EVALUATION SCHEME – SEMESTER IV – Electrical Engineering

Sr. No	Subject Code	Subject Name	Effective Teaching			Credits	Evaluation Scheme		
			L	T	P		Internal Assessment	External Assessment	Total Marks
			Hours/week						
THEORY									
1	MUPEE 401N	Electrical Engineering Design and Drawing	3	-	-	3	-	100	100
2	MUPEE 402N	DC Machine & Transformer	4	-	-	4	20	50	150
3	MUPEE 403N	Digital Electronics & Microprocessors	4	-	-	4	20	50	70
4	MUPEE 404N	Generation , Transmission & Distribution	4	-	-	4	20	50	70
5	MUPEE 405N	Electrical Circuits and Analysis	4	-	-	4	20	50	70
6	MUPEE 406N	Estimating & Costing in Electrical Engineering	5	-	-	5	50	100	150
PRACTICAL/PROJECT									
7	MUPEE 451N	Electrical Engineering Design and Drawing	-	-	2	2	50	50	100
8	MUPEE 452N	D C Machine& Transformer	-	-	2	2	30	50	80
9	MUPEE 453N	Digital Electronics & Microprocessors	-	-	2	2	30	50	80
10	MUPEE 454N	Generation , Transmission & Distribution	-	-	2	2	30	50	80
11	MUPEE455N	Electrical Circuits and Analysis	-	-	2	2	30	50	80
12	MUPGP 451N	General Proficiency	-	-	1	1	25	-	25
13	MUPGP 452N	Industrial Exposure (Assessment at University Level)	-	-	1	1	25	-	25
		TOTAL	**24**	-	**22**	36	**350**	**650**	**1000**

MUPEE 401N	Electrical Engineering Design and Drawing	3L:0T:2P	3 Credits

Course Objectives

The objectives of the course is:

- The student should be able to read, understand and interpret engineering drawings.
- The student should be able to Communicate and co-relatethrough sketches and drawings.
- The student should be able to prepare working drawings of panels, transmissionand distribution.

Course Outcomes

At the end of the Course, Student will be able:		Bloom's Level
CO1	To develop Orthographic Projection of different machine parts	**K4**
CO2	To draw the Schematic and wiring diagram of different Contactor Control Circuits.	**K4**
CO3	To develop schematic of DOL Starter for 3-phase Induction Motor	**K4**
CO4	To understand the Layout of earthing of substation	**K1**
CO5	To Design application circuit used in intelligent building.	**K4**

K1 – Remember K2- Understand K3-Apply K4-Analyze K5 – Evaluate K6 – Create

Syllabus

UNIT I

Symbols and Signs Convention. Various Electrical Symbols used in Domestic and Industrial Installation and PowerSystem as per BIS Panels/Distribution Boards Design and Drawing of panels/Distribution board using MCBs, ELCB, main switches and change over switches for domestic installation, industrial and commercial installation.

UNIT II

Orthographic projections of Simple Electrical Parts. Pin type and shackle type insulator (Pin Type 11kV/66kV) Bobbins of a small transformer / choke Stay insulators/Suspension type insulators Free hand sketching of M.C.B. and E.L.C.B Placed on Distribution Board.Orthographic Projection of Machine Parts

- 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)

UNIT III

Contactor Control Circuits: Schematic and wiring diagram

DOL Starter of 3-phase induction Motor

- Forwarding/reversing of 3-phase induction motor
- Limit switch control of a 3-phase induction motor
- Sequence operation of two motors using T.D.R.
- Two speed motor control
- Automatic star-delta starter for 3-phase induction motor

UNIT IV

Earthing – Layout of earthing of substation, earthing of poles, transformers Key diagram of 33/11 KV substation. Design/Drawing of application circuit used in intelligent building. Security system/intelligent camera/automatic recording/photography system, Stage lighting, Safety system Centralized air-conditioning system, Computer Networking.

RECOMMENDED BOOKS

1. Electrical Engineering Design and Drawings by Surjeet Singh, Dhanpat Raiand Co, New Delhi
2. Electrical Engineering Design and Drawings by SK Bhattacharya, SK Kataria and Sons, New Delhi
3. Electrical Engineering Design and Drawings by Ubhi & Marwaha, IPH, NewDelhi
4. Electrical Design and Drawing by SK Sahdev, Uneek Publications, Jalandhar
5. Electrical Engineering Drawing by Surjit Singh, SK Kataria and Sons, New Delhi

MUPEE 402N	DC Machine & Transformer	4L:0T:2P	4 Credits

Course Objectives

The objectives of the course is:

- The student should be able to deal with various types of electrical machines which are employed in industries, power stations, domestic and commercial appliances etc. The student should be able to Communicate and co-relatethrough sketches and drawings.
- The student should be competent to repair and maintain these machines and give suggestions to improve their performance

Course Outcomes

At the end of the Course, Student will be able:		Bloom's Level
CO1	To Understand the concept of Electromagnetism applicable to motor and generator.	**K1**
CO2	To Understand the constructional features of DC Machines, types of DC Excitation.	**K3**
CO3	To develop an understanding of constructional features and working of transformers at different load conditions.	**K1**
CO4	To understand the constructional features of three phase transformer along with the accessories	**K1**
CO5	To perform various standard tests on DC Machines as well as Transformer for their performance analysis.	**K4**

K1 – Remember K2- Understand K3-Apply K4-Analyze K5 – Evaluate K6 – Create

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UNIT I Introduction to Electrical Machines

Definition of motor and generator, concept of torque, Torque development due to alignment of two fields and the concept of torque angle, Electro-magnetically induced emf, Elementary concept of an electrical machine,

UNIT II DC Machines

Main constructional features, Types of armature winding, Function of the commutator for motoring and generation action, Factors determining induced emf, Factors determining the electromagnetic

torque, Types of dc generation on the basis of excitation, voltage built up in a dc shunt generator, Significance of back e.m.f., the relation between back emf and Terminal voltage, Armature Reaction, Commutation methods to improve commutation, Performance and characteristics of different types of DC motors , Speed control of dc shunt/series motors, Need of starter, three point dc shunt motor starter and 4-point starter, Applications of DC motors, Losses in a DC machine, Determination of losses by Swinburne's test

UNIT III Transformers (Single phase)

Introduction, Constructional features of a transformer and parts of transformer , Working principle of a transformer, EMF equation, Transformer on no-load and its phasor diagram, Transformer – neglecting voltage drop in the windings – Ampere turn balance – its phasor diagram ,Mutual and leakage fluxes, leakage reactance, Transformer on load, voltage drops and its phasor diagram Equivalent circuit, Relation between induced emf and terminal voltage, regulation of a transformer mathematical relation, Losses in a transformer, Open circuit and short circuit test. Calculation of efficiency, condition for maximum efficiency-maintenance of Transformer, scheduled Maintenance, Auto transformer construction, saving of copper, working and applications

UNIT IV Transformers (Three phase)

Construction of three phase transformers and accessories of transformers such as Conservator, breather, Buchholz Relay, Tap Changer (off load and on load) (Brief idea), Types of three phase transformer i.e. delta-delta, delta-star, star-delta and star-star, Conditions for parallel operation (only conditions are to be studied), On load tap changer, Difference between power and distribution transformer, Cooling of transformer.

RECOMMENDED BOOKS

1. Electrical Machines by SK Bhattacharya, Tata Mc Graw Hill, Education Pvt Ltd. New Delhi
2. Electrical Machines by SK Sahdev, Uneek Publications, Jalandhar
3. Electrical Machines by Nagrath and Kothari, Tata Mc Graw Hill, New Delhi
4. Electrical Machines by JB Gupta, SK Kataria and Sons, New Delhi
5. Electrical Machines by Fitzgerald
6. Electrical Machines by Smarajit Ghosh-Pearson Publishers, Delhi.

MUPEE 403N	Digital Electronics & Microprocessors	4L:0T:2P	4 Credits

Course Objectives

The objectives of the course is:

- The student should be able to get the knowledge about the fundamental principles of digital electronics, microprocessor and to get familiar withthe available IC chips.
- The student should be able to grasp the background in the broad field of digital systems design and microprocessors

Course Outcomes

At the end of the Course, Student will be able:		Bloom's Level
CO1	To develop an understanding of the number system in Digital Electronics.	**K1**
CO2	To detail about the logic gates, families specifications and implement them in applications.	**K3**
CO3	To understand the various Combinational logic and sequential logic circuits and implement the results.	**K3**
CO4	To study the phenomena of Analog to digital conversion and vice-versa.	**K1**
CO5	To detail about the evolution, architecture as well as programming of 8085 microprocessor.	**K2**

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(A) Digital Electronics

UNIT I Introduction& Number System

Distinction between analog and digital signal, Applications and advantages of digital signals.

Number System- Binary, Octal and hexadecimal number system: conversion from decimal and hexadecimal to binary and vice-versa, binary addition, subtraction, multiplication and division including binary points. 1's and 2's complement method of addition/subtraction.

Codes and Parity- Concept of code, weighted and non-weighted codes, examples of 8421, BCD, excess-3 and Gray code, Concept of parity, single and double entry and error detection & error correction, Alpha numeric codes: ASCII and EBCDIC

UNIT II Logic Gates, Families & Simplification

Concept of negative and positive logic, Definition, Symbols and truth tables of NOT, AND, OR, NAND, NOR, EXOR Gates, NAND and NOR as universal gates, Logic family classification: Definition of SSI, MSI,LSI, VLSI,RTL, TTL , ECL and CMOS families.

Logic Simplification- Postulates of Boolean algebra, De Morgan's Theorems. Various identities. Formulation of truth table and Boolean equation for simple problem. Implementation of Boolean (logic) equation with gates. Karnaugh map (upto 4variables) and simple applications in developing combinational logic circuits.

UNIT III Combinational logic& Synchronous sequential logic circuits

Arithmetic Circuits- Half adder and Full adder circuit, design and implementation, Half and Full subtractor circuit, design and implementation, 4 bit adder/subtractor, Adder and Subtractor IC

Decoders, Multiplexers and De Multiplexers- Four bit decoder circuits for 7 segment display and decoder/driver ICs, Multiplexers and De- Multiplexers, Basic function and block diagram of MUX and DEMUX, Different types and ICs.

Flip flops- Concept and types of latch with their working and applications, Operation using waveforms and truth tables of RS, T, D, Master/Slave JK flip flops, Difference between a latch and a flip flop.

UNIT IV. Counters, Shift Register and A/D & D/A Converters

Counters- Introduction to Asynchronous and Synchronous counters, Binary counters, Divide by N ripple counters, Decade counter, Up/Down counter, Ring counter.

Shift Register- Introduction and basic concepts including shift left and shift right : Serial in parallel out, serial in serial out, parallel in serial out, parallel in parallel out, Synchronous generators

A/D and D/A Converters- Working principle of A/D and D/A converters.

(B) MICROPROCESSORS

UNIT V Evolution, Architecture & Programming

(With reference to 8085 microprocessor)- Typical organization of a microcomputer system and functions of its various blocks. Concept of Bus, bus organization of 8085, Function block diagram of 8085, Pin details of 8085, Steps to execute a stored program. Brief idea of machine and assembly languages, Machines and Mnemonic codes. Instruction format and addressing mode. Identification of instruction as to which addressing mode they belong. Concept of instruction set. Explanation of the instructions of the following groups of instruction set. Data transfer group, Arithmetic Group, Logic Group, Stack, I/O and Machine Control Group. Programming exercises in assembly language.(Examples can be taken from the list of experiments)

RECOMMENDED BOOKS

1. Digital Electronics: Principles and Integrated Circuits by A.K Maini, Wiley-India Pvt Ltd. Daryaganj, New Delhi
2. Digital Electronics and Applications by Malvino Leach, Tata McGraw Hill Education Pvt Ltd, New Delhi
3. Digital Logic Designs by Morris Mano, Prentice Hall of India, New Delhi
4. Digital Electronics by Soumitra Kumar Mandal, Tata McGraw Hill Education Pvt Ltd,
5. Digital Electronics by V K Sangar , Raj Publishers, Jalandhar
6. Digital Electronics by Tokheim, Tata McGraw Hill Education Pvt Ltd,
7. Digital Electronics by RP Jain, Tata McGraw Hi ll Education Pvt Ltd, New Delhi
8. Digital Electronics by KS Jamwal, Dhanpat Rai and Co., New Delhi
9. Digital Electronics by Rajiv Sapra, Ishan Publication, Ambala
10. Digital Electronics by BR Gupta, Dhanpat Rai & Co., New Delhi

MUPEE 404N	Generation, Transmission and Distribution of Electric Power	4L:0T:2P	4 Credits

Course Objectives

The objectives of the course is:

- The student should be made aware of recent developments, current practices in the electricity departments, corporations and boards to keep them abreast with modern techniques in Transmission and Distribution of Electrical Power.
- The student should be able to deal with the concepts of maintenance of equipment, lines, fault location, planning and designing of simple distribution schemes, executive and supervisory control in power stations,

Course Outcomes

At the end of the Course, Student will be able:		Bloom's Level
CO1	To comprehend the phenomena of power generation through various sources of conventional as well as non-conventional resources.	**K2**
CO2	To understand the concept of Economics of Generation through various factors associated with the generation.	**K1**
CO3	To understand the layout and constructional features of transmission line and calculate the electric features of line using given data.	**K3**
CO4	To develop an understanding of Layout of HT and LT distribution system and determine the faults in a given location using different test.	**K3**
CO5	To develop the concept of power factor and tariffs while understanding the need to improve the power factor.	**K1**

K1 – Remember K2- Understand K3-Apply K4-Analyze K5 – Evaluate K6 – Create

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Unit I Power Generation

Main resources of energy, conventional and non-conventional Different types of power stations, thermal, hydro, gas, diesel and nuclear power stations. Flow diagrams and brief details of their operation, comparison of the generating stations on the basis of running cost, site, starting, maintenance etc. importance of non-conventional sources of energy in the present scenario. Brief details of solar energy, bio-energy, wind energy.

Unit II Economics of Generation

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 there on Base load and peak load power stations, inter-connection of power stations and its advantages, concept of regional and national grid Plant capacity factor, plant use factor, Daily load curve.

Unit III Transmission Systems

Layout of transmission system, selection of voltage for H.T and L.T lines, advantages of high voltage for Transmission of power in both AC and DC. Comparison of different systems: AC versus DC for power transmission, 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.

Mechanical features of line: Importance of sag, calculation of sag, effects of wind and ice related problems; Indian electricity rules pertaining to clearance

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 Transmission Losses.

Unit IV Distribution System

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 and Ring main distribution system.

Constructional features of LT (400Volt), HT (11Kv) underground cables, advantages and disadvantages of underground systems with respect to overhead system. Faults in underground cables-determine fault location by Murray Loop Test, Varley Loop Test. Distribution losses.

Unit V Power Factor and tariffs

Concept of power factor, Reasons and disadvantages of low power factor, Methods for improvement of power factor using capacitor banks, Static VAR Compensator (SVC), Various types of Tariffs. Concept of Tariffs, Block rate, flat rate, maximum demand and two part tariffs simple problems

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

MUPEE 405N	ELECTRICAL CIRCUITS AND ANALYSIS	4L:0T:2P	5 Credits

Course Objectives

The objectives of the course is:

- The student should be able to understand and implement the AC and DC Circuits for its solutions and practical application.
- The student should get an awareness on the different types of signals and understand the phenomena of Control System.

Course Outcomes

At the end of the Course, Student will be able:		Bloom's Level
CO1	To solve DC Networks by applying various theorems associated with it.	**K3**
CO2	To develop an understanding of steady state analysis of AC Circuits and associated terminology.	**K1**
CO3	To solve the AC Networks using the theorem's associated with AC networks.	**K3**
CO4	To solve the three phase AC Circuits and measure the power using two and three wattmeter method.	**K3**
CO5	To understand the various types of control systems and the effect of feedback system.	**K1**

K1 – Remember K2- Understand K3-Apply K4-Analyze K5 – Evaluate K6 – Create

Syllabus

UNIT 1

D.C. Network analysis:- Introduction, characteristic of network element, series resistive circuit, parallel resistance circuit, series parallel circuit, Kirchhoff's law, Ohm's law, nodal analysis, mesh analysis (or loop analysis), star delta conversion, voltage source and current source, Superposition's theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer Theorem.

UNIT II

Steady state analysis of AC circuits:- Generation of alternating emf, definitions related to alternating quantities, instantaneous, average and RMS Value of AC Quantity. Concepts of resistance, inductance, capacitance, impedance, reactance, admittance and susceptance. Phasor representation of an AC quantity, complex and polar form, j- notation.

Series RL circuit, series RC circuit, series RLC Circuit and phasor diagram, impedance in series AC Circuits, Q factor in series AC circuit, Admittance, conductance and susceptance of series AC circuit, series resonance.

Parallel AC circuit and phasor diagram, Admittance, conductance and susceptance of parallel AC circuit, resonance in parallel circuit, Q factor in parallel circuit. Average power Of AC quantity.

UNIT III

A.C. Network analysis:- Superposition's theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer Theorem For AC Applications, star delta connection and relation between line and phase voltage/current, active and reactive power concept in AC system for balance and unbalance load, concepts of power factor.

UNIT IV

(i) **Three Phase AC Circuit :-** Three phase system and it's applications, advantages and disadvantages of three phase power system over single phase power system, Measurements of three phase power by two wattmeter and one wattmeter method .

(ii) **Network Topology: -** definition of graph, tree, basic cut set and tie set matrices and planar network, loop and nodal method of analysis.

(iii) **Signal and System:-** types of signal and system and their properties, Continuous time signals (CT signals) - Discrete time signals (DT signals) - Step, Ramp, Pulse, Impulse, Sinusoidal, Exponential, Classification of CT and DT signals - Periodic & A periodic signals, Deterministic & Random signals, Energy & Power signals-CT systems and DT systems-Classification of systems–Static & Dynamic, Linear & Nonlinear, Time-variant & Time- invariant, Causal & Non causal, Stable & Unstable.

(iv) **Control System:-** Introduction to Control Systems: Types of Control Systems, Effect of Feedback Systems, Differential equation of Physical Systems – Mechanical Systems, Electrical Systems, Analogous Systems. Block diagrams and signal flow graphs, block reduction technique, Transfer functions, Block diagram algebra and Signal Flow graph

RECOMMENDED BOOKS :

1. Network Theory by A.K.Chakraborty, P.K. Satpathy, S.P. Ghosh, Tata McGraw Hill Education Pvt Ltd, New Delhi .
2. Network Theory by A.V. Bakshi, U.A. Bakshi, Technical Publication, pune.
3. Basic Electronics and Linear Circuit by NN Bhargava, Kulshreshta and SC Gupta, Tata McGraw Hill Education Pvt Ltd, New Delhi
4. Electronic Principles by SK Sahdev, Dhanpat Rai & Co., New Delh

MUPEE 406N	Estimating & Costing in Electrical Engineering	5L:0T:0P	5 Credits

Course Objectives

The objectives of the course is:

- The student should be able to read understand the Indian standards and relevant Electricity Rules
- .The student should be able to design good estimates which requires knowledge of materials and methods to deal with economics.

Course Outcomes

At the end of the Course, Student will be able:		Bloom's Level
CO1	To understand the purpose of estimation and costing and the technical terms associated with tender document	**K2**
CO2	To develop an understanding on the different types of electric wiring and use of different protective devices.	**K1**
CO3	To plan a rough domestic installation while preparing the electrical layout for different formats of building.	**K4**
CO4	To plan, design and estimate the industrial installation for single phase motors of different ratings.	**K1**
CO5	To estimate the material required for transmission and distribution lines.	**K4**

K1 – Remember K2- Understand K3-Apply K4-Analyze K5 – Evaluate K6 – Create

Syllabus

UNIT I

Introduction

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 price list, market survey, overhead charges, labour charges, electrical point method and fixed percentage method, contingency, profit, purchase system, enquiries, comparative statements, orders for supply, payment of bills. Tenders – its constituents, finalization, specimen tender.

UNIT II

Types of wiring

IE rules and safety codes, 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)

UNIT III

Estimating and Costing

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 (for house of two room set along with layout sketch), single storey building, auditorium hospital, cinema hall, computer networking, schools and others.

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 singe-phase, 3-phase motor load and the light load (3-phase supply system) Service line connections estimate for domestic upto 10 KW and Industrial loads upto 20 KW (over-head and underground connections) commercial load upto 100 KW, agriculture load 10 hp motor from pole to energy meter.

UNIT IV

Estimating the material required for

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

Estimating of stay and poles, crossing of telephone lines, railway lines and bridge

Substation - Types of substations, substation schemes and components, estimate of 11/0.4 KV pole mounted substation up to 200 KVA rating, methods of earthing of substations, Key Diagram of 66 KV/11KV and 11 KV/0.4 KV Substation and foundation preparation. Single line diagram, layout sketching of outdoor, indoor 11kV sub-station or 33kV sub-station

RECOMMENDED BOOKS

1. Electrical Installation, Estimating and Costing by JB Gupta, SK Kataria and Sons, New Delhi

2. Estimating and Costing by SK Bhattacharya, Tata McGraw Hill, New Delhi

3. Estimating and Costing by Surjeet Singh, Dhanpat Rai & Co., New Delhi

4.Estimating and Costing by Qurashi

5.Estimating and Costing by SL Uppal, Khanna Publishers, New Delhi

6.Electrical Estimating and Costing by N Alagappan and B Ekambaram, TMH, New Delhi