Shri Shankaracharya Technical Campus, Bhilai

(An Autonomous Institute Affiliated to CSVTU Bhilai)

"ज्ञानादेव तु कैवल्यम्"

SCHEME OF TEACHING AND EXAMINATION
B. Tech. Eight Semester- ELECTRICAL AND ELECTRONICS ENGINEERING

B. Tech. (Electrical and Electronics Engineering) Eighth Semester

Effective from 2021-2022 Batch

Sl. No.	Board of Studies (BOS)	Courses (Subject)	Course Code	Period per Week			Scheme of Examination			Total Marks	Credit
				L	T	P	Theory/Lab				
							ESE	CT	TA		
1.	Electrical and Electronics	High Voltage Engineering	EEE103801	3	1	-	100	20	30	150	4
2.	Electrical and Electronics	Professional Elective-IV (Refer Table-IV)	EEE103825	2	1	-	100	20	30	150	3
3.	Electrical and Electronics	Open Elective-III (Refer Table-V)	EEE100842	3	-	-	100	20	30	150	3
4.	Electrical and Electronics	High Voltage Engineering Lab	EEE103891	-	-	2	25	-	25	50	1
5.	Electrical and Electronics	Installation, Maintenance and Testing of Electrical Equipment Lab	EEE103892	-	-	2	25	-	25	50	1
6.	Electrical and Electronics	Capstone Project Phase II	EEE103893	-	-	16	300	-	150	450	8
Total				**8**	**2**	**20**	**650**	**60**	**290**	**1000**	**20**

L : Lecture, T: Tutorial, P : Practical, ESE : End Semester Exam CT : Class test TA: Teacher's assessment

Table IV : Professional Elective - IV			
Sl. No.	**Board of Studies (BOS)**	**Course(Subject)**	**Course Code**
1.	Electrical & Electronics Engineering	Installation, Maintenance and Testing of Electrical Equipment	EEE103821
2.	Electrical & Electronics Engineering	Big data and Hadoop	EEE103822
3.	Electrical & Electronics Engineering	Advanced Digital System Design	EEE103823
4.	Electrical & Electronics Engineering	Introduction to VLSI Design	EEE103824
5.	Electrical & Electronics Engineering	Energy Auditing and Management	EEE103825

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Table V OPEN ELECTIVE III
EIGHTH SEMESTER B.TECH.

Sl. No.	Board of Studies (BOS)	Course(Subject)	Course Code
1	Civil Engineering	Disaster Management	CE100841
2	Civil Engineering	Construction Management	CE100842
3	Civil Engineering	Ecology and sustainable development	CE100843
4	Computer Science and Engineering	Management Information System	CSE100841
5	Computer Science and Engineering	Decision Support System	CSE100842
6	Computer Science and Engineering	Cyber Security	CSE100843
7	Electrical Engineering	Flexible AC Transmission System	EE100841
8	Electrical Engineering	Distributed Generation	EE100842
9	Electrical &Electronics Engineering	Robotics and Automation	EEE100841
10	Electrical &Electronics Engineering	Utilization of Electrical Energy	EEE100842
11	Electronics and telecommunication	Virtual Instrumentation	ET100841
12	Electronics and telecommunication	Enterprise Resource Planning	ET100842
13	Information Technology	Parallel Computing	IT100841
14	Information Technology	Wireless and Mobile Communication	IT100842
15	Mechanical Engineering	Theory of Composite Materials	ME100841
16	Mechanical Engineering	Micro fluidics	ME100842
17	Mechanical Engineering	Micro and Nano Manufacturing	ME100843

Note:

(a) Abbreviations used : L-Lecture, T- Tutorial, P- Practical, ESE- End Semester Exam, CT- Class Test, TA- Teacher's Assessment

(b) 1/4th of total strength of students subject to minimum of 20 students is required to offer an elective in the department in a particular academic session.

(c) Choice of elective course once made for an examination cannot be changed in future examinations.

(d) The duration of end semester examination of all theory papers will be of three hours.

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EIGHTH SEMESTER

		July 2022	1.00	Applicable for AY 2022-23 Onwards
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Subject Code EEE103801	High Voltage Engineering	L = 3	T = 1	P = 0	Credits = 4
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: 1. The course is an advanced course in high voltage technology and electrical insulating materials. It deals with basic gaseous, liquid and solid dielectric breakdown theories. 2. It also contains important experimental methods of high voltage generation and measurement 3. The course makes the students familiar with various applications where high voltage field is used.	**Students will be able to:** **CO1** Describe the various breakdown theories for gaseous, liquid and solid dielectric **CO2** Describe the generating methods for high DC, AC, and impulse **CO3** Describe the measuring methods for high DC, AC and impulse **CO4** Compute the breakdown strength of gas filled insulation systems with sphere gap

UNIT 1 **Introduction to Breakdown theory:** Levels of high voltages, necessity of EHV and its limitations, Electrical insulation and dielectrics, Electrical fields - Uniform and non-uniform fields (weekly and extremely), Types of insulation - gas, liquid, and solids, Types of ionizations - impact, thermal and photo ionization, Electron avalanche in uniform field, Townsend's first and second Criterion for breakdown, Streamer theory of breakdown, Paschen's law.	**CO1** **10 Hrs**
UNIT 2 **Breakdown in Solid Dielectrics:** Breakdown mechanism, Intrinsic breakdown, Electromechanical breakdown, thermal breakdown, breakdown of solid dielectric in practice, Breakdown due to treeing & tracking, breakdown due to the internal discharges	**CO2** **10 Hrs**

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UNIT 3 **Generation of High voltages:** Generation of high D.C. voltages, half wave & full wave rectifier circuits, Van De Graff generators, Electro static Generators, Generation of high alternating voltages, cascade transformers, Generation of impulse voltages, Multistage Impulse generator, Marx circuit, Tripping & control of Impulse generators. **Over Voltage phenomena and Insulation coordination** Lightning phenomena as natural cause for overvoltage, Overvoltage due to switching surges and abnormal conditions, principles of insulation coordination. Protection of substations from lightning stroke.	**CO3** **10Hrs**
UNIT 4 **Measurement of High Voltages:** Measurement of high D.C.voltage, Measurement of high A.C.& impulse voltages, series Impedance voltmeter, series capacitance voltmeter capacitance potential dividers & capacitance voltage transformers, Resistance potential dividers, Electrostatic voltmeter, Spark gap for measurement of high D.C., A.C. & impulse voltages, Potential divider for impulse voltage measurements, CRO for impulse voltage measurements.	**CO3** **10 Hrs**
UNIT 5 **High Voltage Testing of Electrical Apparatus:** Test on insulators, Dry & wet flash over tests & withstand tests, Impulse flash over & withstand voltage test, High voltage tests on cables. Non-Destructive Testing: Measurement of dielectric constant & loss factor, High voltage Schering Bridge.	**CO4** **8 Hrs**

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	High Voltage Engineering	C.L. Wadhwa	2nd Edition	New Age International Ltd
2	High Voltage Engineering	M.S. Naidu & V. Kamraju	3rd Edition	Tata McGraw Hill

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	An Introduction to High Voltage Engineering	Subir Ray	2nd Edition	PHI
2	High voltage Engineering	D. V. Razevig and Chaurasia	2nd Edition	Khanna pbs

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B. Tech. Eighth Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code EEE103821	Installation, Maintenance and Testing of Electrical Equipment	L = 2	T = 1	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: 1. Acquire knowledge on safety measures and precautions. 2. Testing of DC and AC rotating machines and transformers 3. Identify common troubles in Electrical machines and switch gear.	On successful completion of the course, the student will be able to: **CO1**:- Understand the process of commissioning and Maintenance. **CO2**:- Prepare the steps of various maintenance methods / techniques for transformer **CO3**:- Suggest the trouble shooting methods to improve life of electrical equipment of Switchgear, Circuit Breaker **CO4**:- Perform required testing procedure for different Rotating Machines using proper tools and method **CO5**:- Familiar about electrical safety regulations and rules during hotline maintenance

UNIT 1 **Overview of Site Management, Electrical Safety** Introduction to Site activities; Civil works, Erection, Testing & Commissioning, Operation and Maintenance, Type and Scope of Maintenance, Advantages of programmed preventive maintenance, Safety management, Electrical shocks, Recommended safety precautions against electrical shocks in LV and HV installations, Safety procedure during commissioning phase and Operation & maintenance phase	**CO1** **12 Hrs**

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UNIT 2 **Transformer** Important steps in maintenance of power transformer, maintenance schedule for attended and unattended transformer, causes of troubles and failure of power transformer, Dispatch and shipping, inspection, storage, procedure of filling oil in transformer tank, drying out, various commissioning tests on a power transformer, typical maintenance schedule for transformer up to 1000 KVA and above 1000KVA, transformer oil filtration.	**CO2** **10 Hrs**
UNIT 3 **Switchgear, Circuit Breaker** Introduction to switchgears and equipments in substation and their functions, Type tests, routine test and commissioning tests, high/low voltage ac circuit breakers (Air, Oil, Vacuum, SF6) possible troubles, causes and remedial actions for outdoor circuit breakers, maintenance of CB (Air, Oil, Vacuum, SF6), Trouble shooting of substation equipment	**CO3** **10Hrs**
UNIT 4 **Rotating Machines** Standard designation for cooling and degree of protection, Installation and commissioning of introduction motor and rotating machines, drying out of electrical rotating machines, installation resistance measurements, Mechanical maintenance of rotating machines, Care, servicing and maintenance of motor, Troubles, causes, remedies and protective devices during respective abnormal condition in low voltage induction motor, Testing of induction motors.	**CO4** **10 Hrs**
UNIT 5 **Hotline Maintenance and Safety against Electric Fire** Meaning and advantages of hot-line maintenance. Special type non conducting materials used for preparing tools for Hot line maintenance, Tools, Various types of Hot- line operations, safety during Hot line maintenance; Introduction to Electrical Fire Safety, Fire Fighting to extinguish Electrical Fire using Dry Powder type Fire extinguisher	**CO5** **8Hrs**

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Text Books:

S. No.	Title	Authors	Edition	Publisher
1)	Testing, commissioning, operation and maintenance of Electrical equipments	S. Rao	6thEdn.	KhannaPublishers
2)	Installation maintenance and testing of Electrical Equipments	S. Tarlok	2nd 2001	S. K. Kataria & Sons

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1)	Electrical power equipment maintenance and testing	Paul Gill	2008	CRC Press
2)	Installation, Maintenance and testing vol. I & II	B.V.S. Rao	2008	S. Chand & Co

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B. Tech. Eighth Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code EEE103822	Big data and Hadoop	L = 2	T = 1	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: 1. The HDFS file system, MapReduce frameworks are studied in detail. 2. Hadoop tools like Hive, and Hbase, which provide interface to relational databases, are also covered as part of this course work. 3. Analyzing data with unix tools 4. Sorting. Map side and Reduce side joins. 5. Implementation. Java and Mapreduce clients	On successful completion of the course, the student will be able to: **CO1:** Understand the fundamentals of Big cloud and data architectures. **CO2:** Understand HDFS file structure and Mapreduce frameworks, and use them to solve complex problems, which require massive computation power **CO3:** Use relational data in a Hadoop environment, using Hive and Hbase tools of the Hadoop Ecosystem **CO4:** Understand the Comparison with traditional databases. **CO5:** Understand The Hive Shell.

UNIT 1 **Introduction to Big Data** What is Big Data? Why Big Data is Important. Meet Hadoop. Data. Data Storage and Analysis. Comparison with other systems. Grid Computing. A brief history of Hadoop. Apache Hadoop and the Hadoop Eco System. Linux refresher; VMWare Installation of Hadoop.	**CO1** **10 Hrs**
UNIT 2 **The design of HDFS** HDFS concepts Command-linene interface to Hadoop Distributed File System (HDFS). Hadoop File systems. Interfaces. Java Interface to Hadoop. Anatomy of a file read. Anatomy of a file writes. Replica placement and Coherency Model.	**CO2** **10 Hrs**

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Parallel copying with distcp, Keeping an HDFS cluster balanced.	
UNIT 3 **Introduction & Analyzing data with Unix tools** Analyzing data with hadoop. Java MapReduce classes (new API). Data flow, combiner functions, Running a distributed Map Reduce Job. Configuration API. Setting up the development environment. Managing configuration. Writing a unit test with MRUnit. Running a job in local job runner. Running on a cluster. Launching a job. The Map Reduce Web UI.	**CO3** **10Hrs**
UNIT 4 **Classic Map Reduce. Job submission.** Job Initialization. Task Assignment. Task execution .Progress and status updates. Job Completion. Shuffle and sort on Map and reducer side. Configuration tuning. Map Reduce Types. Input formats. Output formats, Sorting. Map side and Reduce side joins.	**CO4** **12 Hrs**
UNIT 5 **The Hive Shell** Hive services. Hive clients. The meta store. Comparison with traditional databases. HiveQl. Hbasics. Concepts. Implementation. Java and Mapreduce clients. Loading data, web queries.	**CO5** **9 Hrs**

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	The Definitive Guide	Tom White, Hadoop	3rd Edition, 2012	O'Reilly Publications
2	Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data	Dirk deRoos, Chris Eaton	1 edition, 2011	McGraw Hill Osborne Media

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1.	Hadoop Operations	Eric Summers	2012	O'Reilly Media

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B. Tech. Eighth Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code EEE103823	Advanced Digital System Design	L = 2	T = 1	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: 1. Demonstrate Logic simulation, Design verification, Verilog. 2. Illustrate behavioral modeling, Boolean-Equation, Flip-Flops and Latches; multiplexers, encoders, and decoders, synchronizers for asynchronous signals. 3. Demonstrate combinational logic; three-state devices and bus interfaces; Registered logic; registers and counters; Resets; Divide and conquer: Partitioning a design.	On successful completion of the course, the student will be able to: **CO1:** Demonstrate logic simulation, Design verification, Verilog. **CO2**: Work on Flip-Flops and Latches; multiplexers, encoders, and decoders, synchronizers for asynchronous signals. **CO3**: Design and implement circuits on combinational logic; Registered logic; registers and counters; Resets; Divide and conquer: Partitioning a design. **C04:** Define basics of PLA; PAL; Programmability of PLDs; CPLDs; FPGAs **C05:** Design and implement circuits on Asynchronous Sequential Circuit.

UNIT 1 **Logic Design with Verilog:** Structural models of combinational logic; Logic simulation, Design verification, and Test methodology; Propagation delay; Truth-Table models of Combinational and sequential logic with Verilog**.**	**CO1** **10 Hrs**
UNIT 2 **Logic Design with Behavioral Models:** Behavioral modeling; A brief look at data types for behavioral modeling; Boolean-Equation – Based behavioral models of combinational logic; Propagation delay and continuous assignments; Latches and Level – Sensitive circuits in Verilog; Cyclic behavioral models of Flip-Flops and Latches; Cyclic behavior and edge	**CO2** **10 Hrs**

detection; A comparison of styles for behavioral modeling; Behavioral models of multiplexers, encoders, and decoders	
UNIT 3 **Synthesis of Combinational and Sequential Logic:** Introduction to synthesis; Synthesis of combinational logic; Synthesis of sequential logic with latches; Synthesis of three state devices and bus interfaces; Synthesis of sequential logic with flip-flops; Synthesis of explicit state machines; Registered logic; State encoding; Synthesis of implicit state machines, registers and counters	**CO3** **10Hrs**
UNIT 4 **Programmable Logic and Storage Devices:** Programmable logic devices; storage devices; PLA; PAL; Programmability of PLDs; CPLDs; FPGAs; Verlog-Based design flows for FPGAs; Synthesis with FPGAs.	**CO4** **12 Hrs**
UNIT 5 **Asynchronous Sequential Circuit Design** Analysis of Asynchronous Sequential Circuit (ASC) – Flow Table Reduction – Races in ASC –State Assignment Problem and the Transition Table – Design of ASC – Static and Dynamic Hazards – Essential Hazards – Data Synchronizers – Designing Vending Machine Controller –Mixed Operating Mode Asynchronous Circuits.	**CO5** **9Hrs**

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Advanced Digital Design with the Verilog HDL	Michael D.Ciletti.	2nd Edition 2017	Pearson
2	Advanced FPGA Design: Architecture, Implementation, and Optimization	Steve Kilts	2007	Wiley

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Advanced Digital Logic Design: Using VHDL, State Machines, and Synthesis for FPGAs	Sunggu Lee	2005	Nelson Engineering
2	Digital Logic applications and Design	John M Yarbrough	2001	Thomson Learning

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B. Tech. Eighth Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code EEE103824	Introduction to VLSI Design	L = 2	T = 1	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: 1. To make student familiar with basic design techniques for IC fabrication. 2. Students will understand the significance of various design rules and its implementation for IC design. 3. To understand the layout design of few combinational and sequential circuits.	On successful completion of the course, the student will be able to: **CO1:** Acquire basic knowledge of IC design. **CO2:** Explain IC fabrication techniques. **CO3:** Develop the concept of layout design rules **CO4:** Design various combinational and sequential circuits. **CO5:** Acquire knowledge of subsystem design process.

UNIT 1 **Overview of VLSI Design Methodology:** Brief introduction of SSI, MSI and LSI,VLSI design flow, VLSI design style, Basics of MOS transistors :Basic Electrical properties of MOS NMOS enhancement transistor, PMOS enhancement transistor, threshold voltage, threshold voltage equations, MOS devices equations, Basic DC equations, Second order effects-Body effect, Channel length modulation, Sub-threshold condition, NMOS inverter-Steered input to an NMOS modules-Depletion mode & enhancement mode pull ups, Design of CMOS Inverters, Supply Voltage Scaling in CMOS Inverters, Power and Area considerations.	**CO1** **12 Hrs**
UNIT 2 **VLSI Fabrication Techniques:** An overview of wafer fabrication -wafer Processing-Oxidation-Patterning Diffusion –Ion implantation- Deposition-Silicon gate NMOS process, CMOS processes-n-well, p-well, Twin-tub, Silicon on insulator- CMOS process	**CO1** **8 Hrs**

enhancement-Interconnect-Circuit elements.	
UNIT 3 **Layout Design Rules**: Need for design rules-Mead Conway design rule for the silicon gate NMOS process CMOS Nwell/ Pwell design rules-Simple layout examples-sheet resistance-area Capacitance-Wiring Capacitance drive large capacitive loads.	**CO3** **8Hrs**
UNIT 4 **Logic Design:** Combinational MOS Logic Circuits- CMOS Logic Circuits : NAND, NOR, Multiplexers, CMOS Transmission Gates (Pass Gates), Pseudo nMOS logic, Dynamic CMOS logic, Clocked CMOS logic and CMOS Domino logic. Sequential MOS logic circuits-Behavior of Bistable Elements, The SR Latch Circuit, Clocked Latch and Flip-Flop Circuits, CMOS D-Latch and Edge-Triggered Flip-Flop.	**CO4** **12 Hrs**
UNIT 5 **Subsystem Design Process**: Design of a 4 bit shifter-General arrangement of a 4 bit arithmetic processor-Design of a ALU subsystem- Implementing ALU functions with an adder-Carry look ahead adders-Multipliers-serial parallel multipliers- Pipelined multiplier array-Modified Booth's Algorithm.	**CO5** **8Hrs**

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Basic VLSI Design	Douglas A .Pucknell & Kamran Eshranghian	3rd edition 1994	Prentice Hall of India, New Delhi
2	Principles of CMOS VLSI Design: A system perspective	Neil H.E.West & Kamran Eshranghian	2nd edition, 1993	Addison-Wesley

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Reference Books:

S. No.	Title	Authors	Edition	Publisher
1.	CMOS VLSI Design: A Circuits and Systems Perspective	Weste	4th edition	TMH
2.	Introduction to VLSI Circuits and Systems	John P. Uyemura	2006	John Wiley & Sons

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B. Tech. Eighth Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code EEE103825	Energy Auditing and Management	L = 2	T = 1	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: 1. Students may decide about energy management in more effective way. 2. Students may analyze about various energy related aspect of electrical system and its auditing methods. 3. Students can carry out financial management	On successful completion of the course, the student will be able to: **CO1:** :Understanding basics of demand side management and mechanisms (technical, legal or financial) that influence energy consumption **CO2:** Learning the basics of energy auditing with application on different sectors. **CO3:** Identification of energy conservation opportunities in various industrial processes **CO4:** Understand the different methods used to reduce energy consumption in lighting system. **CO5:** Perform financial management

UNIT 1 **Basic principles of Energy audit** Energy Scenario: Primary and Secondary Energy, Conventional and non-conventional energy, Energy Security, Energy Conservation and its importance, Concept and methods of energy conservation, Energy needs of growing economy, Introduction to DSM. Concept of DSM, Benefits from DSM, DSM techniques.	**CO1** **10 Hrs**
UNIT 2 **Basic principles of Energy audit** Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach-Understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement, Maximizing system efficiencies, Optimizing	**CO2** **10 Hrs**

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the input energy requirements, Fuel and energy substitution.	
UNIT 3 **Energy efficient Motors** Energy efficient motors, Factors affecting efficiency, Loss distribution , Constructional details, Characteristics ,Variable speed , Variable duty cycle systems, RMS Hp, Voltage Variation, Voltage unbalance, Over motoring, Motor energy audit.	**CO3** **8Hrs**
UNIT 4 **Power Factor Improvement, Lighting and energy instruments** Power factor-Methods of improvement , Location of capacitors , Pf with non linear loads, Effect of harmonics on PF, PF motor controllers, Good lighting system design and practice , Lighting control, Lighting energy audit, Energy Instruments-Watt meter, Data loggers , Thermocouples, Pyrometers, Lux meters.	**CO4** **8 Hrs**
UNIT 5 **Economic aspects and analysis** Economics Analysis-Depreciation Methods, Time value of money, Rate of return, Present worth method, Replacement analysis, Life cycle costing analysis, Energy efficient motors- Calculation of simple payback method, Net present worth method, Lighting - Applications of life cycle costing analysis, Return on investment.	**CO5** **9Hrs**

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Energy technology **(**Non Conventional, Renewable and Conventional)	S. Rao, Parulekar	3rd Edition	KhannaPbs.
2	Industrial Energy Management: Principles and Applications	Petrecca	1999	The Kluwer international series -207
3	Energy-Efficient Electric Motors and Their Applications	T.J.E Miller	2003	John Wiley & Sons,

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Energy Management Handbook 2001	Turner, Wayne C.	2000	The Fairmont Press
2	Plant Engineers and Managers Guide to Energy Conservation	Albert Thumann, P.W	Seventh Edition	TWI Press Inc, Terre Haute.
3.	Renewable Energy Sources and Conservation Technology	N.K. Bansal, Kleeman Millin	1990	Tata McGraw-Hill Publishers

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B. Tech. Eighth Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code EEE100841	Robotics and Automation	L = 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: 1. To introduce various types of Robots and the functional elements of Robotics 2. To impart knowledge of robot drive systems 3. To educate on various sensors used in Robotic automation	On successful completion of the course, the student will be able to: **CO1:** Understand principles of Automation , pneumatics and hydraulics systems **CO2:** Understand types of automation. **CO3:** Understand basic concepts of robotics **C04:** Select appropriate drive for Robotic applications. **C05:** To Select proper sensors for robot as per application requirement

UNIT 1 **Automation:** Definition, Advantages, goals, types, need, laws and principles of Automation. Elements of Automation. Fluid power and its elements, application of fluid power, Pneumatics vs. Hydraulics, benefit and limitations of pneumatics and hydraulics systems, Role of Robotics in Industrial Automation.	**CO1** **10 Hrs**
UNIT 2 **Type Automation:** Automated Flow lines, Methods of Workpart Transport, Transfer Mechanism, Buffer Storage, Control Functions, and Automation for Machining Operations, Design and Fabrication Considerations.	**CO2** **11 Hrs**
UNIT 3 **Fundamentals of Robotics** Historical development of Robotics, Definitions of Industrial Robot, Type and	**CO3** **12Hrs**

Classification of Robots, Asimov's laws of robotics, Robot configurations, Robot Components, Robot Degrees of Freedom, Work volume and work envelope, Robot Joints and symbols, Robot Coordinates, Robot Reference Frames, Resolution, accuracy and precision of Robot, Work cell control	
UNIT 4 **Robot Drive Systems** Pneumatic Drives, Hydraulic Drives, Mechanical Drives, Electrical Drives-D.C. Servo Motors, Stepper Motors, A.C. Servo Motors, BLDC-Salient Features, Applications and Comparison of all these Drives, Micro actuators, selection of drive, Power transmission systems for robot, Motion conversion, Determination of HP of motor, Types of Gearbox: - Planetary, Harmonic, Cycloidal gearbox and gear Ratio, variable speed arrangements	**CO4** **8 Hrs**
UNIT 5 **Robot Sensors** Transducers and sensors, Sensors in robotics, Principles and applications of the following types of sensors- Proximity Sensors, Photo Electric Sensors, Position sensors – Piezo Electric Sensor, LVDT, Resolvers, Encoders – Absolute and Incremental: - Optical, Magnetic, Capacitive, pneumatic Position Sensors, Range Sensors- Range Finders, Laser Range Meters, Touch Sensors, Force and torque sensors, Safety Sensor: Light Curtain, Laser Area Scanner, Safety Switches, Machine vision	**CO15** **7Hrs**

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Automation, Production Systems and Computer Integrated Manufacturing	M.P.Grover	4th Edition	Pearson Education.
2	Industrial Robotics, Technology, Programming & Applications	Groover, M.P. Weiss, M. Nagel, R.N. & Odrey, N.G., Ashish Dutta	2nd Edition	Tata McGraw Hill Education Pvt. Ltd.

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S. No.	Title	Authors	Edition	Publisher
1	Anatomy of Automation	Amber G.H & P.S. Amber,	1962	Prentice Hall
2	Robotics Technology and Flexible Automation	S. R. Deb	2nd Edition	Tata McGraw Hill.

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Subject Code EEE100842	Utilization of Electrical Energy	L = 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objectives	Course Outcomes
The objective of the course to: 1. This course provides an introduction to the principles of electrical drives and their applications. 2. This course deals with the fundamentals of illumination and its classification. 3. This course provides knowledge on electrical traction systems.	**Students will be able to:** **CO1** To understand the operating principles and characteristics of traction motors with respect to speed, temperature, loading condition. **CO2** To acquaint with the different types of heating and welding techniques. **CO3** To study the basic principles of illumination and its measurement. **CO4** To understand the basic principle of electric traction including speed– time curves of different traction services. **CO5** To understand the method of calculation of various traction system for braking, acceleration and other related parameters, including demand side management.

UNIT 1 **Electric Drives, Elevators and Its Industrial Applications** Introduction, Factors affecting selection of Motor, Types of Load, Steady State Characteristics of Drives, Transient Characteristics, Size of Motor, Load Equalization, Industrial Applications, Speed Control Systems, Different Operations.	**CO1** **10 Hrs**
UNIT 2 **Electric Heating, Welding & Electrolytic Process:** Advantages and methods of electric heating, resistance heating, induction heating, and dielectric heating. Electric welding, resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding. Principle,	**CO2** **9 Hrs**

Faraday's laws of electrolysis, current efficiency, energy efficiency.	
UNIT 3 **Illumination:** Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light. Discharge lamps, MV and SV lamps comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of lighting and flood lighting.	**CO3** **10 Hrs**
UNIT 4 **Electric Traction – I:** System of electric traction and track electrification. Review of existing electric traction systems in India. Special features of traction motor, methods of electric braking – plugging, rheostatic braking and regenerative braking. Mechanics of train movement. Speed-time curves for different services – trapezoidal and quadrilateral speed time curves.	**CO4** **8 Hrs**
UNIT 5 **Electric Traction – II :** Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and braking retardation adhesive weight and coefficient of adhesion	**CO5** **8Hrs**

Text Books:

S. No.	Title	Author(s)	Edition	Publisher
1	Utilization of Electrical Energy	E. Opens haw Taylor	1st Edition	University Press
2	Art & Science of Utilization of Electrical Energy	H.Partab	3rd Edition, 1980	Pritam Surat & Sons.

Reference Books:

		July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairman (AC)	Chairman (BoS)	Date of release	Version	

SYLLABUS

B. Tech. Eighth Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

S. No.	Title	Author(s)	Edition	Publisher
1	Utilization of Electrical Power and Electric Traction	J.B.Gupta	10th Edition 2012	S.K.Kataria & Sons
2	Utilization of Electrical Power and Electric Traction	G. C .Garg	2004	Khanna Publishers

SYLLABUS

B. Tech. Eighth Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code EEE103891	High Voltage Engineering Lab	L =0	T = 0	P = 2	Credits = 1
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	25		25	50	

List of Experiments

List of Experiments

1. To calibrate the voltmeter of High voltage control panel with the help of standard sphere gap.
2. To determine the corona starting voltage for :
    a) Rod-plane gap
    b) Rod-sphere gap
3. To study & determine breakdown strength of cable (11KV).
4. Study & determination of breakdown voltage of rod & rod gap.
5. To test Breakdown voltage and One minute with stand voltage on transformer oil.
6. To test power frequency break down strength of solid insulating materials.
    a) Paper
    b) Presspan
    c) Bakelite
7. To determine flash over voltage of 11 KV Disc insulation.
8. To find the string efficiency of a string of 11KV insulator disc.
9. To study impulse generator & obtained standard impulse voltage wave.

List of Equipments Required:

1. HV testing Transformer.
2. Voltmeter.
3. Power frequency high voltage transformer.
4. Sphere arrangement.
1. 5.Solid Insulator testing Set.
5. Impulse Voltage Generator.
6. Auto transformer
7. Oil testing kit

SYLLABUS

B. Tech. Eighth Semester- DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code EEE103892	Installation, Maintenance and Testing of Electrical Equipment Lab	L =0	T = 0	P = 2	Credits = 1
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	25		25	50	

List of Experiments

List of Experiments (At least ten experiments are to be performed by each student)

1. Calibration of Ammeter and voltmeter.
2. To study and prepare the standard operating procedure required while taking electrical shutdown.
3. Calibration of Wattmeter.
4. Calibration of Energy meter.
5. Testing of wiring installation using megger.
6. Testing of Cable using Spark Tester.
7. Current Transformer Testing.
8. Potential Transformer Testing.
9. To study the Installation of Plate and Pipe earthing.
10. Measurement of Earth Resistance using Earth Tester.
11. To study the installation and routine test required for commissioning of 3phase Induction motor.
12. Study of Installation of Pole Mount Substation and preparation of it's estimate.
13. Installation, Maintenance and Testing of HPMV/ Sodium Vapour/ Metal Halide Lamp.
14. Live Demonstration of Fire Fighting to extinguish Electrical Fire using Dry Powder type Fire extinguisher. (Mock Demo to entire group/class at a time; No batch size limitation)
15. Live Demonstration of Artificial Respiration Techniques, Preferably by a Doctor with the help of Dummy Model. (Mock Demo to entire group/class at a time; No batch size limitation)

Apparatus Required:

1. CT, PT
2. Energy meters
3. Ammeter, Voltmeter
4. Induction motor
5. Megger
6. Cable Tester
7. Fire extinguisher

Reference Books:

1. Testing, commissioning, operation and maintenance of Electrical equipments - S. Rao, 6th Edn. Khanna Publishers.
2. A course in electrical and electronic measurement and instrumentation, Sawhney.

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