

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: **B.Tech (VIII)**

Subject: **Installation Maintenance & Testing of Electrical Equipments**

Periods per week (L-T-P): **(2-1-0)**

Number of class Test to be conducted: **2 (Minimum)**

Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

Branch: **Electrical Engineering**

Course Code: **D024811(024)**

Credits: **03**

No. of assignment to be submitted: **05**

COURSE OBJECTIVES:

After successful completion of this course, the student will be able to,

CO Statement	Blooms Level
Categorize and describe the site management activities	2
Categorize various transformer maintenance activities	3
Categorize various Switchgear and Circuit Breaker maintenance activities	3
Categorize various electrical rotating machines maintenance activities	3
Illustrate hotline maintenance and electrical fire safety	4

COURSE DETAILS:

UNIT – I: OVERVIEW OF SITE MANAGEMENT, ELECTRICAL SAFETY

Introduction to Site activities; Civil works, Erection, Testing & Commissioning, Operation and Maintenance, Type and Scope of Maintenance, Safety management, Electrical shocks, treatment of shock, Recommended safety precautions against electrical shocks in LV and HV installations, Earth lead and its size, permissible earth resistance for different installations, improvement of earth resistance, Safety procedure during commissioning phase and Operation & maintenance phase.

UNIT – II: 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.

UNIT – III: 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

UNIT – IV: ROTATING MACHINES

Standard designation for cooling and degree of protection, Installation and commissioning of induction motor and rotating machines, drying out of electrical rotating machines, installation resistance measurements, Mechanical maintenance of rotating machines, Care, servicing and maintenance of motor, Mechanical fixture and alignment, Troubles, causes, remedies and protective devices during respective abnormal condition in low voltage induction motor, Testing of induction motors.

UNIT – V: 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, Electrical accidents, Safety regulations, Fire Fighting to extinguish Electrical Fire using Dry Powder type Fire extinguisher.

TEXT BOOKS:

1. Testing, commissioning, operation and maintenance of Electrical equipments, S. Rao, 6th Edn. Khanna Publishers.

REFERENCE BOOKS:

1. Installation maintenance and testing of Electrical Equipments, S. Tarlok, S. K. Kataria & Sons
2. Fundamentals of maintenance of Electrical Equipment by Bhatia Khanna Pub.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: **B.Tech (VIII)**

Branch: **Electrical Engineering**

Subject: **EHV AC DC Transmission (Elective)**

Course Code: **D024831(024)**

Periods per week (L-T-P): **(2-1-0)**

Credits: **03**

Number of class Test to be conducted: **2 (Minimum)**

No. of assignment to be submitted: **05**

Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

Course Outcomes: After successful completion of this course, the student will be able to:

CO Statement	Blooms Level
Describe fundamentals of EHV AC and DC Transmission system.	2
Describe the series / shunt Compensation of line by applying FACTS devices.	2
Illustrate the conditions of over voltages transmission system.	5
Explain the components of EHV DC system.	5
Explain Control of EHV DC system.	2

UNIT – I: Fundamentals of EHV AC & DC transmission and Converter Constitution of EHV AC and DC Links, Kind of DC Links, Limitations and advantages of AC and DC Transmission, Principal application of AC and DC Transmission, trends EHV AC and DC Transmission, Power-handling capacity, Converter analysis Graetz circuit, Firing control, overlapping.

UNIT – II: Line Compensation and FACTS Devices Extra-long distance lines, Voltage profile of loaded and unloaded line along the line, Compensation of lines, series and shunt compensation, Shunt reactors, Tuned power lines, Problems of extra-long compensated lines, FACTS concept and application.

UNIT – III: Traveling waves and Over voltages in transmission system Travelling waves on transmission systems, their shape, attenuation and distortion, effect of junction and termination on propagation of travelling waves, Over voltages in transmission system, Lightning, switching and temporary over voltage: Control of lighting and switching over voltages.

UNIT – IV: Components and working of EHV dc system Components of EHV dc 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 mis-operation, Commutation failure, Multi-terminal D.C. lines.

UNIT – V: Control of EHV DC system Control of EHV dc system desired features of control, control characteristics, constants current control, Constant extinction angle control, Ignition angle control, parallel operation of HVAC & DC system, Problems and advantages.

Textbooks:

1. EHV AC Transmission, Begamudre, New Age International.
2. EHV AC & DC Transmission, Manoj Nair, Balaji publication
3. HVDC Transmission, Padiyar, New Age Pbs.

Reference Books:

1. EHV-AC and HVDC Transmission Engineering and Practice: Theory, Practice and Solved Problems, Sunil S. Rao, Khanna Publisher.
2. Direct current transmission, Edward Wilson Kimbark, Wiley-Interscience.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: **B.Tech (VIII)**
Subject: **Flexible AC Transmission System (Elective)**
Total Theory Periods - **32**
Class Tests: **Two (Minimum)**
Total marks in End Semester Exam: **100**

Branch: **Electrical Engineering**
Subject Code: **D024832(024)**
Total Tutorial Periods: **8**
Assignments: **Two (Minimum)**

Course Outcomes:

After successful completion of this course, student will be able to:

CO Statement	Blooms Level
Gain the basic knowledge of FACTS controller and its types.	
Explain the operation of Voltage and Current Source Converters.	
Describe the operation of Static Shunt, Static Series and Combined Compensators.	

UNIT-I: Introduction of FACTS Controllers

Problems of AC power transmission, Power Flow in parallel and meshed path, Overview of stability consideration, loading capabilities, Power flow control in AC transmission system, Reactive power compensation, Basic types of FACTS Controllers, Advantages of FACTS technology.

UNIT-II: Voltage Source Converters (VSCs) and Current Source Converters (CSCs)

Basic concepts of VSC, single-phase full wave bridge converter operation, single phase-leg operation, three-phase full wave bridge converter and its operation, transformer connections for 12-pulse, 24-pulse and 48-pulse operation. Basic concepts, three-phase CSCs, three-phase full wave rectifier, comparison of VSC and CSC.

UNIT-III: Static Shunt Compensators:

Basic concepts, method of controllable VAR generation, Static VAR compensator (SVC), application of SVC in power systems, working of STATCOM, V-I and V-Q characteristics, transient stability enhancement and exchange of real power using STATCOM, comparison of SVC and STATCOM, Merits of hybrid compensators.

UNIT-IV: Static Series Compensators

Objectives of series compensation, variable impedance type series compensation, GTO thyristor controlled series capacitors (GCSC), thyristor controlled series capacitor (TCSC), basic concepts of GCSC and TCSC.

UNIT-V: Combined Compensators

UPFC: Unified Power Flow Controller (UPFC), basic operating principles, conventional transmission control capabilities, Comparison of UPFC to series compensators, Applications of UPFC.

IPFC: Interline Power Flow Controller (IPFC), basic operating principles and characteristics, Applications of IPFC.

Text Books:

1. N. G. Hingorani and L. Gyugyi, "Understanding FACTS: Concepts and Technology of FACTS Systems", Wiley-IEEE Press, 1999.
2. K. R. Padiyar, "FACTS Controllers in Power Transmission and Distribution", New Age International (P) Ltd. 2007.
3. T. J. E. Miller, "Reactive Power Control in Electric Systems", John Wiley and Sons, New York, 1983.

Reference Books:

1. Yong Hua Song, Allan T Johns, Flexible AC Transmission Systems FACTS, 1999.
2. Xiao Ping Zhang, Christian Rehtanz, Bikash Pal, Flexible AC Transmission Systems 2006.
3. R. Mohan & R. M. Mathur, Thyristor-based FACTS Controllers for Electrical Transmission Systems, John Wiley, 2002.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: **B.Tech (VIII)**

Subject: **Biomedical Instrumentation (Elective)**

Periods per week (L-T-P): **(2-1-0)**

Number of class Test to be conducted: 2 (Minimum)

Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

Branch: **Electrical Engineering**

Course Code: **D024833(024)**

Credits: **03**

No. of assignment to be submitted: **05**

Course Outcomes: After successful completion of this course, the student will be able to:

CO Statement	Blooms Level
Explain an acquaintance of the physiology of the heart, lung, blood circulation and circulation respiration.	2
Understand the various sensing and measurement devices of electrical origin.	2
Illustrate the latest ideas on devices of non-electrical devices.	5
Describes the important and modern methods of imaging techniques.	2
Describes latest knowledge of medical assistance / techniques and therapeutic equipment.	2

UNIT-I: Human Physiology and Basics:

Brief introduction to human physiology, Basic components of bio-medical instruments, bioelectric signals, action potentials, Bio-electrodes.

UNIT-II: Transducers

Biomedical Transducers: displacement, velocity, force, acceleration, flow, temperature, potential, dissolved ions and gases.

UNIT-III: Electro-Physiological Measurements

Analysis of EEG, ECG, EMG, EOG & Bio-Potential Amplifiers for ECG, EMG, EEG, etc.

UNIT-IV: Electrical Parameter Measurements

Cardiovascular measurement-blood pressure, blood flow, stroke volume, Impedance

Plethysmography, Cardiac output, heart sound etc. Instrumentation for respiratory & nervous systems.

UNIT-V: Monitoring, Assisting, Therapeutic Equipment and Safety

Patient care & monitoring system, Remote monitoring through telephone, Internet, Satellite link, Safety aspects associated with Biomedical Instrumentation. Recent advances in Bio-Medical Instrumentation, Microprocessor based systems, Laser & optical Fiber systems.

Text Books:

1. Biomedical Instrumentation and Measurements, Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, Prentice-Hall,
2. Handbook of Biomedical Instrumentation, R. S. Khandpur, McGraw Hill

Reference Books:

1. Biomedical Instrumentation, M. Arumugam, Anuradha Agencies.
2. Introduction to Biomedical Engineering, Domach, Pearson Education.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: **B.Tech (VIII)**

Branch: **Electrical Engineering**

Subject: **VLSI Design (Elective)**

Course Code: **D024834(024)**

Periods per week (L-T-P): **(2-1-0)**

Credits: **03**

Number of class Test to be conducted: **2 (Minimum)**

No. of assignment to be submitted: **05**

Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

Course Outcomes: After successful completion of this course, the student will be able to:

CO Statement	Blooms Level
Apply his/ her knowledge in basic design techniques for IC fabrication.	4
Understand layout design rules and logic design.	5
Help in VLSI Fabrication Industries.	2
Illustrate the Design of CMOS.	2
Explain the ideas and concepts of Subsystem designing.	5

Unit-I: Overview of VLSI Design Methodology

VLSI design process-Architectural Design-Logical , Design-Physical, Design-Layout Styles-Full custom-semi custom approaches. Basic Electrical properties of MOS & CMOS circuits: NMOS enhancement transistor-PMOS enhancement transistor-threshold voltage-threshold voltage equations-MOS devices equations-Basic DC equations-Second order effects-MOS modules-small signal AC characteristics –NMOS inverter-Steered input to an NMOS modules-Depletion mode & enhancement mode pull ups-CMOS inverter-DC characteristics-Inverter delay-pass transistor transmission gate.

Unit-II: VLSI Fabrication Techniques

An overview of wafer fabrication –wafer Processing-Oxidation-Patterning- Diffusion –Ion implantation-Deposition-Silicon gate NMOS process-CMOS processes-Nwell-Pwell-Wintub Silicon on insulator- CMOS process enhancement-Interconnect-Circuit elements.

Unit-III: 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.

Unit-IV: Logic Design

Switch logic-pass transistor & transmission gate-Gate logic-Inverter-two point, NAND gate-NOR gate-other forms of CMOS logic-Dynamic CMOS logic-clocked CMOS logic-Precharged domino CMOS logic-structured design-simple combinational logic design examples-Parity generator Multiplexes-clocked sequential circuits-two phase clocking-charge storage-dynamic register element-NMOS & CMOS- dynamic shift register-semi static register-JK flip flop circuit.

Unit-V: 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

Text Books:

1. Basic VLSI Design, Douglas A.Pucknell& Kamran Eshranghian, Prentice Hall of India, New Delhi, 3rd edition 1994.

2. CMOS VLSI Design : A Circuits and Systems Perspective, Neil H. E. Weste, David Harris and Ayan Banerjee, Pearson, 3rd Edition
3. Introduction to NMOS & CMOS VLSI system design, Amar Mukherjee, Prentice Hall, USA, 1986

Reference Books:

1. Introduction to VLSI system, Caver Mead & Lynn Conway, Addison Wesley.
2. Introduction to VLSI design, Eugene D.Fabricus, McGraw Hill International edition, 1990.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: **B.Tech (VIII)**

Subject: **Robotics and Automation (Elective)**

Periods per week (L-T-P): **(2-1-0)**

Number of class Test to be conducted: **2 (Minimum)**

Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

Branch: **Electrical Engineering**

Course Code: **D024835(024)**

Credits: **03**

No. of assignment to be submitted: **05**

Course Outcomes: After successful completion of this course, the student will be able to:

CO Statement	Blooms Level
Create matrix algebra and Lie algebra for computing the kinematics of robots.	2
Calculate the forward kinematics and inverse kinematics of serial and parallel robots.	3
Calculate the Jacobian for serial and parallel robot.	3
Apply the path planning for a robotic system.	4
proficient in the use of Maple or Matlab for the simulation of robots.	5

UNIT-I: Fundamental Concepts of robotics

History, present status & future trends-Robotics & automation-Laws of Robotics-Robot definitions Robotics systems & robot anatomy-Specification of Robots-resolution, Repeatability & accuracy of a manipulator. Robot Drives & Power Transmission Systems & Control: Robot drive mechanisms, hydraulic-electric-pneumatic drives, mechanical transmission method-Rotary-to /Rotary motion conversion, Rotary –to linear motion conversion-End effectors-Types- in piping problem-Remote centered compliance devices-control of actuators in robotics mechanisms.

UNIT-II: Sensors & Intelligent Robots

Sensory devices-non-optical-position sensors-optical position sensors-Velocity Sensors-Proximity sensors-contact & non-contact type-touch &slip sensors-Force & torque sensors-AI & Robotics.

UNIT-III: Computer Vision for Robotics Systems

Robot vision systems-Imaging components-image representation-Hardware aspects-Picture coding Object recognition & categorization-Visual Inspection-Software Considerations Application, Commercial robotic vision systems

UNIT-IV: Transformations & Kinematics

Homogenous coordinates-coordinates references frames-Homogenous transformation for the manipulator-The forward & inverse problem of manipulator kinematics-Motion generation, Manipulator dynamics- Jacobian in terms of D-H Matrices-Controller architecture.

UNIT-V: Robot Cell Design & Control

Specification of commercial robots-Robots design & process specification-Motor selection in the design of a robotic joint-Robot cell layouts-Economic & social aspect of robotics. Application of Robots: Capabilities of Robots-Robotics Applications-Obstacle Avoidance-Robotics in India-The future of robotics Factor Automation-Hierarchical computer control.

Text books:

1. Robotics Engg-An Integrated Approach, Richard D.Klafter, Thomas A.Chmielewski Michael Negin, Eastern Economy Edition, Prentice Hall of India P.Ltd.1989.
2. Robotics Technology & Flexible Automation, S. R. Deb and S. Deb, McGraw Hill 2ndedition.

Reference Book:

1. Robotics: Control, Sensing, Vision& Intelligence, K.S.Fu, R.C. Gomalez, C.S.G. Lee,tat McGraw Hill.
2. Industrial Robots-Technology, Programming & application, Mikell P.Groover et.al, McGraw Hill, 2nd edition.
3. Handbook of Industrial Robotics, Shiman Y.Nof, John Willey & Sons, New York, 1985

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Semester: **B.Tech (VIII)**

Subject: **Electrical Estimation and Costing (Elective-V)**

Periods per week (L-T-P): **(2-0-0)**

Number of class Test to be conducted: **2 (Minimum)**

Scheme of Examination (Theory): **Total Marks-150 [ESE-100, CT-20, TA-30]**

Branch: **Electrical Engineering**

Course Code: **D024838(024)**

Credits: **02**

No. of assignment to be submitted: **05**

Course objectives:

After successful completion of this course, the student will be able to-

CO Statement	Blooms Level
Explain general principles of estimation & residential building electrification	1
Plan detailed estimates and costing of residential and commercial installation	5
Design and estimate of overhead transmission & distribution lines, Substations	6

UNIT-I: Principle of Estimation and Residential Building Electrification

Introduction to estimation and costing, Electrical Schedule. Determination of cost material and labor Contingencies. Overhead charges. General Rules, guidelines for wiring of residential installation and positioning of equipments, Principles of circuit design in lighting and power circuits. Procedures for designing the circuits and deciding the number of circuits, Method of drawing single line diagram.

UNIT-II: Electrification of Commercial Installation

Design considerations of electrical installation system for commercial building, Load calculation and selection of size of service connection and nature of supply, Deciding the size of the cables, bus bar and bus bar chambers, Mounting arrangements and positioning of switchboards, distribution boards main switch etc, Earthing of the electrical installation.

UNIT-III: Service Connection, Power Circuits, Inspection and Testing of Installation

Inspection of internal wiring installations, Inspection of new installations, testing of installations, testing of wiring installations, Important considerations regarding motor installation wiring, Determination of rating of cables Determination of rating of fuse, Determination of size of Conduit, distribution Board main switch and starter.

UNIT-IV: Design of Overhead Transmission and Distribution Lines

Overhead line insulators, Insulator materials, Types of insulators, Lightning Arrestors, accessories, Erection of supports, setting of stays, Fixing of cross arms, Fixing of insulators, Conductor erection, Repairing and jointing of conductor, Dead end clamps, Positioning of conductors and attachment to insulators Jumpers, Tee-offs, Earthing of transmission lines, Guarding of overhead lines, Clearance of conductor from ground.

UNIT-V: Design and Estimation of Substation

Classification of substation, Indoor substations, Outdoor substations, Selection and location of site for substation, Main Electrical Connections, Graphical symbols for various types of apparatus and circuit elements on substation main connection diagram.

Text Books:

1. Electrical Installation Estimating & Costing, J.B.Gupta,VIII Edition S.K.Katria & Sons New Delhi.
2. Electrical Design Estimating and Costing, K.B.Raina S.K.Bhattacharya, New Age.

Reference Books:

1. Electrical Wiring Estimating and Costing, S.L.Uppal, G.C Garg, Khanna Publishers.