



Integral University, Lucknow
Department of Polytechnic
Study and Evaluation Scheme

Program: Diploma in Electrical Engineering

Semester IVth

S. No.	Course Code	Course Title	Type of Paper	Period Per hr/week/sem			Evaluation Scheme				Sub. Total	Credit	Total Credits	Attributes						
				L	T	P	CT	TA	Total	ESE				Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics
THEORIES																				
1	DMA-401	Applied Mathematics-II (B)	Core	03	01	00	40	20	60	40	100	3: 1: 0	4	Y		Y				
2	DEE-401	Electronics-II	Core	03	01	00	40	20	60	40	100	3: 1: 0	4			Y				
3	DEE-402	Electrical Instrument & Measurements-II	Core	03	01	00	40	20	60	40	100	3: 1: 0	4	Y	Y	Y				
4	DEE-403	Electrical Machine-I	Core	03	01	00	40	20	60	40	100	3: 1: 0	4	Y	Y	Y				
5	DEE-406	Transmission & Distribution of Electrical Power	Core	03	01	00	40	20	60	40	100	3: 1: 0	4	Y						
6	DEE-407	Power Plant Engineering	Core	03	01	00	40	20	60	40	100	3: 1: 0	4	Y				Y		
PRACTICAL																				
1	DEE-451	Electrical Machine Lab-I	Core	00	00	03	40	20	60	40	100	0:: 0 1.5	1.5	Y	Y	Y				
2	DEE-452	Electronics -II Lab	Core	00	00	03	40	20	60	40	100	0: 0 :1.5	1.5	Y	Y	Y				
3	DEE-453	Elementary Civil Engineering Lab	Core	00	00	03	40	20	60	40	100	0: 0: 1.5	1.5	Y	Y	Y				
4	GP-451	General Proficiency		-	-	-	-	-	60	-	60								Y	Y
Total				18	06	09	-	-	-	-	960		28.5							

APPLIED MATHEMATICS-II (B)

(DMA-401)

(Common to All Diploma Engineering Courses)

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UNIT-1

Differential Calculus-II

[8]

Function of two variables, identification of surfaces in space, partial derivatives, chain rule, higher order partial derivatives, Euler's theorem (without proof) for homogeneous functions, Jacobians.

UNIT-2

[8]

Vectors Calculus

Scalar and Vector function. Derivative, Gradient, Divergence & Curl of functions. Directional derivatives. Line, Surface & Volume integrals.

UNIT-3

[8]

Laplace Transformation

Definition & properties of Laplace & Inverse Laplace transformation. Unit step function, periodic function. Solution of ordinary differential equations by Laplace transformation.

UNIT-4

[8]

Beta and Gamma Functions

Definition of Beta and Gamma functions, relation between Beta and Gamma functions, their use in evaluating integrals.

Fourier Series

Fourier series of odd and even functions.

UNIT-5

[8]

Probability and Statistics

Definition of probability, laws and conditional distribution, discrete and continuous distribution. Binomial, Normal and Poisson distribution.

Method of Least-Square and Curve Fitting: Straight line, parabola.

References:

1. Applied Mathematics: Kailash Sinha, Meerut publication.
2. Applied Mathematics: H.R Luthra, Bharat Bharti Prakashan.
3. Applied Mathematics: H.K Das, C.B.S Publication.
4. Mathematics for Polytechnic: S.P Deshpande, Pune Vidyarthi Griha.

ELECTRONICS-II

(DEE-401)

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UNIT-I [6]

Digital Electronics: Introduction, Basic difference between analog and digital signal; Advantages of digital system and its field of applications.

Number system: Binary, Decimal, Octal and Hexadecimal and their need.

UNIT-II [8]

Logic Gates: Symbol and truth table of AND, OR, NOT, NAND, NOR, EX-OR and EX-NOR gates. Boolean theorems and postulates (without proof), Realization of small Boolean functions and reduction using Karnaugh's map.

Logic Families: TTL, MOS, CMOS, ECL, DTL, HTL.

UNIT-III [10]

Half Adder, Full Adder, Half subtractor and Full subtractor circuits and their operations, Display devices. Encoder, Decoder, Multiplexer and Demultiplexer.

Flip Flops: Introduction, S-R flip flop, D flip flop, J-K flip flop and T flip flop

UNIT-IV [8]

Operational Amplifiers: Specification of ideal operational amplifier and its block diagram as an inverter, adder, subtractor, differential amplifier, buffer amplifier, differentiator, integrator, log and antilog amplifiers.

Introduction to IC: Types of IC's, some example of popular IC's (74 & 40 series) i.e. 7400, 7402, 7404, 7408, 7432, 7486, 74266.

UNIT-V [8]

Registers and Counters: Shift registers, SISO, SIPO, PISO, PIPO, Universal Shift register, ripple counter, synchronous counter, Ring counter, Johnson counter, other counters. Memory and programmable logic: RAM, ROM, PLA, PAL.

References:

1. M. Morris Mano and M. D. Ciletti, "Digital Design", 4th Edition, Pearson Education.
2. Hill & Peterson, "Switching Circuit & Logic Design", Wiley.
3. V.K. Mehta, "Principle of Electronics"
4. S. Salivahanan and S. Arivazhagan, "Digital Electronics", Vikas publication.

ELECTRICAL INSTRUMENTS AND MEASUREMENTS-II

(DEE-402)

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UNIT-I

[8]

Energymeter (Induction type):

Construction, working principle, merits and demerits of single-phase and three phase energy meters.

Testing of energy meters for calibration. Errors and compensation. Simple problems. Digital Energy meter (Single Phase/Three Phase) Construction working and application Trivector Meter, Construction, Working & Its Application.

UNIT-II

[8]

Miscellaneous Measuring Instruments:

The construction, working principle and application of: ohm-meter, meggar, earth tester, multimeter, frequency meter (reed-type) single phase power factor meter (Electrodynamometer type), 3-phase power factor meter, phase sequence indicator, synchronoscope. Trivector meter-Construction, Working and application.

UNIT-III

[8]

Electronic Instruments:

Cathode Ray Oscilloscope, construction, working of various controls of CRO. Simple applications (like measurement of voltage current and frequency). Introduction to electronic multimeter, analog multimeter, digital multimeters and V.T.V.M.

UNIT-IV

[8]

Measurement of Resistance Inductance and Capacitance Bridges : Maxwell bridge, Wein's bridge and Schering bridge. Potentiometer, Kelvin's double bridge.

UNIT-V

[8]

Elements of Process Instrumentation Block diagram of process instrumentation system and purpose of each block. Basic principles of various sensors/transducers for measurement of temperature, pressure, strain and liquid level.

Ref. Book

“A Course in Electrical & Electronics Measurement & Instrumentation – A.K. Shahney

Dhanpat Rai & Sons Publication

ELECTRICAL MACHINE-I

(DEE-403)

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UNIT-I

[8]

1. Generalised Treatment of Electrical Machines:-

- 1.1 Definitions of motor and generator.
- 1.2 Torque due to alignment of two magnetic fields and concept of torque angle
- 1.3 Elementary concept of generator and motor
- 1.4 Classification of main types of electrical machines and their generalised treatments in respect of their working (only d.c. machine to be dealt with).
- 1.5 Common features of rotating electrical machines.

UNIT-II

[8]

2. D.C. Machines

- 2.1 Construction of d.c. machines.
- 2.2 E.M.F. equation
- 2.3 Electromagnetic torque (torque equation)
- 2.4 Principle of generating and motoring action.
- 2.5 Speed and torque equation
- 2.6 Armature reaction and commutation in d.c. m/cs.
- 2.7 Factors controlling speed of d.c. motor.
- 2.8 Speed control methods and starters for d.c. m/cs.
- 2.9 Characteristics and application of D.C. generators and motors.

UNIT-III

[8]

3. Transformer

- 3.1 Classification, construction, principle and working of 1 ph. and 3 ph. transformer.
- 3.2 E.M.F. equation.

3.3 Phasor diagram on no-load and load.

3.4 Transformer connections.

3.5 Losses and efficiency.

3.6 Voltage drops and regulation.

3.7 Connections for parallel operation.

3.8 Cooling

3.9 Testing of transformer as per IS specification (Type test and routine test, etc.)

UNIT-IV

[6]

Special transformer - current transformer, potential transformer uses of C.T. and P.T., auto transformer, rectifier transformer, dry type transformer, furnace transformer earthing transformer, traction transformer and its use.

3.11 Welding transformer: constructional detail, comparison between power and welding transformer, metal rectifier.

UNIT-V

[10]

A. C. Generator (Alternator)

Working principle, construction, Full pitch and short pitch winding, pitch factor or coil span factor, distribution or winding factor, E.M.F. equation, rating of alternators, armature reaction, voltage drops in alternator, vector diagram of loaded alternator, voltage regulation and its determination, Efficiency of alternator, conditions for parallel operation, Methods of parallel operation, operation of alternators when connected to infinite bus bar. Voltage regulator like turrill and brown bovery type.

Ref. Book :

“Electrical Machine – Ashfaq Husain

TRANSMISSION AND DISTRIBUTION OF ELECTRICAL POWER

DEE-406

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UNIT I

ELECTRICAL DESIGN OF LINES 8

Layout of different transmission and distribution systems, Advantages of high voltage transmission, Constructional features of transmission lines, Types of supports, Concept of short, medium and long lines.

COMPENSATION TECHNIQUES

Series compensation and Shunt compensation on a transmission line.

UNIT II

DISTRIBUTION SYSTEM 8

Feeder, Distributors and Service mains, Radial and Ring main distributors, AC distributors fed from one end and both ends. Simple problems on size of feeders and distributors, Kelvin's law, Limitations of Kelvin's law, Modification in Kelvin's law.

UNIT III

CARRIER COMMUNICATION 8

Principle of carrier communication over power lines, Purposes and Equipments, Difference between radio transmission and carrier communication, Block diagram, Voltage control.

UNIT IV

CORONA AND HVDC TRANSMISSION 8

Phenomenon of corona, Factors effecting corona, Disruptive critical and Visual critical voltages, Corona power loss, Minimizing corona.

Components of a HVDC transmission system, Applications of HVDC systems, Limitations of AC transmission, Economic comparison, Advantages and Limitations of HVDC transmission.

UNIT V

POWER FACTOR IMPROVEMENT 8

Effects of low power factor, Causes of low power factor, Necessity of power factor improvement, Methods for improvement of power factor, Advantages of improved power factor by installing capacitors at consumer end.

Reference Books:

1. Ashfaq Hussain, "Electrical Power System"
2. C.L.Wadhwa, "Generation Distribution and Utilization of Electrical Energy" Wiley Eastern Publication.
3. J.B.Gupta, "A Course in Power System", S.K.Kataria & Sons.

POWER PLANT ENGINEERING

DEE-407

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UNIT I

THERMAL POWER PLANT

(9)

Introduction, Advantages and Disadvantages, Working of thermal power plant with various auxiliaries (Boiler, super-heater, steam turbine, condenser, economizer, air-pre-heater, feed water heater etc.), Fuel Handling, Fuel Combustion and Combustion Equipment, Problem of Ash Disposal, Heat Balance and Efficiency, Cooling Tower and Ponds, Introduction to Base Load and Peak Load Plants.

UNIT II

HYDRO-ELECTRIC POWER PLANT

(10)

Introduction, Advantages and Disadvantages, Hydrology, Hydrograph, Flow Duration Curve (simple numerical problems), Working of different types of Hydro-Electric Plants and their field of use, Introduction to auxiliaries (Dams, Surge Tank, Penstock, Spill Way, Tail Race etc.), Types of Turbines (Kaplan, Francis, Pelton), Turbine Governors, Pumped Storage Plants.

UNIT III

NUCLEAR POWER PLANT

(7)

Introduction, Advantages and Disadvantages, Elements of Nuclear Power Plant and Plant Layout, Nuclear Reactor and its Components (Nuclear fuels, Moderator, Coolant, Control Rods, Reflector etc.), Classification of Nuclear Reactor (Boiling Water Reactor, Pressurized Water Reactor, Fast Breeder Reactor)

UNIT IV

DIESEL POWER PLANT

(7)

Introduction, Advantages and Disadvantages, Working of Diesel Power Plant, Diesel Plant Equipments, Diesel Plant Layout, Performance and Fuel Requirements of Diesel Engine Plant, Log Sheet.

GAS-TURBINE POWER PLANT

Introduction, Advantages and Disadvantages, Principle of Operation of Gas Turbine Power Plant, Open Cycle and Closed Cycle Gas Turbine Power Plant.

UNIT V

NON-CONVENTIONAL SOURCES OF ENERGY

(7)

Introduction, Advantages and Disadvantages, Concept of Solar Energy, Biomass Energy, Wind Energy, Tidal Energy, Geothermal Energy, Microhydel Energy

Reference Books

1. Dr. B.R.Gupta, "Generation of Electrical Energy", S.Chand Publication.
2. J.B.Gupta, "A Course in Power System", S.K.Kataria & Sons.

ELECTRICAL MACHINE LAB-I

(DEE-451)

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Perform Any Ten:

1. Measurement of induced emf and magnetising current under open circuit condition in D.C. generators.
2. Determination of the relationship between terminal voltage and load current keeping speed constant for
 - (a) Separately excited generator keeping excitation constant
 - (b) D.C. shunt generator.
3. To measure the variation in no load speed of a separately excited d.c. motor for the variation in
 - (a) Armature circuit resistance
 - (b) Field circuit resistance.
4. Measurement of the speed of a d.c. series motor as a function of the load torque.
5.
 - (a) No-load and short circuit test on a single phase transformer.
 - (b) Determination of efficiency and regulation of transformer.
6. To determine the insulation resistance of a transformer at no load and at full load condition.
7. Determination of the magnetisation curve of an alternator
 - (a) at no-load rated speed,
 - (b) at no load half rated speed and
 - (c) at full non-inductive load and rated speed.
8. Determination of the relationship between terminal voltage and load current of an alternator keeping excitation and speed constant.
9. Determination of regulation and efficiency of an alternator from open circuit and short circuit tests.
10. Parallel operation of polyphase alternators and load sharing.

Ref. Book :

“A Text Book of Laboratory Course in Electrical Engg. – Kharbanda –S.Chand Publication

ELECTRONICS LAB-II

(DEE-452)

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Perform Any Ten

1. Familiarisation with bread-board.

Familiarisation with TTL and MOS ICs.

2. Identification of IC-Nos, pin nos, IC types.

3. To observe that logic low and logic high do not have same voltage value delay of TTL logic gate.

5. Observation of differences between MOS and TTL gates under the following heads:

(a) Logic levels

(b) Operating voltages.

(c) Propagation delay.

6. Use of Op-Amp.(for IC 741) as inverting and noninverting amplifier, adder, comparator, buffer, scale changer.

7. Use of IC 755 as timer. Display Devices and Associated Circuits

8. Familiarisation 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 subtraction using 7483 and NAND gates.

13. Flips Flops.: to verify the truth table for selected positive edge triggered and negative edge triggered F/F of J-K and D type

ELEMENTRY CIVIL ENGINEERING LAB

(DEE-453)

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(i) Ranging a line

(ii) Chaining a line

(iii) Taking offset on the chain line and recording the field book.

(iv) To find the difference in level between several points by single setting by the use of dumpy level.

(v) To find the difference in level between two distant points by

(i) Rise & Fall method

(ii) Line of collimation method.

Ref. Books:

Surveying Volume-I & II by B.C. Punmia