect of temperature, Internal friction, Stray field, Hysteresis and Frequency variation & method of minimizing them, Loading effects, due to shunt connected and series connected instruments, calibration curve, Testing & calibration of instruments. Galvanometers – Theory & operation of ballistic galvanometer, D'arsonal galvanometer, Galvanometer motion & damping, Sensitivity, Flux meter, Vibration galvanometer, Spot deflection galvanometer. Definition of analog & digital instruments, Classification of analog instruments, their operating principle, Operating force, Types of supports, Damping, Controlling.	07
II	Different types of Ammeter & Voltmeter: – PMMC, MI, Electrodynamometer, Hotwire, Electrostatic, Induction, Rectifier, Ferro dynamic & Electro Thermic, Expression for control & deflection torque, their advantages, disadvantages & error, Extension of range of instruments using shunt & multiplier.	07
III	Instrument Transformers Potential and current transformers, ratio and phase angle errors, testing of instrument transformers, Difference Between CT and PT, errors and reduction of errors. Measurement of power: Power in AC and DC Circuit, Electrodynamometer type of wattmeter, Construction, theory, operation & error, Low power factor & UPF wattmeter, Double element and three element dynamometer wattmeter, Measurement of power in three phase circuit, one, two & three wattmeter method, Measurement of reactive power by single wattmeter, Measurement of power using CTs & PTs.	07
IV	Measurement of Energy Single phase induction type energy meter- construction & operation- driving and braking torques- errors & compensations- Testing by phantom loading and using R.S.S. Meter- Three phase energy meter- Tri-vector meter- Maximum demand meter, Ampere hour meter.	07

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	Potentiometer:- DC potentiometer standardization- Lab type Crampon's potentiometer, application of DC potentiometer, AC polar type and coordinate type potentiometer, their construction and Applications.	
V	Miscellaneous Instruments & Measurements: Power factor meter, Single phase and three phase Electro- dynamometer type & moving iron type. Frequency meter- Vibrating reed, Resonance type & Weston type, Synchronoscope, Ohmmeter- series & stunt type, Multi-meter, Megger & Ratio meter. Resistance Measurement- Classification of low, medium & high resistance- Voltmeter, Ammeter, Wheatstone Bridge, Kelvin's double bridge & loss of charge methods for resistance measurement, Earth resistance measurement. Magnetic Measurement- B-H Curve, Hysteresis Loop determination, Power loss in sheet metal- Lloyd Fischer square for measurement of power loss.	07

Text Book/References Books/ Websites:-

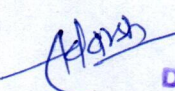
1. E W Golding & F C Widdis; Electrical Measurement & Measuring Instruments; Wheeler Pub.
2. A.K. Sawhney; 'A course in Electrical & Electronic Measurements & Instrumentation'; Dhanpat Rai & co(p) Ltd ,New Delhi
3. Buckingham & Price; Electrical Measurements; Prentice Hall.
4. G. K. Banerjee; 'Electrical and Electronic Measurements'. PHI Learning Pvt.Ltd.
5. R. B. Northrop; 'Introduction to Instrumentation and Measurement'; CRC press Taylor & Francis
6. Vijay Singh; 'Fundamentals of Electrical & Electronic Measurements', New Age International Publishers.

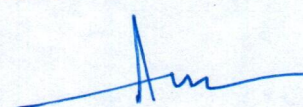
Suggested List of Laboratory Experiments:- (Expandable):

1. Study working and applications of Meggar, Tong-tester, P.F. Meter and Phase Shifter.
2. Measurement of Power in three phase circuit by one, two & three watt meters.
3. Measure low resistance by Crompton potentiometer.
4. Measure Low resistance by Kelvin's double bridge.
5. Measurement of medium resistance using Wheatstone's bridge
6. Measure earth resistance using fall of potential method.
7. Measurement of power in a single phase ac circuit by 3 voltmeter/ 3 Ammeter methods
8. Measurements using Instrument Transformers.
9. Calibrate a voltmeter using Crompton potentiometer.
10. Calibrate a single-phase energy meter by phantom loading at different power factors.


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Programme: Bachelor of Technology

Semester –III

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem	Internal	Total	End Sem	Internal	Total
CBEE-306	Electrical Workshop	-	-	1	(Nil)	(Nil)	(Nil)	(Nil)	(50)	(50)
										Min: 20 (D Grade)

Duration of Theory (Externals): Nil

Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: Nil
Practical Internal Max Marks: 50	Lab Performance/ Quiz/Attendance - Max. Marks: 50	

Pre-Requisite	Nil
Course Objective	Impart a basic knowledge of electrical quantities such as current, voltage, power, energy frequency to understand the impact of technology.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Basic concepts of Electrical wiring 2. Enhance basics of AC circuits. 3. Principle of transformer with background of magnetic circuits. 4. Understand basic concept of Electrical machines. 5. Understand the characteristics of diodes, transistors and digital electronic components.

Unit	Contents (Theory)	Marks Weightage
I	<p>House Wiring Processes Wiring of different lamp control, stair casing circuits, Cleat wiring and conduit wiring. Assembly and interchange wiring of fluorescent tube light, Connection of table and ceiling fans with regulators, Earth resistance measurement and earthing processes.</p> <p>Distribution Boards Processes to make a distribution board containing at least two switches, one fan regulator and one 5A plug point energy meter with main switch.</p> <p>Fault detection and repair of domestic electric installation, Fault detection and its repair in institution's workshop installations, To make a single phase main distribution board with five outgoing circuits for light and fan load including main switch and fuses (only internal connections), Wiring and testing of alarm and indicating relays, indicating lights etc.</p> <p>Dismantling, repairing, assembling and testing of domestic appliance like electric iron, room heater, electric toaster, water heater, electric kettle, electric oven, ceiling fan, Table Fan, regulators, alarm bell, Coil winding for small transformers or alarm bell, Assembling small transformer cores from the given lamination plates. Assembling small battery charger.</p>	50

Text Book/References Books/ Websites:-

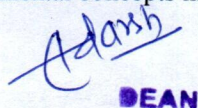
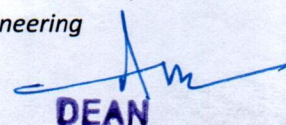
1. Dr. Umesh Rathor; Electrical Workshop Practice; S.K Kataria & Sons Pub.
2. R.P Singh; 'A course in Electrical Workshop'; Tech. SAR Ltd ,New Delhi
3. Buckingham & Price; Electrical Workshop; Prentice Hall.

Suggested List of Laboratory Practical (Expandable):-

1. Students will able to handle basic electrical and electronics equipment's.
2. Students will able to do staircase wiring.
3. Students will able to understand domestic wiring procedures practically.
4. Student will able to assemble electronic systems.
5. Students will understand all the fundamental concepts involving electrical Engineering.
6. Students will understand all the fundamental concepts involving electronics Engineering.

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PEOPLE'S UNIVERSITY, BHOPAL**(Applicable for Admitted from Academic Session 2021-22 onwards)**

Programme: Bachelor of Technology

Semester –III

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-307	NCC-III	L	T	P	End Sem (35)	Internal (15)	Total (50)	End Sem (35)	Internal (15)	Total (50)
		1	-	6			Min: 20 (D Grade)			Min: 20 (D Grade)

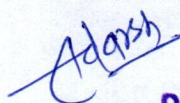
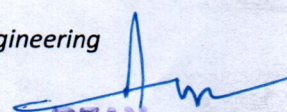
Duration of Theory (Externals): 2 Hours

Theory Internal- Max Marks: 15	Best of Two Mid Semester Test – Max Marks: 10	Assignment/Quiz/Attendance - Max. Marks: 05
Practical Internal Max Marks: 15	Lab Performance/ Quiz/Attendance - Max. Marks: 15	

Pre-Requisite	Nil
Course Objective	<ol style="list-style-type: none"> Understand the life history and leadership qualities of great leaders, sportspersons & entrepreneurs. Understand the various aspects of types of mindset. Understand public speaking methods & qualities. Understand the organizations related to disaster management and their functioning. Understand the role of NCC cadets in disaster management. Understand the various types of adventure activities. Understand the History, Geography & Topography of Border/ Coastal Areas.
Course Outcomes	Student will be able to learn:- <ol style="list-style-type: none"> Admire and get inspired from the accomplishments of leaders from various walks of life. Develop public speaking skills. Understand the importance of positive mindset and optimistic attitude in life. Appreciate the need & requirement for disaster management and his role in disaster management activities. Know the history & geographical peculiarity of our borders & coastal regions.

Unit	Contents (Theory)	Marks Weightage
I	Personality Development 1. Group Discussions - Change your Mindset 2. Public Speaking.	07
II	Leadership Development: Case Studies - APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murthy.	07
III	Disaster Management 1. Disaster Management Capsule. 2. Organization. 3. Types of Disasters. 4. Essential Services. 5. Assistance. 6. Civil Defence Organization.	07
IV	Adventure: Adventure activities.	07
V	Border & Coastal Areas: History, Geography & Topography of Border/ Coastal	07

Note: For NCC-III 05 credits will be allotted after successful completion of camp.


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Semester –III

Text Book/References Books/ Websites:

1. Cadet's handbook, NCC Directorate, MP, CG.
2. Supplementary cadet's handbook, NCC Directorate, MP, CG.

Suggested List of Laboratory Practical (Expandable):**1. Drill**

- Arm Drill.
- Rifle ke saath Savdhan, Vishram aur Aram se.
- Rifle ke saath Parade Par aur Saj, Rifle ke saath Visarjan, Line Tod.
- Bhumi Shastra aur Uthao Shastra, Bagal Shastra aur Baju Shastra.

2. Weapon Training

- Short Range firing.

3. Map Reading

- Setting of Map.
- Findings North and Own Position.

4. Field Craft & Battle Craft

- Observation.
- Camouflage.
- Concealment.

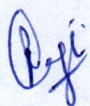
5. Social Service and Community Development

Cadets will participate in various activities throughout the semester e.g., Blood donation Camp, Swachhata Abhiyan, Constitution Day, Jan Jeevan Hariyali Abhiyan, Beti Bachao Beti Padhao etc as per the requirement and similar announced days- National and State level.

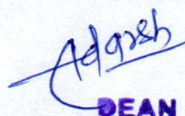
6. Obstacle Training

- Obstacle training - Introduction, Safety-measures, Benefits.
- Obstacle Course- Straight balance, Clear Jump, Gate Vault, Zig- ZagBalance, High Wall.

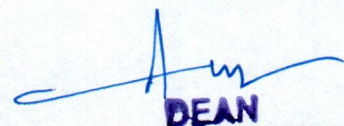
Note: Examination of this NCC course will be conduct as per NCC head quarter norms in consultation with office of COE, PU.


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Programme: Bachelor of Technology

Semester –III

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (35)	Internal (15)	Total (50) Min: 20 (D Grade)
CBTE-308	Introduction to Internet of Things	2	-	1						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: 15	Lab Performance /Attendance / Quiz - Max. Marks: 15	

Pre-Requisite	Nil
Course Objective	Internet of Things is a course that deals with the study of how devices are connected and how it helps to stay connected over the Internet. The course teaches the individuals on how the Internet of Things is helpful in our daily lives and how to stay connected over the Internet.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Fundamental of Internet of Things and its technology. 2. Recognize the factors that contributed to the emergence of IoT. 3. Design and program IoT devices. 4. Use real IoT protocols for communication. 5. Security elements of an IoT device.

Unit	Contents (Theory)	Marks Weightage
I	IoT - What is the IoT and why is it important? Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications, Overview of Governance, Privacy and Security Issues.	14
II	IoT Protocols - Protocol Standardization for IoT – Efforts – M2M , WSN Protocols SCADA and RFID Protocols ,Issues with IoT Standardization – Unified Data Standards Protocols – IEEE802.15.4,BACNet Protocol– Modbus ,KNX , Zigbee, Network layer , APS layer – Security	14
III	IoT Architecture - IoT Open source architecture (OIC) - OIC Architecture & Design Principles- IoT Devices and deployment models- IoTivity: An Open source IoT stack - Overview- IoTivity stack architecture- Resource model and Abstraction.	14
IV	Web of Things- Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence.	14
V	IoT Applications - IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT- A, Hydra etc.	14

Text Book/References Books/ Websites:-

1. Arshdeep Bahga, Vijay Madisetti; Internet of Things (A Hands-on Approach); University Press.
2. Raj Kamal; Internet of things- Architecture and Design Principles; McGraw Hill
3. Cuno Pfister; Getting Started with the Internet of Things; O'Reilly Media
4. Francis daCosta; Rethinking the Internet of Things: A Scalable Approach to Connecting Everything; Apress Open

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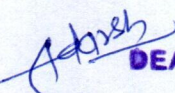
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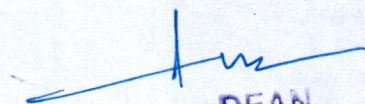
Semester –III

Suggested List of Laboratory Practical (Expandable):-

1. Starting Raspbian OS, Familiarizing with Raspberry Pi Components and interface, Connecting to ethernet, Monitor, USB.
2. Displaying different LED patterns with Raspberry Pi.
3. Displaying Time over 4-Digit 7-Segment Display using Raspberry Pi.
4. Raspberry Pi Based Oscilloscope.
5. Setting up Wireless Access Point using Raspberry Pi.
6. Controlling Raspberry Pi with WhatsApp.


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Programme: Bachelor of Technology

Semester –III

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem	Internal	Total	End Sem	Internal	Total
CBTE-309	Quantitative Aptitude & Logical Reasoning	1	-	-	(Nil)	(50)	Min: 20 (D Grade)	(Nil)	(Nil)	(Nil)

Duration of Theory (Externals): Nil

Theory Internal- Max Marks: 50	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: 50
Practical Internal Max Marks: Nil	Lab Performance / Attendance/ Quiz -Max. Marks: Nil	

Pre-Requisite	Nil
Course Objective	The logical reasoning and quantitative ability represents a systematic way to judge a candidate's mental capability as how he/she performs certain tasks and reacts to different situations.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Solve the problem of number system. 2. Discuss basic concept of algebra, geometry and complex number. 3. Elaborate the concept of probability, set theory and trigonometry. 4. Analyze actively to do logical reasoning such as binary logic, family tree, logical sequence, reflecting on their work. 5. Explore and apply key concepts in logical and quantitative thinking to business problems.

Unit	Contents (Theory)	Marks Weightage
I	Quantitative Aptitude I: LCM and HCF, Percentages, Profit and Loss, Interest (Simple and Compound), Speed, Time and Distance; Time and Work; Averages; Ratio and Proportion, Number System	10
II	Quantitative Aptitude II: Algebra, Geometry/ Mensuration, Pure Math, Venn diagrams, Linear Equations, Quadratic Equations, Complex Numbers, Logarithm, Progressions	10
III	Quantitative Aptitude III: Permutation and Combination, Binomial Theorem, Surds and Indices, Inequalities, Probability Functions, Set Theory, Mixtures and Allegations, Co-ordinate Geometry, Trigonometry	10
IV	Logical Reasoning I: Clocks, Calendars, Binary logic, Seating Arrangement, Blood Relations (Family Tree), Logical Sequence, Assumption, Premise, Conclusion	10
V	Logical Reasoning II: Linear and matrix arrangement, Team Formation, Direction Sense and Decision Making, Syllogism, Cubes, Rows, Quantitative Reasoning, Puzzles, Logical Reasoning based on Rankings, Critical Reasoning	10

Text Book/References Books/ Websites:-

1. Dr. R.S. Aggarwal; Quantitative Aptitude for Competitive Examinations; S. Chand Publication
2. Dr. R.S. Aggarwal; A Modern Approach To Logical Reasoning; S. Chand Publication
3. Arun Sharma; How to Prepare for QUANTITATIVE APTITUDE for CAT ;Mc Graw Hill
4. Arun Sharma; How to Prepare for LOGICAL REASONING for CAT; Mc Graw Hill
5. Sarvesh K Verma ; Quantitative Aptitude Quantum CAT ; Arihant Publication
6. Jaikishan, Premkishan; How to Crack Test of Reasoning; Arihant Publication

Suggested List of Laboratory Practical (Expandable): Nil

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Semester –III

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (Nil)	Internal (Nil)	Total (Nil)	End Sem (Nil)	Internal (50)	Total (50) Min: 20 (D Grade)
CBTE-310	NSS-II/NSO-II	-	-	1						

Duration of Theory (Externals): Nil

Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: Nil
Practical Internal Max Marks: 50	Lab Performance/ Quiz/Attendance - Max. Marks: 50	

Pre-Requisite	Nil
Course Objective	<ol style="list-style-type: none"> 1. The purpose of this course is to understand the community in which they work. 2. To understand themselves in relation to their community. 3. Identify the needs and problems of the community and involve them in problem solving process.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. The objective of the course is to provide the students the knowledge of Improve the quality of educated manpower by fostering social responsibility. 2. Raising society to a higher material and moral level by preparing students for final dedication in the service of nation. 3. Introduce urban students to rural life by living in contact with the community in whose midst their institution is located. 4. Making campus relevant to the needs of the community. 5. To work for community services.

Unit	Contents (Theory)	Marks Weightage
I	Introduction and Basic Concepts of NSS: History and Philosophy & Definition of NSS, Aims& Objectives of NSS, Emblem, flag, Motto, Song, Badge, NSS day etc, Organizational structure (from national to regional level) , Roles and responsibilities of various NSS functionaries.	50
II	NSS Programmes and Activities: Concept of regular activities (one day camp), special seven-day conduction camping, day and night camps and relevance of celebration of important days recognized by united nations, Centre, State Govt. & University, Basis of adoption of village/slums, methodology of conduction survey, financial pattern of the scheme, Coordination with different agencies, Maintenance of the diary	
III	Community Mobilization and Adoption of village: Functioning of community stakeholders, Designing the message in the context of the problem and the culture of the community, Identifying methods of mobilization, Concept of Community development and village adoption.	
IV	Volunteerism and Shramdan: Indian tradition of volunteerism, Value system of volunteerism, Motivation and constraints of volunteerism, Shramdan as a part of volunteerism, Role of NSS volunteers in Swatch Bharat Abhiyan, Role of NSS volunteers in Digital India	
V	Project Work/Practical: The Project should be related from the above topics.	

Text Book/References Books/ Websites: –

Suggested List of Laboratory Practical (Expandable): Nil

1. Project Work/Practical: The Project should be related from the above topics.

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Programme: Bachelor of Technology

Semester –III

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-311	Music Vocal-II/ Music Instruments-II	L	T	P	End Sem (Nil)	Internal (Nil)	Total (Nil)	End Sem (Nil)	Internal (50)	Total (50)
		-	-	1						Min: 20 (D Grade)

Duration of Theory (Externals): -Nil

Theory Internal- Max Marks: -Nil	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance Max. Marks: Nil
Practical Internal Max Marks: 50	Lab Performance/ Quiz/Attendance - Max. Marks: 50	

Pre-Requisite	Basic knowledge of rag tal and musical instruments.
Course Objective	Impart a basic knowledge of music sound, sangeet and folk songs (Vocal and Instruments)
Course Outcome	1. Basic knowledge of Sound. 2. Basic Knowledge of Rabindra & Karnatak Sangeet. 3. Knowledge of various Indian Folk Songs


Unit	Contents (Theory)	Marks Weightage
I	Elementary Study of medium Sound, musical sound and Noise. Study of Vibratory motion, frequency, pitch, magnitude and timber quality duration. Study of Interval, scale, Octave, major tone, minor tone and semi tone & value of each of the three tones. General Knowledge of Rabindra Sangeet. General Knowledge of various folk songs as kajri, Baul, Chaiti, Bhatiali mand, Garba, lavni, Hori, etc.	50

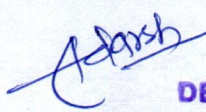
Text Book/References Books/ Websites:

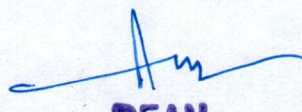
1. Pt. Harishchandra Srivastava ;'Raga Parichay' (Part 1, 2, 3 & 4).
2. Dr. Geeta Banerjee 'Raga Shashtra' (Part 1 & 2)
3. Shanti Govardhan 'Sangeet Shashtra Darpan' (Part 1 & 2)
4. Vasant Sangeet Visharad

Suggested List of Laboratory Experiments :- (Expandable):

1. Practices on of Rabindra Sangeet and any one folk songs (Vocal and Instrumental)


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Programme: Bachelor of Technology

Semester –III

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (Nil)	Internal (50)	Total (50) Min: 20 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBTE-312	Social Engineering	-	-	-						

Duration of Theory (Externals): Nil

Theory Internal- Max Marks: 50	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: 50
Practical Internal Max Marks: Nil	Lab Performance/Attendance /Quiz - Max. Marks: Nil	

Pre-Requisite	Nil
Course Objective	The program's framework was inspired by the realization that an integrated systems approach is the best way to address the set of competencies needed to address societal problems. Numerous opportunities in the business world, the social sector, and government will arise as a result of this integrated programme.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Function effectively in teams to accomplish a common goal. 2. An understanding of professional and ethical responsibility. 3. Ability to self-learn and engage in life-long learning. 4. Understanding of the impact of solutions in an economic, societal, and environment context. 5. Psychological manipulation and human behavior of students into performing actions or divulging confidential information.

Unit	Contents (Theory)	Marks Weightage
I	<p>Social engineering is one of the most prolific and effective means of gaining access to secure systems and obtaining sensitive information yet requires minimal technical knowledge. Social engineering works by manipulating normal human behavioral traits and as such there are only limited technical solutions to guard against it. As a result, the best defense is to educate users on the techniques used by social engineers, and raising awareness as to how both humans and computer systems can be manipulated to create a false level of trust. This can be complemented by an organizational attitude towards security that promotes the sharing of concerns, enforces information security rules and supports users for adhering to them.</p> <p>Contents are as follows: Introduction of Social Engineering: Definition; Types; Psychology in Social Engineering; The Social Engineering Life Cycle; Human Behavior; Weapons of a Social Engineer; Defense against Social Engineering; Social Engineering Attacks; Examples of Social Engineering Attacks; guidelines to Stay Protected Against Social Engineering Attacks; Reverse Social Engineering.</p>	50


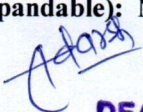
Text Book/References Books/ Websites:

1. Kevin Mitnick; The book of the Art Of Deception.
2. www.socialengineer.com/wpcontent/uploads/2017/02/AdvancedPracticalSocialEngineering-Syllabus.pdf.
3. <https://www.exploit-db.com/docs/english/18135-social-engineering---the-human-factor.pdf>.
4. <https://www.jigsawacademy.com/blogs/cyber-security/what-is-social-engineering/>

Suggested List of Laboratory Practical (Expandable): Nil

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PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)***Programme: **Bachelor of Technology****Semester –IV**

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-401	Entrepreneurship and IPR	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (Nil)	Internal (Nil)	Total (Nil)
		3	-	-			Min: 40 (D Grade)			

Duration of Theory (Externals): 3 Hours

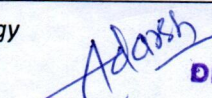
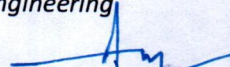
Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: Nil	Lab Performance/Attendance /Quiz - Max. Marks: Nil	

Pre-Requisite	Nil
Course Objective	The course's major objectives are to educate students with various concepts that are essential to comprehend the processes involved in entrepreneurship, grow small and medium-sized businesses, and promote the entrepreneurial spirit of self-employment. To recognize the importance of IP and to educate the students on basic concepts of Intellectual Property Rights.
Course Outcomes	Student will be able to learn: 1. Create and exploit innovative business ideas and market opportunities. 2. Turn market opportunities into a business plan. 3. Demonstrate and present successful work, collaboration and division of tasks in a multidisciplinary and multicultural team. 4. Entrepreneurship and Innovation minors will be able to find problems worth solving. Students advance their skills in customer development, customer validation, competitive marketing and financial analyses, and iteration. 5. Enhanced capability to secure new intellectual properties through Patents and Copyrights

Unit	Contents (Theory)	Marks Weightage
I	Entrepreneurship: Definition and Functions of an Entrepreneur, Qualities of a good entrepreneur; Role of Entrepreneur in Economic Development; Theories of entrepreneur, Socio, Economic, Cultural and Psychological; Entrepreneur Traits and Behavior, Roles in economic growth, employment, social stability, export promotion and indigenization, Creating A Venture, Opportunity Analysis Competitive and Technical Factors, Sources of Fund. Forms of Business Organizations/Ownership – Formation of a Company – procedures and formalities for setting up of New Industry-Sources of information to contact for what and where.	14
II	Management: Importance, Definition and functions; Dimensions of Organizations, Size/Specialization, Behavior Formalization, Authority Centralization, Departmentalization, Span and Line of Control, Technology and Minzberg Organization Typology, Line, Staff & Matrix Organization. Motivation Theories – Maslow, Mc Cullen – Motivation model – need, want, motive and Behavior-Attitude Towards work – Self Assessment and Goal Setting – Achievement, Motivation and Behavior Measurement, SWOT analysis and TA analysis – Stress and Conflict Management; with uncertainty; Creativity and Innovation.	14
III	Marketing: Importance, Definition, Core Concepts of need want and Demand, Project identification and formulation: Sources of Information – Opportunity Guidance – Choice of Technology and its evaluation; Consumer Behavior; Market Survey and research; Preliminary Project Report, Detailed Project Report, Assessing Viability and feasibility of a report. Exchange & Relationships, Product Value, Cost and satisfaction (goods and services) Marketing Environment; Selling, Marketing and Societal Marketing Concepts; Four P's, Product, Price,	14

School of Research and Technology

Department: Electrical Engineering


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PEOPLE'S UNIVERSITY, BHOPAL**(Applicable for Admitted from Academic Session 2021-22 onwards)**Programme: **Bachelor of Technology****Semester –IV**

	Placement, Promotion. Finance: Nature and Scope, Forms of Business Ownerships, Balance Sheet, Profit and loss Account, Fund Flow and Cash Flow Statements, Breakeven Point (BEP) and Financial Ratio analysis, pay-back period, NPV and capital budgeting. Subsidies and concessions for SSI – role of State and Central Government Agencies in Promotion of Small Scale Industry	
IV	Concept of Property: Theories of Property, Types of Intellectual Property- Origin and Development, Theories of Intellectual Property Rights, Need for Protecting Intellectual Property, Commercialization of Intellectual Property Rights by Licensing, Determining Financial Value of Intellectual Property Rights, Negotiating Payments Terms in Intellectual Property Transaction.	14
V	Introduction to Patent Law, (a) Paris Convention , (b) Patent Cooperation Treaty, (c) WTO-TRIPS , Indian Patent Law, The Patents Act, 1970, Patentable Subject Matter, Patentability Criteria, Procedure for Filing Patent Applications, Patent Granting Procedure, Revocation, Patent Infringement and Remedies, Relevant Provisions of the Biological Diversity Act, 2002, Access and Benefit Sharing Issues.	14

Text Book/References Books/ Websites:

1. Arvind rai N. Desai, Environment and Entrepreneur; Ashish Publishing House, New Delhi.
2. Dr. P. Saravanavel; Entrepreneurial Development; Learntech Press Trichy.
3. P Narendra Singh.; Emerging Trends in Entrepreneurship Development Theories & Practices – Entrepreneurship.
4. Dr. S.R.Myneni; Law of Intellectual Property; 9th Ed, Asia law House, 2019.
5. Dr.G.B Reddy; Intellectual Property Rights and Law; Gogia Law Agency.

Suggested List of Laboratory Practical (Expandable): Nil

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PEOPLE'S UNIVERSITY, BHOPAL**(Applicable for Admitted from Academic Session 2021-22 onwards)**

Programme: Bachelor of Technology

Semester –IV

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (35)	Internal (15)	Total (50) Min: 20 (D Grade)
CBEE-402	Electrical Power Generation	3	-	1						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: 15	Lab Performance/Attendance /Quiz - Max. Marks: 15	

Pre-Requisite	Knowledge of the basic electrical equipments and their related terminologies.
Course Objective	The course's major objectives are to educate students with various concepts that are essential to comprehend the processes involved in entrepreneurship, grow small and medium-sized businesses, and promote the entrepreneurial spirit of self-employment. To recognize the importance of IP and to educate the students on basic concepts of Intellectual Property Rights.
Course Outcomes	Student will be able to learn: 1. Create and exploit innovative business ideas and market opportunities. 2. Turn market opportunities into a business plan. 3. Demonstrate and present successful work, collaboration and division of tasks in a multidisciplinary and multicultural team. 4. Entrepreneurship and Innovation minors will be able to find problems worth solving. Students advance their skills in customer development, customer validation, competitive marketing and financial analyses, and iteration. 5. Enhanced capability to secure new intellectual properties through Patents and Copyrights

Unit	Contents (Theory)	Marks Weightage
I	Choice of power station and unit: Type of Generator, Size of Generator and number of units. Thermal Power Station: Main parts and working, Main flow circuits of Thermal Power Station, Power Station auxiliaries, Cooling system of alternators, Starting up procedure of thermal units.	14
II	Nuclear Power Station: Principles of Nuclear reaction, Layout of Nuclear Power Station, Types of power reactors, Main parts and Control reactors, Nuclear waste disposal, Radioactivity and Hazards.	14
III	Hydroelectric Power Station: Stream flow, Hydrographs, Flow duration curve, Arrangement and location of hydroelectric stations, Principle of working, Power station control, Pump and Storage system	14
IV	Advanced Direct Energy Conversion Systems: Basic Principles of Design and Operation of Photovoltaic Energy Systems, Fuel Cells, Magneto-hydrodynamic Power Generators.	14
V	Introduction of non-conventional energy sources: Solar Energy, Wind electricity, Energy from Biomass gasifiers and Biogas reactors, Tidal energy, geothermal energy.	14

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PEOPLE'S UNIVERSITY, BHOPAL**(Applicable for Admitted from Academic Session 2021-22 onwards)**Programme: **Bachelor of Technology****Semester –IV****Text Book/References Books/ Websites:**

1. G. R. Nagpal; "Power Plant Engineering"; Khanna Publisher.
2. M.V. Deshpandey; Modern Design of Power Station.
3. K. K. Ramaligam; Power Plant Engineering; SciTech.

Suggested List of Laboratory Experiments :- (Expandable):

1. To Study about Nuclear Power Station.
2. To Study about Hydroelectric Power Station.
3. To Study Direct Energy Conversion Systems.
4. To Study Thermal Power Station.
5. To Study Magneto-hydrodynamic Power Generators.


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Programme: Bachelor of Technology

Semester –IV

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (35)	Internal (15)	Total (50) Min: 20 (D Grade)
CBEE-403	Electronic Device & Circuits	3	1	1						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: 15	Lab Performance/ Quiz/Attendance - Max. Marks: 15	


Pre-Requisite	Knowledge of concepts of basics Electronic Components
Course Objective	Impart a basic knowledge of electronic device with impact of technology.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Explain the structure and working operation of basic electronic devices 2. Analyze the characteristics of different electronic devices such as diodes and transistors. 3. Choose and adapt the required components to construct an amplifier circuit. 4. To understand the working of different amplifiers. 5. To understand the working of different types of oscillators

Unit	Contents (Theory)	Marks Weightage
I	PN Junction Devices: PN junction diode –structure, operation and V-I characteristics, diffusion and transition capacitance – Rectifiers – Half Wave and Full Wave Rectifier,– Display devices-LED, Laser diodes, Zener diode characteristics- Zener Reverse characteristics – Zener as regulator.	14
II	Transistors And Thyristors: BJT, JFET, MOSFET- structure, operation, characteristics and Biasing UJT, Thyristors and IGBT – Structure and characteristics	14
III	Amplifiers : BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response –MOSFET small signal model– Analysis of CS and Source follower – Gain and frequency response- High frequency analysis.	14
IV	Multistage Amplifiers And Differential Amplifier: BIMOS cascade amplifier, Differential amplifier – Common mode and Difference mode analysis – FET input stages – Single tuned amplifiers – Gain and frequency response Neutralization methods, Power amplifiers –Types (Qualitative analysis).	14
V	Feedback Amplifiers And Oscillators: Advantages of negative feedback – voltage/current, series, Shunt feedback– positive feedback – Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.	14

Text Book/References Books/ Websites

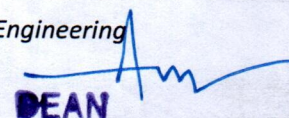
1. Balbir Kumar, Shail.B.Jain ; “Electronic devices and circuits” : PHI learning private limited, 2nd edition 2014.
2. Thomas L.Floyd ; “Electronic devices” ; Conventional current version, Pearson prentice hall, 10th Edition, 2017.
3. Donald A Neamen ; “Electronic Circuit Analysis and Design” ; Tata McGraw Hill, 3rd Edition, 2003.
4. Robert L.Boylestad; “Electronic devices and circuit theory”; 2002.
5. Robert B. Northrop; “Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation; CRC Press, 2004.

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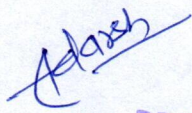
Semester –IV

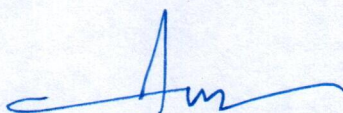
Suggested List of Laboratory Experiments :- (Expandable):

1. To plot P-N Junction Diode Characteristics.
2. To plot Zener Diode Characteristics.
3. To plot BJT Characteristics.
4. To plot FET Characteristics.
5. To plot SCR Characteristics.
6. To plot UJT Characteristics.


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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (35)	Internal (15)	Total (50) Min: 20 (D Grade)
CBEE-404	Electrical Machine-II	3	1	1						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: 15	Lab Performance/ Quiz/Attendance - Max. Marks: 15	

Pre-Requisite	Knowledge of concepts of basics Electrical Machine
Course Objective	Impart a basic knowledge of electrical Machines such as Synchronous Motor & Induction Motor with impact of technology.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Various basic concepts regarding AC machine 2. Characteristics and behavior of Induction Motor in starting and in running condition. 3. Synchronous Motor basic concepts and other special machine and use in industries. 4. Constructional features of synchronous machines. 5. About working and operating characteristics of synchronous motors.


Unit	Contents (Theory)	Marks Weightage
I	Introduction: General equation of induced E.M.F, AC armature windings, concentric and Distributed winding, chording, skewing, and effect on induced EMF. Armature and field MMF, effect of power factor and current on armature MMF, Rotating fields.	14
II	Single Phase Induction Motors: Construction, Theories of operation, Equivalent circuit and Phasor diagram, starting methods, types, applications, Speed-torque characteristics Revolving Field Theory, Cross-field theory.	14
III	Three phase Induction motor: Construction and types, Rotating Magnetic Field, Equivalent circuit, Phasor diagram, Speed-torque characteristics, Deep bar rotor and Double cage rotor. Cogging and Crawling, Starting and Speed control of Three-phase induction motor.	14
IV	Synchronous Generator: Constructions and types, EMF equation, Phasor diagram, Armature reaction, Characteristics, Voltage regulations, Synchronization, Parallel operation, Power angle characteristics, Excitation characteristics. Salient pole synchronous machine: Two-reaction theory, Phasor diagram and Voltage regulation.	14
V	Synchronous Motor: Two reaction theory equivalent circuit model Expression for torque, Phasor diagram, Operating characteristics, Electrical and mechanical power, V curves & inverted V curves, Hunting and Damper winding.	14

Text Book/References Books/ Websites

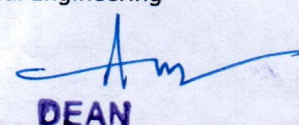
1. Fitzgerald & Kingsley; "Electric Machinery"; MGH.
2. A.S. Langsdorf; "Theory of alternating current machinery"; TMH.
3. P.S. Bhimbra; "Electrical Machines"; Khanna Publishers Delhi.
4. A.E. Clayton & N.N. Nancock, The Performance & design of DC machines CBS publications & distributors, Delhi, 3rd edition
5. P.S. Bhimbra, Electrical Machinery, Khanna Pub.

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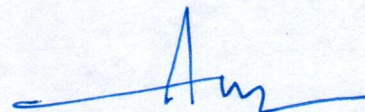

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6. P.S. Bhimbra, Generalized theory of Electrical Machines, Khanna publishers, Delhi,
7. Ashfaq Husain, Electric Machines, Dhanpat Rai, New Delhi
8. I.J. Nagrath & D.P. Kothari, Electric Machines, Tata McGraw Hill, New Delhi,
9. Syed A. Nasar, Electric Machines & Power Systems, Volume I, Tata McGraw Hill, New Delhi
10. A.E. Fitzgerald, C. Kingsley & S.D. Umans, Electric Machinery Tata McGraw Hill New Delhi, 5th edition

Suggested List of Laboratory Experiments :- (Expandable):

1. To synchronize an alternator across the infinite bus (RSEB) & summarize the effects of variation of excitation on load sharing.
2. To plot the V-curve for a synchronous motor for different values of loads.
3. To perform no load and blocked rotor test on a 3 phase induction motor and to determine the parameters of its equivalent circuits.
4. To perform the load test on a 3-phase induction motor and determine its performance characteristics (a) Speed vs load curve (b) P.F. vs load curve (c) Efficiency vs load curve (d) Speed vs torque curve.
5. Determination of losses and efficiency of an alternator.
6. To find X_d and X_q of a salient pole synchronous machine by slip test.
7. To perform no load test on a 3 phase alternator (cylindrical rotor).

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PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)***

Programme: Bachelor of Technology

Semester –IV

Subject Code	Subject Title	Credit			Theory			Practical		
CBEE-405	Digital Electronic	L	T	P	End Sem (35)	Internal (15)	Total (50)	External (35)	Internal (15)	Total (50)
		2	-	1			Min: 20 (D Grade)			Min: 20 (D Grade)

Duration of Theory (Externals): 2 Hours

Theory Internal- Max Marks: 15	Best of Two Mid Semester Test – Max Marks: 10	Assignment/Quiz/Attendance - Max. Marks: 05
Practical Internal Max Marks: 15	Lab Performance/ Quiz/Attendance - Max. Marks: 15	

Pre-Requisite	Knowledge of concepts of basics Electronic Components
Course Objective	Impart a basic knowledge of electronic device with impact of technology.
Course Outcomes	Student will be able to learn: 1. Explain the structure and working operation of basic electronic devices 2. Analyze the characteristics of different electronic devices such as diodes and transistors. 3. Choose and adapt the required components to construct an amplifier circuit.

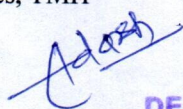
Unit	Contents (Theory)	Marks Weightage
I	Introduction: Digital number systems and information representation; arithmetic operations, decimal and alphanumeric codes. POSs & SOPs, Binary logic, Boolean algebra (identities, functions and manipulation), standard forms, simplification	07
II	Combinational Circuits: Logic gates, switch-level and logic CMOS implementation, integrated circuits. Combinational logic design: circuits (gate level), design hierarchy and procedures, computer-aided design. Combinational two-level and multi-level implementations. Arithmetic (add, subtract, multiply) and other popular (multiplexers, encoders, decoders) modules. Language-directed combinational design (VHDL).	07
III	Sequential Logic Design: latches, flip-flops, state machine design and minimization (Mealy and Moore models), design problems. Language-directed sequential design (VHDL). Registers, Register Transfers and Counters.	07
IV	Digital Circuit: RTL/DTL/DCTL/TTL/MOS/CMOS/ECL, analysis of basic circuits in these families, internal architecture of programmable logic devices.	07
V	Memory System: RAM. ROM, EPROM, EEPROM, PAL, PLDs, PGAs. A/D and D/A conversion techniques and selected case studies.	07

Text Book/References Books/ Websites

1. Morris Mano, Digital Design- Prentice Hall of India Pvt. Ltd
2. H.Taub & D. Schilling, Digital Integrated Electronics, McGraw Hill
3. Douglas L. Perry, VHDL, McGraw Hill, Inc., 2nd Edition, 1993.
4. J.Millman and Halkias, "Integrated Electronics, Analog and Digital Circuits and Systems, Tata McGraw Hill
5. A.Anand Kumar, Digital Electronics, TMH



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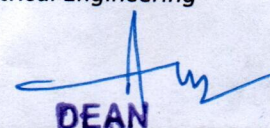


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Semester -IV

Suggested List of Laboratory Experiments :- (Expandable):

1. To test and study of operation of all logic Gates.
2. To implementation of basic Gates using Universal Gates.
3. To Study the binary addition by half adder and full adder circuit.
4. To Study the binary subtraction by half subtractor and full subtractor circuit.
5. To Design a BCD to Excess-3 code convertor.
6. To study the verification of Demorgon's Theorem.
7. To Study the operation of R-S Flip Flop.
8. To Study the operation of J-K Flip Flop.
9. To Study the operation of MUX/DEMUX.
10. To Study the applications of 555 timer (Astable, Monostable, Schmitt trigger and VCO)..


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PEOPLE'S UNIVERSITY, BHOPAL**(Applicable for Admitted from Academic Session 2021-22 onwards)**Programme: **Bachelor of Technology****Semester –IV**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (Nil)	Internal (Nil)	Total (Nil)	End Sem (Nil)	Internal (50)	Total (50) Min: 20 (D Grade)
CBEE-406	Electrical Software Lab-I	-	-	1						

Duration of Theory (Externals): Nil

Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance – Max. Marks: Nil
Practical Internal Max Marks: 50	Lab Performance/ Quiz/Attendance - Max. Marks: 50	

Pre-Requisite	Nil
Course Objective	Impart a basic knowledge of electrical quantities such as current, voltage, power, energy frequency to understand the impact of technology.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Basic concepts of Electrical wiring 2. Enhance basics of AC circuits. 3. Principle of transformer with background of magnetic circuits. 4. Understand basic concept of Electrical machines. 5. Understand the characteristics of diodes, transistors and digital electronic components.

Unit	Contents (Theory)	Marks Weightage
I	Design of basic electrical network theorem based experiments Design and Implementation of Single /Multi output Power supply Design and Implementation of Multi output Switched Mode Power supply Design and Implementation of DOL/Star delta starter for Electrical Machines Design and Implementation of Electro-magnetic relays based on/off control of Electrical loads Design and Implementation of Auxiliary Circuits for Power Electronics Applications: <ol style="list-style-type: none"> 1. Gate drive circuits 2. Snubber circuits Design and Implementation of High frequency magnetics Design and Implementation of Buck/Boost/ Buck-boost dc-dc Converter. Design and Implementation of Voltage and Current sensing circuits in DC and AC circuits Design and Implementation Signal Processing amplifier system for sensor outputs.	50

Text Book/References Books/ Websites: Nil**Suggested List of Laboratory Practical (Expandable):**

1. Students will able to handle basic electrical and electronics equipment's.
2. Students will able to do staircase wiring.
3. Students will able to understand domestic wiring procedures practically.
4. Student will able to assemble electronic systems.
5. Students will understand all the fundamental concepts involving electrical engineering.
6. Students will understand all the fundamental concepts involving electronics engineering.

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Programme: Bachelor of Technology

Semester –IV

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (35)	Internal (15)	Total (50) Min: 20 (D Grade)	End Sem (35)	Internal (15)	Total (50) Min: 20 (D Grade)
CBTE -407	NCC-IV	2	-	1						

Duration of Theory (Externals): 2 Hours

Theory Internal- Max Marks:15	Best of Two Mid Semester Test – Max Marks: 10	Assignment/Quiz/Attendance - Max. Marks: 05
Practical Internal Max Marks: 15	Lab Performance/ Quiz/Attendance - Max. Marks: 15	

Pre-Requisite	Nil
Course Objective	<ol style="list-style-type: none"> 1. Develop a sense of time management and social skills. 2. Understand the life history & leadership qualities of personalities who have contributed in Nation Building and Literature. 3. Understand the role of NCC cadets as 2nd line Defence in 1965 War. 4. Develop awareness about various types of Natural and manmade disasters. 5. Know about life saving tips during disasters. 6. Acquainted about Fire Services. 7. Understand importance of Environmental Awareness & conservation. 8. Understand importance of General Awareness. 9. Know about Armed Forces.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Effectively manage time. 2. Develop the qualities of social skills. 3. Imbibe leadership qualities. 4. Do group discussions effectively. 5. Be motivated to serve the nation by joining Armed forces. 6. Contribute in environmental awareness and conservation activities. 7. Keep abreast of current affairs & general awareness. 8. Effectively contribute in managing disaster relief tasks.

Unit	Contents (Theory)	Marks Weightage
I	Personality Development : Group Discussions –Social Skills & Time management	07
II	Leadership Development : CaseStudies – Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965 war.	07
III	Disaster Management: (i) Initiative Trg, Organising Skills. (ii) Do's and Don'ts. (iii) Natural Disasters. (iv) Man Made Disasters. (v) Fire Services and Fire Fighting.	07
IV	Environmental Awareness: Adventure Environmental Awareness and Conservation. General Awareness: General Awareness.	07
V	Armed Forces: Army, Navy, Air Force and Central Armed Police Forces.	07

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1. Cadet's handbook, NCC Directorate, MP, CG.
2. Supplementary cadet's handbook, NCC Directorate, MP, CG.

Suggested List of Laboratory Practical (Expandable):**1. Drill**

- Arm Drill.
- Salami Shastra.
- Squad Drill with Arms

2. Weapon Training: Short Range firing**3. Map Reading**

- Map to Ground.
- Ground to Map.

4. Field Craft & Battle Craft

- Fire and Move Capsule.
- Field signal- with hand, with Weapons, Signal with Whistle.
- Field signals as means of giving orders.
- Field signals by day, Field signals by night.
- Section Formation.

5. Social Service and Community Development: Cadets will participate in various activities throughout the semester e.g., Blood donation Camp, Swachhata Abhiyan, Constitution Day, Jan Jeevan Hariyali Abhiyan, Beti Bachao Beti Padhao etc as per the requirement and similar announced days- National and State level

6. Health & Hygiene

- Hygiene & Sanitation (Hygiene- Personal & Camp Hygiene).
- First Aid in common medical emergencies.
- Treatment & Care of Wounds.

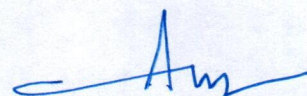
Note: Examination of this NCC course will be conduct as per NCC head quarter norms in consultation with office of COE, PU.


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PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)***

Programme: Bachelor of Technology

Semester –IV

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-408	Research Methodology	L	T	P	End Sem (Nil)	Internal (50)	Total (50)	End Sem (Nil)	Internal (Nil)	Total (Nil)
		1	-	-			Min: 20 (D Grade)			

Duration of Theory (Externals): Nil

Theory Internal- Max Marks: 50	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: 50
Practical Internal Max Marks: Nil	Lab Performance/Attendance /Quiz - Max. Marks: Nil	

Pre-Requisite	Nil
Course Objective	To get to know about research and its analysis.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. To understand the objective and types of research. 2. To understand basic concepts of research formulations. 3. About various design methods. 4. To know about how data is collected for analyzing process & thesis writing. 5. To understand report and thesis writing.

Unit	Contents (Theory)	Marks Weightage
I	Objectives and Types of research: Motivation and objectives – Research methods vs Methodology. Types of research – Descriptive Vs Analytical, Applied Vs Fundamental, Quantitative Vs. Qualitative, Conceptual Vs Empirical.	10
II	Research Formulation: Defining and formulating the research problem - Selecting the problem - Necessity of defining the problem - Importance of literature review in defining a problem.	10
III	Research Design and Methods: Research design – Basic Principles- Need of research design, Features of good design – Important concepts relating to research design – Observation and Facts. Developing a research plan - Exploration, Description, Diagnosis, and Experimentation.	10
IV	Data Collection and Analysis: Execution of the research - Observation and Collection of data - Methods of data collection – Sampling Methods- Data Processing and Analysis strategies - Data Analysis with Statistical Packages - Hypothesis-testing, Generalization and Interpretation.	10
V	Reporting and thesis Writing: Structure and components of scientific reports - Types of report – Technical reports and thesis – Significance – Different steps in the preparation – Layout, structure and Language of typical reports – Illustrations and tables - Bibliography, referencing and footnotes.	10

Text Book/References Books/ Websites:

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal,;An introduction to Research Methodology;RBSA Publishers.
2. Kothari, C.R.;Research Methodology: Methods and Techniques;New Age International.
3. Sinha, S.C. and Dhiman; Research Methodology; Ess Publications. 2 volumes.

Suggested List of Laboratory Practical (Expandable): Nil

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Programme: Bachelor of Technology

Semester –IV

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem	Internal (100)	Total (100)	End Sem	Internal	Total
CBTE-409	Environmental Science	1	-	-			Min: 40 (D Grade)	(Nil)	(Nil)	(Nil)

Duration of Theory (Externals): Nil

Theory Internal- Max Marks: 100	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: 100
Practical Internal Max Marks: Nil	Lab Performance / Quiz/Attendance -Max. Marks: Nil	

Pre-Requisite	Nil
Course Objective	Imparting basic knowledge about the environment and its allied problems and developing an attitude of concern for the environment.
Course Outcomes	<p>Student will be able to learn:</p> <ol style="list-style-type: none"> 1. Conceptual knowledge of energy resources with its applications. 2. To understand the ecosystems and value of these ecosystems to humans and to animals and plants. 3. Developing awareness of biodiversity and its conservation. 4. Categorize different types of pollutions and their control measures. Discover effective methods of waste Management. Analyze global environmental problems and come out with best possible solutions. 5. Understand environmental laws and sustainable development.

Unit	Contents (Theory)	Marks Weight age
I	Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. The multidisciplinary nature of environmental studies. Definition, scope and importance, Need for public awareness.	20
II	Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries).	20
III	Biodiversity and its conservation: Introduction – Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical aesthetic and option values. Biodiversity at global, national and local level. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts. In-situ and Ex-situ conservation of biodiversity.	20
IV	Environmental Pollution: Definition, Causes, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear pollution. Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Disaster management: floods, earthquake, cyclone and landslides.	20

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PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)***Programme: **Bachelor of Technology****Semester –IV**

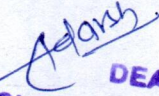
V	Environmental Policy, Legislation, Rules And Regulations : National Environmental Policy Environmental Protection act, Legal aspects Air (Prevention and Control of pollution) Act1981, Water (Prevention and Control of pollution) Act-1974, Water pollution Act-1977, Forest Conservation Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules .	20
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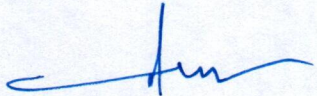
Text Book/References Books/ Websites

1. Dr. S. S. Dara and Dr. D. D. Mishra; A textbook of Environmental Chemistry and Pollution Control, S. Chand & Company Ltd.
2. Dr. Suresh K. Dhameja; Environmental studies; S K Kataria and Sons.
3. A. Ristinen and Jack J. Kraushaar; Energy and the Environment, 2nd Edition: Robert; Shree Sai Publication
4. Anindita Basak ; Environmental Studies; Pearson Publications.
5. Gilbert M. Masters; Introduction to Environmental Engineering and Science; Prentice-Hall Publications.

Suggested List of Laboratory Practical (Expandable): Nil


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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (Nil)	Internal (Nil)	Total (Nil)	End Sem (Nil)	Internal (50)	Total (50) Min: 20 (D Grade)
CBTE-410	Massive Open Online Courses (MOOCs)-I	-	-	1						

Duration of Theory (Externals): Nil

Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: Nil
Practical Internal Max Marks: 50	Lab Performance/Attendance /Quiz - Max. Marks: 50	

Pre-Requisite	Nil
Course Objective	MOOCs build on the engagement of learners who self-organize their participation according to learning goals, prior knowledge and skills, and common interests. Objective of this course is to improve the technical skills of students and its gives an opportunity to explore themselves beyond class room teaching.
Course Outcomes	Student will be able to learn: New interesting courses of their own curiosity and improve their knowledge and skills. MOOCs give an opportunity to connect openly on a global scale, with global learners. The ability to experiment with pedagogical methods on a vast scale.

Unit	Contents (Theory)	Marks Weightage
I	<p>Massive Open Online Courses (MOOCs) are online courses that allow participants free access and unrestricted participation in any course of their choice. Besides the conventional modes of teaching such as lectures, videos and reading material, MOOCs also provide a platform for interactive forums.</p> <p>After the III semester End Sem Examination, all students are instructed to register themselves in a minimum IV (Four weeks) MOOC/NPTEL/SWAYAM Certification course in their Engineering discipline.</p> <p>Students must appear in the certification examination conducted by NPTEL/ SWAYAM and submit it to their respective assigned faculty before the end of the semester. A student should give an effective PowerPoint presentation of chosen course in the class seminars and receive feedback from each other. This effort will help them to communicate their ideas more clearly.</p> <p>The final evaluation of this course will base on a PowerPoint Presentation and Certification during the academic session by the assigned faculty.</p>	50

Text Book/References Books/ Websites:

1. <https://swayam.gov.in/>
2. <http://nptel.ac.in>
3. <https://onlinecourses-archive.nptel.ac.in>

Suggested List of Laboratory Practical (Expandable): Nil

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Semester –IV

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (Nil)	Internal (50)	Total (50)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBTE-411	Sociology	1	-	-			Min: 20 (D Grade)			

Duration of Theory (Externals): Nil

Theory Internal- Max Marks: 50	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance – Max. Marks: 50
Practical Internal Max Marks: Nil	Lab Performance/Attendance /Quiz - Max. Marks: Nil	

Pre-Requisite	Nil
Course Objective	The objective of this course is to provide students a basic understanding of sociological concepts.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. The meaning of Sociology and its importance. 2. The basic concepts involved in sociology. 3. About the social changes 4. About the Basic Social structure. 5. Understand the social law and its control.

Unit	Contents (Theory)	Marks Weightage
I	Introduction: Sociology: definitions, aim and objective; Relation with other social sciences – law and history; Important theoretical approaches: evolutionism, functionalism, conflict theory, interactionist theory; Law as a tool of social engineering: Durkheim, Weber, Pound and Bentham	10
II	Basic Concepts: Social Groups: Cooley and Sumner; Community; Association; Tribes; Social Groups; Status and Role	10
III	Social Change: Social Reform Movements in India – Raja Ram Mohan Roy, Jyotiba Phule, Naicker, etc.; Modernization and Post Modernization; Liberalization and Globalization; Fordism and McDonaldization	10
IV	Social Structure: Culture: Culture Relativism, Racism, Ethnicity and Ethnocentrism; Socialization; Status and Role.	10
V	Social Control: Custom as an Agency of Control; Law as an Agency of Control; Media as an Agency of Control; Public Opinion as an Agency of Control	10

Text Book/References Books/ Websites:

1. Vidya Bhushan and D.R. Sachdeva, An Introduction to Sociology; Kitab Mahal Publisher, New Delhi
2. Desai, N. and M. Krishnaraj Women and Society in India; Ajanta Publications; 1987
3. Myneni Sociology; Allahabad Law Agency, Faridabad; 2004 Goode, W.J. and P.K. Hatt Methods in Social Research; McGraw- Hills; New York; 1952
4. Giddens, A. Sociology; Polity Press, UK; 1993

Suggested List of Laboratory Practical (Expandable): Nil

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Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-412	Fine Arts-II	L	T	P	End Sem (Nil)	Internal (Nil)	Total (Nil)	End Sem (Nil)	Internal (50)	Total (50)
		-	-	1						Min: 20 (D Grade)

Duration of Theory (Externals): -Nil

Theory Internal- Max Marks: -Nil	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance Max. Marks: Nil
Practical Internal Max Marks: 50	Lab Performance /Attendance / Quiz - Max. Marks: 50	

Pre-Requisite	Basic knowledge of art and drawing
Course Objective	To teach the core competencies of critical and conceptual thinking through the continual observation and analysis of the visual and social world also provide a strong philosophical and historical foundation of the visual arts and its impact
Course Outcome	Student will be able to learn: <ol style="list-style-type: none"> 1. Increase ability to communicate with people. 2. Learn to sketch and take field dimensions. 3. Skillfully create artistic form using techniques and methods appropriate to the intended result. 4. Learn to take data and transform it into graphic drawings.

Unit	Contents (Theory)	Marks Weightage
I	History of Indian Painting II :Cave Paintings of India- Ajanta, Bagh, Jain, Pal (Apabhransh), Mughal Painting- Akbar and Jahangir Rajasthani painting- Mewar, Kishangarh, Jaipur	50

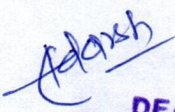
Text Book/References Books/ Websites:

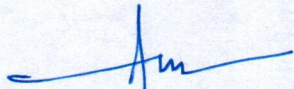
1. Lokesh Chandra Sharma; A Brief History of Indian Painting
2. R.A. Agrawal; Roop Prad Kala Ke mool Adhar.

Suggested List of Laboratory Experiments :- (Expandable):

1. Composition :- Human Figure with Background Poster Colour
2. Copy work :- Indian Miniature


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Programme: Bachelor of Technology

Semester –V

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBTE-5101	Gender Equality	3	-	-						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test- Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: Nil	Lab Performance/Attendance /Quiz- Max. Marks: Nil	

Pre-Requisite	Fluency in English; Basic knowledge about Constitutional Law and Criminal Law.
Course Objective	This course is aimed at discussing the interface between law and gender equality. It also aims to sensitize and create awareness about gender related issues.
Course Outcome	Student will be able to learn: <ol style="list-style-type: none"> 1. The concept of gender equality. 2. Relationship between gender and the law. 3. Different aspects of gender discrimination and reforms 4. National and International efforts towards creating gender equality. 5. Presence of Women-Centric Laws in India

Unit	Contents (Theory)	Marks Weightage
I	Introduction: Meaning of Sex and Gender; History of Gender Movements; Gender roles and gendered division of labour, Private vs public divide and gender inequality; Physical difference, attributes and behavioural dispositions.	14
II	Women as Workers: Unpaid, underpaid and casual work; Women in primary, secondary and tertiary sectors; Classification of work in Indian census and NSSO – Main workers, marginal workers, non-workers; Invisibility of women's work, problems in measurement; Non-recognition of women's work in national income accounting.	14
III	Gender and Health: Poverty, Gender Discrimination and Under Nutrition; Epidemiology of Menstruation and Menstrual Disorder; Early Marriage, Unwanted Pregnancy and Unsafe Abortions; Adolescent Pregnancy and Sexually Transmitted Infection and HIV/AIDS; Health issues relating to Violence: Sexual Abuse, Immoral Trafficking, Rape.	14
IV	Gender Based Violence in Community and State: Rape as a weapon of oppression – causes and implications; Sexual abuse and harassment; Trafficking of Women and Girls; State Violence; Custodial violence; Violence by law enforcing agency; Genocide; Armed Conflict, Displacement and Gender Abuse; War crimes and Sexual abuse; Sexual Assault of Refugees and Displaced Women; New Forms of Violence against Women - Online Violence and its Implications.	14
V	Response to Violence Against Women: International & National response: International Initiatives – legal and policy framework, National Human Rights Commission, National Commission for Women, Law Enforcing Agencies: All Women's Police Stations, Vigilance Cells; Legal Aid Cells; Judiciary: Family Courts/ Mahila Courts; Service Providers: Helplines, Women and Children Help lines; Non-State Actors: INGOs and NGOs, Collective protests, Restorative justice in the context of gender violence.	14

Text Book/References Books/ Websites:

1. Chaudhuri, Maitrayee ;Feminisms in India. Kali for Women; New Delhi
2. Chaudhuri, Maitrayee ;The Indian Women's Movement: Reform and Revival ;Reprinted. Delhi: Palm Leaf. pp. 1-68.

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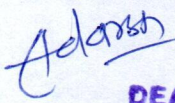
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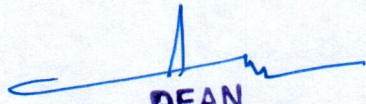
Semester –V

3. Gandhi, N.; When the rolling Pins hit the street: a case study of the Anti-price rise Movement in India; New Delhi.
4. Alexander; Linda Lewis et al (eds) ; New Dimensions in Women & Health.

Suggested List of Laboratory Practical (Expandable): Nil


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Semester –V

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBTE-5102	Human Health & Nutrition	3	-	-						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test- Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: Nil	Lab Performance/Attendance /Quiz- Max. Marks: Nil	

Pre-Requisite	Nil
Course Objective	A study of nutrition and food as applied to daily living. The course provides information on basic nutrition and wellness concepts in relation to the individual and family throughout life.
Course Outcome	Student will be able to learn: <ol style="list-style-type: none"> 1. Basic concepts in food and nutrition. 2. Know different types of nutrients. 3. The basic food groups. 4. Various cooking methods 5. Normal body parameters.

Unit	Contents (Theory)	Marks Weightage
I	Basic Concepts in Food and Nutrition: Basic terms used in study of food and nutrition, Understanding relationship between food nutrition and health, Functions of food-Physiological, Psychological and social.	14
II	Nutrients: Functions, dietary sources and clinical manifestation of deficiency / excess of the following nutrients: Carbohydrates, Lipids and Proteins, Fat soluble vitamins – A,D,E and K, Water soluble vitamins- thiamin, riboflavin, niacin, pyridoxine, Folate, vitamin B12 and vitamin C, Minerals- calcium, iron and iodine.	14
III	Food Groups: Selection, nutritional contribution and changes during cooking of the following food group: <ul style="list-style-type: none"> ▪ Cereals ▪ Fats and oils ▪ Eggs ▪ Pulses ▪ Fruits and vegetables ▪ Milk and milk products ▪ Meat, poultry and fish 	14
IV	Methods of Cooking and Preventing Nutrient Losses: Dry, moist, frying and microwave cooking, Advantages disadvantages and the effect of various methods of cooking on nutrition's, Minimizing nutrient losses.	14
V	Basic Concepts in Food and Nutrition: Basic terms used in study of food and nutrition, Understanding relationship between food nutrition and health, Functions of food-Physiological, Psychological and social.	14

Text Book/References Books/ Websites:

1. Swaminathan; M Hand book of foods and nutrition fifth Ed;Bappco.
2. Srilakshmi B; Nutrition Science 2012; New Age international (P) LTD.
3. Mudambi, SR and Rajagopal; Mv fundamentals of foods Nutrition and Diet Therapy; Fifth Ed: 2012
4. Khanna K Gupta S Seth R Mahana R. Rekhi T.; The AM an and Science of cooking .

Suggested List of Laboratory Practical (Expandable): Nil

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Semester –V

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBTE-5103	Ethical Hacking and Cyber Security	3	-	-						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance Max. Marks: 10
Practical Internal Max Marks: Nil	Lab Performance/Attendance /Quiz- Max. Marks: Nil	

Pre-Requisite	Student should have basic knowledge of computer.
Course Objective	To prepare students with the technical knowledge and skills needed to protect and defend computer systems and networks.
Course Outcome	Student will be able to learn: <ol style="list-style-type: none"> 1. Identify and analyze the stages an ethical hacker requires to take in order to compromise a target system. 2. Techniques to carry out a penetration testing. 3. About various types of attacks, attackers and security threats. 4. Gain knowledge of the tools, techniques and ethical issues likely to face the domain of ethical hacking and ethical responsibilities. 5. Understand details of cybercrime.

Unit	Contents (Theory)	Marks Weightage
I	Introduction: Understanding the importance of security, Concept of ethical hacking and essential Terminologies- Threat, Attack, Vulnerabilities, Target of Evaluation, Exploit, Phases involved in hacking.	14
II	Foot printing: Introduction to foot printing, Types of foot printing, Understanding the information gathering methodology of the hackers, Tools used for the reconnaissance phase.	14
III	System Hacking: Aspect of remote password-guessing Role of Eavesdropping, Various methods of password cracking, Keystroke Loggers, Understanding Sniffers, Comprehending Active and Passive Sniffing, ARP Spoofing and Redirection, DNS, and IP Sniffing, HTTPS Sniffing.	14
IV	Hacking Wireless Networks: Introduction to 802.11, Role of WEP, Cracking WEP Keys, Sniffing Traffic, Wireless DOS attacks, WLAN Scanners, WLAN Sniffers, Hacking Tools, Securing Wireless Networks.	14
V	Introduction to Cybercrime: Defining Cybercrime, Understanding the Importance of Jurisdictional Issues, Quantifying Cybercrime, Differentiating Crimes That Use the Net from Crimes That Depend on the Net, working toward a Standard Definition of Cybercrime, Categorizing Cybercrime, Developing Categories of Cybercrimes, Prioritizing Cybercrime Enforcement, and Reasons for Cybercrimes.	14

Text Book/References Books/ Websites:

1. Rajat Khare; Network Security and Ethical Hacking; Luniver Press
2. Thomas Mathew; Ethical Hacking; EC Council
3. Debby Russell and Sr. G.T Gangemi; Computer Security Basics; O' Reilly Media
4. Thomas R Peltier, Justin Peltier and John blackley; Information Security Fundamentals; Prentice Hall

Suggested List of Laboratory Practical (Expandable): Nil

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Semester –V

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBTE-5104	Industrial Safety and Environment	3	-	-						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: Nil	Lab Performance/ Attendance /Quiz - Max. Marks: Nil	

Pre-Requisite	Student has fundamental knowledge about various types of industries.
Course Objective	To make the students familiar with various industrial safety and their relative acts.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Demonstrate an integrative approach to analyses of safety in various industries. 2. Ability to analyses various types industrial accidents. 3. The ability to apply the fundamental knowledge in environmental factors. 4. Students will understand the basic about industrial hazards. 5. The students will be able to identify types of industrial acts.

Unit	Contents (Theory)	Marks Weightage
I	Industrial Safety: Electrical safety, Construction safety, Chemical safety, Fire safety, Need of safety, Safety programmes, Industrial safety principle, Safety policy, Safety inspection, Safety legislation, Safety measures, Safety audit.	14
II	Industrial Accidents: Types of accidents, Nature and effect of accidents, Causes, Preventions, Accident management, Reporting, Investigations, Laws and Acts, Safety education and training.	14
III	Environmental Factors: Environment introduction, Need of environment control, Safe working environment, Entry and exit, Housekeeping, Work area, Floors and other surfaces, Workstations, Welfare facilities, Air quality, Temperature, Illumination, Noise, Vibrations, Plant layout, Lighting, Ventilations.	14
IV	Industrial Hazards: Classification, Categories, Hazard management, Identification and hazard control, Physical hazard, Chemical hazard, Biological hazard, Psychosocial hazard, Fire hazard, Health hazard, HAZOP, Major industrial hazard, Security management.	14
V	Industrial Acts: Factories act, 1948, Workers safety act, Provision of acts, Requirements of acts, Duties of inspector, OSHA, Indian electricity act -1910, Indian boiler act -1923, Mines act-1952, Petroleum act-1934, Minimum wages act-1948, The payment of wages Act-1936, Employee state insurance act, Workmen compensation act.	14

Text Book/References Books/ Websites:

1. Anupama Prashar; Industrial Safety & Environment, S.K. Kataria and Sons Publication.
2. R. K. Jain and Sunil S. Rao; Industrial Safety, Health and Environment Management Systems; Khanna Publishers.
3. Thomas D. Schneid; Safety Law: Legal Aspects in Occupational Safety and Health (Occupational Safety & Health Guide Series), CRC Press.
4. Pravin M.Pathak & Jayant P. Khairnar; Industrial Safety Management: Safety, Health & Environment Management; Notion Press.
5. R.K. Mishra ; Safety Management: Safety, Health & Environment Management; AITBS Publishers.

Suggested List of Laboratory Practical (Expandable): Nil

School of Research and Technology

Department: Electrical Engineering

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PEOPLE'S UNIVERSITY, BHOPAL**(Applicable for Admitted from Academic Session 2021-22 onwards)**Programme: **Bachelor of Technology**

Semester –V

Subject Code	Subject Title	Credit			Theory			Practical		
CBEE-502	Control System	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (Nil)	Internal (Nil)	Total (Nil)
		3	-	-			Min: 40 (D Grade)			

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance – Max. Marks: 10
Practical Internal Max Marks: Nil	Lab Performance/ Quiz/Attendance - Max. Marks: Nil	

Pre-Requisite	Knowledge about the Linear Algebra and Calculus, Laplace, Fourier transform, and Differential equations etc.
Course Objective	1. To understand the different ways of system representations such as Transfer function representation. 2. To assess the system performance using time domain analysis and methods for improving it. 3. To assess the system performance using frequency domain analysis and techniques for improving the performance. 4. To design various controllers and compensators to improve system performance.
Course Outcomes	Student will be able to learn: 1. Understand the stability concepts of various systems. 2. Knowledge about the basic techniques to make any system stable. 3. Analyze system response and evaluate error dynamics in time domain. 4. To provide understanding of the concepts and techniques involved in proportional integral 5. To understand the various components of control system

Unit	Contents (Theory)	Marks Weightage
I	Introduction to Control Problem: Continuous/Discrete, Time-invariant/Time-varying, Linear/Nonlinear, Open loop/Closed loop, Effects of negative feedback, Transfer Functions – (example: R-L-C series circuit or equivalent), Order and type of transfer functions, Block diagram representation of systems (example: DC motor or equivalent), Block diagram algebra.	14
II	Graph Representation: Properties of Signal Flow Graph, Mason's Gain Formula. Time Response analysis of control system: Time and frequency domain specifications, Transient Analysis of standard first and second order systems with unity feedback, Transient and steady state errors – definitions, Error constants.	14
III	Stability: Routh Hurwitz Criteria and Nyquist stability criterion, Relative stability: Significance of Gain margin and phase margin, Construction of Root locus, Bode plots and Polar plots, Minimum/Non-minimum phase systems, Transportation lag, Pade approximation.	14
IV	Case studies: Effect of P, PI, PD and PID control, Effects of Lead and lag compensation – time domain and frequency domain analysis, Effect of tachogenerator feedback.	14
V	Control system components: Potentiometers, Synchros, Tachogenerators, A.C. and D.C. Servomotors, Gyroscope.	14

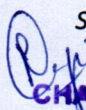

Text Book/References Books/ Websites:

1. M. G'opal; "Control Systems Principles and Design"; Second Edition, Tata McGraw Hill.
2. Benjamin C. Kuo; "Automatic Control Systems" 7th Edition, Prentice Hall of India.
3. Naresh K. Sinha; "Control Systems"; CBS college Publishing.
4. A. Anand Kumar; "Control Systems" 2nd Edition, Kindle Edition.
5. I.J. Nagrath; "Control Systems Engineering" (Multi Colour Edition) New Age international Publisher.

Suggested List of Laboratory Practical (Expandable): Nil

School of Research and Technology

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Semester –V

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	External (Nil)	Internal (Nil)	Total (Nil)
CBEE-503	Transmission & Distribution of Electrical Power	3	1	-						

Duration of Theory (Externals): 3 Hours

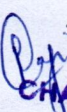
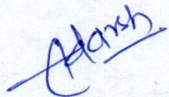
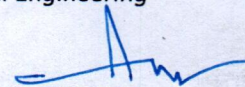
Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: Nil	Lab Performance/ Quiz/Attendance - Nil	

Pre-Requisite	Basic knowledge of electrical terminologies.
Course Objective	<ol style="list-style-type: none"> To learn the fundamentals of transmission system and parameter for the design of transmission system. To comprehend the working and performance of transmission line with the help of its circuit model. To understand and analyze the performance of cables. To model the transmission lines in terms of mechanical parameter and stresses.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> Knowledge of basic power system elements. Ability to understand Transmission Line parameters. Acquire knowledge of various losses in different transmission lines. understand the various effects of corona Knowledge of basic of insulator and different types of cables

Unit	Contents (Theory)	Marks Weightage
I	Supply systems: Basic network of power system. Transmission and distribution voltage, effect of system voltage on size of conductor and losses. Comparison of DC 2- wire, DC wire, 1-phase AC and 3- phase AC (3- wire and 4- wire) systems. Distribution Systems: Primary and secondary distribution systems, feeder, distributor and service mains. Radial and ring- main distribution systems. Kelvin's law for conductor size.	14
II	Mechanical features of overhead lines: Conductor material and types of conductor. Conductor arrangements and spacing. Calculation of sag and tension supports at different levels, effect of wind and ice loading, stringing chart and sag template. Conductor vibrations and vibration dampers.	14
III	Parameters of Transmission Lines: Resistance inductance and capacitance of overhead lines, effect of earth, line transposition. Geometric mean radius and distance. Inductance and capacitance of line with symmetrical and unsymmetrical spacing Inductance and capacitance of double circuit lines. Skin and proximity effects. Equivalent circuits and performance of short and medium transmission lines.	14
IV	Generalized ABCD Line Constants: Equivalent circuit and performance of long transmission line. Ferranti effect. Interference with communication circuits. Power flow through a transmission line. Corona: Electric stress between parallel conductors. Disruptive critical voltage and visual critical voltage, Factors affecting corona. Corona power loss. Effects of corona.	14
V	Insulators: Pin, shackle, suspension, post and strain insulators. Voltage distribution across an insulator string, grading and methods of improving string efficiency. Underground Cables: Conductor, insulator, sheathing and armoring materials. Types of cables. Insulator resistance and capacitance calculation. Electrostatic stresses and reduction of maximum stresses, Causes of breakdown. Thermal rating of cable. Introduction to oil filled and gas filled cables.	14

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Semester –V

Text Book/References Books/ Websites:

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

Suggested List of Laboratory Practical (Expandable): Nil
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Programme: Bachelor of Technology

Semester –V

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (35)	Internal (15)	Total (50) Min: 20 (D Grade)
CBEE-504	Analog & Digital Communication	3	1	1						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: 15	Lab Performance/ Quiz/Attendance - Max. Marks: 15	

Pre-Requisite	Basic knowledge about the signal and systems.
Course Objective	Impart a basic knowledge of electronic device with impact of technology.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Fundamentals of analog and digital communication systems 2. Various techniques for amplitude modulation and demodulation of analog signals 3. To the transmission of digital signals over bandwidth-limited communication channels. 4. Digital modulations techniques. 5. Information theory and coding.

Unit	Contents (Theory)	Marks Weightage
I	Time domain and frequency domain representation of signal: Fourier Transform and its properties, Transform of Gate, Periodic gate, Impulse periodic impulse sine and cosine wave, Concept of energy density and power density (Parseval's theorem), Power density of periodic gate and impulse function, impulse response of a system, convolutions, convolution with impulse function, causal and non causal system impulse response of ideal low pass filter, Correlation & Auto correlation	14
II	Modulation: Base band signal, need of modulation, Introduction of modulations techniques, Amplitude modulation, Equation and its frequency domain representation, Bandwidth, Power distribution. AM suppressed carrier waveform equation and frequency domain representation Generation (Balance/Chopper modulator) and synchronous detection technique, errors in synchronous detection, Introduction to SSB and VSB Transmission Angle modulation, Frequency and phase modulation equation and their relative phase and frequency deviations, modulation index frequency spectrum, NBFM and WBFM, Bandwidth comparison of modulation techniques.	14
III	Sampling of signal: sampling theorem for low pass and Band pass signal, Pulse amplitude modulation (PAM), Time division, multiplexing (TDM). Channel Bandwidth for PAM-TDM signal Type of sampling instantaneous, Natural and flat top, Aperture effect, Introduction to pulse position and pulse duration modulations, Digital signal, Quantization, Quantization error, Pulse code modulation, signal to noise ratio, Companding, Data rate and Baud rate, Bit rate, multiplexed PCM signal, Differential PCM (DPCM), Delta Modulation (DM) and Adaptive Delta Modulation (ADM), comparison of various systems	14
IV	Digital modulations techniques: Generation, detection, equation and Bandwidth of amplitude shift keying (ASK) Binary Phase Shift keying (BPSK), Differential phase shift keying (DPSK), offset and non offset quadrature phase shift keying (QPSK), M-Ary PSK, Binary frequency Shift Keying (BFSK), M-Ary FSK Quadrature Amplitude modulation (QAM), MODEM, Introduction to probability of error	14

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V	Information theory and coding: Information, entropies (Marginal and conditional), Model of a communication system, Mathematical representation of source, channel and receiver characteristics, Mutual information, channel capacity efficiency of noise free channel Binary symmetric channel (BSC) Binary erasure channel (BEC), Repetition of signal, NM symmetric Binary channel, Shannon theorem, Shanon-Hartley theorem (S/N-BW trade off)Source encoding code properties; Shanon, Fano and Huffman coding methods and their efficiency error control coding, Minimum Hamming distance, Linear Block Code, Cyclic code and convolution codes.	14
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Text Book/References Books/ Websites :-

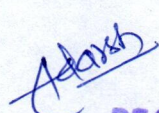
1. Singh & Sapre; Communication System; TMH.
2. Taub & shilling; Communication System; TMH.
3. Hsu; Analog and digital communication (Schaum); TMH .
4. Martin S. Roden, Analog & Digital Communication System; Discovery Press

Suggested List of Laboratory Experiments :- (Expandable):

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



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Programme: Bachelor of Technology

Semester –V

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (35)	Internal (15)	Total (50) Min: 20 (D Grade)
CBEE-505	Switchgear & Protection	3	1	1						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: 15	Lab Performance/ Quiz/Attendance - Max. Marks: 15	

Pre-Requisite	Knowledge of the Electrical Power System operation and basic terminologies.
Course Objective	<ol style="list-style-type: none"> To understand the principle of protective schemes and various faults in the Power System Scenario. To study the various types of the circuit breakers, the arc quenching phenomena and the protection against over voltages. To explain the students protection systems used for
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> Understanding various faults and their affects in the power system. Knowledge about the various types of Relays and their working. Knowledge about the various types of Circuit Breakers and their working. To understand the electrical fuse To understand the various types of Circuit Breakers

Unit	Contents (Theory)	Marks Weightage
I	Fault Analysis: Fault Analysis per unit, representation and its advantages, faults in power systems (Symmetrical & Unsymmetrical), Single line and equivalent impedance diagram Representation of power system components. Symmetrical components and its application to power systems, fault analysis, Sequence networks and their interconnection for different types of faults, Effect of fault impedance, Current Limiting reactors, its location and application, Short circuit calculation.	14
II	Protective Relays: Introduction, Need for power system protection, effects of faults, evolution of protective relays, zones of protection, primary and backup protection, essential qualities of protection, classification of protective relays and schemes, current transformers, potential transformers, basic relay terminology. Operating Principles and Relay Construction: Electromagnetic relays, thermal relays, static relays, microprocessor based protective relays.	14
III	Static Relays: Amplitude & phase comparators, duality between amplitude & phase comparators, Circulating current amplitude comparators, coincidence type phase comparator, block spike phase comparator, integrating phase comparator, Hall effect sine phase comparator, Design of directional relay, reactance relay, mho relay, impedance relay, quadrilateral characteristics relay using cosine phase comparator and amplitude comparator.	14
IV	Fuses: Introduction, fuse element materials, fuse characteristics, types of fuses, application of HRC fuses, Selection of fuse.	14
V	Circuit Breakers: Initiation of Arc, High resistance arc interruption, current zero arc interruption, Recovery voltage, Factor affecting recovery voltage, Re-striking voltage, Rate of Rise of Re-striking Voltage, Breaking of capacitive current, current chopping, Resistance switching, Circuit Breaker rating, Circuit Breaker testing, Minimum oil circuit breaker, Air Blast circuit Breaker, SF-6 Circuit Breaker.	14

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Semester –V

Text Book/References Books/ Websites:


1. B. Ravindran and M Chander; "Power System protection and Switchgear" New Age International.
2. Badrirk; "Power System protection and switchgear"; TMH.
3. CL Wadhwa; "Electrical Power systems"; New age International.
4. Haddi Saade; "Power System Analysis"; TMH.
5. A.R. Bergen, Vijay Vittal; "Power System Analysis"; Pearson Education, Asia.
6. Sunil S. Rao; "Switchgear & protection"; Khanna Publication.

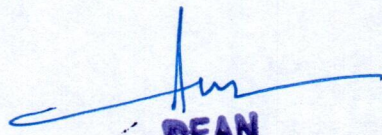
Suggested List of Laboratory Practical (Expandable):

1. To study Over Current Relay static type & draw characteristics.
2. To study Under Voltage relay Electromechanical type & draw characteristics.
3. To study Over Voltage relay Electromechanical type & draw characteristics.
4. To study IDMT Over Current relay Electromechanical Type & draw current verses time characteristics.
5. To study IDMT earth fault relay Electromechanical type draw current verses time characteristics.
6. To study operating characteristics of percentage-biased differential relays tp plot the characteristics of percentage biased Differential relay for 20%, 30% and 40%.
7. To study the construction and operation of Buchholz Relay.
8. To study the characteristics of Instantaneous relays.
9. To study Static type Negative Sequence relay.
10. To study different types of circuit breakers.
11. To study the time-grading protection of feeder.
12. To study the current-grading protection of feeder.
13. To study the time-current grading protection of feeder.
14. To plot the characteristics of Directional Over Current relay.
15. To study different protection schemes for alternators.


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Programme: Bachelor of Technology

Semester –V

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (35)	Internal (15)	Total 50 Min: 20 (D Grade)
CBEE-506	Utilization of Electrical Power	3	-	1						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: 15	Lab Performance/ Quiz/Attendance – Max. Marks: 15	

Pre-Requisite	Basic knowledge of utilization techniques of electrical power.
Course Objective	This subject gives a comprehensive idea in utilization of electrical power such as drives, electric heating, electric welding and illumination, electric traction, electrolysis, refrigeration air-conditioning and automobile electric system.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Method of Electrical heating and electric welding. 2. Illumination process and calculation of lumens efficiency. 3. Application of electrolytic process and manufactures of chemicals. 4. To understand the supply systems 5. To understand the traction Methods of electrical system

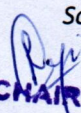
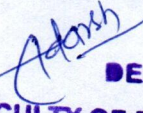
Unit	Contents (Theory)	Marks Weightage
I	Electric Heating: Different methods of electric heating. Principle of high frequency induction and Di-electric heating. Construction, operation, performance and applications of arc furnace and induction furnace. Electric Welding: Welding process, welding transformer, Classification of Electric Welding: arc welding, resistance welding, welding of various metals.	14
II	Illuminations: Definitions, laws of illuminations, polar curves, luminous efficiency, Photometer, incandescent lamps: filament materials, halogen lamp. Electric discharge lamps: sodium vapour lamp mercury vapour lamp and fluorescent lamp. Light Calculations: commercial, industrial, street and flood lighting.	14
III	Electrolytic Process: Principles and applications of electrolysis, electro-deposition, manufactures of chemicals, anodizing, electro polishing electro-cleaning, electroextraction, Electrefining, electro-stripping (parting) power supplies for electrolytic process.	14
IV	Electric Traction & Means of Supplying Power: Systems of Electric Traction: DC & AC Systems, Power Supply for Electric Traction System: Comparison and application of different systems. Sub-station equipment and layout, conductor rail & pantograph.	14
V	Traction Methods: Types of services, speed time and speed distance curves, estimation of power and energy requirements, Mechanics of train movement. Co-efficient of adhesion, Adhesive weight, effective weight. Traction Motor Controls: DC and AC traction motors, Series parallel starting. Methods of electric braking of traction motors.	14

Text Book/References Books/ Websites:-

1. H. Partab; "Art & Science of Utilisation of Electrical Energy"; Dhanpat Rai & Sons.
2. G.W. Vinal; "Storage Batteries"; John Wiley & Sons Inc.
3. N. Mohan, "T.M. Undeland & W.P. Robbins"; Power Electronics; John Wiley & Sons.
4. P.C. Sen; "Power Electronics"; Tata McGraw-Hill Publishing Co. Ltd.
5. P.C. Sen; "Modern Power Electronics"; Wheeler Publishing. Navneet Gupta; Basic Electronics; Dhanpat Rai & Company.

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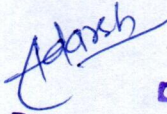
Programme: Bachelor of Technology

Semester –V

Suggested List of Laboratory Practical (Expandable):-

1. Identify the different lighting accessories required for various types of lamps.
2. Identify the different lighting accessories required for various types of lamp fittings.
3. Measure illumination at different places in college using lux meter.
4. Identify the different components required for various types heating furnaces.
5. Observe construction and working of various heating furnaces.
6. Identify the different accessories and safety devices required for various types of welding system.
7. Industrial visit to study the electric installation in a building.
8. To study the electric traction system.
9. Study of AC motors for 25KV AC traction.
10. Visit to Electrolysis process.


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Programme: Bachelor of Technology

Semester –V

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (35)	Internal (15)	Total (50) Min: 20 (D Grade)	End Sem (35)	Internal (15)	Total (50) Min: 20 (D Grade)
CBTE-507	NCC-V	1	-	6						

Duration of Theory (Externals): 2 Hours

Theory Internal- Max Marks: 15	Best of Two Mid Semester Test – Max Marks: 10	Assignment/Quiz/Attendance - Max. Marks: 05
Practical Internal Max Marks: 15	Lab Performance/ Quiz/Attendance - Max. Marks: 15	

Pre-Requisite	Nil		
Course Objective	(a) Understand the concept of Team and its functioning. (b) Hone Public speaking skills. (c) Understand the security set up and management of Border/Coastal areas. (d) Acquire knowledge about an Infantry Battalion organization and its weapons. (e) Acquire knowledge about Indo-Pak Wars fought in 1965 & 1971.		
Course Outcomes	Student will be able to learn: 1. Participate in team building exercise and value team work. 2. Improve communication skills by public speaking activities. 3. Understand the security mechanism and management of Border/Coastal areas. 4. Get motivated to join armed forces.		

Unit	Contents (Theory)	Marks Weightage
I	Personality Development: (i) Group Discussions –Team work. (ii) Public speaking.	07
II	Border & Coastal Areas: Security Setup and Border/Coastal management in the area.	07
III	Introduction to Infantry Battalion and its Equipment: Organization of Infantry Battalion & its weapons.	07
IV	Military History: Study of Battles of Indo-Pak Wars 1965 & 1971.	14

Note: For NCC-V, 05 credits will be allotted after successful completion of camp.

Text Book/References Books/ Websites:

1. Cadet's handbook, NCC Directorate, MP, CG.
2. Supplementary cadet's handbook, NCC Directorate, MP, CG.

Suggested List of Laboratory Practical (Expandable):

1. **Drill**
 - Ceremonial Drill.
 - Guard Mounting.
2. **Field Craft & Battle Craft (Contact Hrs. 04)**
 - Fire control orders.
 - Types of fire control orders.
 - Fire and Movement- when to use fire and movements tactics, Basic considerations, Appreciation of ground cover, Types of cover, Dead ground, Common Mistakes, Map and air photography, Selection of Fire position and fire control.
3. **Map Reading:** Google Maps & applications.
4. **Weapon Training:** Short Range firing

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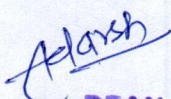
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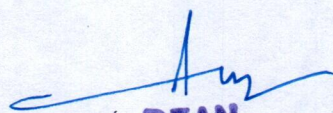
5. **Social Service and Community Development:** Cadets will participate in various activities throughout the semester e.g., Blood donation Camp, Swachhata Abhiyan, Constitution Day, Jan Jeevan Hariyali Abhiyan, Beti Bachao Beti Padhao etc. as per the requirement and similar announced days- National and State level.
6. **Health & Hygiene:**
 - Yoga- Introduction, Definition, Purpose, Benefits.
 - Asanas-Padamsana, Siddhasana, Gyan Mudra, Surya Namaskar, Shavasana, Vajrasana, Dhanurasana, Chakrasana, Sarvaangasana, Halasana etc.
7. **Obstacle Training:**
 - Obstacle training – Intro, Safety measures, Benefits.
 - Obstacle Course- Straight balance, Clear Jump, Gate Vault, Zig- Zag Balance, High Wall etc.

Note: Examination of this NCC course will be conduct as per NCC head quarter norms in consultation with office of COE, PU.


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PEOPLE'S UNIVERSITY, BHOPAL**(Applicable for Admitted from Academic Session 2021-22 onwards)**Programme: **Bachelor of Technology**

Semester –V

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (35)	Internal (15)	Total (50) Min: 20 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBTE-508	Accounting and Finance Management	2	-	-						

Duration of Theory (Externals): 2 Hours

Theory Internal- Max Marks: 15	Best of Two Mid Semester Test – Max Marks: 10	Assignment/Quiz/Attendance - Max. Marks: 05
Practical Internal Max Marks: Nil	Lab Performance/Attendance /Quiz - Max. Marks: Nil	

Pre-Requisite	Nil
Course Objective	The objective of this course is to familiarize the students with concepts and methods in Accounting as a subject in Business Financial Management.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. To understand Basic accounting concepts. 2. To know system of book banking. 3. To understand depreciation methods. 4. To understand the framework of balance sheet. 5. To understand the Bank Reconciliation Statement

Unit	Contents (Theory)	Marks Weightage
I	Accounting: Meaning, scope & relationship with other functional areas, book keeping & accounting.	07
II	Conceptual framework of accounting: Accounting principles, accounting concepts, accounting conventions, systems of books keeping, double entry system of books keeping, journal (Numerical).	07
III	Depreciation Accounting: Concepts causes methods of providing depreciation different assets: Fixed installment method (Numerical), Diminishing balance method (Numerical), Annuity method (Numerical).	07
IV	Final Accounts: Manufacturing account, trading account, profit & loss account, balance sheet and adjustments (Numerical).	07
V	Bank Reconciliation Statement: Objective, Importance & Techniques	07

Text Book/References Books/ Websites:

1. Jain & Narang: Elements of Accounting.
2. S.N. Maheshwari: Fundamentals of Accounting.
3. Shukla, Grewal & Gupta: Advanced Account.

Suggested List of Laboratory Practical (Expandable): Nil

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School of Research and Technology

Department: Electrical Engineering

PEOPLE'S UNIVERSITY, BHOPAL**(Applicable for Admitted from Academic Session 2021-22 onwards)**

Programme: Bachelor of Technology

Semester –V

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem	Internal	Total	End Sem	Internal	Total
CBEE-509	Electrical Simulation-II	-	-	1	(Nil)	(Nil)	(Nil)	(Nil)	(50)	(50)
										Min: 20 (D Grade)

Duration of Theory (Externals): Nil

Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max Marks: Nil
Practical Internal Max Marks: 50	Lab Performance/ Quiz/Attendance -50	

Pre-Requisite	Nil
Course Objective	<ol style="list-style-type: none"> To acquire the knowledge to understand the numerical models of dynamical systems and virtual reality modeling. To cover both analytical methods and simulation of queuing systems in MATLAB and will cover the programming languages of discrete stochastic system (GPSS, SIMSCRIPT). To develop the ability to process of translating real-world problems into simulation models, and the model building techniques involved.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> Fundamentals on all the basics of Simulation and Modeling. Programming concepts in MATLAB. Creating and Simulating a SIMULINK Model. To understand the electrical network by the electrical software To understand the modeling using SIMULINK

Unit	Contents (Theory)	Marks Weightage
I	MATLAB Basics: Simulation Mechanism and Simulation Tools, Starting and Ending MATLAB, MATLAB Desktop, Help Browser, Types of Files, Command Input Assistance, Operators and Special Characters, Variables and Arrays, Handling Arrays, Useful Built-in Functions, Control Structures, Input/output Commands, File Handling	10
II	Introduction to Plotting: The plot command, Formatting and Labeling a Plot, Multiple Plots, Adding Legend, Sub Plots, Plotting Complex Data, 2-D and 3-D Plots, Plotting a Function, Plot Editor, Interactive Plotting using Plotting Tool	10
III	Programming in MATLAB: MATLAB Editor, MATLAB Programming, Debugging MATLAB Programs, MATLAB Debugger, Functions and Function Files, Differential Equation Solver, Symbolic Mathematics, Programming Examples	10
IV	Basic Electrical and Networks Applications Analysis of Electrical Networks – Experiments based on Solution of Series-Parallel Circuits, Solution of system with linear equations - Experiments based on mesh and nodal analysis, Experiments for Validation of Network Theorems, Solution of Network Problems, Solution of First Order Differential Equation – Experiments for the study of Transients, Experiments for AC Signal Waveform Analysis, Study of Resonance in AC Circuit, Study of Frequency Response	10
V	System Modeling using SIMULINK Getting SIMULINK, Creating and Simulating a SIMULINK Model, SIMULINK Solution of Differential Equation, Assigning Variables, Observing Variables During Simulation, Storing/Saving Data, Linking M-file with Model file, Creating and Masking Sub-systems, Solution using Laplace Transform Approach, Solution using Laplace Transform Approach, Study of dynamic response, Simulation of Non-Linear System.	10

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PEOPLE'S UNIVERSITY, BHOPAL**(Applicable for Admitted from Academic Session 2021-22 onwards)**

Programme: Bachelor of Technology

Semester –V

Text Book/References Books/ Websites:

1. Dr Shailendra Jain; "Modelling and Simulation Using MATLAB-SIMULINK"; willey india.
2. Rudraprasad; "MATLAB Programming".

Suggested List of Laboratory Practical (Expandable):

1. Basic Operations on Matrices.
2. Generation of various signals and sequences (Periodic and Aperiodic).
3. Operations on signals and sequences such as Addition, Multiplication, Scaling, Shifting, Folding.
4. Mesh and Nodal Analysis of Electrical circuits.
5. Application of Network Theorems to Electrical Networks
6. Waveform Synthesis using Laplace Transform.
7. Harmonic analysis of non sinusoidal waveforms.
8. Simulation of DC Circuits.
9. Measurement of active Power of three phase circuit for balanced and unbalanced load.
10. Transient Analysis.
11. Simulation of three phase diode bridge rectifiers with R, RL load
12. Simulation of single phase diode bridge rectifiers with filter for R & RL load.


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Semester –V

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-510	Industrial Training	L	T	P	End Sem (Nil)	Internal (Nil)	Total	End Sem (100)	Internal (Nil)	Total (100)
		-	-	1			(Nil)			Min: 40 (D Grade)

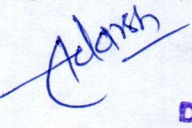
Duration of Theory (Externals): -Nil

Theory Internal- Max Marks: -Nil	Best of Two Mid Semester Test-Max Marks: Nil	Assignment/Quiz/Attendance Max. Marks: Nil
Practical Internal Max Marks: Nil	Lab Performance/ Quiz/Attendance - Max. Marks: Nil	

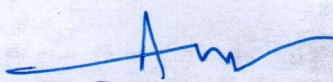
Pre-Requisite	Fundamental Engineering concepts of concern discipline.
Course Objective	The objective of industrial training is to provide to students the feel of the actual working environment and to gain practical knowledge and skills, which in turn will motivate, develop and build their confidence.
Course Outcome	Student will be able to learn: <ol style="list-style-type: none"> 1. Participate in the projects in industries during his or her industrial training. 2. Describe use of advanced tools and techniques encountered during industrial training and visit. 3. Interact with industrial personnel and follow engineering practices and discipline prescribed in industry. 4. Develop awareness about general workplace behavior and build interpersonal and team skills. 5. Prepare professional work reports and presentations..

Unit	Contents (Theory)	Marks Weightage
I	<p>The Course industrial training is to provide work experience, so that student's engineering knowledge is enhanced and employment prospects are improved. Industrial training of the students is essential to overcome the wide gap between the classroom learning and industrial environment.</p> <p>Industrial Training is a practical course, in which the students should undergo in reputed Private / Public Sector / Government organization / companies as industrial training of minimum FOUR weeks in the semester break after IV semester theory examinations.</p> <p>Training period: Minimum of Four weeks or 30 (Thirty) Days.</p> <p>Evaluation: Fifth semester</p> <p>Companies / Areas covered: Any field related to concern branch / discipline of Engineering.</p> <p>Grading: As per Scheme.</p> <p>Note: The presentation is evaluated by your class in charge. Report must be submitted during power point presentation. A Viva voce comprising comprehensive questions based on your presentation and training undergone.</p> <p>Etiquettes: Dress properly, behave well, portray good image as a university student, be punctual, observe work ethics, concern for safety, be professional.</p>	100

Text Book/References Books/ Websites: Nil**Suggested List of Laboratory Experiments: - (Expandable): Nil**

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Semester –V

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (Nil)	Internal (50)	Total (50) Min: 20 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBTE-511	Indian Constitution	-	-	-						

Duration of Theory (Externals): Nil

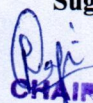
Theory Internal- Max Marks: 50	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance – Max. Marks: 50
Practical Internal Max Marks: Nil	Lab Performance/ Quiz/Attendance - Max. Marks: Nil	

Pre-Requisite	Fluency in English
Course Objective	The objective of this Course is to outline the essential features of the Indian Constitution and to discuss important organs established by it.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> About the fundamental rights and duties About the institutional arrangement provided by the Constitution.(UG) About the institutional arrangement provided by the Constitution.(SG) About the local administration. About the working of election commission.

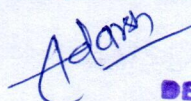
Unit	Contents (Theory)	Marks Weightage
I	Introduction: Constitution-meaning of the term; Indian Constitution: Sources and constitutional history; Features: Citizenship; Preamble; Fundamental Rights and Duties; Directive Principles of State Policy.	10
II	Union Government and its Administration: Structure of the Indian Union: Federalism; Centre- State relationship; President: Role; power and position; PM and Council of ministers; Cabinet and Central Secretariat; Lok Sabha; Rajya Sabha; Supreme Court of India.	10
III	State Government and its Administration: Governor: Role and Position; CM and Council of ministers; State Secretariat: Organization; Structure and Functions; High Courts.	10
IV	Local Administration: District's Administration head: Role and Importance; Municipalities: Introduction; Mayor and role of Elected Representative; CEO of Municipal Corporation; Pachayati raj: Introduction; PRI: Zila Pachayat; Elected officials and their roles; CEO Zila Pachayat: Position and role; Block level: Organizational Hierarchy (Different departments); Village level: Role of Elected and Appointed officials; Importance of grass root democracy.	10
V	Election Commission: Role and Functioning; Chief Election Commissioner and Election Commissioners; State Election Commission: Role and Functioning; Institute and Bodies for the welfare of SC/ST/OBC and women.	10

Text Book/References Books/ Websites:

1. Laxmikanth; Indian Polity.
2. Subhash Kashyap; Indian Administration.
3. D.D. Basu; Indian Constitution.
4. Avasti and Avasti; Indian Administration.

Suggested List of Laboratory Practical (Expandable): Nil

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PEOPLE'S UNIVERSITY, BHOPAL*(Applicable for Admitted from Academic Session 2021-22 onwards)*

Programme: Bachelor of Technology

Semester –VI

Subject Code	Subject Title	Credit			Theory			Practical		
CBEE-6101	Computer Application to Power Systems	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (Nil)	Internal (Nil)	Total
		3	-	-			Min: 40 (D Grade)			(Nil)

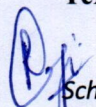
Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance – Max Marks: 10
Practical Internal Max Marks: Nil	Lab Performance/ Quiz/Attendance -Nil	

Pre-Requisite	Knowledge of electrical power system operation.
Course Objective	<ol style="list-style-type: none"> 1. To study the basics of computer aided design of various component of power system. 2. To study the optimal design of power system. 3. To study the optimal design of power transformers. 4. To study the optimal design of FACTS devices. 5. To study the optimal design of bus system.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Requirements for advanced functions for automation and control of power systems. 2. Implement functions for power system control using predefined components and standardized interfaces. 3. Apply the knowledge of matrix Inverse for solving system of linear equations. 4. To understand the knowledge of contingency analysis 5. To understand the voltage and angle stability

Unit	Contents (Theory)	Marks Weightage
I	Models of power system components: network model using graph theory, formation of Z bus, transmission line models, regulating transformer, line load ability, capability curves of alternator.	14
II	Control of load bus voltage using reactive power control variable, SVC & SVS, regulated shunt compensation, series and shunt compensation, Uniform series and shunt compensation and effect of load ability of transmission lines.	14
III	Sensitivity Analysis: General sensitivity relations, generation shift distribution factors, line outage distribution factors, compensated shift factors, sensitivity associated with voltage-VAR, sensitivities relating load bus voltage changes in terms of PV bus voltage changes, sensitivity relating changes in reactive power generation for changes in PV Bus Voltage.	14
IV	Power System Security: Security functions, Security level, contingency analysis, security control, economic dispatch using LP formulation, pre-contingency and post- contingency, corrective rescheduling.	14
V	Voltage Stability: Difference between voltage and angle stability, PV Curve for voltage stability assessment, proximity and mechanism, modal analysis using reduced Jacobian , participation factor, effect of series and shunt compensation on voltage stability effect of load models.	14

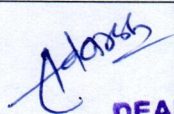
Text Book/References Books/ Websites:



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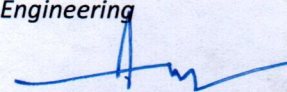
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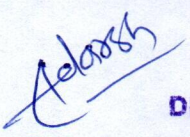
Programme: **Bachelor of Technology**

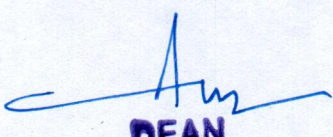
Semester –VI

1. Dr. M. Ramamoorthy , “Computer- Aided Design of Electrical Equipment”, East-West press Pvt. Ltd. New Delhi.
2. A.K. Sawhney; ”Electrical Machine Design”; Dhanpat Rai & Sons.
3. S.K. Sen; “Principles of Electrical Machine Design with Computer Programmes”; Oxford & IBH Publishing Co.
4. M.G. Say; “Performance and Design of A.C. Machines”; Affiliated East West Press Pvt. Ltd. New Delhi.

Suggested List of Laboratory Practical (Expandable): Nil


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PEOPLE'S UNIVERSITY, BHOPAL*(Applicable for Admitted from Academic Session 2021-22 onwards)*

Programme: Bachelor of Technology

Semester –VI

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBEE-6102	Generalized Theory of Electrical Machine	3	-	-						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max Marks: 10
Practical Internal Max Marks: Nil	Lab Performance/ Quiz/Attendance -Nil	

Pre-Requisite	Knowledge of Rotating Electrical Machines and electrostatic fields
Course Objective	To study the basics generalized machine
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. To understand the Primitive machine 2. To understand the basic knowledge of Induction Machine 3. To understand the synchronous Machine 4. To understand the Operational Impedances and Time Constants of Synchronous Machines 5. To understand the Generator & System Analysis

Unit	Contents (Theory)	Marks Weightage
I	Review : Primitive machine, voltage and torque equation. Concept of transformation change of variables & m/c variables and transform variables. Application to D.C. machine for steady state and transient analysis, and equation of cross field commutator machine.	14
II	Induction Machine : Voltage, torque equation for steady state operation, Equivalent circuit, Dynamic performance during sudden changes in load torque and three phase fault at the machine terminals. Voltage & torque equation for steady state operation of 1- ϕ induction motor & charge motor.	14
III	Synchronous Machine : Transformation equations for rotating three phase windings, Voltage and power equation for salient and non salient alternator, their phasor diagrams, Simplified equations of a synchronous machine with two damper coils.	14
IV	Operational Impedances and Time Constants of Synchronous Machines: Park's equations in operational form, operational impedances and G(P) for a synchronous machine with four Rotor Windings, Standard synchronous machine Reactances, time constants, Derived synchronous machine time constants, parameters from short circuit characteristics.	14
V	Approximate Methods for Generator & System Analysis: The problem of power system analysis, Equivalent circuit & vector diagrams for approximate calculations, Analysis of line to line short circuit, Application of approximate method to power system analysis.	14

Text Book/References Books/ Websites:

1. P.C.Krause, Analysis of Electric Machinery.
2. B.Adkins, The General theory of Electrical Machines.
3. B.Adkins & R.G.Harley, The General theory of AC Machines.
4. P.S.Bhimbra, Generalised theory of Electrical m/c
5. White & Woodson, Electro Mechanical Energy Conversion.

Suggested List of Laboratory Practical (Expandable): Nil

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Programme: Bachelor of Technology

Semester –VI

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBEE-6103	Power Electronics Applications to Power System	3	-	-						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max Marks: 10
Practical Internal Max Marks: Nil	Lab Performance/ Quiz/Attendance -Nil	

Pre-Requisite	Nil
Course Objective	<ol style="list-style-type: none"> 1. Interpret principle of operation, design and synthesis of different line commutated converters and their applications. 2. To provide strong foundation for further study of power converters and its applications. 3. Introduce students to different inverter and chopper circuit topologies, principle of operations, design and their applications.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. State, differentiate and analyze the various single phase and three phase inverter topologies. 2. Classify and compare the various control methods and modulation techniques effecting the performance of inverter and chopper circuits. 3. Apply the basics of two/three level inverter circuits to develop understanding of multilevel inverters. 4. Examine, discuss and analyze different chopper topologies for practical, industrial applications. 5. Identify and compare the performance of DC-DC converter topologies with consideration of switch mode power supply (SMPS) applications.

Unit	Contents (Theory)	Marks Weightage
I	AC Voltage Controllers: , types and principle of operation, on-off control and phase angle control, performance analysis with different loads, their applications for power supplies (solid state tap changing regulator) and AC motor control.	14
II	Single Phase & Three Phase Converters: Different single-phase and three phase line commutated converter configurations, performance analysis with different loads, Effect of source inductance, commutation and overlap, Inverter mode of operation, Gate circuit schemes for phase control.	14
III	Inverter Principles: Inverter topologies for single phase and three phase inverters, Push pull, half bridge and full bridge single-phase inverters, Quasi square wave inverters, Three-phase six step and current controlled inverters, current source single & Three-phase inverters.	14
IV	Principles and classification of chopper circuits: Analysis of practical choppers for single, two and four quadrant operation, Device selection, duty cycle range of practical choppers, Design consideration for RL and RLE loads, Multiphase Choppers, thyristor choppers, Switching control circuits for chopper converters.	14
V	Switch Mode Power Supplies: buck, Boost and buck-boost converters, Control of DC-DC converters, Continuous and discontinuous conduction mode, Effect of parasitic elements, Converter comparison.	14

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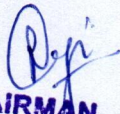
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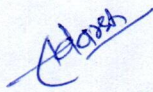
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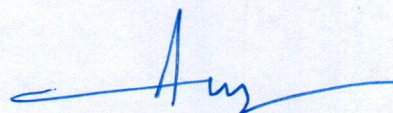
PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)*****Programme: Bachelor of Technology****Semester –VI****Text Book/References Books/ Websites:**

1. N. Mohan, T.M. Undeland and W.P Robbins, "Power Electronics Converters, Applications and Design", third edition, John Wiley & Sons Inc, 2003.
2. M. H. Rashid, "Power Electronics Circuits, Devices and Application", third edition Pearson education 2009.
3. Joseph Vithayathil, "Power Electronics Principles and Applications", Tata McGraw Hill edition 2010.
4. B.W. Williams, "Power Electronics, Devices Drivers and Application" Wiley New York 1987.
5. B. R. Pelley, "Thyristor Phase controlled converters and cyclo-converters", Wiley Inter science, 1971.

Suggested List of Laboratory Practical (Expandable): Nil


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PEOPLE'S UNIVERSITY, BHOPAL*(Applicable for Admitted from Academic Session 2021-22 onwards)*

Programme: Bachelor of Technology

Semester –VI

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBEE-6104	High Voltage Engineering	3	-	-						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max Marks: 10
Practical Internal Max Marks: Nil	Lab Performance/ Quiz/Attendance -Nil	

Pre-Requisite	Nil
Course Objective	1. Gain knowledge in testing of high voltage equipments. 2. Measurement of High Voltages alternating and impulse, 3. Measurement of High Currents-direct, alternating and Impulse, Oscilloscope for impulse voltage and current measurements.
Course Outcomes	Student will be able to learn: 1. Describe the principles behind generating high DC – AC and impulse voltages. 2. Breakdown in gases. 3. Breakdown in liquid and solids. 4. Impulse Generator. 5. Measurement of High Voltage & its testing.

Unit	Contents (Theory)	Marks Weightage
I	Breakdown in gases: Mechanisms of breakdown in gases, various related ionization processes. Townsends and streamer theories. Paschen's law, Breakdown in Non-uniform fields. Effect of wave shape of impressed voltage on the breakdown strength. Breakdown of sphere gap and rod gap.	14
II	Breakdown in liquid and solids: Mechanisms of breakdown in liquids, suspended particle, suspended water, cavitation and bubble and electronic breakdown theories. Mechanisms of breakdown in solids; intrinsic electro-mechanical, erosion, surface, thermal and streamer, Relation between electric strength of solids and time, intrinsic breakdown strength.	14
III	Impulse Generator: Specifications of an impulse voltage Wave, standard impulse, reasons for adopting the particular shape; Analysis and control of simple circuit of impulse generator. Multistage impulse generator (Marx circuit) circuit working, earthing and tripping. Techniques to observe wave front on C.R.O.	14
IV	Measurement of High Voltage: Potential dividers-resistive, capacitive and mixed dividers for high voltage. Sphere gap; construction, mounting, effect of nearby earthed objects, humidity and atmospheric conditions, effect of irradiation and polarity, Electrostatic voltmeter; principle and classification, constructional details of an absolute electrostatic voltmeter. Oscilloscopes and their applications in high voltage measurement.	14
V	High Voltage Testing: Measurement of insulation resistance of cables. Wet and dry flashover test of insulators. Testing of insulators in simulated polluted conditions. Testing of transformers and rotating machines. Measurement of breakdown strength of oil. Basic techniques of non-destructive testing of insulators; measurement of loss angle, High Voltage Schering bridge, and partial discharge measurement techniques.	14

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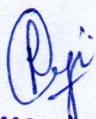
Programme: Bachelor of Technology

Semester –VI

Text Book/References Books/ Websites:

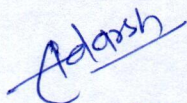
1. L. V. Bewley, "Traveling Waves on Transmission Systems", Wiley New York.
2. M. S. Naidu and V. Kamaraju, "High Voltage Engineering", Tata McGraw Hill.
3. D.V. Razevig, "High Voltage Engineering", translated by Dr.M.P. Chourasia, Khanna Publisher
4. Kuffel & Zingal, High Voltage Engg.
5. Kuffel & Abdullah, High Voltage Engg.

Suggested List of Laboratory Practical (Expandable): Nil



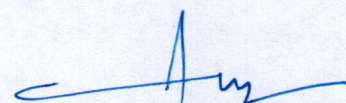
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Programme: Bachelor of Technology

Semester –VI

Subject Code	Subject Title	Credit			Theory			Practical		
CBEE-602	Power Electronics	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (Nil)	Internal (Nil)	Total (Nil)
		3	1	-			Min: 40 (D Grade)			

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: Nil	Lab Performance/ Quiz/Attendance - Max. Marks: Nil	

Pre-Requisite	Knowledge of the Basic Electrical and Electronics Engineering.
Course Objective	<ol style="list-style-type: none"> To introduce students the basic theory of power semiconductor devices and passive components, their practical application in power electronics. To familiarize the operation principle of AC-DC, DC-DC, DC-AC conversion circuits and their applications. To provide the basis for further study of power electronics circuits and systems
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> Basic operation of various power semiconductor devices and passive components. The basic principle of switching circuits. Analyze and design an AC/DC rectifier circuit. Analyze and design DC/DC converter circuits. Analyze DC/AC inverter circuit.

Unit	Contents (Theory)	Marks Weightage
I	Power Semiconductor Devices: Silicon controlled rectifier (SCR), structure, principle of operation, two transistor analogy, switching characteristics, trigger requirement, series and parallel operation of SCRs, ratings and protection, Triac structure and principle of operation only, Modern semiconductor devices, power BJT, MOSFET, IGBT structure, static characteristics.	14
II	Phase Controlled Rectifiers: Principle of phase control, performance parameters, single-phase half wave controlled mid -point full controlled converters and half controlled converters for R, RL and RLE load, comparison of controlled converters with and without freewheeling diode, Effect of source inductance in single-phase. Single phase dual converter in circulating and non circulating mode, Three-phase half wave and fully controlled bridge converter, three-phase semi-converter.	14
III	DC To DC Converters: Forced Commutation Techniques for thyristor, Self commutation, Impulse commutation, Resonant pulse commutation and Complementary commutation, Principle of chopper operation, controlled strategies, step up chopper, step down chopper, chopper, configurations, Performance parameter of step down chopper with R-L-E load for continuous and discontinuous conduction .Working principle of Voltage commutated ,Current commuted and Load commuted thyristor chopper.	14
IV	DC to AC Converter (Inverter): Classification of inverters, voltage source inverter, current source inverter, Series and modified series resonant thyristor inverter. Performance parameters of single phase half bridge and full bridge inverter for R-L loads, 3-phase inverter-180 degree and 120 degree conduction mode using ideal switches for balanced R load only. Pulse width modulated switching scheme for voltage control, SPWM and modified SPWM of 1-phase inverters, PWM with Uni-polar and Bipolar Voltage Switching. (Elementary analysis only)	14

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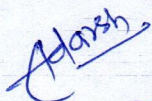
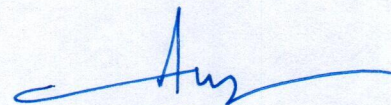
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	Chopper: Principle of chopper operation, Various control strategies in chopper, Step up & step-up/step down choppers, chopper configuration (Type A,B, C,D, & E), Steady state analysis of chopper circuits, Current & voltage commutation of chopper circuits Jones & Morgen's chopper	
V	Cyclo-converters & AC Controllers: Basic principle of operation, step-up and step down single-phase to single-phase cyclo-converter, Principle of On-off and phase control, AC controller circuit configurations, Performance parameters of Single phase bidirectional controllers for R and RL only.	14

Text Book/References Books/ Websites:

1. "Power electronics Circuits, Devices and Applications", Muhammad .H. Rashid, PHI pbs.3rd Edition
2. "Power Electronics", Dr. P.S. Bhimbra, Khanna Publishers, 3 rd Edition.
3. "Power Electronics Converters", applications and Design" Mohan, Undeland, Robbins, John Wiley & Sons, 3 rd Edition.
4. "A text book of power electronics", S.N Singh, Dhanpat Rai & Co.(P)Ltd. 1 st Edition.
5. "An Introduction to thyristor and its applications" M. Ramamoorthy, East-West Press, 2 nd Edition.

Suggested List of Laboratory Practical (Expandable): Nil

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Programme: Bachelor of Technology

Semester –VI

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (35)	Internal (15)	Total: (50) Min: 20 (D Grade)
CBEE-603	Electrical Drives	3	1	1						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: 15	Lab Performance/ Quiz/Attendance – Max. Marks-15	

Pre-Requisite	Knowledge of the basic electrical machines.
Course Objective	<ol style="list-style-type: none"> 1. Describe the structure of Electric Drive systems and their role in various applications. 2. Understand basic requirements placed by mechanical systems on electric drives. 3. Describe the operation of dc motor drives to satisfy four-quadrant operation to meet mechanical load requirements. 4. Design torque, speed and position controller of motor drives. 5. Describe operation of tractions.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Electric drive systems for different mode of operations. 2. Operation of tractions. 3. Speed control of DC and AC machines using Power Electronics. 4. Design of ratings on the basis of heating and cooling. 5. To understand the Electric Traction system

Unit	Contents (Theory)	Marks Weightage
I	Dynamics of Electric Drives: Fundamental torque equations, speed-torque conventions and multi quadrant operation, equivalent values of drive parameters, nature and classification of load torques, steady state stability, load equalization, close loop configurations of drives.	14
II	DC Drives: Speed torque curves, torque and power limitation in armature voltage and field control, Starting. Braking: Regenerative Braking, dynamic braking and plugging. Speed Control: Controlled Rectifier fed DC drives, Chopper Controlled DC drives.	14
III	Induction Motor Drives: Review of conventional method of starting, and Speed control, Braking: Regenerative braking, Dynamic braking, Plugging. Speed control by stator voltage control, supply frequency control, Voltage source inverter (VSI) and current source inverter (CSI) fed three-phase induction motor drives, Static rotor resistance control induction motor drive, Slip power recovery drives.	14
IV	Synchronous Motor Drive: Control of Synchronous Motor-Separately Controlled and VSI fed Self-Controlled Synchronous Motor Drives. Dynamic and Regenerative Braking of Synchronous Motor with VSI. Control of Synchronous Motor Using Current Source Inverter(CSI).	14
V	Traction Drives: Electric Traction system, Nature of traction load, calculation of Traction drive rating and energy consumption, Important feature of traction drives, Motors employed in traction, Conventional method for AC and DC traction drives control, Semiconductor converter controlled drives employing DC motors, AC motors for 25 KV AC traction.	14

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Programme: Bachelor of Technology

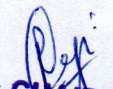
Semester –VI

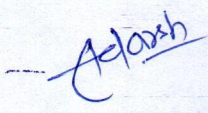
Text Book/References Books/ Websites:

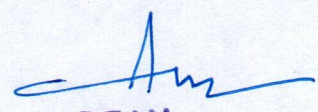
1. S. K Pillai; "A first course on Electrical Drives"; Second edition, Wiley Eastern.
2. G. K. Dubey; "Power Semiconductor Controlled Drives"; Prentice-Hall, Englewood Cliffs.
3. G. K Dubey; "Fundamentals of Electrical Drives"; Narosa Publishing House.
4. B. K Bose; "Power Electronics and AC Drives"; Prentice-Hall.
5. P.V. Rao; "Power semiconductor Drives"; BS Publications.

Suggested List of Laboratory Practical (Expandable):

1. Study the starting and running characteristics of converter fed DC traction motor.
2. To study the energy recovery systems and braking of a DC drive.
3. To study the braking Methods of a three-phase induction motor.
4. To study the performance of VSI fed three-phase induction motor using PWM technique.
5. To control the speed of a three phase slip ring Induction motor using rotor impedance control.
6. To study the performance of Vector Controlled three phase Induction motor drive.
7. To Study frequency Controlled Synchronous motor drive.
8. To study the control & performance Characteristics of switched Reluctance motor.
9. To study the performance & control of a Stepper motor.
10. To Study the Performance of a permanent magnet Brushless dc motor.


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Programme: Bachelor of Technology

Semester –VI

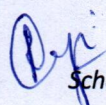
Subject Code	Subject Title	Credit			Theory			Practical		
CBEE-604	Protection of Power Systems	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (35)	Internal (15)	Total (50)
		3	1	1			Min: 40 (D Grade)			Min: 20 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: 15	Lab Performance/ Quiz/Attendance - Max. Marks: 15	

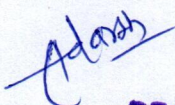
Pre-Requisite	Knowledge of the Electrical Power System operation and basic terminologies.
Course Objective	<ol style="list-style-type: none"> 1. To introduce all kinds of circuit breakers and relays for protection of Generators, Transformers and feeder bus bars from Over voltages and other hazards. 2. To describe neutral grounding for overall protection. 3. To understand the phenomenon of Over Voltages and it's classification.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Understanding various faults and their affects in the power system. 2. Apply technology to protect power system components. 3. Select relay settings of over current and distance relays. 4. To understand the over current protection 5. To understand the distance protection

Unit	Contents (Theory)	Marks Weightage
I	Generator protection: Differential protection of stator, inter turn fault protection, protection against unbalance loading, protection of rotor against ground fault, protection against field failure, protection against failure of prime mover, field suppression in alternators. Transformer protection: Difficulties in differential protection, mode of C.T. connection for differential protection of three phase transformer, protection against magnetizing inrush current, core balance earth leakage protection. Bus bar protection: Differential protection, frame leakage protection.	14
II	Surge Protection & Insulation Co-Ordination: Switching surges, Phenomena of Lightning, over voltage due to lightning, Protection against lightning, Lightning arrestors, selection of lightning arrestors, Surge absorbers and diverters, Rod gap, Horn gap expulsion type & valve type lightning arrestors, Solid resistance and reactance earthing, Arc suppression coil, earthing transformers, Earth wires, Earthing of appliances, insulation co-ordination, Definitions determination of line insulation, insulation level of substation equipment, coordination Amongst items of substation equipment	14
III	Feeder and Transmission line protection: Feeder protection- protection of ring main feeder, protection of parallel feeders. Transmission line protection-Over current protection of lines, Three step distance protection, effect of power swings on distance relay, Directional comparison carrier current protection, phase comparison carrier current protection, carrier aided distance protection.	14
IV	Over-Current Protection: Time-current characteristics, current setting, over current protective schemes, directional relay, protection of parallel feeders, protection of ring mains, Phase fault and earth fault protection, Combined earth fault and phase fault protective scheme, Directional earth fault relay.	14



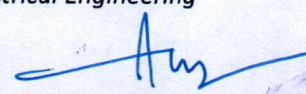
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Department: Electrical Engineering



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V	Distance Protection: Impedance relay, reactance relay, MHO relay, input quantities for various types of distance relays, Effect of arc resistance, Effect of power swings, effect of line length and source impedance on the performance of distance relays, selection of distance relays, MHO relay with blinders, Reduction of measuring units, switched distance schemes, auto re-closing.	14
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Text Book/References Books/ Websites:

1. B. Ravindran and M Chander; "Power System protection and Switchgear" New Age International.
2. Badirka; "Power System protection and switchgear"; TMH.
3. CL Wadhwa; "Electrical Power systems"; New age International.
4. Haddi Saade; "Power System Analysis"; TMH.
5. A.R. Bergen, Vijay Vittal; "Power System Analysis"; Pearson Education, Asia.
6. Sunil S. Rao; "Switchgear & protection"; Khanna Publication.

Suggested List of Laboratory Practical (Expandable):

1. To study the time-grading protection of feeder.
2. To study the current-grading protection of feeder.
3. To study the time-current grading protection of feeder.
4. To plot the characteristics of Directional Over Current relay.
5. To study different protection schemes for alternators.
6. Differential protection of 1- Φ transformer.
7. Finding the sequence impedances of 3- Φ Transformer.
8. To study the parallel feeders.
9. To study different types of earthing.
10. Measurement of earth resistance.


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Programme: Bachelor of Technology

Semester –VI

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (35)	Internal (15)	Total (50) Min: 20 (D Grade)
CBEE-605	Electronics Instrumentation and Measurement	2	-	1						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: 15	Lab Performance/ Quiz/Attendance - Max. Marks: 15	

Pre-Requisite	Nil
Course Objective	1. Explain basic concepts and definitions in measurement. 2. Describe the bridge configurations and their applications.
Course Outcomes	Student will be able to learn: 1. Knowledge of various Electronic devices and their applications. 2. Recognize the evolution and history of units and standards in Measurements. 3. Identify the various parameters that are measurable in electronic instrumentation. 4. Employ appropriate instruments to measure given sets of parameters. 5 Practice the construction of testing and measuring set up for electronic systems.

Unit	Contents (Theory)	Marks Weightage
I	Introduction to CRO: Different parts of CRO, Its Block diagram, Electrostatic focusing, Electrostatic deflection, post deflection acceleration, Screen for CRTs, Graticule, Vertical & Horizontal deflection system, Time base circuit, Oscilloscope probes and transducers, Attenuators, Application of CROs, Lissajous patterns, Special purpose CROs- Multi input, Dual trace, Dual beam, Sampling, Storage (Analog & Digital) Oscilloscopes.	14
II	A.C. Bridges: Measurement Sources and detectors, Use of Bridges for measurement of inductance, Capacitance & Q factor Maxwells bridge, Maxwells inductance capacitance bridge, Hays bridge, Andersons bridge, Owen's Bridge, De-sauty's Bridge, Schering Bridge, High Voltage Schering bridge Measurement of relative permittivity, Heaviside cambell's bridge, Weins bridge, Universal bridge, Sources of errors in Bridge circuit, Wagner's Earthing device, Q meter and its applications and measurement methods.	14
III	Transducers: Transducers definition and classification, mechanical devices as primary detectors, Characteristic & choice of Transducers, Resistive inductive and capacitive transducers, strain gauge and gauge factor, Thermistor, Thermo couples, LVDT, RVDT, Synchros, Piezo-Electric transducers, Magnet elastic and magnetostrictive Hall effect transducers, Opto-electronic transducers such as photo voltaic Photo conductive, photo diode and photo conductive cells, Photo transistors, Photo optic transducers. Introduction to analog & Digital data acquisition systems-Instrumentation systems used, Interfacing transducers to electronic control & measuring systems Multiplexing - D/A multiplexing A-D Multiplexing, Special encoders. Digital control description.	14
IV	Signal Generators: Fixed & variable frequency AF oscillators, Sine wave generators, Standard signal generator, AF Sine and Square wave generator Function generator, Square and pulse generator, Random noise generator, Sweep generator, TV Sweep generator, Marker generator, Sweep- Marker generator Wobblyscope, Video pattern generator Vectroscope, Beat frequency oscillator, Wave analyzer: Basic wave analyzer, Frequency selective wave analyzer, Heterodyne wave analyzer, Harmonic distortion, analyzer, spectrum analyzer digital Fourier analyzer.	14

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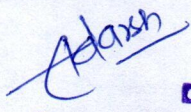
V	Digital Instruments: Advantages of Digital instruments over analog instruments, resolution and sensitivity of Digital meters., Digital Voltmeter - Ramp type, Dual slope integration type, Integrating type, Successive approximation type, Continuous balance DVM or Servo balancing potentiometer, comparison of Electronic & Digital Volt meter, Digital Multimeter, Digital frequency meter, Time period measurement High frequency measurement, Electronic counter, Digital tachometer, Digital PH meter, Digital phase meter, Digital capacitance meter. Digital display system and indicators like CRT, LED, LCD, Nixies, Electro luminescent, Incandescent, Electrophoretic image display, Liquid vapour display dot-matrix display, Analog recorders, X-Y recorders. Instruments used in computer-controlled instrumentation RS 232C and IEEE 488, GPIB electric interface.	14
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Text Book/References Books/ Websites:

1. Kalsi H.S., Electronic Instrumentation, TMH.
2. A.K. Sawhney, Electrical and Electronic measurements and Instrumentation, Dhanpat Rai and Co.
3. E.W. Golding, Electrical Measurement and Measuring Instruments Sir Isaac Pitman and Sons, Ltd. London 1940
4. C.S. Rangan, G.R. Sarma, V.S.V. Mani, Instrumentation Devices and Systems Tata McGraw-Hill Publishing Company Ltd.
5. B.C. Nakra, K.K. Choudhry, Instrumentation, Measurement and Analysis Tata McGraw-Hill Publishing Company Ltd.
6. Morris A.S., Principles of Measurement & Instrumentation, PHI
7. Albert. D. Helfrick, W.D. Cooper, Modern Electronic Instrumentation and measurement techniques, PHI.

Suggested List of Laboratory Practical (Expandable):

1. Measurement of inductance of a coil using Anderson Bridge.
2. Measurement of capacitance of a capacitor using Schering Bridge.
3. LVDT and capacitance transducers characteristics and calibration.
4. Resistance strain gauge- Strain Measurement and calibration.
5. Measurement of R, L, C & Q using LCR-Q meter.
6. Study & measurement of frequency using Lissajous patterns.
7. Measurement of pressure using pressure sensor.
8. Study of Piezo-electric Transducer and Measurement of impact using Piezo-electric Transducer
9. Measurement of Displacement using LVDT.
10. Measurement of speed of a Motor using photoelectric transducer.
11. Study & Measurement using pH meter.
12. Temperature measurement & Control using thermo couple & using thermistor


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PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)***Programme: **Bachelor of Technology**

Semester –VI

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-606	Human Resource Management	L	T	P	End Sem (35)	Internal (15)	Total (50)	End Sem (Nil)	Internal (Nil)	Total
		2	-	-			Min: 20 (D Grade)			(Nil)

Duration of Theory (Externals): 2 Hours

Theory Internal- Max Marks: 15	Best of Two Mid Semester Test – Max Marks: 10	Assignment/Quiz/Attendance - Max. Marks: 05
Practical Internal Max Marks: Nil	Lab Performance/Attendance / Quiz - Max. Marks: Nil	

Pre-Requisite	Nil
Course Objective	The objective of the course is to acquaint students with the techniques and principles to manage human resource of an organization.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. To understand the basis concept of HRM. 2. To learn the techniques for the acquisition of Human Resource. 3. To understand the concept of training and development. 4. To understand the factors responsible for performance appraisal. 5. Human Resource Maintenance.

Unit	Contents (Theory)	Marks Weightage
I	Introduction: Human Resource Management: Definition, Nature and Scope of Human Resources Management, Functions Role Competencies of HR Manager, HR Policies, HRM vs HRD. Emerging Challenges of Human Resource Management.	07
II	Acquisition of Human Resource: Human Resource Planning-Definition, Objective, Significance, Process of Human Resources Planning, Factor influencing HRP job analysis-job description and job specialization; Recruitment-process, Methods, Sources, Selection-Concept and process; Test and interview; placement and induction & Orientation.	07
III	Training and Development: Concept and Importance; Identifying Training and Development Needs; Training Programmes, Types of Training , Evaluating Training Effectiveness; Training Process Outsourcing; Management Development; Career Development, Managing employee well being and concept of work life balance and quality of work life.	07
IV	Performance Appraisal: Nature, objectives and importance; Techniques and systems of performance appraisal; performance appraisal forms potential appraisal and employee counseling; well being and concept of work life balance and quality of work life.	07
V	Maintenance: Employee health and safety; employee welfare; social security; Employer-Employee relations-an over view; concept of redeployment, redundancy, attrition, VRS, downsizing, layoffs and retrenchment, ethics and HRM.	07

Text Book/References Books/ Websites:

1. Bohlendar and Snell; Principal of Human Resource Management; Cengage Learning.
2. Neeru Kapoor; Human Resource Management, Dhanpat Rai & Co.; Delhi.
3. Robert L. Mathis and John H. Jackson; Human Resource Management; PHI Learning.

Suggested List of Laboratory Practical (Expandable): Nil

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PEOPLE'S UNIVERSITY, BHOPAL*(Applicable for Admitted from Academic Session 2021-22 onwards)*

Programme: Bachelor of Technology

Semester –VI

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-607	NCC-VI	L	T	P	End Sem (35)	Internal (15)	Total (50)	End Sem (35)	Internal (15)	Total (50)
		2	-	1			Min: 20 (D Grade)			Min: 20 (D Grade)

Duration of Theory (Externals): 2 Hours

Theory Internal- Max Marks:15	Best of Two Mid Semester Test – Max Marks: 10	Assignment/Quiz/Attendance - Max. Marks: 05
Practical Internal Max Marks: 15	Lab Performance/ Quiz/Attendance - Max. Marks: 15	

Pre-Requisite	Nil
Course Objective	<ol style="list-style-type: none"> 1. Get acquainted about counselling process its need and importance. 2. Know about SSB procedure and different tasks and tests. 3. Know about the conduction during the interview. 4. Understand the security challenges & role of cadets in Border Areas. 5. Know about the modes of entry in Armed forces, CAPF & police. 6. Understand the life history & leadership qualities of great generals. 7. Learn about 1999 Kargil war. 8. Acquire the knowledge about various wars and their heroes. 9. Know about various components of communication process.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Get motivated to join Armed forces, police & CAPF. 2. Write their CV effective and appealing. 3. Face SSB interview effectively in their future. 4. Understand individual responsibilities & role in meetings the security challenges on Border/Coastal areas. 5. Imbibe the feeling of patriotism. 6. Communicate more effectively.

Unit	Contents (Theory)	Marks Weightage
I	Personality Development: <ol style="list-style-type: none"> (i) Career Counselling. (ii) SSB Procedure. (iii) Interview Skills 	07
II	Border & Coastal Areas: Security Challenges & Role of cadets in Border management.	07
III	Armed Forces : Modes of Entry into Army, Police and CAPF.	07
IV	Military History : <ol style="list-style-type: none"> (i) Biographies of Renowned Generals. (ii) War Heroes : Param Veer Chakra Awardees. (iii) Study of Battles of Kargil. (iv) War Movies. 	07
V	Communication: Introduction to Communication & Latest Trends.	07

Text Book/References Books/ Websites:

1. Cadet's handbook, NCC Directorate, MP, CG.
2. Supplementary cadet's handbook, NCC Directorate, MP, CG.

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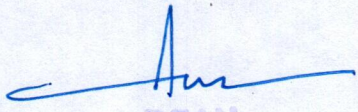
PEOPLE'S UNIVERSITY, BHOPAL**(Applicable for Admitted from Academic Session 2021-22 onwards)****Programme: Bachelor of Technology****Semester –VI****Suggested List of Laboratory Practical (Expandable):****1 .Drill**

- Ceremonial Drill.
- Guard of Honour.

2. Weapon Training (WT): Short Range firing.**3. Map Reading (MR): Google maps and Applications.****4. Field Craft & Battle Craft (FCBC): Knots, Lashing and Stretchers.****5. Social Service and Community Development (SSCD) :** Cadets will participate in various activities throughout the semester e.g., Blood donation Camp, Swachhata Abhiyan, Constitution Day, Jan Jeevan Hariyali Abhiyan, Beti Bachao Beti Padhao etc as per the requirement and similar announced days-National and State level.**6. Introduction of Infantry Weapons & Equipment (INF):** Characteristics of 5.56MM INSAS Rifle, Ammunition, Fire Power, Stripping, Assembling & Cleaning Practice.**7. Communication (COM)**

- Basic Radio Telephony (RT) Procedure.
- Introduction, Advantages, Disadvantages, Need for standard procedures.

Note: Examination of this NCC course will be conduct as per NCC head quarter norms in consultation with office of COE, PU.


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Programme: Bachelor of Technology

Semester –VI

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-608	Company and Compensation Law	L	T	P	End Sem (35)	Internal (15)	Total (50)	End Sem (Nil)	Internal (Nil)	Total (Nil)
		2	-	-			Min: 20 (D Grade)			

Duration of Theory (Externals): 2 Hours

Theory Internal- Max Marks: 15	Best of Two Mid Semester Test – Max Marks: 10	Assignment/Quiz/Attendance - Max. Marks: 05
Practical Internal Max Marks: Nil	Lab Performance/Attendance / Quiz - Max. Marks: Nil	

Pre-Requisite	Fluency in English.
Course Objective	The objective of this course is to teach students about the origin, management and winding up of companies. Students will also learn about social security legislations.
Course Outcomes	Student will able to learn: <ol style="list-style-type: none"> 1. Basic concepts of company law. 2. Memorandum of Association and Articles of Association. 3. Conduct meeting and its documentations. 4. Basic concepts of compensation law. 5. Social Welfare Legislations.

Unit	Contents (Theory)	Marks Weightage
I	Introduction: Characteristics of a company; lifting of corporate veil; types of companies including one person company, small company; formation of company –promoters, their legal position, pre-incorporation contract and provisional contracts; online registration of a company.	07
II	Documents and Shares: Memorandum of association, articles of association, prospectus, shelf and red herring prospectus, misstatement in prospectus; issue, allotment and forfeiture of share, Debentures, transmission of shares, buyback; issue of bonus shares.	07
III	Management and Meetings: Classification of directors, women directors, independent director, small shareholder's director; disqualifications, director identity number (DIN); appointment; legal positions, powers and duties; removal of directors; key managerial personnel, meetings of shareholders and board; types of meeting, convening and conduct of meetings, postal ballot, meeting through video conferencing, e-voting.	07
IV	Compensation Law: Employees State Insurance Act, 1948; Minimum Wages Act, 1948; Employees' Compensation Act, 1923.	07
V	New Developments in Compensation Law: Code on Social Security 2020: History, Significance and Important Provisions.	07

Text Book/References Books/ Websites:

1. K.L Malik ; Industrial Laws and Labour Laws; Eastern Book Company; Lucknow.
2. J.P. Sharma, J.P.; An Easy Approach to Company and Compensation Laws; Ane Books Pvt Ltd; New Delhi.
3. S.C. Srivastava ; Industrial Relations & Labour Laws; Vikas Publishing House (P) Ltd.
4. Companies Act and Corporate Laws, Bharat Law House Pvt Ltd, New Delhi.
5. Company Law Digest, Bharat Law House Pvt Ltd, New Delhi.

Suggested List of Laboratory Practical (Expandable): Nil

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Programme: Bachelor of Technology

Semester –VI

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem	Internal	Total	End Sem	Internal	Total
CBEE-609	Electrical Engineering Software Lab-II	-	-	1	(Nil)	(Nil)	(Nil)	(Nil)	(50)	Min: 20 (D Grade)

Duration of Theory (Externals): Nil

Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: Nil
Practical Internal Max Marks: 50	Lab Performance/ Quiz/Attendance - Max. Marks: 50	

Pre-Requisite	Nil
Course Objective	Impart a basic knowledge of electrical quantities such as current, voltage, power, energy frequency to understand the impact of technology.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Basic concepts of Electrical wiring 2. Enhance basics of AC circuits. 3. Principle of transformer with background of magnetic circuits. 4. Understand basic concept of Electrical machines. 5. Understand the characteristics of diodes, transistors and digital electronic components.

Unit	Contents (Theory)	Marks Weightage
I	<ol style="list-style-type: none"> 1. Formation of Y-BUS for the given system using MATLAB code 2. To simulate a TCR circuit using PSCAD. 3. Power Quality calculation using PSCAD 4. To carry out Newton Raphson method of load flow using MATLAB and PST package. 5. Contingency analysis and computation of sensitivity factor using power world simulator. 	50

Text Book/References Books/ Websites: Nil

Suggested List of Laboratory Practical (Expandable):

1. Distribution load flow for radial distribution systems and its analysis
2. To analyse transient stability of the system using MATLAB and PST package.
3. To analyse small signal stability of the system using PST toolbox and MATLAB.
4. State estimation and its analysis using MATLAB.

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Programme: Bachelor of Technology

Semester –VI

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-610	Universal Human Ethics	L	T	P	End Sem (Nil)	Internal (100)	Total (100)	End Sem (Nil)	Internal (Nil)	Total (Nil)
		2	1	-			Min: 40 (D Grade)			

Duration of Theory (Internal): Nil

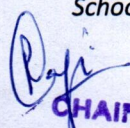

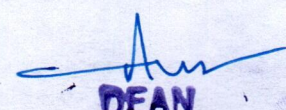
Theory Internal- Max Marks: 100	Best of Two Mid Semester Test – Max Marks: -50	Assignment/Quiz/Attendance - Max. Marks: 50
Practical Internal Max Marks: Nil	Lab Performance / Attendance / Quiz - Max. Marks: Nil	

Pre-Requisite	Nil
Course Objective	<ol style="list-style-type: none"> 1. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings. 2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way. 3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.
Course Outcomes	<p>Student will be able to learn:</p> <ol style="list-style-type: none"> 1. To start exploring themselves: get comfortable with each other and with the teacher; they start appreciating the need and relevance for the course. 2. Their desires and are able to see that all physical facility they are required for a limited time in a limited quantity. 3. The natural acceptance and see that respect is right evaluation, and only right evaluation leads to fulfillment in relationship. 4. Differentiate between the characteristics and activities of different orders and study the mutual fulfillment among them, feel confident that they can understand the whole existence; nothing is a mystery in this existence. 5. Grasp the right utilization of their knowledge in their streams of Technology/Engineering to ensure mutual fulfillment.

Unit	Contents (Theory)	Marks Weightage
I	Introduction to Value Education: Understanding Value Education, Self-exploration as the Process for Value Education ,Sharing about Oneself ,Continuous Happiness and Prosperity – the Basic Human Aspirations, Right Understanding, Relationship and Physical Facility ; Exploring Human Consciousness , Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations ,Exploring Natural Acceptance.	20
II	Harmony in the Human Being : Understanding Human being as the Co-existence of the Self and the Body ,Distinguishing between the Needs of the Self and the Body ,Exploring the difference of Needs of Self and Body ,The Body as an Instrument of the Self, Understanding Harmony in the Self , Exploring Sources of Imagination in the , Harmony of the Self with the Body , Programme to ensure self-regulation and Health.	20
III	Harmony in the Family and Society : Harmony in the Family – the Basic Unit of Human Interaction, Values in Human-to-Human Relationship, 'Trust' – the Foundational Value in Relationship, Exploring the Feeling of Trust, 'Respect' – as the Right Evaluation , Exploring the Feeling of Respect , Understanding Harmony in the Society, Vision for the Universal Human Order , Exploring Systems to fulfill Human Goal.	20

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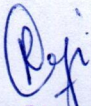
PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)*****Programme: Bachelor of Technology****Semester –VI**

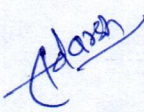
IV	Harmony in the Nature/Existence: Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature, Exploring the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence, Exploring Co-existence in Existence.	20
V	Implications of the Holistic Understanding – a Look at Professional Ethics: Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct , Exploring Ethical Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Exploring Humanistic Models in Education, Holistic Technologies, Production Systems and Management Models Typical Case Studies, Strategies for Transition towards Value-based Life and Profession, Exploring Steps of Transition towards Universal Human Order.	20

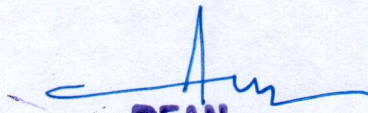
Text Book/References Books/ Websites:

- 1.R.R Gaur; R Sangal; G P Bagaria; A foundation course in Human Values and professional Ethics; Excel books; New Delhi.
- 2.B L Bajpai; Indian Ethos and Modern Management; New Royal Book Co.
- 3.A.N. Tripathy; Human Values; New Age International Publishers.
- 4.Value Education websites, <http://uhv.ac.in>.

Suggested List of Laboratory Practical (Expandable): Nil


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PEOPLE'S UNIVERSITY, BHOPAL**(Applicable for Admitted from Academic Session 2021-22 onwards)**Programme: **Bachelor of Technology**

Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBEE-7101	Power Quality	3	-	-						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: -Nil	Lab Performance/ Quiz/Attendance - Max. Marks: -Nil	

Pre-Requisite	Knowledge of Physics and Mathematics.
Course Objective	Impart a basic knowledge of electrical quantities such as current, voltage, power, energy frequency to understand the impact of technology.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Basic concepts of energy band diagram.. 2. Enhance basics of material. 3. Principle of magnetic circuits. 4. Understand basic concept of Atomic Model. 5. Understand the characteristics of conducting material.

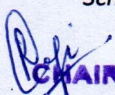
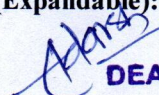
Unit	Contents (Theory)	Marks Weightage
I	Introduction to Power Quality: Terms and definitions of transients, Long Duration Voltage Variations: under Voltage, Under Voltage and Sustained Interruptions; Short Duration Voltage Variations: interruption, Sag, Swell; Voltage Imbalance; Notching D C offset, waveform distortion; voltage fluctuation; power frequency variations	14
II	Voltage Sag: Sources Of Voltage Sag, motor starting, arc furnace, fault clearing etc; estimating voltage sag performance and principle of its protection; solutions at end user level- Isolation Transformer, Voltage Regulator, Static UPS, Rotary UPS, Active Series Compensator	14
III	Electrical Transients: Sources of Transient Over voltages- Atmospheric and switching transients- motor starting transients, pf correction capacitor switching transients, ups switching transients, neutral voltage swing etc; devices for over voltage protection.	14
IV	Harmonics: Causes of harmonics; current and voltage harmonics, measurement of harmonics; effects of harmonics on – Transformers, AC Motors, Capacitor Banks, Cables, and Protection Devices, Energy Metering, Communication Lines etc. harmonic mitigation techniques.	14
V	Measurement and Solving of Power Quality Problems: Power quality measurement devices Harmonic Analyzer , Transient Disturbance Analyzer, wiring and grounding tester, Flicker Meter, Oscilloscope, multimeter etc. Introduction to Custom Power Devices-Network Reconfiguration devices; Load compensation and voltage regulation using DSTATCOM; protecting sensitive loads using DVR; Unified power Quality Conditioner. (UPQC)	14

Text Book/References Books/ Websites:

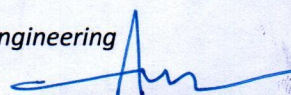
1. Roger C Dugan, McGrahan, Santoso & Beaty; "Electrical Power System Quality"; McGraw Hill
2. Arinthom Ghosh & Gerard Ledwich; "Power Quality Enhancement Using Custom Power Devices"; Kluwer Academic Publishers
3. C. Sankaran; "Power Quality"; CRC Press

Suggested List of Laboratory Practical (Expandable): Nil

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Programme: Bachelor of Technology

Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
CBEE-7102	Power Systems Deregulation	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (Nil)	Internal (Nil)	Total (Nil)
		3	-	-			Min: 40 (D Grade)			

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: -Nil	Lab Performance/ Quiz/Attendance - Max. Marks: -Nil	

Pre-Requisite	Knowledge of Physics and Mathematics.
Course Objective	Impart a basic knowledge of electrical quantities such as current, voltage, power, energy frequency to understand the impact of technology.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Describe Power System deregulation, its need and different entities in the deregulated environment and market models. 2. Explain the role of Independent System Operator in different market environments. 3. Summarize the importance of Short-term Load Forecasting and Energy Price Forecasting. 4. Explain Transmission Open Access and illustrate various pricing methods. 5. Define Ancillary Service Management and explain different ancillary services in various countries.

Unit	Contents (Theory)	Marks Weightage
I	Deregulation of the Electric Supply Industry: Introduction, what is Deregulation? Different entities in deregulated electricity markets – GENCO's, Transco's, Discom's, Independent System Operator (ISO), Market Operator; Background to Deregulation – Industrialized Market Structure and Operation – Objectives of Market operations; Electricity Market Models	14
II	Power System Operation In Competitive Environment: Introduction, Role of the Independent System Operator; Operational planning activities of ISO Bilateral Markets; Market participation issues.	14
III	Short-Term Load Forecasting And Energy Price Forecasting: Short-term Load Forecasting Introduction, application of load forecasting, factors affecting load patterns, load forecasting categories.	14
IV	Transmission Open Access And Pricing Issues: Introduction, Power Wheeling, Transmission Open Access, Cost components in transmission, Pricing of Power Transactions – Embedded Cost Based and Incremental Cost Based Transmission Pricing.	14
V	Ancillary Service Management: General description of some ancillary services; Ancillary Service Management in various countries – US, UK and Australia; Reactive Power as an Ancillary service.	14

Text Book/References Books/ Websites:

1. Roger C Dugan, McGrahan, Santoso & Beaty; "Electrical Power System Quality"; McGraw Hill
Suggested List of Laboratory Practical (Expandable): Nil

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Programme: Bachelor of Technology

Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
CBEE-7103	HVDC & FACTS	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (Nil)	Internal (Nil)	Total
		3	-	-			Min: 40 (D Grade)			(Nil)

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: -Nil	Lab Performance/ Quiz/Attendance - Max. Marks: -Nil	

Pre-Requisite	Knowledge of Physics and Mathematics.
Course Objective	Impart a basic knowledge of electrical quantities such as current, voltage, power, energy frequency to understand the impact of technology.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Basic concepts of energy band diagram.. 2. Enhance basics of material. 3. Principle of magnetic circuits. 4. Understand basic concept of Atomic Model. 5. Understand the characteristics of conducting material.

Unit	Contents (Theory)	Marks Weightage
I	Introduction to HVDC: historical development, equipment required for HVDC system, standard rated voltages of HVDC and EHVAC system, choice of EHVAC and UHVAC lines and substation, comparison of HVDC LINK with EHVAC link, HVCD-VSC transmission system.	14
II	HVDC Converter Thyristors And Characteristics: silicon controlled rectifier (SCR), insulated gate bipolar transistors (IGBT), HVDC converter valves and valve assembly, HVDC – voltage source converter: principle & operation, 3-phase 6-pulse converters using SCR or thyristors, 12-pulse bridge converters.	14
III	Harmonics In HVDC System: importance of harmonic study, generation of harmonics by converters, characteristics harmonics on DC side ,characteristics current harmonics, characteristics variation of harmonic current with variation of α and μ , effect of control modes on harmonics ,no characteristic harmonics, harmonics in VCS converter.	14
IV	Description and Definition of Introduction to FACTS: Basic types of controller-benefits from FACTS technology-static VAR compensator (SVC): Principle of operation, configuration and control. Thyristor controlled series compensator (TCSC): Principle of operation, Configuration and control, Application for damping electrochemical oscillations, Application for mitigation of SSR. Static compensator	14
V	STATCOM: Principle of operation, configuration and control. Static synchronous series compensator (SSSC), Principle of operation, configuration and control. Thyristor controlled phase angle regulator (TCPAR): Principle of operation, Configuration and control, unified power flow controller (UPFC), Principle of operation, Configuration and control, simulation of UPFC, Steady state model of UPFC. Interline power flow controller, Principle of operation, Configuration and control	14

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(Applicable for Admitted from Academic Session 2021-22 onwards)

Programme: Bachelor of Technology

Semester –VII

Text Book/References Books/ Websites:

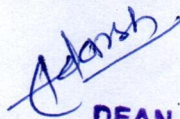
1. Reactive Power Control in Power Systems, T J E Miller John Wiley.
2. Computer modeling of Electrical Power Systems, J Arriliga, N R Watson, Wiley
3. Understanding FACTS' N G Hingorani and L Gyugyi, IEEE Press.
4. Flexible ac Transmission Systems (FACTS), Y.H. Song, A.T.Johns,IEEE P.

Suggested List of Laboratory Practical (Expandable):Nil



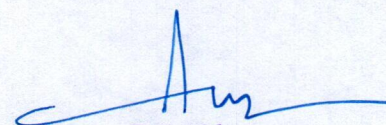
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Programme: Bachelor of Technology

Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBEE-7104	Power System Economics	3	-	-						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: -Nil	Lab Performance/ Quiz/Attendance - Max. Marks: -Nil	

Pre-Requisite	Knowledge of Physics and Mathematics.
Course Objective	Impart a basic knowledge of electrical quantities such as current, voltage, power, energy frequency to understand the impact of technology.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Basic concepts of energy band diagram.. 2. Enhance basics of material. 3. Principle of magnetic circuits. 4. Understand basic concept of Atomic Model. 5. Understand the characteristics of conducting material.

Unit	Contents (Theory)	Marks Weightage
I	Power System Fundamentals: Regulation and deregulation, condition for deregulation, problems with regulation, problem with deregulating electricity, risk management and forward markets, congestion management, ATC.	14
II	Pricing Power, Energy And Capacity: Measuring power and energy, measuring generation capacity, pricing generation capacity. Power Supply & Demand: Describing the demand for power, screening curve, use of screening curve to select a generator, identifying fixed costs on screening curve, capacity cost based and energy cost based screening curves, using screening curves to find the optimal mix of technologies.	14
III	Competitions In Power Market: What is competition, efficiency of perfect competition, marginal cost in power market, role of marginal cost, working with marginal cost, results of marginal cost.	14
IV	Market Structure & Architecture: Reliability requirement, effective demand elasticity, supply concentration, market types. MARKET POWER: Defining market power, defining price quality outcomes, three stages of market power, using price quality outcomes to show power, monopoly power in a power auction, market power on demand side.	14
V	Designing & Testing Market Rules: Design for competitive prices, testing a market design, designing to reduces market power. RESTRUCTURE: Fundamental restructure system, transmission sizing and tracking of power, load elastic.	14

Text Book/References Books/ Websites:

1. Power system economics-designing for electricity-steven stoft. (IEEE press & WILEY-INTERSCIENCE).

Suggested List of Laboratory Practical (Expandable): Nil

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Programme: Bachelor of Technology

Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
CBEE-7201	Energy Audit & Management	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (Nil)	Internal (Nil)	Total
		3	-	-			Min: 40 (D Grade)			(Nil)

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: -Nil	Lab Performance/ Quiz/Attendance - Max. Marks: -Nil	

Pre-Requisite	Knowledge of Physics and Mathematics.
Course Objective	Impart a basic knowledge of electrical quantities such as current, voltage, power, energy frequency to understand the impact of technology.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Basic concepts of Electrical Engineering. 2. Enhance basics of AC circuits. 3. Principle of transformer with background of magnetic circuits. 4. Understand basic concept of Electrical machines. 5. Understand the characteristics of diodes, transistors and digital electronic components.

Unit	Contents (Theory)	Marks Weightage
I	Introduction to energy & power scenario of world: National Energy consumption data, environmental aspects associated with energy utilization; Energy Auditing- need, types, methodology and barriers, role of energy managers, instruments of energy auditing.	14
II	Components of EB billing: HT and LT supply, transformers, cable sizing; Concept of capacitors, power factor improvement, harmonics; Electric motors- motor efficiency computation, energy efficient motors; Illumination Lux, Lumens, types of lighting, efficacy, LED lighting and scope of energy conservation in lighting.	14
III	Thermal systems: Boilers, Furnaces and Thermic Fluid heaters- efficiency computation and energy conservation measures; Steam distribution and usage, steam traps, condensate recovery, flash steam utilization; Insulation & Refractories.	14
IV	Energy conservation in major utilities: pumps, fans, blowers, compressed air systems, Refrigeration & Air Conditioning systems, Cooling Towers, DG sets.	14
V	Energy Economics: discount period, payback period, internal rate of return, net present value; Life Cycle costing ESCO concept.	14

Text Book/References Books/ Websites:

1. Witte L.C., Schmidt P.S. and Brown D.R., Industrial Energy Management and Utilization, Hemisphere Publ., Washington, 1988.
2. Callaghan P.W., Design and Management for Energy Conservation, Pergamon Press, Oxford, 1981.
3. Murphy W.R. and McKay G., Energy Management, Butterworths, London, 1987.
4. Energy Manager Training Manual, Bureau of Energy Efficiency (BEE) under Ministry of Power, GOI, 2004 (available at www.energymanagertraining.com).

Suggested List of Laboratory Practical (Expandable): Nil

School of Research and Technology

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Programme: Bachelor of Technology

Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBEE-7202	Special Machine	3	-	-						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: -Nil	Lab Performance/ Quiz/Attendance - Max. Marks: -Nil	

Pre-Requisite	Knowledge of Physics and Mathematics.
Course Objective	The basic objective of this course is to introduce the theory, construction, design, control electronics, and in-depth analysis of several non-traditional machines such as stepper motors, switched reluctance motors.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Ability to analyze and design controllers for special Electrical Machines. 2. Ability to acquire the knowledge on construction and operation of stepper motor. 3. Ability to acquire the knowledge on construction and operation of stepper switched reluctance motors. 4. Ability to construction, principle of operation, switched reluctance motors. 5. Ability to acquire the knowledge on construction and operation of permanent magnet brushless D.C. motors.

Unit	Contents (Theory)	Marks Weightage
I	Stepper Motors: Constructional features –Principle of operation –Types – Torque predictions – Linear Analysis – Characteristics – Drive circuits – Closed loop control – Concept of lead angle - Applications.	14
II	Switched Reluctance Motors (SRM): Constructional features –Principle of operation- Torque prediction–Characteristics Steady state performance prediction – Analytical Method – Power controllers – Control of SRM drive- Sensor less operation of SRM – Applications.	14
III	Permanent Magnet Brushless D.C. Motors: Fundamentals of Permanent Magnets- Types- Principle of operation- Magnetic circuit analysis- EMF and Torque equations- Power converter Circuits and their controllers - Characteristics and control- Applications.	14
IV	Permanent Magnet Synchronous Motors (PMSM): Constructional features -Principle of operation – EMF and Torque equations - Sine wave motor with practical windings – Phasor diagram - Power controllers – performance characteristics -Digital controllers – Applications.	14
V	Other Special Machines: Constructional features – Principle of operation and Characteristics of Hysteresis motor- Synchronous Reluctance Motor–Linear Induction motor-Repulsion motor- Applications.	14

Text Book/References Books/ Websites:

1. R.Krishnan, 'Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design and Application', CRC Press, New York, 2001.
2. T. Kenjo and S. Nagamori, 'Permanent Magnet and Brushless DC Motors', Clarendon Press, London, 1988.
3. T.J.E.Miller, 'Brushless Permanent-Magnet and Reluctance Motor Drives', Oxford University Press, 1989.
4. R.Srinivasan, 'Special Electrical Machines', Lakshmi Publications, 2013.

Suggested List of Laboratory Practical (Expandable):Nil

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Programme: Bachelor of Technology

Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
CBEE-7203	SCADA Systems and Applications	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (Nil)	Internal (Nil)	Total (Nil)
		3	-	-			Min: 40 (D Grade)			

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: -Nil	Lab Performance/ Quiz/Attendance - Max. Marks: -Nil	

Pre-Requisite	Knowledge of Physics and Mathematics.
Course Objective	To understand about the SCADA system components and SCADA communication protocols To provide knowledge about SCADA applications in power system.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Describe the basic tasks of Supervisory Control Systems (SCADA) as well as their typical applications. 2. Acquire knowledge about SCADA architecture, various advantages and disadvantages of each system. 3. Knowledge about single unified standard architecture IEC 61850. 4. To learn about SCADA system components: remote terminal units, PLCs, intelligent electronic devices, HMI systems, SCADA server. 5. Learn and understand about SCADA applications in transmission and distribution sector, industries etc.

Unit	Contents (Theory)	Marks Weightage
I	Introduction to SCADA and PLC: Data acquisition system, evaluation of SCADA, communication technologies, monitoring and supervisory functions. PLC: Block diagram, programming languages, Ladder diagram, Functional Block diagram, Applications, Interfacing of PLC with SCADA.	14
II	SCADA System Components: Schemes, Remote Terminal Unit, Intelligent Electronic Devices, Communication Network, SCADA server.	14
III	SCADA Architecture: Various SCADA Architectures, advantages and disadvantages of each system, single unified standard architecture IEC 61850 SCADA / HMI Systems.	14
IV	SCADA Communication: Various industrial communication technologies- wired and wireless methods and fiber optics, open standard communication protocols.	14
V	Operation and Control of Interconnected Power System: Automatic substation control, SCADA configuration, Energy management system, system operating states, system security, state estimation, SCADA applications Utility applications, transmission and distribution sector operation, monitoring analysis and improvement. Industries oil gas and water. Case studies, implementation, simulation exercises.	14

Text Book/References Books/ Websites:

1. Stuart A Boyer: SCADA supervisory control and data acquisition.
2. Gordan Clark, Deem Reynders, Practical Modem SCADA Protocols.
3. Sunil S. Rao, Switchgear and Protections, Khanna Publication.

Suggested List of Laboratory Practical (Expandable): Nil

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Programme: Bachelor of Technology

Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
CBEE-7204	Artificial Neural Network & Fuzzy Logic	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (Nil)	Internal (Nil)	Total (Nil)
		3	-	-			Min: 40 (D Grade)			

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: -Nil	Lab Performance/ Quiz/Attendance - Max. Marks: -Nil	

Pre-Requisite	Nil
Course Objective	<ol style="list-style-type: none"> To introduce the concepts and understanding of artificial neural networks To provide adequate knowledge about supervised and unsupervised neural networks To introduce neural network design concepts To expose neural networks based methods to solve real world complex problems
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> Comprehend the concepts of biological neurons and artificial neurons. Analyze the feed-forward and feedback neural networks and their learning algorithms. Calculate Comprehend the neural network training and design concepts. Analyze the application of neural networks to non linear real world problem. Comprehend the concept of fuzziness involved in various systems.

Unit	Contents (Theory)	Marks Weightage
I	Fuzzy System Introduction: Fuzzy relation, Membership function, Fuzzy matrices and entropy, Fuzzy operation and composition.	14
II	Fuzzy Variables: Linguistic variables, measures of fuzziness, concepts of defuzzification, Fuzzy control applications.	14
III	Fundamentals of Artificial Neural Networks: Biological prototype – Artificial neuron, Activation functions, Single layer and multiplayer networks. Training Artificial neural networks, Preceptrons, Linear separability, Storage efficiency, Preceptron learning, perceptron training algorithms. Back propagation, Training algorithm, network configurations, Network paralysis, Local minima, temporal instability.	14
IV	Counter Propagation Networks: Kohonen layer, Training the kohonen layer, Pre processing the inputted vectors, Initialising the wright vectors, Statistical properties, Training the grosberg layer. Full counter propagation networks, Applications. Statistical methods, Boltzman training, Cauchy training, Artificial specific heat methods, Applications to general non-linear optimization problems. Back propagation and cauchy training.	14
V	Recurrent Networks : Hopfield nets, , Stability, Associative memory, Thermodynamic systems, Statistical Hopfield networks, Applications. Bi-directional associative memories, Retrieving on stored association, Encoding the associations.	14

Text Book/References Books/ Websites:

- Laurence Fausett, "Fundamentals of Neural Networks", Prentice Hall.
- Zimmermann H.J., "Fuzzy Set Theory and its Applications", Allied Publishers Ltd.
- Klir G.J., and Folger T., "Fuzzy Sets, Uncertainty and Information", Prentice Hall.
- Limin Fu., "Neural Networks in Computer Intelligence", McGraw Hill.

Suggested List of Laboratory Practical (Expandable): Nil

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Programme: Bachelor of Technology

Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBEE-703	EHV AC/DC Transmission Systems	3	-	-						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: Nil	Lab Performance/ Quiz/Attendance - Max. Marks: Nil	

Pre-Requisite	Knowledge of Physics and Mathematics.
Course Objective	Impart a basic knowledge of electrical quantities such as current, voltage, power, energy frequency to understand the impact of technology.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Basic concepts of Electrical Engineering. 2. Enhance basics of AC circuits. 3. Principle of transformer with background of magnetic circuits. 4. Understand basic concept of Electrical machines. 5. Understand the characteristics of diodes, transistors and digital electronic components.

Unit	Contents (Theory)	Marks Weightage
I	Constitution of EHV A.C. And D.C. Links: Kind of d.c. links, Limitations and Advantages of a.c. and d.c. transmission, Principal application of a.c. and d.c. transmission, Trends in EHV a.c. and d.c. transmission, Power handling capacity. Converter analysis garetz circuit, Firing angle control, Overlapping.	14
II	FACTS Devices: basic types of controller, series controller, static synchronous series compensator(SSSC), thyristor-controlled series capacitor(TCSC), thyristor controlled series reactor(TCSR), shunt controller (STATCOM), static VAR compensator(SVC), series-seriescontroller, combined series-shunt controller, unified power flow controller(UPFC), thyristor controlled phase shifting transformer(TCPST)	14
III	Components of EHV D.C. System: converter circuits, rectifier and inverter valves, Reactive power requirements, harmonics generation, Adverse effects, Classification, Remedial measures to suppress, filters, Ground return. Converter faults & protection harmonics misoperation, Commutation failure, Multiterminal D.C. lines.	14
IV	Control of EHV D.C. System: desired features of control, control characteristics, Constant current control, Constant extinction angle control. Ignition Angle control. Parallel operation of HVAC & DC system. Problems & advantages.	14
V	Travelling Waves on Transmission Systems: Their shape, Attenuation and distortion, effect of junction and termination on propagation of traveling waves. Over voltages in transmission system. Lightning, switching and temporary over voltages: Control of lighting and switching over voltages.	14

Text Book/References Books/ Websites:

1. S. Rao, - "EHV AC & DC Transmission" Khanna pub.
2. Kimbark, - "HVDC Transmission" jodhnwilly & sonspub.
3. Arrillaga, - "HVDC Transmission" 2ⁿ Edition, IEE londonpub.
4. Padiyar, - "HVDC Transmission" 1st Edition, New age international pub.

Suggested List of Laboratory Practical (Expandable): Nil

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Programme: Bachelor of Technology

Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
CBEE-704	Computer Aided Design of Electrical Machine	L	T	P	End Sem (70)	Internal (30)	Total (100)	External (35)	Internal (15)	Total (50)
		3	-	1			Min: 40 (D Grade)			Min: 20 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance – Max. Marks: 10
Practical Internal Max Marks: 15	Lab Performance/ Quiz/Attendance - Max. Marks: 15	

Pre-Requisite	Knowledge of Physics and Mathematics.
Course Objective	Impart a basic knowledge of electrical quantities such as current, voltage, power, energy frequency to understand the impact of technology.
Course Outcomes	Student will able to learn: <ol style="list-style-type: none"> 1. Basic concepts of Electrical Engineering. 2. Enhance basics of AC circuits. 3. Principle of transformer with background of magnetic circuits. 4. Understand basic concept of Electrical machines. 5. Understand the characteristics of diodes, transistors and digital electronic components.

Unit	Contents (Theory)	Marks Weightage
I	Basic Principles of Electrical Machine Design: Specifications, Factors affecting the design, Limitations, main dimension, loadings, output equation, factor affecting the size and rating, Electrical Engineering Materials: conducting, magnetic and insulating materials. Magnetic Circuit Calculation: Ohm's law for magnetic circuit, mmf required for air gap and iron parts, tapered teeth, real and apparent flux density, magnetizing current.	14
II	Heating and Cooling of Electrical Machines: heat dissipation and heat flow equations, Newton's law of cooling, equations for temperature rise, Rating of Machines: Continuous, short and intermittent ratings, mean temperature rise, hydrogen cooling of turbo alternators, quantity of cooling medium.	14
III	Computer Aided Design of Transformers: Power and Distribution Transformers, core and yoke cross sections, square and stepped core, output equations, main dimensions, types & design of windings, optimization concepts	14
IV	Computer Aided Design of Synchronous Machines: Turbo and Hydro alternators, choice of specific magnetic & electric loading, short circuit ratio and its effects, air gap length, output equation, main dimensions, flow charts for design of synchronous machine, design of stator core & winding.	14
V	Computer Aided Design of Induction Machines: Output equation, main dimensions, design criteria, flow charts for design of induction motor, air gap length, design of stator core and winding, rotor design.	14

Text Book/References Books/ Websites:

1. Dr. Ramamurthy. M; "Computer- Aided Design of Electrical Equipment"; Affiliated East-West press Pvt. Ltd. New Delhi.
2. Sawhney A.K.; "Electrical Machine Design"; Dhanpat Rai & Sons.
3. Sen S.K.; "Principles of Electrical Machine Design with Computer Programmes"; Oxford & IBH Publishing Co.
4. Say M.G.; "Performance and Design of A.C. Machines"; Affiliated East West Press Pvt. Ltd., New Delh

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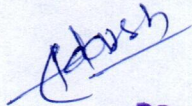
Programme: Bachelor of Technology

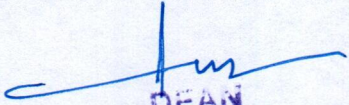
Semester –VII

Suggested List of Laboratory Practical (Expandable):

1. Develop program for calculating main dimension of DC generator.
2. Develop program for design of commutator and brush.
3. Program from calculating losses in efficiency.
4. Temperature rise of armature.
5. Design of synchronous machine.
6. Design a 30000 KVA, 3000 Rpm, 50 Hz, 3 phase air cooled turbo alternator. The load power is 0.8 lagging.


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Programme: Bachelor of Technology

Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-705	Power System Operation & Control	L	T	P	End Sem (70)	Internal (30)	Total (100)	External (35)	Internal (15)	Total (50)
		3	1	1			Min: 40 (D Grade)			Min: 20 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: 15	Lab Performance/ Quiz/Attendance - Max. Marks: 15	

Pre-Requisite	Knowledge of Physics and Mathematics.
Course Objective	<ol style="list-style-type: none"> To understand the fundamentals of speed governing system and the concept of control areas. To get the insight of load frequency control and its modelling. To provide knowledge about Hydrothermal scheduling, Unit commitment and solution techniques. To realize the requirements and methods of real and reactive power control in power system.
Course Outcomes	<p>Student will be able to learn:</p> <ol style="list-style-type: none"> Explain about the operation and control of power system and List the past and present status of Indian power sector. Develop the static and dynamic model of Load Frequency Control in single and two area system. Analyse the problems associated with hydro thermal Scheduling and to construct the algorithm for feasible load management. Distinguish between various methods involved in unit commitment and economic dispatch problems. Define about the power system security factors and analyse the algorithms used for optimal power flow.

Unit	Contents (Theory)	Marks Weightage
I	Introduction: System load variation System load characteristics, load curves - daily, weekly and annual, load- duration curve, load factor, diversity factor. Reserve requirements: Installed reserves, spinning reserves, cold reserves, hot reserves. Overview of system operation and Control: Load forecasting, techniques of forecasting, Indian power sector – Past and present status: Recent growth of power sector in India – An overview, A time line of the Indian power sector, Players in the Indian power sector, basics of power system operation and control.	9 14
II	Load Frequency Control: Need for frequency and voltage control - Plant and system level control - modeling of LFC of single area system - static and dynamic analysis - LFC of two area system - static and dynamic analysis - Tie line bias control - development of state variable model of single and two area systems.	14
III	Hydrothermal Scheduling Problem: Hydrothermal coordination – hydro electric plant models - short term and long term scheduling problem – gradient approach – Hydro units in series - Hydro-thermal scheduling with pumped hydro plant: Scheduling of systems using Dynamic programming and linear programming.	14

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Programme: Bachelor of Technology

Semester –VII

IV	Unit Commitment and Economic Dispatch: Statement of Unit Commitment (UC) problem; constraints in UC: spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints; UC solution methods: Priority-list methods, forward dynamic programming approach, numerical problems. Incremental cost curve, co-ordination equations without loss and with loss, solution by direct method and λ -iteration method. Gradient method-Newton's method – Base point and participation factor method. Economic dispatch controller added to LFC control.	9 14
V	Power System Security: Need for power system Security- - Contingency analysis – linear sensitivity factors – AC power flow methods – contingency selection – concentric relaxation – bounding-security constrained optimal power flow-Interior point algorithm-Bus incremental costs.	19


Text Book/References Books/ Websites:

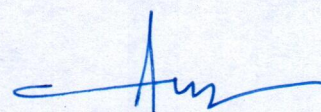
1. Robert H. Miller, James H. Malinowski, 'Power system operation', Tata McGraw-Hill, 2009
2. Allen J. Wood, Bruce F. Wollenberg, 'Power Generation, Operation and Control', Wiley India Edition, 2nd Edition, 2009.
3. Olle. I. Elgerd, "Electric Energy Systems Theory – An Introduction", Tata McGraw Hill Publishing Company Ltd, New Delhi, Second Edition, 2003.
4. D.P. Kothari and I.J. Nagrath, "Modern Power System Analysis", Third Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
5. L.L. Grigsby, "The Electric Power Engineering, Hand Book", CRC Press & IEEE Press, 2001.
6. Allen.J.Wood and Bruce F.Wollenberg, "Power Generation, Operation and Control", John Wiley & Sons, Inc., 2003.
7. <http://nptel.ac.in/courses/108101040/> (PSOCwebcourse)

Suggested List of Laboratory Practical (Expandable):

1. To study Single area Load Frequency Control.
2. To study two area loads frequency control.
3. To study about Power system security.
4. To study about hydrothermal scheduling problem.
5. To study of unit commitment and economic load dispatch.


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Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBTE-706	Non Conventional Energy Sources	3	1	-						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance – Max. Marks: 10
Practical Internal Max Marks: Nil	Lab Performance/ Quiz/Attendance – Max. Marks: Nil	

Pre-Requisite	Knowledge of Physics and Mathematics.
Course Objective	Impart a basic knowledge of electrical quantities such as current, voltage, power, energy frequency to understand the impact of technology.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Basic concepts of Electrical Engineering. 2. Enhance basics of AC circuits. 3. Principle of transformer with background of magnetic circuits. 4. Understand basic concept of Electrical machines. 5. Understand the characteristics of diodes, transistors and digital electronic components.

Unit	Contents (Theory)	Marks Weightage
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.	14
II	Wind Energy System Wind Energy, Wind Mills, and Grid connected systems. System configuration, working principles, limitations. Effects of wind speed and grid conditions. 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.	14
III	Solar Energy System Solar Radiation Extraterrestrial solar radiation, terrestrial solar radiation, Solar thermal conversion, Solar Photo tonic 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.	14
IV	Ocean Energy System- Introduction to ocean Energy resources, Wave Energy, 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 nonconventional energy	14
V	Biomass Energy System: System configuration, Biomass engine driven generators, feeding loads in stand-alone or hybrid modes, Biomass energy and their characteristics. 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.	14

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Programme: Bachelor of Technology

Semester –VII

Text Book/References Books/ Websites:

1. John Twidell & Toney Weir, Renewable Energy Resources, E & F N Spon.
2. Rai G D, Non-conventional Energy Resources, Khanna.
3. F Howard E. Jordan, "Energy-Efficient Electric Motor & their Application-II", Plenum Press, New York USA
4. Anna Mani, "Wind Energy Resource Survey in India-III", Allied Publishers Ltd., New Delhi, S.P. Sukhatme: Solar Energy, TMH4e,
5. 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,
6. Solanki –Renewable Energy Technologies – PHI Learning
7. Sawhnew –Non Conventional Energy Resources – PHI Learning

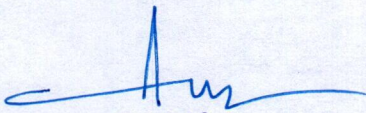
Suggested List of Laboratory Practical (Expandable): Nil


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Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
CBEE-707	Innovative Project Lab	L	T	P	End Sem (Nil)	Internal (Nil)	Total (Nil)	End Sem (Nil)	Internal (50)	Total (50)
		-	-	1						Min: 20 (D Grade)

Duration of Theory (Externals): Nil

Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: Nil
Practical Internal Max Marks: 50	Lab Performance/ Quiz/Attendance - Max. Marks: 50	

Pre-Requisite	Fundamental Engineering concepts of concern discipline.
Course Objective	This course sets in motion an exploration of the fundamental approaches that underpin the making and development of an innovation. It draws on ideas and practices such as - interdisciplinary, creativity, collaboration and entrepreneurship to identify problems and opportunities that give rise to innovation.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Carry out independent and/or collaborative research in the planning and scoping of a creative industry project that seeks to present an innovative outcome. 2. Identify, analyze & define the problem. 3. Generate alternative solutions to the problem identified. 4. Compare & select feasible solutions from alternatives generated. 5. To work effectively in a team.

Unit	Contents (Theory)	Marks Weightage
I	<p>Students shall be encouraged to form groups (Maximum 5) to do a Project on technical topic of concern branch. The student should prepare a working system or some design or understanding of a complex system (on minor level) that he/she has selected for his/her innovative project work using system analysis tools and submit the same in the form of a write-up i.e. detail project report.</p> <p>The student should maintain proper documentation of different stages of project such as concept evaluation, requirement specification, objectives, work plan, analysis, design, implementation and test plan wherever applicable.</p> <p>Each student is required to prepare a project report based on the above points and present the same at the final examination with a demonstration of their project.</p>	50

Text Book/References Books/ Websites: Nil**Suggested List of Laboratory Practical (Expandable): Nil**

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Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (Nil)	Internal (Nil)	Total (Nil)	End Sem (Nil)	Internal (50)	Total (50) Min: 20 (D Grade)
CBTE-708	Introduction to MATLAB	-	-	1						

Duration of Theory (Externals): Nil

Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: Nil
Practical Internal Max Marks: 50	Lab Performance/ Quiz/Attendance - Max. Marks: 50	

Pre-Requisite	C Programming, Basics of Engineering Mathematics, Basic computer literacy is expected.
Course Objective	<ol style="list-style-type: none"> To Impart the Knowledge to the students with MATLAB software to enhances programming knowledge in Research and Development. To introduce students the use of a high-level programming language, MATLAB for scientific problem solving with engineering applications.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> Understand the basics of MATLAB. Break a complex task up into smaller, simpler tasks. To prepare programmes under Case Study (Any two Modules). Tabulate results and analyze.

Unit	Contents (Theory)	Marks Weightage
I	<ol style="list-style-type: none"> Introduction- Starting MATLAB, Using MATLAB as a calculator, Creating MATLAB variables, Making corrections, Miscellaneous commands Mathematical functions- Creating simple plots, Adding titles, axis labels, and annotations, multiple data sets in one plot, Matrix generation, entering a vector, Matrix indexing. Array operations and Linear equations- Array arithmetic operations, Matrix inverse, Matrix functions. Introduction to programming in MATLAB - M-File Scripts, Script side-effects, Anatomy of a M-File function, Input and output arguments, Input to a script file, Output commands. Debugging M-files - Debugging process , Preparing for debugging, Setting breakpoints, Running with breakpoints. 	50

Text Book/References Books/ Websites:

- <http://www.matlabtutorials.com/mathforum/>
- <http://www.mathworks.in/matlabcentral/>
- MATLAB Manuals and Handbooks

Suggested List of Laboratory Practical (Expandable):

- Study of introduction to MATLAB.
- Find the factorial of 5 using MATLAB command.
- Generate the following row vector $b=[1, 2, 3, 4, 5, \dots, 9, 10]$, then transpose it to column vector.
- Write a programme to Solve the following system $x+y=1$ $x-y+z=0$ $x+y+z=2$
- Write a programme, let $x=[2 -3 5 ; 0 11 0]$, then a) find elements in x that are greater than 2 b) find the number of nonzero elements in x.
- Plot Sinc function, where $\text{Sinc}(x) = \sin(x) / x$, and $-2\pi \leq x \leq 2\pi$
- Study of M file, Script file and function file in MATLAB with suitable examples.
- Two case studies related to your respective disciplines.

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Programme: Bachelor of Technology

Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-709	Psychology	L	T	P	End Sem (Nil)	Internal (50)	Total (50)	End Sem (Nil)	Internal (Nil)	Total
		1	-	-			Min: 20 (D Grade)			(Nil)

Duration of Theory (Externals): Nil

Theory Internal- Max Marks: 50	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: 50
Practical Internal Max Marks: Nil	Lab Performance/ Quiz/Attendance - Max. Marks: Nil	

Pre-Requisite	Nil
Course Objective	This course makes the students able to understand and deal with personal and professional aspects of life. They become able to deal with common psychological problems encountered in an engineer's life. Their ability to deal with societal aspects of behavior is enhanced. By application of knowledge their quality of personal living and job is maximized.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. Be able to understand and deal with personal and organization phenomenon. 2. Be able to deal with common psychological aspects related to an Engineer's life. 3. Be able to understand the impact of social environment on individuals, groups and communities. 4. Be able to utilize the knowledge of Sociology and to improve the quality of living of self and social relationship at large.

Unit	Contents (Theory)	Marks Weightage
I	Psychology: Introduction Definition and Scope of Psychology; Psychology as a science, Personality: Definition, types of personality, Measurement of Personality. Perception, Motivation and Learning.	10
II	Application of Psychology: Stress-management, Well-being; Self-development: Application of Psychology in building memory and creativity.	10
III	Sociology: Introduction, Importance of Sociology for Engineers, Sociology: Definition and nature; Origin of Society, Social Processes: – Competition, Cooperation Conflict, Accommodation and Assimilation, Social groups – Types and Characteristics; Social Institutions: Marriage: and Family; Religion: Functions and dysfunctions of religion.	10
IV	Social concerns Social Stratification: Nature and types, Prejudices, Social Mobility. Social Changes: – Urbanization, Westernization, and Pluralism. Social Disorganization, Social Problems: – Deviance, Delinquent behavior amongst youth, Crime, Prostitution, Gender injustice, Child Abuse, Terrorism. Social Movements.	10
V	Cognitive Psychology. An introduction to human mental processes, problem solving, pattern recognition, imagery, memory retention, language comprehension Attention & Perception: Definition, types of attention, perception.	10

Text Book/References Books/ Websites:

1. Eastwood and Atwater; Psychology for living: Adjustment, growth and behavior today; Prentice Hall.
2. Meena Hariharan and Radhanath Rath, Coping with life stress. Sage Publications, ;
3. Shankar Rao; C.N, Sociology; S.Chand & Co Ltd.
4. S. K. Mangal; General Psychology; Sterling Publishers Pvt. Ltd.
5. Baron A. Robert; Psychology; Prentice Hall of India.

Suggested List of Laboratory Practical (Expandable): Nil

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Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (Nil)	Internal (Nil)	Total (Nil)	End Sem (Nil)	Internal (50)	Total (50) Min: 20 (D Grade)
CBTE-710	Massive Open Online Courses (MOOCs)-II	-	-	1						

Duration of Theory (Externals): Nil

Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: Nil
Practical Internal Max Marks: 50	Lab Performance/ Quiz/Attendance - Max. Marks: 50	

Pre-Requisite	Nil
Course Objective	MOOCs build on the engagement of learners who self-organize their participation according to learning goals, prior knowledge and skills, and common interests. Objective of this course is to improve the technical skills of students and its gives an opportunity to explore themselves beyond class room teaching.
Course Outcomes	Student will be able to learn: New interesting courses of their own curiosity and improve their knowledge and skills. MOOCs give an opportunity to connect openly on a global scale, with global learners. The ability to experiment with pedagogical methods on a vast scale.

Unit	Contents (Theory)	Marks Weightage
I	<p>Massive Open Online Courses (MOOCs) are online courses that allow participants free access and unrestricted participation in any course of their choice. Besides the conventional modes of teaching such as lectures, videos and reading material, MOOCs also provide a platform for interactive forums.</p> <p>After the VI semester End Sem Examination, all students are instructed to register themselves in a minimum IV (Four weeks) MOOC/NPTEL/SWAYAM Certification course in their Engineering discipline.</p> <p>Students must appear in the certification examination conducted by NPTEL/ SWAYAM and submit it to their respective assigned faculty before the end of the semester. A student should give an effective PowerPoint presentation of chosen course in the class scientific seminars and receive feedback from each other. This effort will help them to communicate their ideas more clearly.</p> <p>The final evaluation of this course will base on a PowerPoint Presentation and Certification during the academic session by the assigned faculty.</p>	50

Text Book/References Books/ Websites:

1. <https://swayam.gov.in/>
2. <http://nptel.ac.in>
3. <https://onlinecourses-archive.nptel.ac.in>

Suggested List of Laboratory Practical (Expandable): Nil

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Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-711	Professional Ethics and Proficiency	L	T	P	End Sem (Nil)	Internal (Nil)	Total (Nil)	End Sem (35)	Internal (15)	Total (50)
		-	-	1						Min: 20 (D Grade)

Duration of Theory (Externals): -Nil

Theory Internal- Max Marks: -Nil	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance Max. Marks: Nil
Practical Internal Max Marks: 15	Lab performance/Quiz/Attendance: Max. Marks: 15	

Pre-Requisite	Nil
Course Objective	To enable the students to imbibe and internalize the values and ethical behaviour in personal and professional live.
Course Outcome	Student will be able to: <ol style="list-style-type: none"> 1. Understand the core values that shape the ethical behaviour of a professional. 2. Learn the need for professional ethics, codes of ethics and roles. 3. Discuss the ethical issues related to engineering. 4. Realize the responsibilities and rights of an engineer in the society. 5. Apply the knowledge of human values and social values to contemporary ethical values and global issues.

Unit	Contents (Theory)	Marks Weightage
I	Introduction to Professional ethics. Basic concepts, Governing ethics , Personal and Professional ethics, Ethical Dilemmas, Life Skills, Emotional intelligence, Thoughts of Ethics, Value education, Dimension of ethics, Professional associations, Professional risks, Professional accountabilities, Professional success, Ethics and profession .	50
II	Communications: Communication and personality development covering, Psychological aspects of communication, cognition as a part of communication;; Politeness and Etiquette in communication; Cultural factors that influence communication; Mannerisms to be avoided in communication; Language and persuasion; Language and conflict resolution.	
III	Career Oriental Communication covering, Resume and Bio-data: Design & style; Applying for a job: Language and format of job application. Job Interviews: purpose and process.	
IV	Presentation Skills: Power-point presentation: structure and format; Using e-mail for business communication; Standard e-mail practices; Language in e-mail; Using internet for collecting information; Referencing while using internet materials for project reports. Advanced Techniques in Technical Communication covering, Interview through telephone/video-conferencing;	
V	Global Ethical Issues. Multinational Corporations- Environmental Ethics- Business Ethics- Computer Ethics -Role in Technological Development-Engineers as Managers- Consulting Engineers- Engineers as Expert witnesses and advisor -Moral leadership.	

Text Book/References Books/ Websites:

1. M. Govindarajan, S .Natarajan and V. S. Senthil Kumar, Engineering Ethics, PHI Learning Private Ltd, New Delhi, 2012.
2. R S Naagarazan, A text book on professional ethics and human values, New age international (P) limited, New Delhi, 2006.
3. Mike W Martin and Roland Schinzinger, Ethics in Engineering, 4th edition, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi, 2014.

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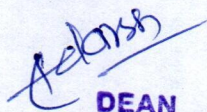
Semester –VII

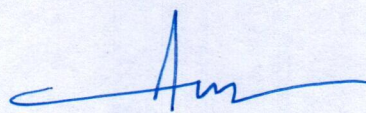
4. Charles D Fleddermann, Engineering Ethics, Pearson Education/ Prentice Hall of India, New Jersey, 2004.
5. <http://www.slideword.org/slidestag.aspx/human-values-and-Professional-ethics>.

Suggested List of Laboratory Practical (Expandable): Nil

Students should prepare and submit hard and soft copy of their report to assigned faculty before End Semester Examination.


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Programme: Bachelor of Technology

Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (Nil)	Internal (Nil)	Total (Nil)	End Sem (Nil)	Internal (50)	Total (50) Min: 20 (D Grade)
CBTE-712	GD/Seminar	-	-	1						

Duration of Theory (Externals): Nil

Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance – Max. Marks: Nil
Practical Internal Max Marks: 50	Lab Performance/Attendance /Quiz - Max. Marks: 50	


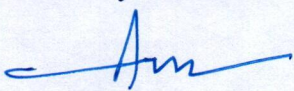
Pre-Requisite	Nil
Course Objective	To enable the students perform as a team player and also emerge as a leader in the group.
Course Outcomes	Student will be able to: <ol style="list-style-type: none"> 1. Understand nature, importance and characteristics of group discussion. 2. Familiarise himself/herself with the different types of group discussions. 3. Learn to identify areas of evaluation in selection group discussions. 4. Chalk out strategies for making individual contributions in group discussion. 5. Learn the method of in-depth study in a specialized area and prepare and present the report of the same.

Unit	Contents (Theory)	Marks Weightage
I	Group Discussion: <ul style="list-style-type: none"> • Nature, importance and characteristics of group discussions. • Selection Group Discussions • Group Discussion Strategies • Techniques for Individual Contribution • Group Interaction Strategies 	50
	Seminar: <ul style="list-style-type: none"> • In depth study in a specialized area by doing literature survey, understanding different aspects of the problem and arriving at a status report in that area. • Learn investigation methodologies, study relevant research papers, correlate work of various authors/researchers critically, study concepts, techniques, prevailing results etc., analyze it and present a seminar report. 	

Text Book/References Books/ Websites: Nil

Suggested List of Laboratory Practical (Expandable):

Students should prepare and submit hard and soft copy of their report to assigned faculty before End Semester Examination.


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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem	Internal	Total	End Sem	Internal	Total
CBEE-801	Project Internship and Viva- Voce	-	-	10	(Nil)	(Nil)	(Nil)	(300)	(200)	(500)
										Min: 200 (D Grade)

Duration of Theory (Externals): Nil

Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: Nil
Practical Internal Max Marks: 200	Lab Performance/Attendance /Quiz - Max. Marks: 200	

Pre-Requisite	Must have practical knowledge of respective program.
Course Objective	Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry. Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job. • Exposure to the current technological developments relevant to the subject area of training.
Course Outcomes	Student will be able to learn: <ol style="list-style-type: none"> 1. After completion of this semester long course the student trained in his specialized area of operation. 2. Will be able to critically think, observe and communicate. 3. Will acquire the work experience through advance learning (in terms of depth, complexity and engagement) in an industrial environment. 4. Will be able to apply, extend and test the knowledge gained from class room experience to understand and mitigate complex issues and address real industry challenges 5. Will be able to assimilate technical and administrative or managerial skills from his interactions with a variety of individuals, systems and practices

Unit	Contents (Theory)	Marks Weightage
I	<p>The purpose of the Internship Program is to provide each student practical experience in a standard work environment. The students must undergo industrial training/internship for a minimum period of one semester during the 8th semester in any of the reputed industry, Government-sponsored Research & Development Organization, and reputed academic institution/foreign universities. The student will give a seminar with help of power point presentation based on his/her training report before an departmental expert committee constituted by the concerned department as per norms of the institute and submit a report in hard copy to the department. The evaluation will be based on the following criteria:</p> <ul style="list-style-type: none"> • Internal departmental presentation to check knowledge & experience of Project Internship. • External Viva-Voce to evaluate Project Internship work done by student. 	500

Text Book/References Books/ Websites: Nil**Suggested List of Laboratory Practical (Expandable): Nil**

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