P.K.UNIVERSITY, SHIVPURI (MP)

(FACULTY OF ENGINEERING & TECHNOLOGY)

EVALUATION SCHEME & SYLLABUS

FOR

DIPLOMA IN ELECTRICAL ENGINEERING

ON

CHOICE BASED CREDIT SYSTEM (CBCS)

[Effective from the Session: 2025-26]

EVALUATION SCHEME

Diploma EE 6th Semester study and evaluation scheme

Study And Evaluation Scheme For Diploma Electrical Engineering												
Year- 3rd /Semester -6th												
Subject Code	Subjects Name	Study Scheme Periods/ Week			Credits	Marks in Evaluation Scheme						Total Marks of Internal & External
						Internal Assessment			External Assessment			
		L	T	P		Th	Pr	Total	Th	Pr	Total	Grand Total
DENVIEE601	Environmental Education & Disaster Management	4	-	-	4	30	-	30	70	-	70	100
DINSTEE602	Installation, Maintenance& Repair of Electrical Machines	4	1	-	5	30	-	30	70	-	70	100
DELECEE603	Electrical Design, Drawing & Estimating – II	4	-	-	4	30	-	30	70	-	70	100
DUTILEE604	Utilization of Electrical Energy	4	1	-	5	30	-	30	70	-	70	100
DELECEE605	Installation, Maintenance& Repair of Electrical Machines Lab	-	-	2	1	-	25	25	-	25	25	50
DPROJEE606	Project	-	-	12	6	-	100	100	-	100	100	200
Total		16	2	14	25	120	125	245	280	125	405	650
For pass the candidate is required to obtain 40% marks in each paper and 50% marks in aggregate.												250

Department of Electrical Engineering

(Faculty of Engineering & Technology)

P.K. University, Shivpuri (MP)

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3rd Year/6th Semester

DENVIEE601: ENVIRONMENTAL EDUCATION & DISASTER MANAGEMENT

1. INTRODUCTION: **(4 periods)**

- Basics of ecology, Ecosystem, Biodiversity Human activities and its effect on ecology and eco system, different development i.e. irrigation, urbanization, road development and other engineering activities and their effects on Ecology and eco system, Mining and deforestation and their effects.
- Lowering of water level, Urbanization.
- Biodegradation and Biodegradability, composting, bio remediation, Microbes. Use of bio pesticides and bio fungicides.
- Global warning concerns, Ozone layer depletion, Greenhouse Effect, Acid Rain, etc.

2. POLLUTION: (4 periods)

Sources of pollution, natural and manmade, their effects on living environments and related legislation.

(06 Periods)

2.1 WATER POLLUTION: **(06 periods)**

- Factors contributing water pollution and their effect.
- Domestic waste water and industrial waste water. Heavy metals, microbes and Leaching metal.
- Physical, Chemical and Biological Characteristics of waste water.
- Indian Standards for quality of drinking water.
- Indian Standards for quality of treated waste water.
- Treatment methods of effluent (domestic waste water and industrial/ Mining waste water), its reuse/safe disposal.

2.2 AIR POLLUTION:

Definition of Air pollution, types of air pollutants i.e. SPM, NOX, SOX, GO, CO2, NH3, F, CL, causes and its effects on the environment.

- Monitoring and control of air pollutants, Control measures techniques. Introductory Idea of control equipment in industries i.e.

A. Settling chambers
B. Cyclones
C. Scrubbers (Dry and Wet)
D. Multi Clones

E. Electro Static Precipitations
F. Bog Fillers.

- Ambient air quality measurement and their standards.
- Process and domestic emission control

- Vehicular Pollution and Its control with special emphasis of Euro-I, Euro-II, Euro-III and Euro IV.

(08 periods)

2.3 NOISE POLLUTION:

Sources of noise pollution, its effect and control.

2.4 RADISACTIVE POLLUTION:

Sources and its effect on human, animal, plant and material, means to control and preventive measures.

2.5 SOLID WASTE MANAGEMENT:

Municipal solid waste, biomedical waste, Industrial and Hazardous waste, Plastic waste and its management.

3. LEGISLATION: (08 periods)

Preliminary knowledge of the following Acts and rules made there under-

- The Water (Prevention and Control of Pollution) Act - 1974.
- The Air (Prevention and Control of Pollution) Act - 1981.
- The Environmental Protection (Prevention and Control of Pollution) Act - 1986. Rules notified under EPAct - 1986 Viz.

The Manufacture, Storage and Import of Hazardous Chemical (Amendment) Rules, 2000# The Hazardous Wastes (Management and Handling) Amendment Rules, 2003 # Bio-Medical Waste (Management and Handling) (Amendment) Rules, 2003.
the Noise Pollution (Regulation and Control) (Amendment) Rules, 2002. # Municipal Solid Wastes (Management and Handling) Rules, 2000.
The Recycled Plastics Manufacture and Usage (Amendment) rules, 2003.

4. ENVIRONMENTAL IMPACT ASSESSMENT (EIA): (10 periods)

- Basic concepts, objective and methodology of EIA.
- Objectives and requirement of Environmental Management System (ISO-14000) (An Introduction).

5. DISASTER MANAGEMENT:

Definition of disaster - Natural and Manmade, Type of disaster management, How disaster forms, Destructive power, Causes and Hazards, Case study of tsunami Disaster, National policy- Its objective and main features, National environment Policy, Need for central intervention, State Disaster Authority-Duties and powers, Case studies of various Disaster in the country, Meaning and Benefit of vulnerability reduction, Factor promoting vulnerability reduction and Mitigation, Emergency support function plan. Main feature and function of National Disaster Management Frame Work, Disaster mitigation and prevention, Legal Policy Frame Work, Early warning system, Human Resource Development and Function, Information dissemination and communication.

RECOMMENDED BOOKS

1. Aggarwal, J.C. (2007): Education for values, environment and human rights, Shipra publications, Delhi.
2. Dani,H.M.(1996): Environmental Education. Publication Bureau, Punjab University,Chandigarh.
3. Kohli,V.K. and Kohli,V(2000): Environmental Pollution and Management. Vivek Publishers, Ambala.
4. Nanda,V.K.(1997): Environmental Education, Anmol Publications, NewDelhi.
5. Nanda,V.K.(1997): Environmental Education, Anmol Publications, NewDelhi.
6. Sharma, R.C. Environmental Education, Metropolitan Book Pvt. Ltd.
7. Sungosh, S.M.(2006): An introduction to Environmental Education, Akashi Book Depot, Shillong .
8. Trivedi,R.N. (1990): Dimensions of safe environment, Anmol Publications, NewDelhi.

Department of Electrical Engineering

(Faculty of Engineering & Technology)

P.*K. University, Shivpuri (MP)*

3rd Year/ 6th Semester

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DINSTEE602: INSTALATION, MAINTENANCE AND REPAIR OF ELECTRICAL MACHINES

DETAILED CONTENTS

1. Tools and Accessories **(14 Periods)**

Tools, accessories and instruments required for installation, maintenance and repair work. Knowledge of Indian Electricity rules, safety codes, causes and prevention of accidents, artificial respiration of an electrocuted person, workmen's safety devices

2. Installation **(40 Periods)**

2.1 Installation of transmission and Distribution Lines

Erection of steel structures, connecting jumpers, tee-off points, joints and dead ends; crossing of roads, streets, power/telecommunication lines and railway line crossings, clearances; earthing of transmission lines and guarding, spacing and Configuration of conductors: Arrangement for suspension and strain insulators, bird guards, anti-climbing devices and danger plates; sizes of conductor, earth wire and guy wires. Laying of service lines, earthing, provision of service fuses, installation of energy meters

2.2 Laying of Underground Cables

Inspection, storage, transportation and handling of cables, cable handling equipment, cable laying depths and clearances from other services such as: water, sewerage, gas, heating and other mains, and also a series of power and telecommunication cables and coordination with these services, excavation of trenches, direct cable laying, including laying of cable from the drum, laying cable in the trench, taking all measurements and making drawings, back filling of trenches with earth or sand, laying protective layer of bricks etc.,) laying of cables into pipes and conduits and within buildings.

2.3 Elementary idea regarding, inspection and handling of transformers; pole mounted substations, plinth mounted substations, grid substation, bus bars, isolators, voltage and current transformers, lightning arrestors, control and relay panels, HT/LT circuit breakers, LT switches, installation of power/distribution transformers, dehydration. Earthing system, fencing of yard, equipment foundations and trenches etc.

2.4 Testing of various electrical equipment such as electrical motor, transformers, cables, and generators, motor control centres, medium voltage distribution panels, power control centres, motor control centres, lighting arrangement, storage, pre-installation checks, connecting and starting, pre-commissioning checks, drying out

2.5 Testing of Transformers: Type test, oil testing of transformers

3. Maintenance (30 Periods)

3.1 Types of maintenance, maintenance schedules, procedures

3.2 Maintenance of Transmission and Distribution System Authorized persons, danger notice, caution notice, permit to work, arranging of shutdowns personally, temporary earthing, and cancellation of permit and restoration of supply. Patrolling and visual inspection of lines - points to be noted during patrolling from ground; special inspections and night inspections;

Location of faults using Meggar, effect of open or loose neutral connections, provision of proper fuses on service lines and their effect on system, causes of dim and flickering lights.

3.3 Maintenance of Distribution Transformers

Transformer maintenance and points to be attended to in respect of various items of equipment

Checking of insulation resistance, transformer oil level and BDV test of oil, measurement of earth resistance

3.4 Maintenance of Grid Substations

Checking and maintenance of bus bars, isolating switches, HT/LT circuit breakers, LT switches. Power transformers.

3.5 Maintenance of Motors over hauling of motors, preventive maintenance, Trouble shooting of electric motors.

3.6 Domestic Installation

Introduction, testing of electrical installation of a building, testing of insulation resistance to earth, testing of insulation and resistance between conductors, continuity or open circuit test

RECOMMENDED BOOKS

1. Testing, Commissioning , Operation and Maintenance of Electrical Equipment by SRao,Khanna Technical Publication, New Delhi
2. Preventive Maintenance of Electrical Apparatus by SK Sharotri, Katson PublishingHouse, Ludhiana
3. Installation and Maintenance of Electrical Equipment by Praveen Kumar, NorthPublication, Jalandhar

Department of Electrical Engineering

(Faculty of Engineering & Technology)

P.K. University, Shivpuri (MP)

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3rd Year/6th Semester

DELECEE603: ELECTRICAL DESIGN, DRAWING & ESTIMATING – II

DETAILED CONTENTS

1 Contractor Control Circuits (10 periods)

Design of circuit drawing of schematic diagram and power wiring

diagram of following circuits, specification of contactors

1.1 DOL starting of 3-phase induction motor
1.2 3-phase induction motor getting supply from selected feeder
1.3 Forwarding/reversing of a 3-phase induction motor
1.4 Two speed control of 3-phase induction motor
1.5 Limit switch control of a 3-phase induction motor
1.6 Sequential operating of two motors using time delay relay
1.7 Manually generated star delta starter for 3-phase induction motor
1.8 Automatic star delta starter for 3-phase Induction Motor
1.9 Control circuit for cross road signal

2. Earthing (08 periods)

2.1 Concept and purpose of earthing Different types of earthing, drawings of plate and pipe earthing
2.2 Procedure of earthing, test of materials required and costing and estimating
2.3 Method of reducing earth resistance
2.4 Relevant IS specifications of earth electrode for earthing a transformer, a high building
2.5 Earthing layout of distribution transformer
2.6 Substation earthing layout and earthing materials
2.7 Line diagram of 11kV, 33kV, 66kV, 132 kV sub-stations

3. Schematic Diagram of lighting system of conference room/Theatre/sports stadium (indoor and outdoor) and Circuits using timers using CAD and, Drawing sheets.

4. Estimation of Internal Wiring Installation (12 periods)

Estimation of wiring installation for commercial and industrial buildings such as multi- storied hotels, hospitals, schools, colleges, cinema,

community centers, public library, high rise residential buildings etc. including design of layout, load estimation, Demand factor and diversity factor, power distribution scheme, list of material with specifications estimation of cost preparing relevant electrical schedule or rate (CPWDor PWD) using latest practices, materials andAccessories.

5. Estimation of Power Wiring **(08 periods)**

I.S. specifications and I.E. rules, calculation of current for single and three phase motors. Determination of sizes of cables, conductors distribution board, main switches and starters for power circuits. Cost of equipment and accessories and schedule of material. Estimation and cost of material and work for motors up to 20 H.P., pump sets and small workshops.

6. Estimation of Overhead and Underground Distribution Lines (08 periods)

Main components of overhead lines-line supports, cross-arm, clamps, conductors and stay sets, lightening arrestors, danger plates, anti-climbing devices, bird guards, jumpers etc., concerting of poles, earthing of transmission line, formation of lines, specification of materials for O.H. lines, I.S, specification and I.E. rules. Cost of material and work for overhead and undergoing lines up to 11 KV only

7. Estimation of Service Connections **(08 periods)**

Service connection, types of service connections-overhead and underground for single story and double story buildings, estimate of materials required for giving service connection to domestic consumers, commercial consumers and industrial consumers at L.T. and H.T. costing of material and work in above cases.

8. Estimation of Small Sub-Station **(08 periods)**

Main equipment and auxiliaries installed on the substation. Estimation of materials required for a small distribution substation (indoor and outdoor type-platform and pole mounted). Costing of material and work of above substations.

Note: Draw various schematic and wiring diagrams using graphic package (preferably CAD)

RECOMMENDED BOOKS

1. Electrical Design and Drawings by Raina & Bhattacharya
2. Electrical Design & Drawings by Sarabjeet Singh
3. IEEE Guide 80 for Earthing, IEEE Publication, New York
4. Electrical Design and Drawing by Surjit Singh, North Publication, Jalandhar
5. BIS for Electrical Earthing
6. e-books/e-tools/relevant software to be used as recommended by

P.K. University, Shivpuri (MP)

3rd Year/6th Semester

DUTILEE604: UTILIZATION OF ELECTRICAL ENERGY

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DETAILED CONTENTS

1. Illumination (14 Periods)

1.1 Nature of light, visibility spectrum curve of relative sensitivity of Human eye and wave length of light.

1.2 Definition: Luminous flux, solid angle, intensity, luminous efficiency. Space to height ratio, reflection factor, lux, shadow.

1.3 Different types of lamps, construction and working of incandescent and discharge lamps. Fitting required for filament lamp, mercury vapor, sodium lamp, halogen lamp, CFL, LED lamp.

1.4 Calculation of number of light points for interior illumination calculation of indoor and outdoor illumination levels at different points.

1.5 Time switches, street lighting, flood lighting and its characteristics.

2. Electric Heating and Welding (18 Periods)

2.1 Advantages of electrical heating

2.2 Heating methods

2.2.1 Resistance heating – direct and indirect resistance heating, electric ovens, their temperature range, properties of resistance heating elements, domestic water heaters and other heating appliances, thermostat control circuit

2.2.2 Induction heating; principle of core type and coreless induction furnace, their construction and applications

2.2.3 Electric arc heating; direct and indirect arc heating, construction, working and applications of arc furnace

2.2.4 Dielectric heating, applications in various industrial fields

2.2.5 Infra-red heating and its applications (construction and working of two appliances)

2.2.6. Microwave heating and its applications (construction and working of two appliances)

2.2.7 Solar Heating

2.3 Calculation of resistance heating elements (simple problems)

2.4 Electric Welding

2.4.1 Advantages of electric welding

2.4.2 Welding methods

2.4.3 Principles of resistance welding, types – spot, projection, seam and butt welding, welding equipment

2.4.4 Principle of arc production, electric arc welding, characteristics of arc; carbon arc, metal arc, hydrogen arc welding method and their applications.

Power supply requirement. Advantages of using coated electrodes, comparison between AC and DC arc welding, welding control circuits, welding of aluminum and copper

3. Electrolytic Processes (08 Periods)

3.1 Need of electro-deposition
3.2 Laws of electrolysis, process of electro-deposition - clearing, operation, deposition of metals, polishing and buffing
3.3. Equipment and accessories for electroplating
3.4. Factors affecting electro-deposition
3.5. Principle of galvanizing and its applications
3.6 Principles of anodizing and its applications
3.7 Electroplating of non-conducting materials
3.8 Manufacture of chemicals by electrolytic process

4. Electrical Circuits used in Refrigeration, Air Conditioning and Water Coolers (08 Periods)

4.1 Principle of air conditioning
4.2 Description of Electrical circuit used in
a) Refrigerator,
b) Air-conditioner, and
c) Water cooler

5. Electric Drives (10 Periods)

5.1 Advantages of electric drives
5.2. Characteristics of different mechanical loads
5.3. Types of motors used as electric drive
5.4. General idea about the methods of power transfer by direct coupling by using devices like belt drive, gears, chain drives etc.
5.5. Examples of selection of motors for different types of domestic loads
5.5 Selection of drive for applications such as general workshop, textile mill, paper mill, steel mill, printing press, and crane and lift etc. Application of flywheel.
5.6 Selection of motors for Domestic Appliances

6. Electric Traction (12 Periods)

6.1 Advantages of electric traction
6.2 Different systems of electric traction, DC and AC systems, diesel electric system, types of services – urban, sub-urban, and main line and their speed- time curves
6.3 Different accessories for track electrification; such as overhead catenary wire, conductor rail system, current collector-pantograph
6.4 Factors affecting scheduled speed
6.5. Electrical block diagram of an electric locomotive with

description of various equipment and accessories used.

6.6 Types of motors used for electric traction

6.7 Power supply arrangements

6.8 Starting and braking of electric locomotives

6.9 Introduction to EMU and metro railways

6.10 Train Lighting Scheme

Note: Students should be taken for visits to nearest electrified railway track and railway stationto study the electric traction system. Also visit should be made to show electric Illumination in building.

RECOMMENDED BOOKS

1. Art and Science of Utilization of Electrical Energy by H Partap, Dhanpat Rai & Sons,Delhi
2. Utilization of Electrical Energy by JB Gupta, Kataria Publications, Ludhiana
3. Utilization of Electrical Energy by Sahdev, Uneek Publication, Jalandhar
4. A Text Book. of Electrical Power by Dr. SL Uppal, Khanna Publications, Delhi
5. Modern Electric Traction by H Partap,Dhanpat Rai & Sons, Delhi
6. Utilization of Electrical Energy by D.R. Arora, North Publication, Jalandhar
7. Generation, Distribution and Utilization if Electrical Power by CL Wadhwa,WileyEastern Ltd., New Delhi
8. E-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR

Department of Electrical Engineering

(Faculty of Engineering & Technology)

P.K. University, Shivpuri (MP)

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3rd Year/6th Semester

DINSTEE605: INSTALATION, MAINTENANCE AND REPAIR OF ELECTRICAL MACHINES LAB

E. M. R. Lab:

1. Setting handling of tools and accessories for installing heavy equipment.
2. Commissioning of electrical equipment.
3. Measurement of earth resistance.
4. Testing of transformer oil.
5. Fault finding and repairing of different types of electrical wiring.
6. Disassembling and assembling of electrical machines e.g. electric iron, washing machines. geyser, submersible pumps, coolers etc.
7. Trouble shooting and repairing of different types of domestic and industrial electrical equipment.
8. Winding of small ac motor/transformers/chokes.
9. Cable jointing using epoxy resin kits.
10. Repair and maintenance of circuit breakers up to 11 kv.
11. Trouble shooting and repair of direct on line and star delta starter.

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)

3rd Year/6th Semester

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DPROJEE606: PROJECT	**0**	**0**	**12**

Some of the project activities are given below:

- Projects related to designing small electrical equipment / instruments.
- Projects related to increasing productivity in electrical manufacturing areas.
- Projects related to quality assurance.
- Projects connected with repair and maintenance of plant and equipment.
- Projects related to design of PCBs.
- Projects related to design of small oscillators and amplifier circuits.
- Projects related to design, fabrication, testing and application of simple digital circuits and components.
- Projects related to microprocessor/microcontroller based circuits/ instruments.

A suggestive list of project is given below:-

1. Design and fabrication of control panel for various applications in the field of electrical engineering.
2. Rewinding of a single phase/three phase induction motor
3. Fabrication of working model of a solar thermal power plant.
4. Design and fabrication of automated car parking system.
5. Design and fabrication of automated gate control of railway crossing.
6. Design and fabrication of electrical resistive/inductive/capacitive loads.
7. Design and fabrication of remote control of various domestic electrical appliances.
8. Design and fabrication of microcontroller based DC drive system.
9. Design and fabrication of automatic water level control system.
10. Design and fabrication of automatic solar battery charger.
11. Fabrication of automatic star-delta starter.
12. Fabrication of working model of hydroelectric power plant.
13. Fabrication of sine wave inverter up to 500VA.
14. Fabrication of water level indicator.
15. Fabrication of rain/fire/ smoke/burglar detector.
16. Fabrication of automatic solar panel based street lights.
17. Fabrication of automatic solar panel based traffic lights
18. Fabrication of automatic voltage stabilizer up to 1 KVA.
19. Fabrication of working model of wind power plant.
20. Fabrication of heat convector blower with humidifier.
21. Fabrication of oil based radiation type room heater.
22. Fabrication of small 1- phase transformer up to 1KVA.
23. Fabrication of UPS up to 500VA.
24. Fabrication of a distribution board as per requirement.
25. Fabrication of Direct-On-Line (DOL) starter.
26. Fabrication of solar tracking system.
27. Fabrication of automatic power factor corrector.
28. Fabrication of desert cooler/ room cooler.

29. Fabrication of electric/solar water heater.
30. Erection, installation & commissioning of electrical equipment.
31. Fault detection & repair of electrical/ electronic instruments.
32. Drawing, estimating and costing of electrical installation of the institution from supplier's pole to the institution distribution board.
33. Drawing, estimating and costing of electrical installation of a workshop having a given number of electrically operated appliances/machines.
34. To study the laying out of underground distribution cable for a small colony starting from main distribution pole.
35. To study the erection of a 5 pole span overhead line for a small distance for distribution of electrical energy and to prepare list of material required.
36. Energy audit for the workshop of your institution & to suggest remedies to reduce electricity bills.
37. Estimate the material required to provide a service connection to a consumer's premises for domestic purposes.
38. To survey the load of a given area in a village, small colony, calculate the effective load and find out the sizes of cables/conductors for the proposed distribution system.
39. Designing of light and fan scheme for an institutional or commercial building.
40. To study and estimate the material required during augmentation of a nearby pole mounted sub-station.
41. To study and estimate the material required during augmentation of a nearby in door sub-station.
42. To study and estimate the material required for a solar power station up to 100KW after visiting the actual site
43. To prepare a proposal for substation of your nstitution calculating the total load (estimating and costing)
44. Installation of home security system
45. Detection of electricity theft control system with wireless indication system
46. Fabrication of cyclo-converter (frequency changer)
47. Design and fabrication of panel for automatic switching of DG set with supply system
48. Design and fabrication of wireless AC Power transmission.

Design and fabrication of solar energy bored projects like solar cooker, solar dryer, solar street light, solar inverter, solar pump, solar emergency light etc

NOTE: The project should be preferably undertaken by a group of students depending upon cost and time involved.

There is no binding to take up the above projects as it is only a suggestive list of projects.