

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]

Department of Electrical Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)
2nd Year / 4th Semester

DELECEE401: ELECTRONICS – II

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DETAILED CONTENTS

1. Digital Electronics: (12 Periods)

- (i) Introduction - Basic difference between analog and digital signal; Advantages of digital system and its field of applications.
- (ii) Number system - Binary, Decimal, Octal and Hexadecimal and their need.
- A. Logic Gates** - Symbol and truth tables of AND, OR NOT, NAND, NOR and EX-OR gates. Boolean theorems and postulates (without proof) Realization of small Boolean functions and reduction using Karnaugh's Map up to 3 variables using logic gates and vice-versa.

B. Logic Families- TTL, CMOS, MOS, ECL, DTL, HTL, IIL. (6 Periods)

- (iv) Half Adder and full adder circuits and their operations, Display Devices.
- (v) Encoder, Decoder, Multiplexer and Demultiplexer.
- (vi) Need of Flip-Flops, Detail idea of counters and (Synchronous and Asynchronous) and register with purpose. Idea of astable, monostable, Bistable multivibrators.
- (vii) A/D and D/A conversion.

2. Operational Amplifiers (6 Periods)

Specifications of ideal operational amplifier and its block diagram as an Inverter, scale changer, adder, subtract or, differential amplifier, buffer Amplifier, differentiator, integrator, Schmitt trigger and log and antilog Amplifiers.

3. Microprocessors (10 Periods)

- (i) Microprocessors and its need in modern technology.
- (ii) Functional block diagram of microprocessors and function of its various Blocks with reference to 8085 microprocessors. Concepts of and Assembly Language programming with 8085.

4. Communication Engineering

- (i) Basic block diagram of a modern communication system and its working.
- (ii) Concept of modulation/demodulation its need and types.
- (iii) Concept of demodulation its need and types.
- (iv) Introduction to digital and data communication.
- (v) Introduction to modern ways of communication- Brief idea and concept of optical Fiber communication, Microwave communication, Satellite communication and Mobile communication.

5. INTEGRATED CIRCUITS (10 Periods)

- (i) Introduction to IC and its importance in modern electronics, types of IC's.
- (ii) Difference between SSI, MSI, LSI, VLSI.

NOTE: Only brief idea of above topics should be given.

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DELECEE402: ELECTRICAL DESIGN, DRAWING & ESTIMATING-I

DETAILED CONTENTS (To make 16 Sheets)

1. Symbols and Signs Conventions (2 Sheets)

Various Electrical Symbols used in Domestic and Industrial Installation and Power System (Generation, Transmission and Distribution including Sub-stations) as per BIS Code.

2. Wiring Diagram

- 2.1. Wiring diagram of light, fan, bell and alarm circuits. (6 Sheets)
- 2.2. Staircase and godown wiring
- 2.3. Traffic light signal control circuit at crossroads

3. Panels/Distribution Boards (6 Sheets)

Design and Drawing of panels/Distribution board using MCB, ELCB main switches and change over switches for domestic installation, industrial and commercial installation.

4. Orthographic projections of Simple Electrical Parts (8 Sheets)

- ☐ Bus bar post/ Kit Kat
- ☐ Pin type and shackle type insulator (Pin Type 11kV/66kV)
- ☐ Bobbins of a small transformer / choke
- ☐ Stay insulators/Suspension type insulators
- ☐ Rotor of a squirrel cage induction motor
- ☐ Motor body (induction motor) as per IS Specifications (using outside dimensions)
- ☐ Slip rings of 3-phase induction Motor.
- ☐ Stator of 3 phase Induction motor (Sectional View)

5. Prepare at least 2 wiring diagram and block diagrams for circuits/systems using anyEngineering Graphic package (preferably CAD) (4 Sheets)

6. Introduction to Estimating & Costing (04 periods)

Purpose of estimating and costing, proforma for making estimates, preparation of materials schedule, costing, price list, preparation of tender document (with 2-3 exercises), net rice list, market survey, overhead

charges, labor charges, electrical point method and fixed percentage method, contingency, profit, purchase system, enquiries,

Comparative statements, orders for supply, payment of bills.

7. Types of Wiring (04 Periods)

Cleat, batten, casing capping and conduit wiring, comparison of different wiring systems, selection and design of wiring schemes for particular situation (domestic and Industrial). Selection of wires and cables, wiring accessories and use of protective devices i.e. MCB, ELCB etc. Use of wire-gauge and tables (to be prepared/arranged)

8. Estimating and Costing (18 Periods)

8.1 Domestic installations; standard practice as per IS and IE rules. Planning of circuits, sub-circuits and position of different accessories, electrical layout, preparing estimates including cost as per schedule rate pattern and actual market rate (single storey and multi-storey buildings having similar electrical load)

8.2 Industrial installations; relevant IE rules and IS standard practices, planning, designing and estimation of installation for single phase motors of different ratings, electrical circuit diagram, starters, preparation of list of materials, estimating and costing exercises on workshop with single-phase, 3-phase motor load and the light load (3-phase supply system)

8.3 Service line connections estimate for domestic and industrial loads (over-head and underground connections) from pole to energy meter.

9. Estimating Materials Required (12 Periods)

9.1 Transmission and distribution lines (overhead and underground) planning and designing of lines with different fixtures, earthing etc. based on unit cost calculations

9.2 Substation: Types of substations, substation schemes and components, estimate of 11/0.4 kV pole mounted substation up to 200 kVA rating, earthing of substations, single Diagram of 66 kV/11 kV, 132KV/11KV, 220KV/33KV Substation

9.3 Single line diagram, layout sketching of outdoor, indoor 11kV sub-station or 33kV sub-station

10. Preparation of Tender Documents (04Periods)

Tender – constituents, finalization, specimen tender. Procedure to take financial loans from banks for taking contracts.

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DPOWEEE403: POWER PLANT ENGINEERING

DETAILED CONTENTS

1. Power Generation (06 Periods)

- 1.1 Main resources of energy, conventional and non-conventional
- 1.2 Different types of power stations-thermal, hydro, gas, diesel and nuclear power stations, comparison of generating stations.

2. Thermal Station (10 Periods)

Main parts and working of stations-thermodynamic cycles, fuel handling, combustion and combustion equipment, problem of ash disposal, circulating water schemes and supply of make-up water, choice of pressure of steam generation and steam temperature, selection of appropriate vacuum; economizer, air pre-heater feed water heaters and dust collection. Characteristics of turbo alternators, steam power plant heat balance and efficiency.

3. Hydro-Electric Plant (8 Periods)

Hydrology, stream flow, hydrograph, flow duration curves. Types of hydroelectric plants and their fields of use, capacity calculations for hydropower, Dams, head water control, penstocks, water turbines, specific speeds, turbine governors. Hydro plant auxiliaries, plant layout, automatic and remote control of hydro plants, pumped storage projects, cost of hydro-electric projects. Cooling of alternators.

4. Nuclear Power Plant (9 Periods)

Elements of nuclear power plant, nuclear reactor, fuels, moderators, coolants, control. Classification of nuclear power stations. Cost of nuclear power.

5. Diesel Power Plant (6 Periods)

Diesel engine performance and operation, Plant layout, Log sheets, applications, selection of engine size.

6. Gas Turbine Plant (9 Periods)

Plant layout, methods of improving output and performance. Fuels and fuel systems.

Methods of testing. Open and closed cycle plants. Operating characteristics. Applications. Free piston engine plants, limitation and applications. Non-conventional energy sources.

7. Combined Working of Power Plant (10 Periods)

Advantages of combined working of different types of power plants. Need for co-ordination of various types of power plants in power systems, base load stations and peak load stations.

8. Economics of Generation (12 Periods)

8.1 Fixed and running cost, load estimation, load curves, demand factor, load factor, diversity factor, power factor and their effect on cost of generation, simple problems.

8.2 Base load and peak load power stations, concept of regional and national grid, reason of grid failure and its remedies.

9. Non-Conventional Source of Energy (5 Periods)

Introduction, Concept of Solar Energy, Bio Mass Energy, Wind Energy, Tidal Energy, Geothermal Energy, Micro hydel Energy, Biodiesel Energy.

RECOMMENDED BOOKS

1. Electrical Power System and Analysis by CL Wadhwa, 3rd edition, New Age International Publishers, New Delhi
2. Substation Design and Equipment by Satnam and PV Gupta, Dhanpat Rai & Sons, New Delhi
3. Electrical Power –I by SK Sahdev, Uneek Publications, Jalandhar
4. Electrical Power System by VK Mehta, S Chand and Co., New Delhi
5. Electrical Power System by JB Gupta, SK Kataria and Sons, New Delhi
6. Sub-Station Design by Satnam, Dhanpat Rai and Co., New Delhi
7. Electrical Power Distribution System by AS Pabla, Tata McGraw Hill, New Delhi
8. Electrical Power System by S Channi Singh, Tata McGraw Publishing Co. New Delhi
9. Electrical Power by Soni Gupta and Bhatnagar; Dhanpat Rai & Sons, New Delhi
10. E-books/e-tools/relevant software to be used as recommends.

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TRANSMISSION & DISTRIBUTION OF ELECTRICAL POWER

DETAILED CONTENTS

1. Transmission Systems (28 Periods)

- 1.1 Layout of transmission system, selection of voltage for H.T and L.T lines, advantages of high voltage for Transmission both AC and DC
- 1.2 Comparison of different system: AC versus DC for power transmission, conductor material and sizes from standard tables
- 1.3 Constructional features of transmission lines: Types of supports, types of insulators, Types of conductors, Selection of insulators, conductors, earth wire and their accessories, Transposition of conductors and string efficiency of suspension type insulators, Bundle Conductors.
- 1.4 Mechanical features of line: Importance of sag, calculation of sag, effects of wind and ice related problems; Indian electricity rules pertaining to clearance
- 1.5 Electrical features of line: Calculation of resistance, inductance and capacitance without derivation in a.c. transmission line, voltage regulation, and concept of corona. Effects of corona and remedial measures
- 1.6 Transmission Losses
- 1.7 Economic Principle of Transmission Kelvin's law, limitation of Kelvin's law modification in Kelvin's law

2. Distribution System (21 Periods)

- 2.1 Lay out of HT and LT distribution system, constructional feature of distribution lines and their erection. LT feeders and service mains; Simple problems on AC radial distribution system, determination of size of conductor
- 2.2 Preparation of estimates of HT and LT lines (OH and Cables).
- 2.3 Constructional features of LT (400 V), HT (11 kV) underground cables, advantages and disadvantages of underground system

- with respect to overhead system.
- 2.4 Losses in distribution system
- 2.5 Faults in underground cables-determine fault location by Blavier Test, Murray Loop Test, Varley Loop Test
- 3. Substations: (21 Periods)**
- 3.1 Brief idea about substations; outdoor grid sub-station 220/132 KV, 66/33 KV outdoor substations, pole mounted substations And indoor substation
- 3.2 Layout of 33/11 KV & 220/33KV distribution substation and various auxiliaries and equipment associated with it.
- 4. Power Factor: (14 Periods)**
- 4.1 Concept of power factor
- 4.2 Reasons and disadvantages of low power factor
- 4.3 Methods for improvement of power factor using capacitor Banks, Static VAR Compensator (SVC)
- 5. Revenue and Energy loss (14 Periods)**
- Technical losses and Commercial losses, Input energy calculation, Sales calculation, Billing efficiency, Collection efficiency, Total energy billed (KWH), Percent aggregated technical and commercial losses.

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1. Electrical Power System and Analysis by CL Wadhwa, 3rd edition New Age International Publishers, New Delhi.
2. Substation Design and Equipment by Satnam and PV Gupta, Dhanpat Rai & Sons, New Delhi.
3. Electrical Power –I by SK Sahdev, Uneek Publications, Jalandhar
4. Electrical Power System by VK Mehta, S Chand and Co., New Delhi
5. Electrical Power System by JB Gupta, SK Kataria and Sons, New Delhi
6. Sub-Station Design by Satnam, Dhanpat Rai and Co., New Delhi
7. Electrical Power Distribution System by AS Pabla, Tata McGraw Hill, New Delhi.
8. Electrical Power System by S Channi Singh, Tata McGraw Publishing Co. New Delhi

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DELECEE405: ELECTRONICS - II LAB

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10 Experiments are to be performed at least 4 from each group

A - Digital Electronics

1. Familiarizations with bread-board. Familiarizations with TTL and MOS ICs.
2. Identification of IC-No's, pin no's, IC types.
3. To observe that logic low and logic high do not have same voltage value in INPUT and OUTPUT of a logic gate.
4. To observe the propagation delay of TTL logic gate.
5. Observation of differences between MOS and TTL gate under the Following heads:
(a) Logic levels (b) Operating voltages.
6. Use of Op-Amp. (For IC 741) as inverting and non-inverting amplifier, adder, Comparator, buffer, scale changer.
7. Use of IC 755 as timer. Display Devices and Associated Circuits
8. Familiarizations and use of different types of LEDs common anode and Common cathode seven segment display Logic Gates
9. Verification of truth tables for 2 Input NOT, AND, OR NAND, NOR, XOR GATES.
10. To construct half adder and half subtractor using XOR and NAND gates Verification of their truth tables.
11. To construct a full adder circuit with XOR and NAND gates.
(a) Study of 3 bit adder circuit implemented with OR and NAND gates.
(b) To construct 4 bit adder and full subtractor using full adder chip 7480 and NAND GATES.
12. (a) To verify the truth table of 4 bit adder IC chip 7483.
(b) To construct the 4-bit adder/2 complement subtract using 7483 and AND Gates.

12. Flip Flops

To verify the truth table for selected positive edge triggered and negative Edge triggered F/F of J-K and D type.

13. Counters

To construct and verify truth table for asynchronous bin and decade counter Using J-K flip flops.

- (a) To construct divide by 60 counter using ripples counter IC Chips.
- (b) To use counter IC chip 7493 in the divided by eight mode and divide by Sixteen modes.
- (c) To construct a divide by 100 counter using CMOS
To construct a divide by 60 counter using synchronous counter IC chips.

14. Registers

To construct a 4 bit buffer register using 4 bit register IC chips.

To construct a 4 bit universal shift register using flip flops.

To use a 4035 B universal shift registers.

B-Microprocessor;

1. Familiarization with 8085 and 8088 Trainer.
2. Add two 8 bit numbers.
3. a) Obtain 2's complement of 8-bit numbers.
b) Subtraction of two numbers using 2's complement.
4. Extract fifth bit of a number in A and store it in another register.
5. Count No. of bits in high state in accumulator.
6. Check even parity and odd parity.
7. a) Add two 16-bit numbers by repetitive addition.
b) Divide two 8-bit numbers by repetitive sub-traction.
8. a) Smallest number of three digits. b) Largest number of three digits.
9. Arrange numbers in ascending order.
10. Write a program to find out sum of first n-multiplier of a number.
11. Arrange number in descending order.
15. Use of Op-Amp. (For IC-741) as Inverting and non-inverting amplifier, Adder, comparator, buffer, scale changer.

NOTE: Every Student should fabricate a Mini Project based on Solid State Device.

RECOMMENDED BOOKS

1. Basic Electronics and Linear Circuit by NN Bhargava, Kulshreshta and SC Gupta, Tata McGraw Hill Education Pvt Ltd, New Delhi.
2. Principles of Electrical and Electronics Engineering by VK Mehta; S Chand and Co., New Delhi
3. Electronics Devices and Circuits by Millman and Halkias; McGraw Hill.
4. Electronic Devices and Circuits by Dharma Raj Cheruku and Battula Tirumala Krishna: Pearson Education (Singapore) Pvt Ltd., Indian Branch, 482 F.I.E Patparganj, Delhi- 92
5. Basic Electronics by JB Gupta, SK Kataria and Sons, New Delhi
6. Electronics Devices and circuit by Boylested, Tata McGraw Hill, New Delhi

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DELECEE406: ELECTRICAL DESIGN, DRAWING & ESTIMATING-I LAB

LIST OF PRACTICALS

1. Framing of Tender and reply to tender to get job/project
2. Identification of wiring for different applications
3. Prepare an estimate for a Two room residential building as per given plan
4. Prepare an estimate for service connection for residential building having load Connected

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1. Electrical Engineering Design and Drawings by SK Bhattacharya, SK Kataria and Sons, New Delhi
2. Electrical Engineering Design and Drawings by Ubhi& Marwaha, IPH, New Delhi
3. Electrical Design and Drawing by SK Sahdev, Uneek Publications, Jalandhar
4. Electrical Engineering Drawing by Surjit Singh, SK Kataria and Sons, New Delhi
5. Electrical Installation, Estimating and Costing by JB Gupta, SK Kataria and Sons, New Delhi
6. Estimating and Costing by SK Bhattacharya, Tata McGraw Hill, New Delhi
7. Estimating and Costing by Surjeet Singh, Dhanpat Rai & Co., New Delhi
8. Estimating and Costing by Praveen Kumar; North Publication, Jalandhar
9. Estimating and Costing by SL Uppal, Khanna Publishers, New Delhi
10. Electrical Estimating and Costing by N Alagappan and B Ekambaram, TMH,

