

POLYTECHNIC ENGINEERING
Sri Satya Sai University of Technology & Medical Sciences, Sehore (M.P.)
Syllabus of Examination - AICTE Pattern
Undergraduate Diploma Courses in Engineering & Technology
Department of Electrical Engineering
Semester-V

Course Code	DEEA-501
Course Title	Energy Conservation and Audit
Number of Credits	4 (L: 3: T:0 : P: 0)

Course Outcomes:

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

- Interpret energy conservation policies in India
- Implement energy conservation techniques in electrical machines
- Apply energy conservation techniques in electrical installations
- Use cogeneration and relevant tariff structures to reduce losses
- Undertake energy audits for electrical systems

Course Contents:

Unit – I: Energy Conservation Basics

- **Energy Scenario:** Primary and Secondary Energy, Energy demand and supply, National scenario
- **Energy Conservation and Energy Audit:** Concepts and differences
- **Indian Electricity Act 2001:** Relevant clauses of energy conservation
- **Bureau of Energy Efficiency (BEE):** Roles and responsibilities
- **Maharashtra Energy Development Agency (MEDA):** Roles and responsibilities
- **Star Labelling:** Need and its benefits

Unit – II: Energy Conservation in Electrical Machines

- **Need for Energy Conservation** in induction motor and transformer
- **Energy Conservation Techniques in Induction Motors:**
 - Improving power quality
 - Conducting motor surveys
 - Matching motor with load
 - Minimizing idle and redundant operation
 - Operating in star mode
 - Rewinding motors
 - Replacing with energy-efficient motors
 - Periodic maintenance
- **Energy Conservation Techniques in Transformers:**
 - Load sharing
 - Parallel operation
 - Isolation techniques

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- Replacement by energy-efficient transformers
- Periodic maintenance
- **Energy Conservation Equipment:**
 - Soft starters
 - Automatic star-delta converters
 - Variable Frequency Drives (VFD)
 - Automatic Power Factor Controller (APFC)
 - Intelligent Power Factor Controller (IPFC)
- **Energy Efficient Machines:**
 - **Energy Efficient Motors:** Features, advantages, applications, and limitations
 - **Energy Efficient Transformers:** Amorphous core transformers, epoxy resin cast transformers, and dry-type transformers

Unit–III: Energy Conservation in Electrical Installation Systems

- **Aggregated Technical and Commercial Losses (ATC):**
Power system structure at state, regional, national, and global levels
- **Technical Losses – Causes and Reduction Measures:**
 - a) Controlling I^2R losses
 - b) Optimizing distribution voltage
 - c) Balancing phase currents
 - d) Compensating reactive power flow
- **Commercial Losses:**
Causes such as pilferage and their remedies
- **Energy Conservation Equipment:**
 - Maximum Demand Controller
 - kVAR Controller
 - Automatic Power Factor Controller (APFC)
- **Energy Conservation in Lighting Systems:**
 - a) Replacing lamp sources
 - b) Using energy-efficient luminaires
 - c) Using light-controlled gears
 - d) Installing separate transformers/servo stabilizers for lighting
 - e) Conducting periodic surveys and maintenance programs
- **Energy Conservation Techniques in Fans:**
Use of electronic regulators

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Unit–IV: Energy Conservation through Cogeneration and Tariff

- **Cogeneration and Tariff:**
Concepts and significance for energy conservation
- **Types of Cogeneration (Based on Energy Use Sequence):**
 - Topping cycle
 - Bottoming cycle
- **Types of Cogeneration (Based on Technology):**
 - Steam turbine cogeneration
 - Gas turbine cogeneration
 - Reciprocating engine cogeneration
- **Selection Factors and Advantages of Cogeneration**
- **Tariff Structures and Their Applications:**
 - Types: Time-of-day tariff, Peak-off-day tariff, Power factor tariff, Maximum demand tariff, Load factor tariff
 - Application: Reducing energy bills

Unit–V: Energy Audit of Electrical System

- **Energy Audit Definition:**
As per the Energy Conservation Act
- **Energy Audit Instruments and Applications**
- **Questionnaire for Audit Projects**
- **Energy Flow Diagram:**
Sankey diagram representation
- **Audit Procedures:**
 - Walk-through audit
 - Detailed audit
 - Simple payback period calculation
- **Energy Audit Report Format**

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Course Title	Energy Conservation and Audit Laboratory
Number of Credits	4 (L: 0, T: 0, P: 2)

Course Objectives: The aim of this course is to help the student attain the following industry-identified competency through various teaching-learning experiences:

• **Undertake energy conservation and energy audit.**

Course Outcomes (COs):

Upon completion of this laboratory course, students will be able to:

- a) Interpret energy conservation policies in India
- b) Implement energy conservation techniques in electrical machines
- c) Apply energy conservation techniques in electrical installations
- d) Use cogeneration and relevant tariff systems for reducing losses in facilities
- e) Undertake energy audits for electrical systems

Practicals:

1. Identify star-labelled electrical apparatus and compare the data for various star ratings.
2. Determine the percentage loading of the given loaded induction motor.
3. Determine the reduction in power consumption in star mode operation of induction motor compared to delta mode.
4. Use Automatic Power Factor Controller (APFC) unit for improving the power factor of electrical loads.
5. Compare power consumption of different types of tube lights (with choke, electronic ballast, and LED lamps) by direct measurement.
6. Determine the reduction in power consumption by replacing lamps in a classroom or laboratory.
7. Determine the reduction in power consumption by replacing fans and regulators in a classroom or laboratory.
8. Collect the electricity bill of an industrial consumer and suggest a suitable tariff for energy conservation, including its impact on the energy bill.
9. Collect the electricity bill of a commercial consumer and suggest a suitable tariff for energy conservation and bill reduction.
10. Collect the electricity bill of a residential consumer and suggest practical methods for energy conservation and reduction in the energy bill.
11. Estimate energy savings by improving power factor and load factor for given scenarios.
12. Prepare a sample energy audit questionnaire for a given industrial facility.
13. Prepare an energy audit report – Phase I
14. Prepare an energy audit report – Phase II
15. Prepare an energy audit report – Phase III

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Course Code	DEEA-502
Course Title	Building Electrification
Number of Credits	4 (L: 3: T:0 : P: 0)

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences: •
Design electrical installation systems in building complexes.

Course outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

- a) Select accessories, wires, cables and wiring systems for electrification.
- b) Design electrical wiring installation system for residential unit.
- c) Design proper illumination scheme for residential unit.
- d) Prepare wiring layouts on wiring board.
- e) Locate and diagnose faults in electrical wiring installation.
- f) Do proper earthing for building electrification

Course contents:

Unit – I Wiring Tools and Accessories

Various tools required for wiring- screwdrivers, pliers, Try square, saws, hacksaw, chisel, hammers, mallet, rawl punch, hand drill machine, portable drilling machine, files, plumb bob, line thread, electricians knife, test lamp, tester and their BIS specifications, application, care & maintenance of tools. Classification of electrical accessories- controlling, holding, safety, outlet BIS symbols of following electrical accessories. Switch – Their types according to construction such as surface switch, flush switch, and pull switch, rotary switch, knife switch, pendent switch, Main-switch (ICDP, ICTP). Their types according to working such as single pole, double pole, two-way, two-way centre off, intermediate, series parallel switch Holders- Their types such as bayonet cap lamp holder, pendent holder, batten lamp holder, angle holder, bracket holder, tube light holder, screw type Edison and goliath Edison lamp holder, swivel lamp holder. Socket outlets and plugs- two pin, three-pin, multi pin sockets, two-pin and three-pin plug. Others- Iron connector, adaptor, and ceiling rose, distribution box, neutral link, bus-bar chamber. Wooden/ mica boards, Moulded/ MS Concealed boxes of different sizes. Modular accessories.

Unit – II Electrical Wires and Underground Cables Conductors: -

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wire, cable, bus bar, stranded conductor, cable, armoured cable, flexible cable, solid conductor, PVC wires, CTS wire, LC wire, FR (Fire retardant) wire, Size of wire according to BIS. Tools used for measurement of wire size, Wire jointing methods. Classification of cables, low tension, high tension, and extra high tension cables, solid, oil filled and gas filled type Cable insulation materials –vulcanized rubber (VIR), polyvinyl chloride (PVC), cross linked polythene (XLPE), impregnated paper, Selection of suitable cable size and type from standard data Cable jointing methods Cable laying methods. Factors determining selection of electric cables

Unit– III Wiring Methods and wiring layout Factors determining the selection of wiring methods.

Classification of wiring methods. PVC casing-capping wiring- wiring rules according to IS: 732-1983 Conduit wiring- Types of conduit, comparison between Metal and PVC conduit, types of conduit wiring (Surface/Concealed). Conduit wiring accessories, BIS rules for Metal and PVC conduit wiring. Comparison of various wiring systems. General BIS rules for domestic installations. Design, working and drawing of following electrical circuits: Simple light and fan circuits, Stair case wiring, Go-down wiring circuit, Bedroom lighting circuit, Corridor lighting circuit, Series parallel circuit, Master switch control circuit, Different lighting circuit using - Intermediate switch, Call bell circuit using bell indicator, Design of wiring circuits according to user's requirement.

Unit– IV Residential Building Electrification Domestic Dwellings/Residential Buildings:

Reading of Civil Engineering building drawing, Interpretation of electrical installation plan and electrical diagrams, electrical symbols as per IS: 732. Electrical installation for residential building as per part I section 9 of NEC-2011 Difference between residential and industrial load, rules/requirements related to lighting load followed in electrical installations, Positioning of equipment. Lighting and power circuits: Light and fan circuit, Power circuit Wiring and circuit Schematic diagram according to IS: 2042(Part-I)-1962: multiline and single line representation Load assessment: Selection of size of conductor, Selection of rating of main switch and protective switch gear. Design and drawing, estimation and costing of a residential installation having maximum 5 KW load; Sequence to be followed for preparing estimate; Calculation of length of wire and other materials, labour cost Testing of wiring installation as per IS: 732-1982: Insulation resistance - between earth and conductors, between conductors, polarity test of single pole switches. Testing of earth continuity path. Residential building Service Connection- types Underground and overhead. Calculation of Material required for service connection.

Unit– V Protection of Electrical Installation

Fuse in electric circuit: fuse element, fuse current rating, minimum fusing current, cut-off current, fusing factor, Fuse material Types of fuses –Re-wirable, cartridge fuses (HRC and LRC), Fuse material Selection of fuse. Miniature circuit Breaker (MCB)-Construction, Principle rating and uses, Earth Leakage Circuit Breaker (ELCB)-Construction, Principle rating and uses. System and equipment earthing and its requirements, Earth, earth electrode, earth current, earth terminal, earthing wire, earthing lead, fault current, leakage current, Measurement of earth resistance using earth tester, Methods of reducing earth resistance, Methods of earthing as per IS 3043: 1987 and their procedure- Driven pipe, pipe and plate earthing, modern methods of earthing,

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Illumination in Residential Installation

Concept of Luminous flux, Luminous intensity, Lumen, Illumination or illuminance, Lux, Space-height ratio, utilization factor, depreciation factor, luminous efficiency- values for different luminaries. Laws of Illumination-Inverse Square Law, Cosine Law, illumination received directly underneath, horizontal screen and screen moved horizontally at certain distance Factors affecting the illumination. Different types of lighting arrangements, Luminous flux of different types of light sources, Lux level required for different places as per SP 72: 2010.

References:

1. Raina, K.B. and S.K.Bhattacharya, Electrical Design Estimating and Costing, New Age International Ltd., New Delhi, ISBN 978-81-224-0363-3
2. Allagappan, N. S. Ekambarram, Electrical Estimating and Costing, New Delhi, ISBN-13: 9780074624784
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5. Bureau of Indian Standard, IS: 732-1989, Code of practice for electrical wiring installation
6. Bureau of Indian Standard, SP 30 National Electrical Code 2010
7. Bureau of Indian Standard, SP 72 National Lighting Codes 2010

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Course Code	DEEA-502
Course Title	Building Electrification LAB
Number of Credits	4 (L: 0: T:0 : P: 2)

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:
Design electrical installation systems in building complexes.

Course outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

- a) Select accessories, wires, cables and wiring systems for electrification.
- b) Design electrical wiring installation system for residential unit.
- c) Design proper illumination scheme for residential unit.
- d) Prepare wiring layouts on wiring board.
- e) Locate and diagnose faults in electrical wiring installation.
- f) Do proper earthing for building electrification.

List of Practicals:

1. Prepare series testing board.
2. Select the electric wire using measuring and testing instruments for particular applications.
3. Identify cables of different current ratings.
4. Prepare wiring installation on a board showing control of one lamp, one fan and one socket from one switch board in PVC surface conduit wiring system.
5. Prepare wiring installation on a board.
6. Control one lamp from two different places using PVC surface conduit wiring system.
7. Prepare wiring installation on a board. Control one lamp from three different places using PVC surface conduit wiring system.
8. Prepare wiring installation on a board.
9. Perform go-down wiring for three blocks using PVC casing capping.
10. Design 2 BHK residential installation scheme and estimate the material required. And draw the details required for installation on A4 size sheet.
11. Test wiring installation using megger.

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Course Code	DEEA-503(A)
Course Title	Electric Vehicle
Number of Credits	3 (L: 3: T:0 : P: 0)

Course Objectives:

The aim of this course is to help the student attain the following industry-identified competency through various teaching-learning experiences: Maintain electric vehicles.

Course Outcomes (COs):

Upon successful completion of this course, students will be able to:

- a) Interpret the salient features of Hybrid Electric Vehicles
- b) Interpret the dynamics of hybrid and electric vehicles
- c) Maintain DC–DC converters in EV applications
- d) Maintain DC–AC converters in EV applications
- e) Select appropriate batteries for EV applications

Course Contents:

Unit–I: Introduction to Hybrid Electric Vehicles Evolution of Electric Vehicles

- Advanced electric drive vehicle technologies:
 - Electric Vehicles (EV)
 - Hybrid Electric Vehicles (HEV)
 - Plug-in Electric Vehicles (PIEV)
- Components of Hybrid Electric Vehicles
- Economic and environmental impact of electric and hybrid vehicles
- Parameters affecting environmental and economic analysis
- Comparative study of vehicle types based on cost and emissions

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Unit–II: Dynamics of Hybrid and Electric Vehicles

- General description of vehicle movement
- Factors affecting vehicle motion:
 - Vehicle resistance
 - Tyre-ground adhesion
 - Rolling resistance
 - Aerodynamic drag
 - Grading resistance equation
 - Dynamic equations
- Drivetrain configuration and classification
- Performance characteristics of IC engines and electric motors
- Need for gearboxes in EVs
- Classification of motors used in EVs
- Basic hybrid drivetrain architecture and types
- Energy-saving potential of hybrid systems
- HEV configurations:
 - Series
 - Parallel
 - Series-parallel
 - Complex hybrids

Unit–III: DC–DC Converters for EV and HEV Applications

- Converter-based EV and HEV configurations
- Classification:
 - Unidirectional
 - Bidirectional
- Step-down and step-up operations
- Boost and buck-boost converters
- Two-quadrant and multi-quadrant converters

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Unit–IV: DC–AC Inverters & Motors for EV and HEVs

- Principle of DC–AC conversion
- Half-bridge and single-phase full-bridge inverter operation with R and R-L loads
- Electric machines used in EVs and HEVs:
 - Working principles
 - Control mechanisms
- Motor types:
 - Permanent Magnet Motors
 - Switched Reluctance Motors
- Characteristics and applications

Unit–V: Batteries and Energy Sources

- Battery overview and parameters
- Types of batteries used in EVs
- Battery charging techniques
- Alternative energy sources:
 - Solar photovoltaic cells
 - Fuel cells
 - Super capacitors
 - Flywheels
- EV control systems and ECU overview
- Schematic hybrid drivetrain and control architecture
- Regenerative braking in EVs

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Course Code	DEEA-503(B)
Course Title	Industrial Automation and Control

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Number of Credits	3 (L: 3: T:0 : P: 0)
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Course Objectives:

The aim of this course is to help the student attain the following industry-identified competency through various teaching-learning experiences:

- Maintain Industrial Automation Systems

Course Outcomes (COs):

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

- a) Identify different types of automation systems
- b) Interface input/output devices with PLC modules
- c) Develop ladder programs for PLC-based industrial applications
- d) Select suitable motor drives for different industrial processes
- e) Design and implement basic SCADA applications

Course Contents:

Unit–I: Introduction to Industrial Automation

- Automation: Need and benefits
- Types of automation systems: Fixed, Programmable, Flexible
- Overview of industrial automation systems: PLC, HMI, SCADA, DCS, Drives
- Evolution of Programmable Logic Controllers (PLC)

Unit–II: PLC Fundamentals

- Building blocks of PLC:
 - CPU
 - Memory organization
 - Input-output modules (Discrete and Analog)
 - Specialty I/O Modules
 - Power supply
- Fixed and Modular PLCs; redundancy in PLC modules
- Criteria for selecting I/O modules

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- Interfacing I/O devices with suitable modules

Unit–III: PLC Programming and Applications

- PLC I/O addressing
- PLC programming instructions:
 - Relay-type instructions
 - Timer instructions: On-delay, Off-delay, Retentive
 - Counter instructions: Up, Down, High-speed
 - Logical, comparison, data handling, and arithmetic instructions
- PLC Programming Languages:
 - Functional Block Diagram (FBD)
 - Instruction List
 - Structured Text
 - Sequential Function Chart (SFC)
 - Ladder Programming
- Simple programming examples:
 - Relay logic
 - Timer/counter-based
 - Logical and arithmetic control
 - Data handling
- **PLC-based Applications:**
 - Motor sequence control
 - Traffic light control
 - Elevator control
 - Tank level control
 - Conveyor system
 - Stepper motor control
 - Reactor control
 - Gate trigger circuits (R and RC circuits)

Unit–IV: Electric Drives and Special Machines

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- Types and functions of electric drives
- Characteristics and four-quadrant operation
- DC and AC motor control methods:
 - V/F control
 - Direct Torque Control (DTC)
 - Parameter tuning
- Drive specifications and selection for industrial applications
- Speed control for AC and DC motors

Unit–V: Supervisory Control and Data Acquisition (SCADA) Systems

- Introduction to SCADA:
 - Architecture/block diagram
 - Benefits and applications
- SCADA Editors and Components
- Interfacing SCADA with PLC:
 - Typical connection diagram
 - OPC (OLE for Process Control) architecture
 - Creating SCADA screens for simple objects
 - Linking SCADA tags/items to PLC ladder programs
- **SCADA Applications:**
 - Traffic light control
 - Water distribution systems
 - Pipeline monitoring and control

References:

1. Dunning, G., *Introduction to Programmable Logic Controllers*, Thomson/Delmar Learning, 2005. ISBN: 9781401884260
2. Jadhav, V. R., *Programmable Logic Controller*, Khanna Publishers, 2017. ISBN: 9788174092281
3. Petruzella, F. D., *Programmable Logic Controllers*, McGraw Hill, 2010. ISBN: 9780071067386
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Course Code	DEEA-504(A)
Course Title	Illumination Practices
Number of Credits	3 (L: 3: T:0 : P: 0)

Course Objectives:

The aim of this course is to help students attain the following industry-identified competency through various teaching-learning experiences:

- **Design illumination schemes and associated electrification of buildings.**

Course Outcomes (COs): Upon successful completion of this course, students will be able to:

- a) Select relevant lamps for various applications considering illumination levels
- b) Choose suitable lighting accessories for given wiring schemes
- c) Design illumination schemes for interior applications
- d) Design lighting layouts for residential, commercial, and industrial use
- e) Create efficient lighting designs for diverse outdoor applications

Course Contents:

Unit–I: Fundamentals of Illumination

- Basic concepts and terminology
- Laws of illumination
- Polar curves: meaning and application in lamp design
- Photometry and measurement of illumination
- Lighting calculation methods:
 - Watt/m² method
 - Lumens (light flux) method
 - Point-to-point method
- Illumination standards for various applications

Unit–II: Types of Lamps

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- Incandescent lamp
- ARC lamps: AC and DC arc lamps
- Fluorescent lamps
- Other types:
 - Mercury vapour lamp
 - HPMV lamp
 - Mercury iodide lamp
 - Sodium vapour lamp
 - Halogen lamps
 - Ultraviolet lamps
 - Neon lamps and neon sign tubes
 - Metal halide lamps
 - HID and arc lamps
 - LED lamps
 - CFLs
 - Lasers
- Lamp selection criteria

Unit–III: Illumination Control and Control Circuits

- Purpose of lighting control and dimmers
- Types of dimmers:
 - Resistance-type (salt water) dimmer
 - Dimmer transformer
 - Auto-transformer dimmer
 - Two-winding transformer dimmer
 - Electronic dimmers:
 - Thyristor-operated dimmer
 - Triac-operated dimmer
- Enhanced lighting control methods
- Lighting control circuits:
 - ON/OFF control
 - Single lamp controlled by single switch or two switches
 - Two-point, three-point, and four-point control methods

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Unit–IV: Illumination for Interior Applications

- Illumination standards for interior spaces
- Design considerations for:
 - Residential areas (1/2/3/4 BHK layouts)
 - Commercial premises
 - Industrial premises
- Illumination schemes for different interior applications

Unit–V: Illumination for Outdoor and Special Applications

- Factory lighting
- Street lighting (latest technologies)
- Flood lighting
- Railway station lighting
- Lighting for advertisements, hoardings, and sports arenas
- Agricultural and horticultural lighting
- Healthcare facilities and hospitals
- Decorative lighting, stage lighting
- Aquariums and shipyards
- Special-purpose lamps for photography and video production
- **References:**

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Course Code	DEEA-504(B)
Course Title	Electrical Instrumentation and condition monitoring
Number of Credits	3 (L: 3: T:0 : P: 0)

Course Objectives:

- The aim of this course is to help students Understanding concepts of **Measurements**, signal conditioning and Knowledge of standards relevant to specific industries.

Course Outcomes (COs):

- Upon successful completion of this course, students will be able to:
- Select appropriate instrumentation for various applications.
- Perform routine and advanced condition monitoring tasks.
- Analyze data to identify potential problems and prevent failures.
- Contribute to the reliability and efficiency of electrical systems and industrial processes

Course Contents

UNIT I. Basic Electrical Measurements:

- **Fundamentals of Measurement:**

Understanding concepts like accuracy, precision, range, resolution, and error analysis in electrical measurements.

- **DC and AC Measurements:**

Measuring voltage, current, resistance, power, and power factor using various instruments.

- **Electronic Instruments:**

Working with multimeters, oscilloscopes, signal generators, and logic analyzers.

- **Transducers:**

Learning about different types of transducers for converting physical parameters into electrical signals, including resistive, capacitive, inductive, and piezoelectric transducers.

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UNIT II. Instrumentation Systems:

- **Signal Conditioning:**

Understanding the need for signal conditioning (amplification, filtering, isolation) and common circuits like amplifiers, filters, and isolation amplifiers.

- **Data Acquisition Systems (DAS):**

Introduction to data acquisition hardware and software, including analog-to-digital converters (ADCs) and digital-to-analog converters (DACs).

- **Telemetry:**

Understanding principles of data transmission and communication in instrumentation systems.

UNIT III. Condition Monitoring Techniques:

- **Vibration Analysis:**

Using vibration sensors (accelerometers) and FFT analysis to detect faults in rotating machinery.

- **Thermography:**

Utilizing infrared cameras to identify temperature variations and potential issues in electrical equipment.

- **Partial Discharge Measurement:**

Detecting and analyzing partial discharges in high-voltage equipment to assess insulation condition.

- **Motor Current Signature Analysis:**

Analyzing motor current waveforms to detect faults like rotor defects, stator winding faults, and bearing problems.

- **Oil Debris Analysis:**

Analyzing lubricating oil samples for wear particles to assess the health of lubricated components.

- **Ultrasound Testing:**

Using ultrasound equipment to detect leaks, bearing defects, and other issues in machinery.

UNIT IV. Specific Applications:

- **Rotating Machinery:**

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Condition monitoring techniques applied to motors, generators, pumps, and compressors.

- **Transformers:**

Monitoring parameters like temperature, winding resistance, and oil quality to assess transformer health.

- **Circuit Breakers:**

Testing and monitoring the performance of circuit breakers.

- **Cables:**

Detecting faults and assessing the condition of cables using techniques like time-domain reflectometry (TDR).

UNIT V. Relevant Standards and Regulations:

- **IEEE Standards:** Understanding relevant IEEE standards for condition monitoring and electrical testing.
- **National Electrical Code (NEC):** Familiarity with NEC requirements for electrical installations and safety.
- **Industry-Specific Standards:** Knowledge of standards relevant to specific industries (e.g., power generation, oil and gas).

Course Code	DOE-505
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Course Title	Open Elective –I (A) Economic Policies In India
Number of Credits	3 (L:3: T:0: P:0)

Course Objectives:

The objective of this course is to familiarize the students of different streams with the basic concepts, structure, problems and issues concerning Indian economy.

Course outcomes:

At the end of the course, the student will be able to:

- 1 Understand Indian economics policy, planning strategies
- 2 It will enable to students to comprehend theoretical and empirical development across countries and region for policy purposes
- 3 Development Economics as a discipline encompasses different approaches to the problems of unemployment, poverty, income generation, industrialization from different perspectives
- 4 Able to identify the problems and capable to decide the application for future development
- 5 Analyze economic issues and find solutions to complex economic problems and take correct economic judgment

UNIT-I: Basic features and problems of Indian Economy: Economic History of India; Nature of Indian Economy, demographic features and Human Development Index, Problems of Poverty, Unemployment, Inflation, income inequality, Black money in India.

UNIT-II: Sectoral composition of Indian Economy: Issues in Agriculture sector in India, land reforms Green Revolution and agriculture policies of India,

UNIT-III: Industrial development, small scale and cottage industries, industrial Policy, Public sector in India, service sector in India.

UNIT-IV: Economic Policies: Economic Planning in India, Planning commission v/s NITI Aayog, Five Year Plans, monetary policy in India, Fiscal Policy in India, Centre state Finance Relations, Finance commission in India. LPG policy in India

UNIT-V: External sector in India: - India's foreign trade value composition and direction, India Balance of payment since 1991, FDI in India, Impact of Globalization on Indian Economy, WTO and India.

Reference Books:

1. Dutt Rudder and K.P.M Sunderam (2017). Indian Economy. S Chand & Co. Ltd. New Delhi.
2. Mishra S.K & V.K Puri (2017). Indian Economy and –Its Development Experience. Himalaya Publishing House.
3. Singh, Ramesh, (2016): Indian Economy, Tata-McGraw Hill Publications, New Delhi.
4. Dhingra, I.C., (2017): March of the Indian Economy, Heed Publications Pvt. Ltd.
5. Karam Singh Gill, (1978): Evolution of the Indian Economy, NCERT, New Delhi
6. Kaushik Basu (2007): The Oxford Companion to Economics of India, Oxford University Press.

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Course Code	DOE-505
Course Title	Open Elective -I (B) Disaster Management
Number of Credits	3 (L:3: T:0: P:0)

Course Objectives:

Following are the objectives of this course:

- 1 To learn about various types of natural and man-made disasters.
- 2 To know pre- and post-disaster management for some of the disasters.
- 3 To know about various information and organisations in disaster management in India.
- 4 To get exposed to technological tools and their role in disaster management..

Course outcomes:

After competing this course, student will be:

- CO1 Acquainted with basic information on various types of disasters
- CO2 Knowing the precautions and awareness regarding various disasters
- CO3 Decide first action to be taken under various disasters
- CO4 Familiarised with organisation in India which are dealing with disasters
- CO5 Able to select IT tools to help in disaster management

Unit – I: Understanding Disaster

Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity– Disaster and Development, and disaster management.

Unit – II: Types, Trends, Causes, Consequences and Control of Disasters

Geological Disasters (earthquakes, landslides, tsunami, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire)

Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters

(building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters) Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters.

Unit- III: Disaster Management Cycle and Framework

Disaster Management Cycle – Paradigm Shift in Disaster Management.

Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness.

During Disaster – Evacuation-Disaster Communication-Search and Rescue -Emergency Operation Centre Incident Command System – Relief and Rehabilitation

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Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure

Early Recovery – Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action.

Unit– IV: Disaster Management in India

Disaster Profile of India – Mega Disasters of India and Lessons Learnt.

Disaster Management Act 2005 – Institutional and Financial Mechanism,

National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national), Non-Government and Inter Governmental Agencies

Unit– V: Applications of Science and Technology for Disaster Management

Geo-informatics in Disaster Management (RS, GIS, GPS and RS).

Disaster Communication System (Early Warning and Its Dissemination).

Land Use Planning and Development Regulations, Disaster Safe Designs and Constructions,

Structural and Non Structural Mitigation of Disasters

S&T Institutions for Disaster Management in India

Reference Books:

1. Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management
2. Bhandani, R. K., An overview on natural & man-made disasters and their reduction, CSIR, New Delhi
3. Srivastava, H. N., and Gupta G. D., Management of Natural Disasters in developing countries, Daya Publishers, Delhi
4. Alexander, David, Natural Disasters, Kluwer Academic London
5. Ghosh, G. K., Disaster Management, A P H Publishing Corporation
6. Murthy, D. B. N., Disaster Management: Text & Case Studies, Deep & Deep Pvt. Ltd.

Course Code	DEEA-506
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Course Title	Summer Internship-II (6 weeks) after IVth Sem
Number of Credits	2 (L: 0: T:0 : P: 0)

Couse Objectives

To expose the students to actual working environment of electrical engineering and enhance their knowledge and skill from what they have learned in the classes. 2. Another purpose of this program is to instill the good qualities of integrity, responsibility and selfconfidence. 3. To persue students with the electrical field ethics and rules in terms of the society.

Course Outcomes:

Ability to communicate efficiently. Acquired to be a multi-skilled engineer with good technical knowledge of electrical and electronics components and their processing, management, leadership and entrepreneurship skills. Ability to identify, formulate and model problems and find engineering solution based on a systems approach.

Course content:

Students must observe following points to enrich their learning in electrical engineering during industrial training: -

Industrial environment and work culture. –

Organisational structure and inter personal communication. –

Machines/ equipment/ instruments - their working and specifications. –

Product development procedures and phases. - Project planning, monitoring and control. –

Quality control and assurance. - Maintenance system. - Costing system. –

Stores and purchase systems. - Roles and responsibilities of different categories of personnel. –

Customer services. –

Problems related to various areas of Work etc. –

Layout if any

To be submitted :The students has to submit the power point presentation of minimum15 slides of the training performed(comprising of points stated above) along with the original certificate of training performed with proper seal and signature of the authorized person.

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Course Code	DEEA-507
Course Title	Major Project-I (Project Planning)
Number of Credits	1 (L: 0: T:0 : P: 2)

COURSE MODULES

- Introduction to Project Management
- Project Design and Planning
- Project Implementation
- Budgeting
- Workplan Development
- Stakeholder Analysis
- Log Approach to project planning and Implementation
- Introduction to Monitoring and Evaluation

Course Outcomes: At the end of this course students will demonstrate the ability to

- Design and validate real life industrial based projects
- Analyze the dynamic response and the calibration of few instruments
- Learn about various measurement devices, their characteristics, their operation and their limitations
- Understand statistical data analysis
- Understand computerized data acquisition.
- Conceive a problem statement either from rigorous literature survey or from the requirements raised from need analysis.
- Design, implement and test the prototype/algorithm in order to solve the conceived problem.
- Able to write comprehensive report on major project work.