Faculty of Engineering & Technology

Syllabus

For

Diploma in Engineering

Electrical Engineering (EE)

(Program Code: ET0131EE)

(2023-24)

Approved by the Academic Council vide resolution no ……

INDEX

1. INTRODUCTION

Technical Education plays a vital role in Human Resource Development of the country by creating skilled man power, enhancing Industrial productivity. Diploma in Engineering 3 year (6 Semester) programme is a professional course for learning of fundamental concepts. It helps to provide trained man power to carry out various trades in engineering. It also promotes entrepreneurial skills among the students. Jagan Nath University presently offers 3-Year Diploma programme in (i) Civil Engineering, (ii) Computer Science Engineering, (iii) Electrical Engineering and (iv) Mechanical Engineering with Choice Based Credit System (CBCS).

2. DURATION OF THE DIPLOMA PROGRAM

(a) There shall be a 3-Year (6 Semester) Program leading to the diploma of engineering

(b) Each Academic Year shall be divided into two Semesters, i.e. July to November / December and January to May / June.

(c) Each Semester shall consist of minimum 18 weeks.

3. TYPES OF COURSES

Course code	Definitions
L	Lecture
T	Tutorial
P	Practical
HS	Humanities & Social Sciences Courses
BS	Basic Science Courses
ES	Engineering Science Courses
PC	Program Core Courses
PE	Program Elective Courses
OE	Open Elective Courses
SI	Summer Internship
PR	Project
SE	Seminar

4. PROGRAM STRUCTURE DIPLOMA IN ENGINEERING (ELECTRICAL ENGINEERING)

SEMESTER I

THEORY PAPERS		Type	No. of Teaching Hours			Marks Allocation			
Code	**Subject/Paper**		**L**	**T**	**P**	**IA**	**EA**	**Total**	**Credits**
DIP101	Applied Physics -I	BS	3	1	-	30	70	100	4
DIP102	Computer Fundamental	ES	3	1	-	30	70	100	4
DIP103	Applied Mathematics-I	BS	3	1	-	30	70	100	4
DIP104	English and communication Skills	HS	3	1	-	30	70	100	4
DIP105	Applied Chemistry	BS	3	1	-	30	70	100	4
PRACTICALS/VIVA-VOCE			**No. of Teaching Hours**			**Sessional**	**Practical**	**Total**	**Credits**
DIP106	Physics Lab-I	BS	-	-	2	60	40	100	1
DIP107	Computer Fundamental Lab	ES	-	-	2	60	40	100	1
DIP108	Engineering Drawing Lab	ES	-	-	2	60	40	100	1
DIP109	Basic Workshop Practice Lab – I	ES	-	-	2	60	40	100	1
DIP110	Chemistry Lab	BS	-	-	2	60	40	100	1
DIP111	Social Outreach, Discipline & Extra Curricular Activities	HS	-	-	-	100	-	100	1
TOTAL			**15**	**5**	**10**	**550**	**550**	**1100**	**26**

SEMESTER II

THEORY PAPERS		Type	No. of Teaching Hours			Marks Allocation			
Code	**Subject/Paper**		**L**	**T**	**P**	**IA**	**EA**	**Total**	**Credits**
DIP201	Applied Physics II	BS	3	1	-	30	70	100	4
DIP202	Advanced English	HS	3	1	-	30	70	100	4
DIP203	Engineering Mechanics	ES	3	1	-	30	70	100	4
DIP204	Applied Mathematics II	BS	3	1	-	30	70	100	4
DIP205	Environmental Sciences	BS	3	1	-	30	70	100	4
PRACTICALS/VIVA-VOCE			**No. of Teaching Hours**			**Sessional**	**Practical**	**Total**	**Credits**
DIP206	Physics Lab-II	BS	-	-	2	60	40	100	1
DIP207	English and Communication Lab	HS	-	-	2	60	40	100	1
DIP208	Basic Workshop Practice Lab - II	ES	-	-	2	60	40	100	1
DIP209	Social Outreach, Discipline & Extra Curricular Activities	HS	-	-	-	100	-	100	1
TOTAL			**15**	**5**	**6**	**430**	**470**	**900**	**24**

SEMESTER - III

Theory Papers		Type	No. of Teaching hours			Marks Allocation			
Code	**Subject/paper**		**L**	**T**	**P**	**IA**	**EA**	**Total**	**Credits**
DIPEE301	Basic Electronics	PC	3	-	-	30	70	100	3
DIPEE302	Renewable Energy	PC	3	1	-	30	70	100	4
DIPEE303	Basic Electrical Engineering	PC	3	1	-	30	70	100	4
DIPEE304	Electrical Measurement & Instrumentation	PC	3	-	-	30	70	100	3
DIPEE305	Electrical Circuit Theory	PC	3	1	-	30	70	100	4
PRACTICALS/VIVA-VOCE			**No. of Teaching Hours**			**Sessional**	**Practical**	**Total**	**Credits**
DIPEE306	Basic Electronics Lab	PC	-	-	2	60	40	100	1
DIPEE307	Basic Electrical Engineering Lab	PC	-	-	2	60	40	100	1
DIPEE308	Electrical Measurement & Instrumentation Lab	PC	-	-	2	60	40	100	1
DIPEE309	Electrical Circuit Theory Lab	PC	-	-	2	60	40	100	1
DIPEE310	Social Outreach, Discipline & Extra Curricular Activities	HS	-	-	-	100	-	100	1
Total			**18**	**3**	**8**	**520**	**580**	**1100**	**26**

SEMESTER – IV

Theory Papers		Type	No. of Teaching hours			Marks Allocation			
Code	**Subject/paper**		**L**	**T**	**P**	**IA**	**EA**	**Total**	**Credits**
DIPEE401	Electrical Machines – I	PC	3	1	-	30	70	100	4
DIPEE402	Power System – I	PC	3	-	-	30	70	100	3
DIPEE403	Microprocessor and Interface	PC	3	-	-	30	70	100	3
DIPEE404	Digital electronics	PC	3	1	-	30	70	100	4
DIPEE405	C- programming	PC	3	1	-	30	70	100	4
PRACTICALS/VIVA-VOCE			**No. of Teaching Hours**			**Sessional**	**Practical**	**Total**	**Credits**
DIPEE406	Electrical Machines – I Lab	PC	-	-	2	60	40	100	1
DIPEE407	Microprocessor Lab	PC	-	-	2	60	40	100	1
DIPEE408	Digital electronics Lab	PC	-	-	2	60	40	100	1
DIPEE409	C- programming Lab	PC	-	-	2	60	40	100	1
DIPEE410	Social Outreach, Discipline & Extra Curricular Activities	HS	-	-	-	100	-	100	1
Total			**18**	**3**	**8**	**520**	**580**	**1100**	**26**

SEMESTER – V

Theory Papers		Type	No. of Teaching hours			Marks Allocation			
Code	**Subject/paper**		**L**	**T**	**P**	**IA**	**EA**	**Total**	**Credits**
DIPEE501	Power Electronics & Drives	PC	3	-	-	30	70	100	3
DIPEE502	Power System – II	PC	3	-	-	30	70	100	3
DIPEE503	Electrical Machine-II	PC	3	1	-	30	70	100	4
DIPEE504	Electrical Design & Drawing	PC	3	-	-	30	70	100	3
DIPEE505	Fundamentals of Control System	PC	3	-	-	30	70	100	3
DIPEE506	Non Conventional Energy Sources	PC	3	-	-	30	70	100	3
PRACTICALS/VIVA-VOCE			**No. of Teaching Hours**			**Sessional**	**Practical**	**Total**	**Credits**
DIPEE507	Power Electronics & Drives Lab	PC	-	-	2	60	40	100	1
DIPEE508	Power System Lab	PC	-	-	2	60	40	100	1
DIPEE509	Electrical Machine-II Lab	PC	-	-	2	60	40	100	1
DIPEE510	Electrical Design & Drawing Lab	PC	-	-	2	60	40	100	1
DIPEE511	Control System Lab	PC	-	-	2	60	40	100	1
DIPEE512	Social Outreach, Discipline & Extra Curricular Activities	HS	-	-	-	100	-	100	1
Total			**18**	**1**	**10**	**580**	**620**	**1200**	**25**

SEMESTER –VI

Theory Papers		Type	No. of Teaching hours			Marks Allocation			
Code	**Subject/paper**		**L**	**T**	**P**	**IA**	**EA**	**Total**	**Credits**
DIPEE601	Power System -III	PC	3	1	-	30	70	100	4
DIPEE602	Utilization of Electrical Power & Traction	PC	3	-	-	30	70	100	3
DIPEE603	Estimating, Costing & Design of Electrical Installations	PC	3	-	-	30	70	100	3
DIPEE604	Switchgear & Protection	PC	3	1	-	30	70	100	4
DIPEE605	Energy Management	PC	3	-	-	30	70	100	3
PRACTICALS/VIVA-VOCE			**No. of Teaching Hours**			**Sessional**	**Practical**	**Total**	**Credits**
DIPEE606	Power System Design Lab	PC	-	-	2	60	40	100	1
DIPEE607	Switchgear & Protection Lab	PC	-	-	2	60	40	100	1
DIPEE607	Energy Management Lab	PC	-	-	2	60	40	100	1
DIPEE608	Technical Seminar	SE	-	-	2	60	40	100	2
DIPEE609	Practical Training cum Project	PR	-	-	-	60	40	100	3
DIPEE610	Social Outreach, Discipline & Extra Curricular Activities	HS	-	-	-	100	-	100	1
Total			**15**	**2**	**8**	**550**	**550**	**1100**	**26**

Note-: The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format, thereafter he/she will have to present the progress of the work through seminars and progress reports. Seminar related to the project should be delivered one after starting of semester .The progress will be monitored through seminars and progress reports.

- The Total Number of credits of the Diploma in Electrical Engineering program=**153**.
- The award of the degree a student shall be required to earn the minimum of **153** credits

5. DETAILED SYLLABI OF DIPLOMA IN ENGINEERING (EE)

SEMESTER I

THEORY PAPERS		Type	No. of Teaching Hours			Marks Allocation			
Code	**Subject/Paper**		**L**	**T**	**P**	**IA**	**EA**	**Total**	**Credits**
DIP101	Applied Physics -I	BS	3	1	-	30	70	100	4
DIP102	Computer Fundamental	ES	3	1	-	30	70	100	4
DIP103	Applied Mathematics-I	BS	3	1	-	30	70	100	4
DIP104	English and communication Skills	HS	3	1	-	30	70	100	4
DIP105	Applied Chemistry	BS	3	1	-	30	70	100	4
PRACTICALS/VIVA-VOCE			**No. of Teaching Hours**			**Sessional**	**Practical**	**Total**	**Credits**
DIP106	Physics Lab-I	BS	-	-	2	60	40	100	1
DIP107	Computer Fundamental Lab	ES	-	-	2	60	40	100	1
DIP108	Engineering Drawing Lab	ES	-	-	2	60	40	100	1
DIP109	Basic Workshop Practice Lab – I	ES	-	-	2	60	40	100	1
DIP110	Chemistry Lab	BS	-	-	2	60	40	100	1
DIP111	Social Outreach, Discipline & Extra Curricular Activities	HS	-	-	-	100	-	100	1
TOTAL			**15**	**5**	**10**	**550**	**550**	**1100**	**26**

DIP101: APPLIED PHYSICS-I

Course Contents:

Unit I: **Measurement:** Physical Quantities, Units for Measurement, Fundamental and Derived Units, Systems of Units, SI Units, Dimensional Analysis, Uses of Dimensional Analysis, Limitations of Dimensional Analysis, Accuracy in Measurement, Errors in Measurement, Combination of Errors, Order of Magnitude, Significant Digits.

Unit II: **Motion and Force:** Distance and Displacement, Speed and Velocity, Relative Velocity, Acceleration and Retardation, Uniformly Accelerated Motion, Equations of Motion, Force and Inertia, Momentum, Impulse, Newton's Law of Motion with examples, Law of Conservation of Momentum, Friction, Laws of Friction, Sliding and Rolling Friction.

Unit III: **Gravitation:** Law of Universal Gravitation, Acceleration due to Gravity, Variation in the value of 'g', Inertial and Gravitational Mass, Gravitational Field, Gravitational Potential Energy, Gravitational Potential, Escape Velocity, Artificial Satellite, Geostationary Satellite, Polar Satellite, Weightlessness in Satellites, Kepler's Laws of Planetary Motion.

Unit IV: **Properties of Matter:** Elasticity, Stress, Strain, Hooke's Law, Young's Modulus, Bulk Modulus, Modulus of Rigidity, Poisson's Ratio, Surface Tension, Surface Energy, Cohesive and Adhesive Force, Angle of Contact, Capillarity, Stream Line and Turbulent Flow, Viscosity, Coefficient of Viscosity, Reynold's Number.

Unit V: **Transfer of Heat:** Modes of Heat Transfer, Isothermal Surface and Temperature Gradient, Coefficient of Thermal Conductivity, Black Body, Reflecting Power, Absorbing Power, Transmitting Power and Emissive Power, Kirchhoff's Law, Wein's Displacement Law, Stefan's Law, Planck's Law of Radiation, Newton's Law of Cooling.

Reference books:

1. Applied Physics Vol. I & II, TTTI Publication Tata McGraw Hill, Delhi
2. Basic Applied Physics by R K Gaur; Dhanpat Rai Publications
3. Simple Course in Electricity and Magnetism by C L Arora, S Chand and Co, New Delhi
4. Fundamental Physics- Vol. I and II by Gomber and Gogia; Pardeep Publications, Jalandhar
5. Concepts in Physics by HC Verma, Bharti Bhawan Ltd., New Delhi
6. Physics XI &XII, NCERT, New Delhi
7. Physics XI &XII Rajasthan Board, Ajmer

DIP102: COMPUTER FUNDAMENTALS

Course Objective:

- To give the basic knowledge of Computer hardware and application software to the students.
- Students able to learn how computers work and how they can be used to make your work more efficient.
- Also Course the basic utilization of the MS Office software package.

Course Contents:

Unit I: Computer System: Basics of computer systems, history, types and Generation of computer, capability and limitations of computer systems. Hardware organization: Anatomy of a digital computer; Internal architecture of CPU.

Unit II: Memory Units: Memory Hierarchy, Primary Memory, Secondary Memory, cache memory. Storage Devices, Input and Output Devices.

Unit III: Number system & Conversions: decimal, binary, octal and hexadecimal number systems and their inter conversions, 1's and 2's complement representation, Binary Arithmetic operations: addition, subtraction, multiplication, division.

Unit IV: Word processor: Introduction to MS-Word, Starting MS-Word, Opening Document, Typing and Editing, Copying, Inserting, Moving, Deleting, Copying from One Document to Others, Undo, Redo, Spell Check, Find and Replace, Formatting, Characters and Fonts, Spacing, Removing Characters Formatting, Inserting Symbols, Paragraphs, Page Setting, Header and Footer, Page Breaks, Borders and Shading, Print Preview and Printing; Tables and Columns

Unit V: Electronic Spread Sheet: Introduction to MS-Excel, Working with Spread Sheet, Editing the Worksheet, Worksheet Formatting, Formula Entering, Saving and Printing Work Book

References:

1. Sinha, P.K. Computer Fundamentals (BPB Publications).
2 Niranjan Mansal and Jayshri Saraogi Computer Made Easy For Beginners (Hindi)
3 Satish Jain, Shashank Jain and Madhullika Jain. It Tools and Applications (BPB Publications)
4 MS Office 2000. Joe Habraken
5 Rapidex Computer Course (Pustak Mahal)
6 Davinder Singh Minhas- Dynamic Memory Computer Course (Fusin Books), New Delhi

DIP103: APPLIED MATHEMATICS-I

Course Contents:

Unit-I: **Introduction to Different Types of Expansion:** Factorial Notation , Meaning of C(n, r), P(n, r) , Binomial Theorem for Positive Index, any Index , Exponential Theorem , Logarithm Theorem, Complex umber: Definition of Complex Number , Operations on Complex Number (Add., Sub., Multiplication, Division) , Conjugate Complex Number , Modulus and Amplitude of a Complex Number , Polar form of a Complex Number

Unit-II: **Trigonometry:** Allied Angle(sin (180±A), sin (90±A) etc., Sum and Difference Formula (without proof) and their Application Product Formula and C-D Formula , T-Ratios of Multiple and Sub-Multiple Angles (2A, 3A, A/2) , Solution of Trigonometric Equations : sin X = 0, tan X = 0, cos X = 0, sin X=A, cos X =A & tan x = A

Unit-III: **Matrices and Determinants:** Definition and Properties of Determinants , Definition and Types of Matrix , Transpose of a Matrix, Symmetric, Skew Symmetric Matrices, Orthogonal matrices, , Minors and Cofactors , Adjoint and Inverse of a Matrix , Cramer's Rule , Solution of Simultaneous Linear Equations by Inverse Matrix Method. Numerical Integration : Trapezoidal Rule , Simpson's 1/3 Rule , Simpson's 3/8 Rule , Newton - Raphson Rule

Unit-IV: **Two Dimensional Coordinate Geometry:** General Introduction , Distance Formula and Ratio Formula , Co-ordinate of Centroid, In-Centre, Ortho-Centre and Ex-Centre of a Triangle , Area of Triangle , Straight Line, Slope form, Intercept form, Perpendicular form, One Point Slope form, Two Point form & General form , Angle between Two Lines , Perpendicular Distance of a Line from a Point

Unit- V: **Conic:** Definition and Standard Equations , Equations of Tangent and Normal at a Point (simple problems) , Parabola : Definition and Standard Equations , Equations of Tangent and Normal at a Point (Simple problems) , Ellipse and Hyperbola : Definition and Standard Equations , Equations of Tangent and Normal at a Point (simple problems)

Reference Books :

1. Mathematics XI & XII	NCERT, New Delhi
2. Mathematics XI & XII	Rajasthan Board, Ajmer
3. Polytechnic Mathematics	H. K. Dass

DIP104 : ENGLISH AND COMMUNICATION SKILLS

Course Contents:

Unit I: Grammar

1. Usage of Tense.
2. Articles (A, an, the)
3. Active & Passive voice
4. Direct & Indirect Speech.
5. Modal Verbs.

Unit II: Comprehension

1. The Luncheon: W.S. Maugham
2. How Much Land Does a Man Need?: Leo Tolstoy
3. The Last Leaf: O. Henry
4. If : Rudyard Kipling

Unit III: Composition

1. Paragraph Writing.
2. Letter Writing.
3. E-Mails
4. Resume Writing.

Unit IV Elements of Communication

1. Communication: Meaning, Importance and Process
2. Functions/Objectives of Communication
3. Barriers to Communication**.**
4. Qualities of good Communication

Unit V Types of Communication

1. Verbal and Non- Verbal Communication
2. Formal and Informal Communication
3. Professional Communication
4. Interpersonal Communication and Methods to Improve It.

Recommended Books:

1. English for Competitive Examinations, Prof. R.P.Bhatnagar, Macmillan Publications.
2. "Current English Grammar and Usage with Composition" by R.P. Sinha, Oxford University Press (New Delhi).
3. Effective Technical Communication By M Ashraf Rizvi Tata McGraw-Hill Companies, New Delhi.
4. Communication Skills by sanjay kumar & Pushp Lata. Oxford University Press (New Delhi)

DIP105 : APPLIED CHEMISTRY

Course Contents:

Unit-I **Atomic Structure**: Constituents of the Atom**,** Bohr's Model of the Atom, Quantum Number and Electronic Energy Levels, Aufbau's Principle, Pauli's Exclusion Principle, Hund's Rule, $n + l$ Rule, Electronic Configuration of Elements (s,p,d Block Elements)

Development of Periodic Table: Modern Periodic Law, Long form of Periodic Table.Study of Periodicity in Physical and Chemical Properties with special reference to : - Atomic and Ionic Radii, Ionisation Potential. Electron Affinity. Electronegativity. Variation of Effective Nuclear Charge in a Period. Metallic Character.

Unit-II **Carbon Chemistry:** Definition of Organic Chemistry. Difference between Organic and Inorganic Compounds. Classification and Nomenclature - Open Chain and Closed Chain Compounds, IUPAC System of Nomenclature. (upto C5). **New Engineering Materials:** Superconductors, Organic Electronic Materials, Fullerences, Optical Fibres

Unit-III **Metals and Alloys:** General Principles and Terms listed in Metallurgy, Metallurgy of Iron and Steel, Different forms of Iron, Effect of Impurities on Iron and Steel, Effect of Alloying Elements in Steel. Extraction of Fe, Cu, Al and their important ores.

Kinetic Theory of Gases: Postulates of kinetic Theory, Ideal Gas Equation, Pressure and Volume Corrections, Vender Walls Equations, Liquefaction of Gases, Critical Pressure and Critical Temperature for Liquefaction. Liquefaction of Gases by Joule – Thomson Effect, Claude's Method and Linde's Method

Unit-IV **Water:** The sources of water, common Impurities, soft and hard water, Hardness of water, degrees of hardness and its effects, determination of hardness by various techniques, Municipal Water supply, requisites of drinking water, purification of water by sedimentation, filtration, reverse osmosis (RO), sterilization, chlorination. treatment by preheating, lime-soda process, permutit de-ionizer or demineralization.

Unit-V **Electrochemistry:** Redox reactions; conductance in electrolytic solutions, specific and molar conductivity variations of conductivity with concentration, Kohlrausch's Law, electrolysis and laws of electrolysis (elementary idea), dry cell – electrolytic cells and Galvanic cells; lead accumulator, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells. Relation between Gibbs energy change and EMF of a cell, fuel cells;

Reference Books:

1. Engineering Chemistry II- Mathur and Agarwal
2. Chemistry of Engineering Materials C.V. Agarwal
3. Engineering Chemistry P.C. Jain and Monika
4. Engineering Chemistry M.M. Uppal
5. Engineering Chemistry V.P.Mehta Jain Bros. Jodhpur
6. Hand book of Technical Analysis Bannerji Jain Bros.Jodhpur
7. Inorganic Chemistry Shivhare & Lavania.
8. Organic Chemistry Kumar & Mehnot
9. A Text book of Engineering Chemistry S. K. Jain & K. D. Gupta
10. Engineering Chemistry Dr. K.L. Menaria & Dr Praveen Goyal

DIP106: PHYSICS-I LAB

List of Experiments:

1. To study of least count, error analysis and curve fitting.
2. Conversion of a Galvanometer into an Ammeter.
3. Conversion of a Galvanometer into Voltmeter.
4. To determine the acceleration due to gravity by using a simple pendulum.
5. To determine the diameter of given material using Screw gauge.
6. To determine the internal diameter, outer diameter and depth of a calorimeter by using Vernier caliper.
7. To determine the height of given spherical surface by using Spherometer.
8. To determine the wavelength of He -Ne Laser beam.
9. To determine minimum deviation angle for different light using prism and spectrometer

DIP107 : COMPUTER FUNDAMENTAL LAB

Course Objective:

- To Understand the Basics of Operating systems
- To Undestand how to use software packages in day to day activities.
- To to identify word processing terminology and concepts, Create technical documents, Animation and Design document, format and edit documents, use simple tools and utilities, Mail merge,Graph ,Chart, Reports and Mathematical expressions.

List of Experiments :

1. Create simple news letter in ms word.
2. Create greeting card in ms word.
3. Create a mail merge letter in MS Word.
4. Create a cover page of the project report.
5. Create a simple presentation in MS Power Point to list simple dos commands, hardware, software.
6. In Power Point create an animation with video and sound.
7. In MS Excel create a report containing the pay details of the employee with followings:
   It contains: sl no, name, employee id
   Enter the following formula to calculate the respective values.
   da (60% of basic)
   hra (7.5% of basic)
8. Create a student result sheet.
9. Create a pie chart for a sample data and give legends
10. Create a macro which creates a line chart using the data in the worksheet.

DIP108: ENGINEERING DRAWING

List of Experiments:

Preparation of following on Imperial Size Drawing Sheet:

1.1 Lines, Letters and Scales

1.2 Geometrical Constructions and Engineering Curve

1.3 Projection of Lines

1.4 Projection of Planes

1.5 Projection of Solids

1.6 Orthographic Projections of Simple objects

1.7 Section and Development of Surfaces of Solids
i.e. Cone, Cylinder, Sphere etc.

Preparation of following Drawings in Sketch Book (Home Assignment) :

2.1 Lettering (On Graph Sheet)

2.2 Projections of Points in Different Quadrants

2.3 Isometric Projections of Various Planes

DIP109: BASIC WORKSHOP PRACTICE - I

Electrical Workshop

1. Study of the various electrical symbol.
2. Study of the tools used in electrical works with diagram.
3. Study of the electrical apparatus, multimeter, ammeter, voltmeter, and wattmeter.
4. Study the various type of electrical wiring (1) Batten wiring (2) Casing- capping wiring (3) C**on**duit wiring
5. Study of the electrical iron and electrical rod.
6. Study of the electrical fan.
7. Study of the electrical heater.
8. Study of the various type of lamps.
9. Study of the florescent lamp.

10 Study of the electrical energy meter (single phase).

Electronic Workshop

1. Explain and measurement of the resistant.
2. Study and measurement of the electronic component and symbols.
3. Study of the types of switches.
4. Study of the function generator.
5. Study of the cathode Ray oscilloscope.
6. Practice of the soldering-de soldering iron.

DIP110: CHEMISTRY LAB

List of Experiments :-

1. To determine the strength of a given unknown copper sulphate solution (Iodometrically) with titrate Hypo (sodium thiosulphate) solution.
2. To determine the strength of a given unknown FAS solution with titrate potassium dichromate solution using N-phenyl anthranilic acid (internal indicator).
3. To determine the viscosity and viscosity index of a given sample of lubricating oil using Redwood viscometer No.1
4. To determine the flash and fire point of a given sample of lubricating oil using Pensky Marten's apparatus.
5. Determine the cloud and pour point of a given sample of lubricating oil.
6. Determination of hardness of water by complexometric method (using EDTA).
7. To estimation the amount of sodium hydroxide and sodium carbonate in the given alkali mixture solution (or in water sample) by titrating against an intermediate hydrochloric acid using phenolphthalein and methyl orange indicator.
8. Determine the pH of an acid (strength of an acid) pH – metrically.
9. Determine the strength of a given unknown HCl solution by titrating it against NaOH solution (Conductometric analysis).
10. To determine the moisture and ash content in a given sample of coal by proximate analysis**.**

DIP111: Social Outreach, Discipline & Extra Curricular Activities

This course aims to cultivate self-confidence, leadership, and community responsibility. It influences academic and personal development, fostering civic responsibility. Students grasp the value of social work and discipline's significance. They contribute to social up-gradation through engagement in organizations, blood donation, awareness programs, and personality development initiatives.

SEMESTER II

THEORY PAPERS		Type	No. of Teaching Hours			Marks Allocation			
Code	**Subject/Paper**		**L**	**T**	**P**	**IA**	**EA**	**Total**	**Credits**
DIP201	Applied Physics II	BS	3	1	-	30	70	100	4
DIP202	Advanced English	HS	3	1	-	30	70	100	4
DIP203	Engineering Mechanics	ES	3	1	-	30	70	100	4
DIP204	Applied Mathematics II	BS	3	1	-	30	70	100	4
DIP205	Environmental Sciences	BS	3	1	-	30	70	100	4
PRACTICALS/VIVA-VOCE			**No. of Teaching Hours**			**Sessional**	**Practical**	**Total**	**Credits**
DIP206	Physics Lab-II	BS	-	-	2	60	40	100	1
DIP207	English and Communication Lab	HS	-	-	2	60	40	100	1
DIP208	Basic Workshop Practice Lab - II	ES	-	-	2	60	40	100	1
DIP209	Social Outreach, Discipline & Extra Curricular Activities	HS	-	-	-	100	-	100	1
TOTAL			**15**	**5**	**6**	**430**	**470**	**900**	**24**

DIP201: APPLIED PHYSICS-II

Course Contents:

Unit I: **Electrostatics and Magnetism:** Electric Charge, Conservation of Charge, Coulomb's Law, Principle of Superposition, Electric Field and Potential, Electric Field and Potential due to Point Charge, Electrostatic Potential Energy, Current, Resistance, Ohm's Law, Magnetic Field, Biot-Savart's Law and its Applications.

Unit II: **Semiconductor Physics:** Solids, Energy Bands in Solids, Conductors, Insulators and Semiconductors, Intrinsic and Extrinsic Semiconductors, Conductivity and Resistivity of Semiconductors, P-N Junction Diode, Biasing and Characteristic Curves, Rectifier, Solar Cell, Zener Diode, LED.

Unit III: **Alternating Current:** Peak Value, Average Value and Root Mean Square Value of Alternating Voltage and Current, Reactance and Impedance, AC Circuits containing R, C, L, R-C, R-L, L-C and L-C-R, Resonant Circuits and their Characteristics, Power of an AC Circuit, Choke Coil, Transformer, Dynamo, D. C. Motor, Starter.

Unit IV: **Optics:** Reflection and Refraction of Light, Laws of Refraction, Critical Angle, Total Internal Reflection,Refraction of Light at a Spherical Surface, Image, Mirrors, Lenses and Prism, Formation of Image by Lenses, Lens Formula, Linear Magnification, Refractive Index of medium of Prism, Dispersion of Light, Spectrum, Angular Dispersion.

Unit V: **Oscillation and Waves:** Periodic Motion, Simple Harmonic Motion, Displacement Equation, Phase and Phase difference, Velocity, Acceleration and Energy of SHM, Simple Pendulum, Wave Motion, Transverse and Longitudinal Waves, Progressive and Stationary Waves, Principle of Superposition of Waves, Sound Waves, Interference of Sound Waves.

Reference books:

1. Applied Physics Vol. I & II, TTTI Publication Tata McGraw Hill, Delhi
2. Basic Applied Physics by R K Gaur; DhanpatRai Publications
3. Simple Course in Electricity and Magnetism by C L Arora, S Chand and Co, New Delhi
4. Fundamental Physics – Vol. I and II by Gomber and Gogia; Pardeep Publications, Jalandhar
5. Concepts in Physics by HC Verma,BhartiBhawan Ltd., New Delhi
6. Physics XI &XII, NCERT,New Delhi
7. Physics XI &XII Rajasthan Board,Ajmer

DIP202 : ADVANCED ENGLISH

Course Contents:

Unit-I (Grammar)

1. Modal
2. Preposition
3. Conjunction

Unit-II (Composition)

1. Resume writing
2. Report writing
3. Advertisement

Unit-III (Personality)

1. Define Personality
2. Types of Personality
3. How to develop one's personality

Unit-IV (Elements of Communication)

1. Meaning
2. Barriers to communication
3. Functions / Objectives of Communication

Unit-V (Poems)

1. 'No men are foreign' – by James Kirk up
2. 'Death, Be not Proud' – by John Donne

DIP203: ENGINEERING MECHANICS

Course Contents:

Unit I **Force System:** Introduction, force, principle of transmissibility of force, resultant of a force system, resolution of a force, moment of force about a line. Varigon's theorem, Lami's theorem. Force body diagram.

Unit II **Centroid & Moment of Inertia:** Location of centroid and center of gravity, Moment of inertia, Parallel axis and perpendicular axis theorem, Radius of gyration, M.I of composite section, Polar Moment of inertia, Lifting Machines: Mechanical advantage, Velocity Ratio,

Unit III **Friction:** Types of Friction, Laws of friction, Angle of friction, Angle of repose, Ladder, Wedge, Belt Friction. Belt Drive: Types of belts, Types of belt drives, Velocity ratio, Effect of slip on Velocity ratio, Length of belt, Ratio of tensions and power transmission by flat belt drives.

Unit IV **Kinematics of Particles and Rigid Bodies:** Velocity, Acceleration, Types of Motion, Equations of Motion, Rectangular components of velocity and acceleration, Angular velocity and Angular Acceleration, Radial and transverse velocities and accelerations,

Unit V **Work, Energy and Power:** Work of a force, weight, spring force and couple, Power, Efficiency, Energy, Kinetic energy of rigid body, Principle of work and energy, Conservative and Nonconservative Force, Conservation of energy.

References Books:

1. Vector Mechanics for Engineers, Beer and Johnston, Tata McGraw-Hill.
2. Engineering Mechanics, Hibbeler, Pearson Education.
3. Engineering Mechanics, Meriam and Kraige, John Wiley & Sons.
4. Engineering Mechanics, Timoshenko and Young, Tata McGraw-Hill.
5. Engineering Mechanics, Shames, Pearson Education.
6. Engineering Mechanics, Boresi and Schmidt, CL-Engineering.
7. Engineering Mechanics, Andrew Pytel & Kiusalas, Cengage Learning.

DIP204: APPLIED MATHEMATICS-II

Course Contents:

Unit-I **Function:** Definition of Function , Range and Domain of Function , Types of Function , Absolute Value Function , Exponential value Function , Identity Function , Reciprocal Function , Rational and Irrational Function , Increasing and decreasing Function , Limits , Concept of Limit , L.H.L., R.H.L. , Limit of Standard Functions, Concept of Continuity and Differentiability at a Point (simple Problems)

Unit-II: **Differential Calculus :** Standard Formulae (Except Hyperbolic Function) Derivative of Sum, difference, Multiplication and Division of two Functions ,Differentiation of Function of a Function , Logarithmic Differentiation , Differentiation of Implicit Functions , Differentiation of Parametric Functions , Differentiation by Trigonometric Transformations , Differentiation of a Function w.r.t. Another Function , Second Order Derivative

Applications of Differential Calculus: Tangents and Normals , Angle of Intersection between two Curves , Derivative as a Rate Measurer , Maxima and Minima of Function with one Variable

Unit-III: **Integral Calculus:** General Introduction of Integral Calculus , Integration of Sum and difference of Functions , Integration by Simplification , Integration by Substitution , Integration by Parts , Integration of Rational and Irrational Functions ,Integration of Trigonometric Functions , Definite Integral and its Properties

Unit IV: **Differential Equations:** Definition of differential Equation, Order, Degree and Solution of a differential Equation, Solution of a differential Equation of First Order and First Degree using: Variable Separable Method , Homogenous Form , Reducible to Homogenous Form , Linear differential Equation , Bernoulli's Equation , Exact differential Equation .

Unit V: Solution of Linear Differential Equation of Higher order with Constant Coefficients, Vector Algebra: Definition, Addition and Subtraction of Vectors , Scalar and Vector Product of two Vectors , Scalar Triple Product and Vector Triple Product , Applications of Vectors in Engineering Problems

Reference Books:

1. Mathematics XI & XII NCERT, New Delhi
2. Mathematics XI & XII Rajasthan Board, Ajmer
3. Polytechnic Mathematics H. K. Dass
4. Text Book on Differential Calculus Chandrika Prasad
5. Text Book on Integral Calculus Chandrika Prasad
6. Differential Calculus M. Ray, S. S. Seth, & G. C. Sharma
7. Integral Calculus M. Ray, S. S. Seth, & G. C. Sharma

DIP205: ENVIRONMENTAL SCIENCE

Course Contents:

Unit-I **Ecosystem: concepts and functions**

Ecosystem- Definition and Introduction of Ecosystem- Abiotic and Biotic components, types of Ecosystems, Food chain, Food web, Ecological pyramids, Energy flow in Ecosystem. Types values, threats and conservation methods of biodiversity.

Unit-II **Environmental Pollutions and Disaster management**

Causes, Effects and Control measures of: Air pollution, Water pollution, Noise pollution, Disaster management: Floods, earthquake, cyclone and landslides.

Unit-II **Solid Waste Management**

Introduction, Classification of solid waste, Composition and characteristics of solid waste, collection, conveyance and disposal methods of solid waste, Reuse, Recycle and Recovery of waste.

Unit-IV **Non-conventional Energy sources**

Introduction, Renewable Sources of Energy: Solar energy, wind energy, Energy from ocean, energy from biomass, geothermal energy and Nuclear Energy.

Unit-V **Social Issues and Environment**

Sustainable development, urban problems related to energy, water shed management and Rain water harvesting, Environmental Education and Public awareness. Environment Protection Act- 1986, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest conservation Act.

Recommended Reference Books:

1. Brunner R.C., Hazardous Waste Incineration, McGraw Hill Inc. 1989.
2. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB).
3. Cunningham, W.P, Cooper, T.H. Gorhani, E & Hepworth, M.T. , Environmental Encycolopedia, Jaico Publishing House, Mubmbi, 2001.
4. De. A.K., Environmental Chemistry, Wiley Eastern Ltd.
5. Agarwal, K.C. 2001 Environmental Biology, Nidhi Publ. Ltd. Bikaner.
6. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut.
7. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p.
8. Shikha Agarwal and Suresh Sahu, Environmental Engineering, Dhanpat rai and co. (P) LTD. 2009.

DIP206: PHYSICS LAB -II

List of Experiments:

1. To study of least count, error analysis and curve fitting.
2. To determine the value of ‘g’ with help of Compound Pendulum.
3. To study Zener diode as a constant voltage regulator
4. To Study the inverse square law using photocell.
5. To determine the numerical aperture of optical fiber.
6. To study the charging of a condenser.
7. To study the discharging of a condenser.
8. To determine the Planck’s constant using LED.
9. Study of the variation of magnetic field at the center of coil when radius remains constant and current vary fitted with the compass box.

DIP207: ENGLISH & COMMUNICATION SKILLS LAB

Topics to be covered:

1. Introducing yourself.
2. Role Plays.
3. Words often mis-spelt and Mis- Pronounced.
4. One word for many.
5. Synonyms and Antonyms.
6. Seminar Presentation.
7. Group Discussion.
8. Job Interview.

DIP208: BASIC WORKSHOP PRACTICE Lab - II

Fitting Shop

1. Finishing of two sides of a square piece by filing and to cut a Square notch using hacksaw.
2. To drill three holes and Tapping on the given specimen.

Welding Shop

3. To prepare Lap Joint with the help of Arc welding
4. To prepare Butt Joint with the help of arc Welding
5. Gas welding practice by students on mild steel flat

Machine Shop Practice

6 Job on lathe M/C with centering
7. Job on lathe M/C with step turning
8. Job on lathe M/C with grooving.
9. Study of Shaper M/C.

DIP209: Social Outreach, Discipline & Extra Curricular Activities

This course aims to cultivate self-confidence, leadership, and community responsibility. It influences academic and personal development, fostering civic responsibility. Students grasp the value of social work and discipline's significance. They contribute to social up-gradation through engagement in organizations, blood donation, awareness programs, and personality development initiatives.

SEMESTER - III

Theory Papers		Type	No. of Teaching hours			Marks Allocation			
Code	**Subject/paper**		**L**	**T**	**P**	**IA**	**EA**	**Total**	**Credits**
DIPEE301	Basic Electronics	PC	3	-	-	30	70	100	3
DIPEE302	Renewable Energy	PC	3	1	-	30	70	100	4
DIPEE303	Basic Electrical Engineering	PC	3	1	-	30	70	100	4
DIPEE304	Electrical Measurement & Instrumentation	PC	3	-	-	30	70	100	3
DIPEE305	Electrical Circuit Theory	PC	3	1	-	30	70	100	4
PRACTICALS/VIVA-VOCE			**No. of Teaching Hours**			**Sessional**	**Practical**	**Total**	**Credits**
DIPEE306	Basic Electronics Lab	PC	-	-	2	60	40	100	1
DIPEE307	Basic Electrical Engineering Lab	PC	-	-	2	60	40	100	1
DIPEE308	Electrical Measurement & Instrumentation Lab	PC	-	-	2	60	40	100	1
DIPEE309	Electrical Circuit Theory Lab	PC	-	-	2	60	40	100	1
DIPEE310	Social Outreach, Discipline & Extra Curricular Activities	HS	-	-	-	100	-	100	1
Total			**18**	**3**	**8**	**520**	**580**	**1100**	**26**

DIPEE 301: BASIC ELECTRONICS

Course Contents:

Unit I Semi Conductor Diode:

1.1 Basic Introduction of P-N junction iode

1.2 Semiconductor diode as half wave rectifier, its efficiency and ripple factor

1.3 Semiconductor diode as full wave rectifier, its efficiency and ripple factor

1.4 Bridge rectifier, Overall comparison between half wave and other full wave rectifiers

1.5 Peak inverse voltage (PIV)

1.6 Use of filter circuit in rectifiers

1.6.1 L filter

1.6.2 C filter

1.6.3 LC section filter

1.6.4 π Section filter

Unit II Bi-Polar Junction Transistor :

2.1 Concept of transistor

2.2 Types of transistor and their working in forward and reverse bias

2.3 Constants of transistor (α,β,γ)

2.4 Analysis of transistor amplifier, load line

2.5 Operating point and biasing

2.6 Input - output characteristics in CB, CC and CE configuration

2.7 Low frequency small signal hybrid equivalent circuit of transistor

2.8 Derivation of voltage, current and power gain, input and output impedance of CE configuration

Unit III R-C Coupled and Power Amplifier :

3.1 Gain at low, mid and high frequency range, cut off frequencies

3.2 Concept of power amplifiers

3.3 Types of power amplifier

3.4 Class A power amplifier, output power analysis

3.5 Push-pull amplifier.

3.6 Class - B power amplifier

Unit IV Semiconductor devices

4. Construction, operation, equivalent circuit and characteristics of

4.1.1 JFET, MOSFET, CMOS

4.1.2 Semiconductor photo devices such as LED, LDR, photo transistor

4.1.3 Varactor diode

Unit V Feed Back and Oscillators

5.1 Basic concept of feedback and types of feedback

5.2 Advantages and disadvantages of negative feedback for gain, stability, frequency and nonlinear distortion

5.3 Voltage series, shunt and current series and shunt feed back circuit

5.4 Use of positive feedback for oscillators

5.5 Barkhausen criteria

5.6 Principles of RC phase shift, Wein bridge oscillator

Reference Books:

1. Electronic Principles V.K.Mehta
2. Electronics Devices & Circuits Sanjeev Gupta
3. Integrated Electronics Millman & Halkias (TMH)
4. Digital Principles & Application Malvino Leach
5. Digital Electronics T.C. Bartee
6. Modern Digital Electronics R.P.Jain

DIPEE 302: Renewable Energy

Course Contents:

1. Solar cell fundamentals:
   - 1.1 Current conduction in semiconductor.
   - 1.2 Atomic structure of silicon, Energy band formation in semiconductor, P-Type and N-type material with silicon, Formation of P-N junction of semiconductor.
   - 1.3 Principles for Electron-Hole Pair generation by Photon absorption, Photo-electric effect, Photo-conductive effect and Photovoltaic effect.
   - 1.4 Materials for Opto-Electronic applications.
   - 1.5 Concept of solar cell, Main elements of silicon solar cell.

2. Solar cell characteristics:
   - 2.1 Current-Voltage (I-V) characteristics of a Photovoltaic cell.
   - 2.2 Power-Voltage (P-V) characteristics of a Photovoltaic cell.
   - 2.3 Equivalent circuit of a solar cell, Maximum power point (MPP).
   - 2.4 Design considerations of Solar cells – Short circuit current (Isc), Open circuit voltage (Voc), Fill factor (FF), Energy losses & factors for loss, Efficiency. Factors limiting the efficiency of solar cell.
   - 2.5 Impact of external parameters on solar cell performances – (i)Radiation, (ii)Temperature, (iii) Wind velocity.

3. Materials for Photovoltaic Cells: (10 periods)
   - 3.1 Classification of solar cell, Cell size.
   - 3.2 Single crystalline silicon cell, Polycrystalline silicon cell.
   - 3.3 Thin film solar cell – Amorphous Silicon, Gallium Arsenide, Cadmium Telluride, Copper Indium Gallium Diselenide.
   - 3.4 Multijunction solar cell.
   - 3.5 Other non-silicon materials for photovoltaic cell fabrications.
   - 3.6 Production technology of Gallium Arsenide and Amorphous Solar Cell.
   - 3.7 Materials required for solar panel and formation of solar panel.

4. Technologies for Photovoltaic Cells Fabrication:
   - 4.1 Dye-sensitized Solar Cell (DSSC) technology, Organic solar cell technology, Quantum Dot Solar cell technology.
   - 4.2 Concept of PV module, PV panel, PV array and its formation.
   - 4.3 Silicon Group and non-Silicon Group, PV cell, PV module, PV panel and PV array fabrication.
   - 4.4 Application of Nano-Technology in Solar Cell.
   - 4.5 Technical data sheet of solar PV panel.

4.6 Basic control diagram of PV system and its components.

4.7 Power distribution layout of PV system.

5. Testing and Evaluation of Photovoltaic Cells:

5.1 Solar Simulator and its application.

5.2 Current-voltage analysis of solar cell, Power analysis.

5.3 Light soaking and temperature cycling analysis.

Recommended Books:

1. Fundamentals of Renewable Energy Sources by N.S. Rathore (Author), Khobragade Chetan (Author), Asnani Bhawana (Author)
2. Fundamentals and Applications of Renewable Energy Mehmet Kanoğlu Yunus A. Çengel John M. Cimbal
3. Fundamentals of Renewable Energy Sources by G.N. Tiwari
4. Fundamentals of Renewable Energy Processes By Aldo Vieira da Rosa

DIPEE303: BASIC ELECTRICAL ENGINEERING

Course Contents:

Unit I D.C. Circuits :

1.1 Resistance, specific resistance, Ohm's law, Resistance in series, parallel and series parallel circuits.

1.2 Kirchhoff's laws

1.3 Application of Kirchhoff's laws

Unit II Capacitance :

2.1 Capacitor

2.2 Capacitance of an isolated sphere

2.3 Parallel plate capacitor

2.4 Special cases of parallel plate capacitor

2.5 Cylindrical capacitor

2.6 Capacitor in series and parallel

2.7 Capacitor with compound dielectric

2.8 Energy stored in capacitor

2.9 Charging and discharging of a capacitor, time constant

2.10 Different types of capacitor used in various electrical applications.

Unit III Magnetic Circuits :

3.1 Introduction

3.2 Comparison between magnetic circuit and electric circuits

3.3 Behavior of magnetic circuits

3.4 Composite magnetic circuits

3.5 Parallel magnetic circuits

3.6 B-H curve

3.7 Rise of current in inductive circuit

3.8 Decay of current in inductive circuit

Unit IV Phasor Algebra :

4.1 Mathematical representation of a vector

4.2 Symbolic notation

4.3 Significance of operator-j

4.4 Conjugate complex number

4.5 Trigonometrical form of vector representation

4.6 Exponential form of vector representation

4.7 Polar form of vector representation

4.8 Addition and subtraction of vector

4.9 Multiplication and division of vector quantity

4.10 120^{o} operator

Unit V A.C. Circuits :

5.1 Alternating quantity and its equation

5.2 Maximum, Average and RMS values.

5.3 Form factor

5.4 Behaviour of R, L and C in A.C. circuits with phasor diagrams

5.5 A.C. through R-L circuit, power factor, active and reactive component of current, power

5.6 Q-factor of a coil

5.7 A.C. through R-C circuit, dielectric loss and power factor of a capacitors

5.8 Solving series R-L-C circuits

5.9 Solving A.C. parallel circuit by phasor diagram and phasor algebra

5.10 Solving A.C. series and parallel circuits.

Reference Books:

1. Electrical Engineering (Hindi & English) K.D.Sharma
2. Electrical Technology Vol. -I B.L.Theraja
3. Electrical Engineering Part-I D.R.Nagpal
4. Electrical Technology J.B.Gupta
5. Basic Electrical Engg. Nagrath & Kothari
6. Electrical Engineering Materials T.T.T.I. Madras
7. Electrical Engineering Materials Raina, Bhattacharya
8. Electrical Engg. Materials B.R. Sharma
9. Electrical Engg. Materials P.L. Kapoor

DIPEE304: ELECTRICAL MEASUREMENT AND INSTRUMENTATION

Course Contents:

Unit I Introduction to Measuring Instruments :

1.1 Classification of M.I.

1.1.1 Absolute & Secondary Instruments

1.1.2 Analog & Digital Instruments

1.2 Different Principles used in M.I.

1.3 Sensitivity

1.4 Accuracy and precision

1.5 Types of errors

1.6 Deflecting, controlling and damping torque

Unit II Different Measuring Instruments :

2.1 PMMC, moving iron and rectifier type ammeters and voltmeters

2.2 Electrostatic voltmeter

2.3 Dynamometer type ammeter, voltmeter and wattmeter

2.4 Induction type wattmeter & energy meter

2.5 Blondels theorem and measurement of power by two wattmeter method in 3-Phase circuits

2.6 Testing of single phase induction type energy meter by direct and phantom loading

2.7 Adjustments of single phase induction type energy meter

2.8 Brief study of static energy meter (single and 3 phase)

2.9 Range extension using shunts and series multipliers

Unit III Measurement of Resistance :

3.1 Classification of resistance

3.2 Measurement of low resistance by Kelvin's double bridge

3.3 Measurement of medium resistance by Ammeter and Voltmeter, Whetstone's bridge, Substitution methods

3.4 Measurement of high resistance and insulation resistance

3.5 Megger, Earth tester and Ohmmeter

Unit IV Potentiometers & Transducer :

4.1 Types of A.C. and D.C. potentiometers

4.2 Construction

4.3 Standardisation

4.4 Applications

4.1.1 Classification of transducer

4.1.2 Primary transducers

4.1.2 Secondary transducer

4.1.3 Active transducer

4.1.4 Passive transducer

4.1.5 Analog transducer

4.1.6 Digital transducer

4.2 Construction, principle of operation and application of the following transducers :

4.2.1 Potentiometer

4.2.3 L V D T and R V D T

4.2.4 Resistance strain gauge

4.2.4 Gauge factor

4.2.5 Gauge materials

4.2.6 Temperature compensation

4.3.1 Thermocouple

4.3.2 Thermister

4.3.3 R T D

4.3.4 Photo cell

4.3.5 Piezo Electric

4.3.6 Capactive

Unit V A.C. Bridges :

5.1 General equation for bridge balance

5.2 Maxwell's inductance bridge

5.3 Maxwell's inductance - capacitance bridge

5.4 Anderson's bridge

5.5 Schering Bridge

5.6 Wien's bridge for frequency measurements

Reference Books:

1. Electrical Measurement & Instruments — J.B.Gupta
2. Electrical Measurement — E.W.Golding
3. Electrical Measurement — D.R.Nagpal
4. Electrical and Electronics Measurement and Instrumentation — A.K.Sawhney.
5. Instrumentation and System — Rangan & Sharma

DIPEE 305 : ELECTRICAL CIRCUIT THEORY

Course Contents:

Unit I Network Parameters :

1.1 Active and passive

1.2 Linear and non-linear

1.3 Unilateral and bilateral

1.4 Lumped and distributed

1.5 Time varying and time invariant parameters

1.6 Voltage and current sources (ideal and practical)

1.7 Dependent and Independent sources

1.8 Source conversion techniques

Unit II Network Theorems :

2.1 Node and mesh analysis, Solution by Kramer's rule up to three variables

2.2 Star-delta transformation

2.3 Superposition theorem

2.4 Reciprocity theorem

2.5 Thevenin's theorem

2.6 Norton's theorem

2.7 Maximum power transfer theorem

2.8 Millman's theorem

2.9 Tellegen's theorem

Unit III Resonance :

3.1 Series resonance

3.2 Parallel resonance

3.3 Q-factor, bandwidth, selectivity, half power frequencies, graphical representations

3.4 Importance of resonance

Unit IV Circuit Transients :

4.1 Introduction to Laplace transform and inverse Laplace transformations

4.2 Laplace transformation of following functions

4.2.1 Unit impulse function

4.2.2 Unit step function

4.2.3 Exponential function

4.2.4 Ramp function

4.2.5 Sinusoidal function

4.2.6 Derivative function

4.2.7 Integral function

4.3 Laplace transformation theorem

4.3.1 Shifting Theorem

4.3.2 Shift in 's' domain theorem

4.3.3 Complex differentiation theorem

4.3.4 Final value theorem

4.3.5 Initial value theorem

4.3.6 Complex integration theorem

4.4 Solution of series RL, RC and RLC circuits by Laplace transformation

Unit V Two Port Network :

5.1 z-parameters

5.2 y-parameters

5.3 h-parameters

5.4 ABCD- parameters

5.5 Inter relation among z,y,h and ABCD parameters.

5.6 Special types of network such as T, π, Bridge - T, Parallel-T and Lattice.

Reference Books:

1. Electrical Circuit Theory — Arumugam & Premkumaran
2. Electrical Networks — Soni & Gupta
3. Electrical Network Analysis — Umesh Sinha
4. Electrical Network Analysis — G.K.Mithal
5. Text Book of Circuit Theory — G.S. Verma
6. Electrical Circuit — M.E. Valvenkerberg

DIPEE306: BASIC ELECTRONICS LAB

List of Experiments

1. Plot V-I characteristics of P-N semiconductor diode in forward and reverse bias
2. Plot the V-I characteristics of a zener diode and design a voltage regulator using zener diode.
3. Observe the wave form for HWR and calculate ripple factor.
4. Observe the wave form for FWR and calculate ripple factor.
5. Observe the wave form for bridge rectifier and calculate ripple factor
6. Observe the wave form for capacitor filter and find the effect of value of capacitor on ripple factor.
7. Plot input output characteristics of P-N-P transistor in CB configuration. Plot input output characteristics of P-N-P transistor in CE configuration.
8. Plot V-I characteristics of N-P-N transistor in CB configuration
9. Plot V-I characteristics of N-P-N transistor in CE configuration

DIPEE307: BASIC ELECTRICAL ENGINEERING

1. Study of the electrical symbol.
2. Study of the tools use in electrical works with diagram.
3. Study of the electrical apparatus, multimeter, ammeter, voltmeter, and wattmeter.
4. Type of electrical wiring (1) Batten wiring (2) Casing- capping wiring (3) C**on**duit wiring
5. Study of the electrical iron and electrical rod.
6. Study of the electrical fan.
7. Study of the electrical heater.
8. Study of the type of lamps.
9. Study of the florescent lamp

10 Study of the electrical energy meter (single phase).

DIPEE308: ELECTRICAL MEASUREMENT AND INSTRUMENTATION LAB

List of Experiments

1. Calibration of ammeter and voltmeter.
2. Calibration of dynamometer type wattmeter and induction type energy meter.
3. Measurement of power in 3-phase circuits by two wattmeter method
4. Measurement of resistance by Kelvin's double bridge
5. Measurement of resistance by Whetstone bridge
6. Measurement of Earth's resistance by Earth tester
7. Calibration of ammeter and voltmeter measurement of resistance by D.C. potentiometer
8. Measurement of inductance and capacitance with the help of a suitable A.C. Bridge
9. Measurement of frequency using CRO
10. Measurement of displacement using following transducers :
    - 10.1 Potentiometer
    - 10.2 L.V.D.T.
    - 10.3 Capacitive
11. Measurement of temperature with the help of
    - 11.1 Thermocouple
    - 11.2 Thermister
    - 11.3 R.T.D.
12. Measurement of strain with the help of strain gauge.
13. Velocity and speed measurement by suitable transducer

DIPEE 309: ELECTRICAL CIRCUIT THEORY LAB

List of Experiments

1. Measurement of armature winding and series field winding resistance of a D.C. machine by ammeter-voltmeter method.
2. Measurement of shunt field winding resistance of a D.C. machine by ammeter-voltmeter method.
3. Verification of Kirchhoff's laws in D.C. circuits.
4. Verification of Kirchhoff's laws in A.C. circuits.
5. Determination of B-H curve of a D.C. machine.
6. Measurement of power and power factor of single phase R-L-C series circuit
7. Determination of R and L of a choke coil using 3-voltmeter and an ammeter.
8. Determination of R and C of a capacitor using 3-ammeter and a voltmeter
9. Measurement of phase and line voltage and current in Star and Delta connection
10. Measurement of power in 3-phase circuit (for balanced load)

DIP310: Social Outreach, Discipline & Extra Curricular Activities

This course aims to cultivate self-confidence, leadership, and community responsibility. It influences academic and personal development, fostering civic responsibility. Students grasp the value of social work and discipline's significance. They contribute to social up-gradation through engagement in organizations, blood donation, awareness programs, and personality development initiatives.

SEMESTER – IV

Theory Papers		Type	No. of Teaching hours			Marks Allocation			
Code	**Subject/paper**		**L**	**T**	**P**	**IA**	**EA**	**Total**	**Credits**
DIPEE401	Electrical Machines – I	PC	3	1	-	30	70	100	4
DIPEE402	Power System – I	PC	3	-	-	30	70	100	3
DIPEE403	Microprocessor and Interface	PC	3	-	-	30	70	100	3
DIPEE404	Digital electronics	PC	3	1	-	30	70	100	4
DIPEE405	C- programming	PC	3	1	-	30	70	100	4
PRACTICALS/VIVA-VOCE			**No. of Teaching Hours**			**Sessional**	**Practical**	**Total**	**Credits**
DIPEE406	Electrical Machines – I Lab	PC	-	-	2	60	40	100	1
DIPEE407	Microprocessor Lab	PC	-	-	2	60	40	100	1
DIPEE408	Digital electronics Lab	PC	-	-	2	60	40	100	1
DIPEE409	C- programming Lab	PC	-	-	2	60	40	100	1
DIPEE410	Social Outreach, Discipline & Extra Curricular Activities	HS	-	-	-	100	-	100	1
Total			**18**	**3**	**8**	**520**	**580**	**1100**	**26**

DIPEE401: ELECTRICAL MACHINES - I

Course Contents:

Unit I **Energy conversion** : Principal of Electromechanical energy conversion, Energy stored in a magnetic field system , Singly and Doubly excited system .

Unit II **DC generators**: Construction ,Type of dc generators , Emf equation , lap& wave windinas , Armature reaction , Commutations , Methods of improving commutations demagnetizing and cross magnetizing mmf , Inter poles characteristics , Parallel operation,.

Unit III **DC motor**: Principal ,Back emf , Types , Production of torque , Armature reaction & inter poles characteristics of shunt, Series & compound motor ,DC motor starting , Speed control of dc motor , Armature voltage and Field Current.Control method, ward Leonard method , Breaking, losses and Efficiency, Direct & Indirect test ,Swin burne test , Hopkinsim Test, Field & Retardation Test,

Unit IV **Transformer** : Construction , Theory and operation , Emf equation , Phasor diagram , Equivalent circuit , Open and Short Circuit test , Back to Back test , Voltage regulation and Efficiency ,Autotransformers, Three winding Transformers, Parallel Operation Of Single Phase and Three Phase Transformer, Three Phase Transformer Connections, Phasor groups , Three phase to Two Phase and Six Phase Conversion , Harmonics and Excitation Phenomenon , Inrush Corrent Phenomena .

Unit V **Cross Field Machines**: Principal of Operation of Rosenberg generators , Amplidyne and Metadyne .

Reference Books:

1.	Vidyut Engg.(S.I.Units) (Hindi)	K.D.Sharma
2.	Electrical Engg. part I& II(Hindi)	D.R.Nagpal
3.	Electrical Machines	J.B.Gupta
4.	Electrical Technology	S.L.Uppal
5.	Electrical Technology Vol.-II	B.L.Theraja
6.	A Basic Course in Electrical Engg.	Sharma & Gupta
7.	Electric Machine	P.S. Bimbra
8.	Electric Machine	Nagrath & Kothari

DIPEE 402: POWER SYSTEM - I

Course Contents:

Unit I Introduction :

1.1 Electrical energy demand and electrical energy growth in India
1.2 Electrical energy growth in India
1.3 Electrical energy sources
1.4 Fossil fuels and nuclear fuels
1.5 Preesent status of electrical demand in Rajasthan

Unit II Thermal Power Station :

2.1 Selection of plant location
2.2 Block diagram of plant and its working
2.3 Coal handling plant
2.4 Pulverising plant
2.5 Draft system
2.6 Boilers
2.7 Ash handling plant
2.8 Turbine
2.9 Different types of condensers
2.10 Cooling towers and ponds
2.11 Feed water heater
2.12 Economiser
2.13 Super heater and reheater
2.14 Air preheater

Unit III Hydro Electric Power Plants :

3.1 Selection of site
3.2 Advantages and disadvantages of hydro power plant
3.3 Hydrology
3.4 Classification based on
    3.1.1 Water flow regulations
    3.1.2 Load
    3.1.3 Head
3.5 Element of hydro power plant and their functions
    3.5.1 Dam
    3.5.2 Storage reservoir
    3.5.3 Fore bay
    3.5.4 Surge tank

3.5.6 Pen stocks

3.5.7 Spill way

3.5.8 Head race and tailrace

3.5.9 Types of turbines

3.5.10. Specific speed

3.6 Brief idea about small and mini hydro plants

3.7 Pumped storage plant

Unit IV Nuclear Power Station :

4.1 Introduction and selection of site

4.2 Block diagram of plant and its working

4.3 Main components and their function

4.4 Energy mass relationship

4.5 Energy due to fission and fusion

4.6 Nuclear chain reaction

4.7 Multiplication factor and critical size

4.8 Moderators materials

4.9 Fissile and fertile materials

4.10 Classification of Nuclear reactor, main parts and their functions

4.11 Safety measures required in nuclear plant

4.12 Disposal of nuclear waste

Unit V Diesel Power Plants :

5.1 Main components and working of diesel power plant with the help of block diagram

5.2 Advantage and disadvantage of diesel power plant

5.3 Application of diesel power plant

5.4 Principle and operation of gas turbine plants

5.5 Comparison of different power stations

5.6 Inter connection of power stations

Reference Books:

1. Generation of Electrical Energy — B.R. Gupta
2. Power Plant Engg. — Domkundwar
3. A course in Electrical Power — Soni, Gupta, Bhatnagar
4. Energy technology — S.Rao & B.B. Parulekar
5. Non-conventional Energy Sources — A.N. Mathur & N.S.Rathore
6. Non-conventional Sources of energy and appropriate technology — D.M. Agrawal & S.K. Bhatnagar
7. Non-conventional Energy Sources — G.D.Rai
8. Solar Energy — Garg & Prakash

DIPEE 403: MICROPROCESSOR AND INTERFACES

Course Contents:

Unit I Introduction :

1.1 Evolution of microprocessor
1.2 Digital computer
1.3 Organisation of computer
1.4 Definition of
    1.4.1 Instruction
    1.4.2 Program
    1.4.3 Machine language
    1.4.4 Assembly language
    1.4.5 High level language
1.5 Compiler and Assembler

Unit II Microprocessors Architecture (Intel 8085) :

2.1 Functional block diagram
2.2 Pin-Out diagram with description
2.3 Buses
    2.3.1 Address bus
    2.3.2 Data bus
    2.3.3 Control bus
2.4 Registers
2.5 Arithmetic and logic unit
2.6 Timing and control unit
2.7 Types of instructions and classification into groups
2.8 Types of addressing modes
2.9 Status flags

Unit III Programming and Application of Microprocessor :

3.1 Some examples of assembly language programme
3.2 Introduction to circuits (block diagram only) used in electrical application
    3.2.1 ADC
    3.2.2 DAC
    3.2.3 Analog Multiplexer
    3.2.4 Sample and Hold
    3.2.5 Programmable peripheral interface (PPI)
3.3 Measurement of Electrical Quantities :

3.3.1 Frequency measurement

3.3.2 Phase angle and power factor measurement

3.3.3 Voltage and current measurement

3.3.4 Power and energy measurement

3.4 Measurement of Physical Quantities :

3.4.1 Temperature measurement

3.4.2 Deflection measurement

3.4.3 Water level indicator

3.4.4 Angular speed

3.5 Traffic Control.

Unit IV 8085 MICROPROCESSOR INTERFACING:

8259, 8257, 8255, 8253, 8155 chips and their applications. A/D conversion, memory, keyboard and display interface (8279).

Unit V INTRODUCTIONS TO 8051 MICROCONTROLLER:

General features & architecture of 8051. Memory, timers and interrupts. Pin details. Interfacing and applications.

Reference Books:

1. Microprocessor & Micro Computer — B. Ram
2. Microprocessor, Architecture Programming & Applications — Ramesh & Gaonkar
3. An Introduction to Microprocessors — A.P. Mathur

DIPEE 404: DIGITAL ELECTRONICS

Course Contents:

Unit I Classification of Electrical Signals :

1.1 Analog & Digital signals and its representation

1.2 Advantages of digital techniques

Unit II Logic Gates :

2.1 Introduction

2.2 Symbol and truth table of NOT, AND, OR, NAND, NOR, EX-OR, EX-NOR gates

2.3 Universal gates and realization of other gates

2.4 Positive, negative logic

Unit III Boolean Algebra :

3.1 Basic laws of Boolean algebra

3.2 Proof by perfect induction

3.3 De'Morgen's theorem and its applications

3.4 Simplification of expression by Boolean algebra

3.5 K-Map

3.6 Realization of simplified expression by logic gates

Unit IV Combinational Circuits :

4.1 Binary half and full adder

4.2 Binary half and full subtractor

4.3 Binary serial, parallel and BCD adder

4.4 Parity bit generator and checker

4.5 Binary comparator

4.6 Basic idea of multiplexer, demultiplexer, encoder and decoder

Unit V Sequential Circuits :

5.1 Introduction to R-S,D,J-K,T, M/s J-K and their truth table

5.2 Concept of edge and level triggering

5.3 Asynchronous and synchronous counters – up, down and up-down

5.4 Mode counter – Mod - 3, Mod - 5, decade counter

5.5 Ring counter, Johnson counter

5.6 Left, right and bi-direction shift register

5.7 Series and parallel shift register

5.8 Use of shift register for binary multiplication and division

Reference Books:

1. Digital Principles & Application — Malvino Leach
2. Digital Electronics — T.C. Bartee
3. Modern Digital Electronics — R.P.Jain

DIPEE 405: “C” PROGRAMMING

'C' is computer programming language and also structured programming language. In 'C' programming language we consider various syntax used in programming. By having good knowledge of 'C', students can write modular application and system programs. 'C' can be used in the engineering applications. By acquiring a sound knowledge of 'C' students will be able to understand the concept of all the application areas. This course is specially designed for engineering students of all diploma streams.

Course Contents:

Unit I Introduction :

1.1 Evolution of microprocessor
1.2 Digital computer
1.3 Organisation of computer
1.4 Definition of
  1.4.1 Instruction
  1.4.2 Program
  1.4.3 Machine language
  1.4.4 Assembly language
  1.4.5 High level language
  1.4.6 Compiler and Assembler

Unit II Introduction of ‘C’ Language :

2.1 Scope of ‘C’ Language
2.2 Distinction and similarities with other HLLs
2.3 Special features and Application areas

Unit III Elements of ‘C’ :

3.1. Character set
3.2. Key words
3.3. Data types
3.4 Constants and Variables
3.5 Operators: unary, binary, ternary
3.6 Operator precedence

Unit IV Console Input-Output :

4.1 Types of I-O
4.2 Console I-O
4.3 Unformatted console I-O: getchar(),putchar(), gets(), puts(), getch(),getche()

4.4 Formatted I-O: scanf(), printf()

Unit V Control Flow & Arrys :

5.1 Statements and blocks
5.2 if
5.3 switch
5.4 Loops: for, while, do-while
5.5 goto and labels
5.6 break, continue, exit
5.7 Nesting control statements
5.8 Basic concepts
5.9 Memory representation
5.10 One dimensional array
5.11 Two dimensional array

Reference Books:

1. 'C' Programming — Stephen Kochan
2. Programming with 'C' — Schaum's Series
3. 'C' Programming — V.Balguru Swami
4. 'C' Programming — Kernighan & Ritchie
5. Let us 'C' — Yashwant Kanetkar

DIPEE406: ELECTRICAL MACHINES–I LAB

List of Experiments

1. Study of constructional features of D.C. machine and identify the terminals of D.C. shunt generator.
2. Determination of O.C.C of D.C. shunt generator
3. Determination of external characteristics of D.C. shunt generator.
4. Determination of external characteristics of compound generator
5. Study of constructional features of D.C. shunt and compound motor starter and connecting, starting and reversing the direction of D.C. shunt motor.
6. Performing Swineburne's test on a D.C. machine
7. Performing Hopkinson's test on a D.C. machine.
8. Speed control of D.C. shunt motor by rheostatic control (both field and armature control)
9. Study of constructional features of single phase and three phase transformers
10. Determination of transformation ratio, regulation and efficiency of a single-phase transformer by direct loading.
11. Open circuit and short circuit test of a single-phase transformer and determination of its equivalent circuit parameters, efficiency and regulation.
12. Parallel operation of single-phase transformers with same voltage ratio and sharing of loads.

DIPEE 408: MICROPROCESSOR LAB

List of Experiments

1. Study of Intel 8085 microprocessors
2. Program to add two 8-bit numbers
3. Program to subtract two 8-bit number
4. Program to find 1's complement of a 8-bit numbers
5. Program to find 2's complement of a 8-bit numbers
6. Program to shift an 8-bit number left by one bit
7. Program to mask of least significant 4 bits of a 8 bit number
8. Program to mask of most significant 4 bits of a 8 bit number

DIPEE 408: DIGITAL ELECTRONICS LAB

List of Experiment:

1. To verify the truth tables of basic logic gates: AND, OR, NOR, NAND, NOR. Also to verify the truth table of Ex-OR, Ex-NOR.
2. To verify the truth table of OR, AND, NOR, Ex-OR, Ex-NOR realized using NAND & NOR gates.
3. To realize an SOP and POS expression.
4. To realize adder and Subtractor using universal gates.
5. To verify the truth table of Encoder and decoder.
6. To verify the truth table of multiplexer and demultiplexer.
7. To study and perform Various types of Flip-Flops.
8. To study and perform various types of counters.
9. To study and perform various types of shift registers.

DIPEE 409: “C” PROGRAMMING LAB

List of Experiments

1. Program to find square from look up table
2. Program to find largest of two numbers
3. Program to find smallest of two numbers
4. Problems based on arithmetic expression, fixed mode arithmetic.
5. Problems based on conditional statements and control structures.
6. Problems based on arrays (1-D, 2-D), functions and pointers.
7. Problems based on engineering applications.

DIPEE410: Social Outreach, Discipline & Extra Curricular Activities

This course aims to cultivate self-confidence, leadership, and community responsibility. It influences academic and personal development, fostering civic responsibility. Students grasp the value of social work and discipline's significance. They contribute to social up-gradation through engagement in organizations, blood donation, awareness programs, and personality development initiatives.

SEMESTER – V

Theory Papers		Type	No. of Teaching hours			Marks Allocation			
Code	**Subject/paper**		**L**	**T**	**P**	**IA**	**EA**	**Total**	**Credits**
DIPEE501	Power Electronics & Drives	PC	3	-	-	30	70	100	3
DIPEE502	Power System – II	PC	3	-	-	30	70	100	3
DIPEE503	Electrical Machine-II	PC	3	1	-	30	70	100	4
DIPEE504	Electrical Design & Drawing	PC	3	-	-	30	70	100	3
DIPEE505	Fundamentals of Control System	PC	3	-	-	30	70	100	3
DIPEE506	Non Conventional Energy Sources	PC	3	-	-	30	70	100	3
PRACTICALS/VIVA-VOCE			**No. of Teaching Hours**			**Sessional**	**Practical**	**Total**	**Credits**
DIPEE507	Power Electronics & Drives Lab	PC	-	-	2	60	40	100	1
DIPEE508	Power System Lab	PC	-	-	2	60	40	100	1
DIPEE509	Electrical Machine-II Lab	PC	-	-	2	60	40	100	1
DIPEE510	Electrical Design & Drawing Lab	PC	-	-	2	60	40	100	1
DIPEE511	Control System Lab	PC	-	-	2	60	40	100	1
DIPEE512	Social Outreach, Discipline & Extra Curricular Activities	HS	-	-	-	100	-	100	1
Total			**18**	**1**	**10**	**580**	**620**	**1200**	**25**

DIPEE 501: POWER ELECTRONICS AND DRIVES

RATIONE

This course aims at imparting knowledge about specific electronics aspects, which are of practical importance for an engineer in consumer and industrial applications. Increasing use of electronic gadgets in control of electrical machines makes this course indispensable for having an insight into trouble-shooting techniques.

Course Contents:

Unit I Introduction:

1.1 Principle, construction ,characteristics and ratings of

1.1.1 SCR

1.1.2 DIAC

1.1.3 TRIAC

1.1.4 UJT

1.2 Series connection of SCR

1.3 Parallel connection of SCR

1.4 UJT as a relaxation oscillator

1.5 Snubber circuit

1.6 Transistor analogy of SCR

1.7 Comparison of SCR and TRIAC

1.8 Over voltage and over current protection circuit for SCR.

Unit II Power Control Rectification:

2.1 Phase control of SCR

2.2 Different phase controlling circuits

2.1.1 R

2.2.1 RC

2.3.1 UJT (Pedestal and Ramp)

2.4.1 Transformer circuit

2.3 Different methods of turn off of SCR

2.4 Single-phase and three-phase half wave and full wave rectifier using SCR

2.5.1 With resistive load

2.6.1 With inductive load

2.7.1 With flywheel diode

Unit III Inverter :

3.1 Basic principle of inverter

3.2 Series inverter

3.3 Parallel inverter

3.4 Single phase voltage source inverter

3.5 Three phase bridge inverter

3.6 Applications

3.7 UPS

Unit IV Chopper:

4.1. Principle of chopper operation

4.2. Control strategies

4.1.1 Constant frequency system

4.2.1 Variable frequency system

4.3. Types of chopper circuits

4.3.1 First quadrant or type A chopper

4.4.1 Second quadrant or type B chopper

4.5.1 Two quadrant type A chopper (type C chopper)

4.6.1 Two quadrant type B chopper (type D chopper)

4.7.1 Four quadrant chopper (type E chopper)

Unit V Cycloconvertor :

5.1 Principle of cycloconvetor

5.1.1 Single phase to single phase circuit step up cycloconverter

5.1.1.1 Mid point cycloconverter

5.2.1.1 Bridge type cycloconverter

5.2.1 Single phase to single phase circuit step down cycloconverter

5.3.1.1 Mid point cycloconverter

5.4.1.1 Bridge type cycloconverter

5.2 Three phase half wave cycloconverter

1.8.1 Three phase to single phase cycloconverter

1.8.2 Three phase to Three phase cycloconverter

Reference Books:

1. Power Electronics P.C. Sen
2. Motor Control P.S Bhimbra
3. Thyristor Engineering M.S. Berde
4. Industrial Electronics G.K. Mithal
5. Thyristor Control Drive G.K. Dubey

DIPEE 502:POWER SYSTEM - II

Course Contents:

Unit I Transmission and Distribution :

1.1 Need and basic flow diagram of power system

1.2 Relative advantages and disadvantages of A.C and D.C transmission

1.3 Selection of transmission voltage

1.4 Comparison of A.C. 1-phase, A.C. 3-phase 3 wire and A.C. 3-phase 4 wire on the basis of copper volume for overhead and underground cable

1.5 Comparison of D.C. 2-wire and D.C. 3-wire system on the basis of copper volume.

Unit II Materials used in Overhead Lines :

2.1 Need, requirement, construction and special feature of line supports

2.2 Types of conductors : hollow, stranded and relative merits and demerits

2.3 Selection of size of conductor, general rules used in RSEB for calculation

2.4 Types of insulators, their construction and application

2.5 Potential distribution over a string of insulators

2.6 String efficiency and methods of improving string efficiency

Unit III Mechanical Design :

3.1 Sag and span

3.2 Sag calculation in overhead lines with same and different level supports

3.3 Effect of wind, ice and temperature on sag

3.4 Effect of sag on overhead conductor configuration and their spacing

3.5 Effect of span on sag

3.6 Stringing chart

3.7 Transposition of conductors

Unit IV Electrical Design:

4.1 Overhead line constants

4.2 Classification of lines

4.3 R, L, C, of over head lines (formula without proof)

4.4 Skin and Ferranti effect

4.5 Calculation of efficiency and regulation for

4.5.1 Short transmission line

4.5.2 Medium transmission line (T and π methods)

4.5.3 Long transmission line (Rigorous method)

4.6 Generalized circuit constants of transmission line

4.6.1 Determination of Generalized circuit constants of

4.6.1.1 Short transmission line

4.6.1.2 Medium transmission line (T and π methods)

4.6.1.3 Long transmission line

Unit V D.C. Distribution Systems :

5.1 Layout of distribution system, feeders, distributors and service mains

5.2 Radial distributor

5.3 Ring main distributor and with interconnector

5.4 Voltage drop calculation for D.C. distributor for uniform and concentrated loading

5.5 Radial distributor fed at one end

5.6 Radial distributor fed at both end with equal and unequal voltages

5.7 Ring main distributor

Reference Books:

1.	Generation of Electrical Energy	B.R. Gupta
2.	Power System Design	M.V. Despandey
3.	Electrical Power System	Nagrath & Kothari
4.	Elements of Power system	Stevension
5.	Power System Analysis and Design	B.R. Gupta
6.	Electrical Power Systems	Ashfaq Husain

DIPEE503 : ELECTRICAL MACHIES - II

Course Contents:

Unit I Induction Motor:

1.1 Production of rotating magnetic field by two phase and three-phase supply
1.2 Construction of slip ring and squirrel cage motors
1.3 Principle of operation
1.4 Slip
1.5 Torque Production
  1.5.1 Gross torque and shaft torque
  1.5.2 Starting torque
  1.5.3 Maximum torque
  1.5.4 Full load torque
  1.5.5 Relation between starting, maximum and full load torque
1.6 Torque-slip characteristics & effect of rotor resistance
1.7 Power stages and efficiency
1.8 Equivalent circuit: approximate and exact
1.9 Phasor diagram
1.10 No-load and blocked rotor tests
1.11 Circle diagram
1.12 Methods of starting
1.13 Speed control of induction motors
  1.13.1 Rotor resistance control
  1.13.2 Stator voltage control
  1.13.3 Frequency control
  1.13.4 Pole changing method
  1.13.5 Cascade control
1.14 Cogging and crawling
1.15 Double cage induction motor, characteristic, applications
1.16 Industrial applications

Unit II Single Phase Induction Motor :

2.1 Double revolving field theory and cross-filed theory
2.2 Construction, working principle and characteristics of following motors
  2.2.1 Resistance start
  2.2.2 Capacitor start & induction run
  2.2.3 Capacitor start & capacitor run
  2.2.4 Shaded pole motor
2.3 Industrial applications

Unit III Alternators :

3.1 Constructional features
3.2 Principle of operation

3.3 Winding factors
3.4 EMF equation
3.5 Idea of leakage reactance (cylindrical rotor) and armature reaction
3.6 Synchronous reactance synchronous impedance
3.7 Phasor diagram at different power factors (cylindrical rotor)
3.8 Voltage regulation
3.9 Open circuit and short circuit tests
3.10 Calculation of voltage regulation by synchronous impedance and m.m.f methods
3.11 Parallel operation of three phase alternators
3.12 Effect of variation in excitation and prime mover power on the performance of parallel connected alternators

Unit IV Synchronous Motors :

4.1 Construction and principle of operation
4.2 Phasor diagram at no load and on load (cylindrical rotor)
4.3 Power equation
4.4 Power angle characteristics
4.5 V - curves and inverted V- curves
4.6 Methods of starting
4.7 Synchronous motor operation at
  4.7.1 Constant input power and variable excitation
  4.7.2 Constant excitation and Variable input power
4.8 Synchronous condenser
4.9 Comparison of induction motor and synchronous motor
4.10 Application of synchronous motor

Unit V Stability Analysis of Synchronous Machines:

5.1 Transient behaviour
5.2 Reactance
5.3 Symmetrical short circuit
5.5 Swing equation, swing curve, M and H constants
5.6 Steady state stability
5.7 Transient stability
5.8 Equal area criterion of stability
5.9 Hunting phenomenon in synchronous machines

Reference Books:

1. Electrical Machines I.J. Nagrath
2. Electrical Technology B.L.Theraja
3. Electrical Machines P.S.Bhimbra

DIPEE504: ELECTRICAL DESIGN AND DRAWING

Course Contents:

Unit I Transformer Design :

1.1 Single phase and three-phase core type distribution transformer

1.2 Single phase shell type transformer

1.3 Output equation

1.4 Main dimension of frame

1.5 Core design and winding design

Unit II Design of Winding :

2.1 Definition of -

2.1.1 Single and double layer winding

2.1.2 Full pitch and short pitch winding

2.1.3 Integral and fractional winding

2.2 Developed winding diagrams of single phase and three-phase induction motors

2.3 Developed winding diagrams of alternators

Unit III D.C. Machine Design :

3.1 Choice of specific magnetic and specific electric loading

3.2 Output equation (Armature Design)

3.3 Calculation of main dimensions

3.4 Output coefficients

3.5 Choice of number of poles

3.6 Design of shunt field winding

Unit IV Phase Induction Motor Design :

4.1 Choice of specific magnetic and specific electric loading

4.2 Output equations

4.3 Calculation of main dimensions

4.4 Relation between D and L

4.5 Effect of length of air gap on motor performance

4.6 Calculation of no load current

Unit V Simple Alarm and Signal Circuits :

Using contactors, designing and drawing schematic and wiring diagrams of alarm and signal circuits. Circuits should involve use of switches, push buttons, bells, indicating light which are used in offices, hospitals, hotels and buses etc.

Reference Books:

1.	Electrical Design, Estimating and Costing	K.B. Raina, S.K. Bhattacharya
2.	Electrical M/C Design	A.K. Shawney
3.	Electrical Drawing and Design	Jaggi
4.	Electrical M/C Design	V.N. Mittal
5.	Electrical Engg. Drawing	Surjit singh
6.	Electrical Engg. Drawing	J.B.Gupta
7.	Handbook of Electrical Engg.	S.L. Bhatia

DIPEE505: FUNDAMENTALS OF CONTROL SYSTEM

Course Contents:

Unit I Control System:

1. Basic definition
2. Open loop and Closed loop systems
3. Transfer function
4. Transfer function of different R- C networks
5. Block diagram and its reduction technique
6. Signal flow graph and Mason's gain formula

Unit II Control System Components :

2.1 D.C. Servo motor

2.2 A.C. Servo motor

2.3 Synchro pair

2.4 Tachogenerator

Unit III Time Domain Analysis :

3.1 Various test signals used in control system (step, impulse, ramp, parabolic)

3.2 Impulse response

3.3 First order and second order system

3.4 Time domain specifications

3.5 Step response of first order and second order system

3.6 Stability analysis of control system

- 3.6.1 Absolute satiability
- 3.6.2 Marginal satiability
- 3.6.3 Relative satiability
- 3.6.4 Asymptotic satiability

3.7 Routh's stability criterion

- 3.7.1 Formation of Routh array
- 3.7.2 Difficulties in formation of Routh array and their remedies
- 3.7.3 Determination of gain K

3.8 Static and dynamic error coefficients

Unit IV Frequency Response :

4.1 Frequency domains analysis

4.2 Frequency domain specifications

4.3 Gain margin and phase margin

4.4 Polar plots

4.5 Bode plot

4.6 Nyquist stability criterion

4.7 Stability analysis using Nyquist plot and Bode plot

4.8 M & N circle

Unit V Root Locus :

5.1 Introduction

5.2 Rules for constructing root loci

5.3 Root locus plots

5.4 Effect of Zeros and Poles on root locus

Reference Books:

1. Control System Engg. Nagrath & Kothari
2. Control System B.C. Kuo
3. Control System Engg. Ogata
4. Automatic Control System Hassan Saeed

DIPEE506: Non Conventional Energy Sources

CONVENTIONAL ENERGY SOURCES

UNIT	CONTENTS
Unit I	**Introduction:** World energy situation, conventional and non-conventional energy sources, Indian energy scene. **Tidal Energy:** Introduction to tidal power. Components of tidal power plants, double basin arrangement. Power generation. Advantages and limitations of tidal power generation. Prospects of tidal energy in India.
Unit II	**Solar Energy:** Solar radiation, solar radiation geometry, solar radiation on tilted surface. Solar energy collector. Flat- plate collector, concentrating collector - parabolidal and heliostat. Solar pond. Basic solar power plant. Solar cell, solar cell array, basic photo-voltaic power generating system.
Unit III	**Wind Energy:** Basic principle of wind energy conversion, efficiency of conversion, site selection. Electric power generation-basic components, horizontal axis and vertical axis wind turbines, towers, generators, control and monitoring components. Basic electric generation schemes- constant speed constant frequency, variable speed constant frequency and variable speed variable frequency schemes. Applications of wind energy. **Geothermal Energy:** Geothermal fields, estimates of geothermal power. Basic geothermal steam power plant, binary fluid geothermal power plant and geothermal preheat hybrid power plant. Advantages and disadvantages of geothermal energy. Applications of geothermal energy. Geothermal energy in India.
Unit IV	**Nuclear Fusion Energy:** Introduction, nuclear fission and nuclear fusion. Requirements for nuclear fusion. Plasma confinement – magnetic confinement and inertial confinement. Basic Tokamak reactor, laser fusion reactor. Advantages of nuclear fusion. Fusion hybridand cold fusion.
Unit V	**Biomass Energy:** Introduction, biomass categories, bio-fuels. Introduction to biomass conversion technologies. Biogas generation, basic biogas plants-fixed dome type, floating gasholder type, Deen Bandhu biogas plant, Pragati design biogas plant. Utilization of bio gas. Energy plantation. Pyrolysis scheme. Alternative liquid fuels –ethanol and methanol. Ethanol production.

Text Books

1 G. D. Rao: Renewable Energy

2 B. H. Khan: Non-Conventional Energy Resources, MGH.

Reference Books

1 A. N. Mathur: Non-Conventional Resources of Energy.

2 Boyle: Renewable Energy, 3rded Oxford.

3 Bent Sorensen, 4th ed.: Renewable Energy, Elsevier.

4 V. V. N. Kishore: Renewable Energy Engineering and Technology, TERI.

5 Garg & Prakash: Solar Energy : Fundamentals and Applications, MGH

6 David Boyles: Bio Energy, Elis Horwood Ltd.,

DIPEE 507: POWER ELECTRONICS AND DRIVES LAB

List of Experiments

1. Draw characteristics of SCR.
2. Draw characteristics of TRAIC.
3. Draw characteristics of DIAC.
4. Draw characteristics of UJT
5. Study of UJT oscillator
6. Speed control of D.C. Shunt motor.
7. .Speed control of D.C series motor.
8. Study of various SCR firing circuits.
9. Study of various commutation circuits.
10. Speed control of A.C 1-phase motor

DIPEE 508: POWER SYSTEM LAB

List of Experiments:

1. To study the operation of electro-mechanical type on inverse time over current relay by using VPL 102A.
2. To study the operation of electro-mechanical type under voltage relay by using VPST-103B.
3. To study the performance of directional over current relay using VPL-82.
4. To study the phase to earth fault relay by balance condition using VPL-04A.
5. To study the operational of micro-controller based biased single phase differential protection on transformer secondary relay using VPL-83.
6. To study the characteristics of normal fuse, HRC fuse and MCB, using fuse, HRC fuse and MCB characteristics trainer VPL-03.
7. To analyses the directional over current relay by DMT & IDMT method using VPL-81.
8. To study the gas actuated buchholz relay.

DIPEE509: ELECTRICAL MACHIES – II LAB

List of Experiments

1. Connecting, starting and reversing the direction of rotation of 3-phase squirrel cage induction motor by using
   - 1.1 D.O.L starter
   - 1.2 Star-Delta starter
2. Speed control of 3-phase induction motor by rotor resistance control.
3. Speed control of 3-phase induction motor by stator voltage control
4. No-load and blocked rotor tests on 3-phase induction motor and plotting of circle diagram.
5. Study the various types of single-phase Induction motor with starting and reversing operation.
6. Starting of synchronous motor and plotting V-curves.
7. Determination of load characteristics of alternator at rated speed.
8. Determination of regulation of alternator by direct loading.
9. Determination of magnetisation curve of an alternator at rated speed
10. O.C and S.C tests on alternator and determination of regulation by synchronous impedance method.
11. Synchronisation of alternators.

DIPEE510: ELECTRICAL DESIGN AND DRAWING LAB

Preparation of drawing sheets for the following.

1.	Electrical symbols as per I.S.	1 Sheet
2.	Preparation of sectional plan, elevation and view of transformer	
	2.1 Single-phase core and shell type	1 Sheet
	2.2 Three-phase core and shell type	1 Sheet
3.	Alarm circuits.	3 Sheets
4.	Contactor circuits.	3 Sheets
5.	Developed winding diagrams.	4 Sheets
6.	Panel wiring diagram.	3 Sheets

DIP511: Control System Lab

List of Experiments

1. (a) Plot step response of a given TF and system in state-space. Take different values of damping ratio and wn natural undamped frequency.

   (b) Plot ramp response.
2. To design 1st order R-C circuits and observe its response with the following inputs and trace the curve.

   (a) Step

   (b) Ramp

   (c) Impulse
3. To design 2nd order electrical network and study its transient response for step input and following cases.

   (a) Under damped system

   (b) Over damped System.

   (c) Critically damped system.
4. To Study the frequency response of following compensating Networks, plot the graph and final out corner frequencies.

   (a) Leg Network

   (b) Lead Network.

   (c) Leg-lead Network.
5. Draw the bode plot in real time for a Non-Inverting amplifier.
6. Draw the bode plot in real time for an Inverting amplifier.
7. Draw the bode plot for second order transfer function.
8. Draw the bode plot for first order transfer function.
9. Design and analyse Tow- Thomas biquad filter.
10. Design and calculate Kp, Ki for PI controller.

DIPEE512: Social Outreach, Discipline & Extra Curricular Activities

This course aims to cultivate self-confidence, leadership, and community responsibility. It influences academic and personal development, fostering civic responsibility. Students grasp the value of social work and discipline's significance. They contribute to social up-gradation through engagement in organizations, blood donation, awareness programs, and personality development initiatives.

SEMESTER –VI

Theory Papers		Type	No. of Teaching hours			Marks Allocation			
Code	**Subject/paper**		**L**	**T**	**P**	**IA**	**EA**	**Total**	**Credits**
DIPEE601	Power System -III	PC	3	1	-	30	70	100	4
DIPEE602	Utilization of Electrical Power & Traction	PC	3	-	-	30	70	100	3
DIPEE603	Estimating, Costing & Design of Electrical Installations	PC	3	-	-	30	70	100	3
DIPEE604	Switchgear & Protection	PC	3	1	-	30	70	100	4
DIPEE605	Energy Management	PC	3	-	-	30	70	100	3
PRACTICALS/VIVA-VOCE			**No. of Teaching Hours**			**Sessional**	**Practical**	**Total**	**Credits**
DIPEE606	Power System Design Lab	PC	-	-	2	60	40	100	1
DIPEE607	Switchgear & Protection Lab	PC	-	-	2	60	40	100	1
DIPEE607	Energy Management Lab	PC	-	-	2	60	40	100	1
DIPEE608	Technical Seminar	SE	-	-	2	60	40	100	2
DIPEE609	Practical Training cum Project	PR	-	-	-	60	40	100	3
DIPEE610	Social Outreach, Discipline & Extra Curricular Activities	HS	-	-	-	100	-	100	1
Total			**15**	**2**	**8**	**550**	**550**	**1100**	**26**

DIPEE601: POWER SYSTEM – III

Course Contents:

Unit I Load and Load Curves :

1.1 Types of load

1.2 Variation in demand, chronological load curve

1.3 Load duration curve, energy load curve

1.4 Load factor, capacity factor, diversity factor, connected load, maximum demand, utilization factor

Unit II Economic Aspects of Generation :

2.1 Factor affecting the cost of generation

2.2 Cost reduction by power station inter connection

2.3 calculation of cost per unit

2.4 Incremental rate of generation and condition for economic loading

Unit III Tariffs:

3.1 Objectives of tariff

3.2 General tariff form and types of tariff

- 3.2.1 Flat rate
- 3.2.2 Straight meter rate
- 3.2.3 Block meter rate
- 3.2.4 Hopkinson demand tariff
- 3.2.5 Doherty demand rate
- 3.2.6 Wright demand rate

3.3 Present tariff pattern in Rajasthan

Unit IV Power Factor Improvement :

4.1 Meaning of power factor

4.2 Causes of low power factor

4.3 Effects of low power factor

4.4 Advantages of power factor improvement

4.5 Methods of power factor improvement

4.6 Location of shunt capacitors

Unit V Combined Operation of Power Stations :

5.1 Types and advantage of interconnection

5.2 Base load, peak load and load allocation among different power station

5.3 Real and reactive power control of turbo alternator

5.4 Reactive power requirements during peak and off peak hours

Reference Books:

1. Generation of Electrical Energy — B.R. Gupta
2. Power System Design — M.V. Despandey
3. Electrical Power System — Nagrath & Kothari
4. Elements of Power system — Stevension
5. Power System Analysis and Design — B.R. Gupta
6. Electrical Power Systems — Ashfaq Husain

DIPEE602: UTILIZATION OF ELECTRICAL POWER AND TRACTION

Course Contents:

Unit I Industrial Utilization :

1.1 Advantages of electrical drives over mechanical drives

1.2 Group and individual drives

1.3 Characteristics and application of various types of electric motors

1.4 Selection of electrical motors for

1.4.1 Domestic uses - Fans, sewing machines, refrigerators, air conditioners, coolers, mixers and grinders, washing machines, hair dryer

1.4.2 Industrial uses - Lathes, drilling machine, elevators, cranes lift, conveyors, textile and paper mills.

Unit II Electric Heating :

2.1 Principle of electric heating

2.2 Advantages of electric heating

2.3 Methods of heating

2.3.1 Resistance heating

2.3.2 Induction heating

2.3.3 Dielectric heating

Unit III Electric Welding:

3.1 Principle of electric welding

3.2 Classification of electric welding

3.3 Resistance welding

3.3.1 Spot welding

3.3.2 Butt welding

3.3.3 Seam welding

3.4 Arc Welding

3.4.1 Metal arc welding

3.4.2 Carbon arc welding

3.5 Comparison between resistance and arc welding

Unit IV Illumination:

4.1 Terms used in illumination

4.2 Laws of illumination

4.2.1 Inverse square law

4.2.2 Lambert's cosine law

4.3 Electrical sources of light

4.3.1 Design of lighting schemes for domestic, commercial and industrial premises based upon illumination level required for various works.

4.4 Types of lamps

4.5 Comparison of fluorescent tubes and filament lamps

4.6 Requirement of good lighting

4.7 Lighting schemes for flood light

Unit V Traction Systems:

5.1 Ideal traction system

5.2 Different systems of traction

5.3 Systems of electric traction

5.4 Systems of track electrification

5.5 Comparison between D.C. and A.C. systems of railway electrification form the point of view of main line and suburban line railway service

Reference Books:

1.	A Course in Electrical Power	J .B. Gupta
2.	Utilization of Electric Power & Electric traction	G.C. Gay
3.	Art & Science of utilization of Electrical Energy	H. Partab
4.	Electrical Utilization & Traction	Yash & Basant
5	Electric Drives	G.K. Dubbey

DIPEE603: Estimating, Costing & Design of Electrical Installations

Course Contents:

Unit I Wiring Materials and Accessories:

1.1 Different electrical symbols

1.2 Brief description, general specification and approximate cost of

1.2.1 Different types of wire and cable

1.2.2 Switches, socket outlets, ceiling roses, lamp holders, plugs

1.2.3 Conduits and it accessories

1.2.4 Distribution boards and boxes

1.2.5 Fuses, MCB, isolators, E.L.C.B. and energy meters

1.2.6 Incandescent, Fluorescent and discharge lamps

1.2.7 D.C. and A.C. motors and starters

Unit II General Principle of Estimating and Costing :

2.1 Purpose and essential of estimating and costing

2.2 Preparation of list of materials

2.3 Market survey, price list and net prices

2.4 Calculation of material and labour cost, contingencies, supervision, overhead charges, profit and total cost.

2.5 Purchase process: quotations, comparative statement, purchase order, tender order, security money

Unit III Earthing:

3.1 Need of earthing

3.2 Pipe and plate earthing

3.3 Schedule of material and accessories, costing and estimates.

Unit IV Service Connection:

4.1 General rules and regulation

4.2 Overhead and underground service connection

4.3 Schedule of material and accessories for single phase and three-phase service connection

4.4 Costing of material and work

Unit V Plan Estimation of 1-φ and 3-φ Electrical load :

5.1 Installation plan

5.2 Single line-wiring diagram

5.3 Calculation of conductor size

5.4 Design for main switch boards and distribution board

5.5 Calculation of number of circuits

5.6 List of material required for following and preparation of estimate, calculation of material cost using PWD B.S.R.

5.6.1 Single storey & Multi storey building

5.6.2 Small workshop

5.6.3 Agricultural pump

5.6.4 Institution or office building

Reference Books:

1	Electrical Estimating & Costing	S.L.Uppal
2	Electrical Estimating & Costing	J.B.Gupta
3	Installation, Design & Drawing	J.B. Gupta
4	Electrical Engg. Drawing	Surjeet Singh
5	Electrical Estimating and Costing	TTTI Madras
6	Electrical Estimating and Costing	M.F. Buereslui
7	Electrical Estimating and Costing	Raina, Bhattacharya

DIPEE604 : SWITCHGEAR AND PROTECTION

Course Contents:

Unit I Faults in Power System :

1.1 Sources of faults
1.2 Percentage reactance and base KVA
1.3 3-phase short circuits on alternator
1.4 Calculations of short-circuit KVA current
1.5 Construction of reactors
1.6 Limitations of fault current
1.7 Location of reactor

Unit II Symmetrical Components :

2.1 Operator 'a'
2.2 Determination of sequence components
2.3 Sequence impedance and sequence network
2.4 Types of faults at the terminals of unloaded alternator
2.5 Determination of fault current

Unit III Fuses :

3.1 Definition of different terms
3.2 Selection of fuse materials
3.3 Types of fuses
3.4 Application of H.R.C. fuses
3.5 Drop out fuse
3.6 Advantage and disadvantage of fuses

Unit IV Circuit Breakers :

4.1 Basic construction of circuit breaker
4.2 Arc phenomenon
4.3 Arc extinction methods
4.4 Interruption of capacitive current
4.5 Current chopping
4.6 Resistance switching
4.7 Construction, working and application of
    4.7.1 Oil circuit breaker
        4.7.1.1 Bulk oil C.B.
        4.7.1.2 Minimum oil C.B.

4.7.2 Air Circuit breaker

4.7.3 Air blast circuit breaker

4.7.4 Vacuum circuit breaker

4.7.5 SF_6 circuit breaker

4.8 Ratings of circuit breaker

Unit V Protection :

5.1 Principle of protection systems

5.2 Basic requirement of relays

5.3 Classification of relays according to construction, uses and operating time

5.4 Types o f relays (construction, setting and applications)

1 Thermal relay

2 Electromagnetic relay

3 Induction type relay

4 Differential type relay

5 Distance relay

5.5 Over current, reverse power and earth leakage protection

5.6 Static relays

5.6.1 Basic elements

5.6.2 Applications

Reference Books:

1. Switchgear & Protection Sunil S.Rao
2. A Course in Electrical Power Soni, Gupta & Bhatnagar
3. Switchgear & Protection M.Chander & Ravindranath
4. Electrical Power System C.L. Wadhwa.

DIPEE605 : ENERGY MANAGEMENT

Course Contents:

Unit I Energy Management and Energy Planning :

1.1 Definitions and Significance

1.2 Energy Strategy, Energy Policy and Energy Planning

1.3 Two Sides of Energy Management

1.4 Sectors of Supply Side Energy Management

1.5 Objectives of Energy Management

1.6 Hierarchical Levels of Sup-- Side Energy Management

1.7 Trade-off between Energy and Environment

1.8 Finery- and Energy Planning

1.9 Energy and Economy

1.10 Essential Imperatives and Steps in Supply Side Energy Planning

1.11 Energy Planning Flow for Supply Side

1.12 Essential Data for Supply-side Energy Planning

1.13 Per Capita Energy Consumption

1.14 Essential Imperatives and Steps in User Side Energy Planning

1.15 Energy Management and Control Systems (EMCs or EMS) for Demand Side

1.16 Energy Management in End-User Plant

1.17 Seven Principles of Energy Management

1.18 Energy Policy of a Supply Organization and Demand Side Organization

1.19 Energy Policy of a Demand Side Organization (Energy Consumer)

1.20 Organization for Energy Management

Unit II Energy and Power Management :

2.1 Overview of India's Energy and Power Sector

2.2 National Energy Strategies of India

2.3 Primary Energy Sources for Power Generation and

2.4 Electric Power Sector Planning in India

2.5 India's Nonconventional, Renewable arid Alternate Energy Planning

2.6 Rural Electrification Programs in India

2.7 Economic Reforms in Energy and Power Sector

2.8 Energy Consumption Trends in India, Integrated Estimates

2.9 Energy Conservation Measures under 9th Five Year Plan

2.10 Per Capita Availability of Commercial Energy Resources, Reserve to Production Ratio (R/P)

Unit III Energy Audit :

3.1 Aim of Energy Audit
3.2 Energy flow diagram
3.3 Strategy of Energy Audit
3.4 Comparison with Standards
3.5 Energy Management Team
3.6 Considerations in Implementing Energy Conservation programmes
3.7 Periodic progress review
3.8 Instruments for energy audit
3.9 Energy Audit of illumination system
3.10 Energy audit of electrical system
3.11 Energy audit of Heating, ventilation and Air conditioning systems
3.12 Energy audit of compressed air system
3.13 Energy audit of buildings
3.14 Energy Audit of steam Generation, Distribution and utilization system
3.15 Economic analysis

Unit IV Energy Conversation :

4.1 Introduction
4.2 Motivation for Energy Conservation
4.3 Principles of Energy Conservation
4.4 Energy Conservation planning
4.5 Energy Conservation in following sectors
    4.5.1 Industries
    4.5.2 Electrical Generation, Transmission and distribution
    4.5.3 Household and commercial sectors
    4.5.4 Transport
    4.5.5 Agriculture
4.6 Energy Conservation Legislation

Unit V Environmental Aspects of Energy and Pollution Control :

5.1 Introduction
5.2 Terms and Definitions
5.3 Pollution from use of energy
5.4 Combustion products of fossil fuels
5.5 Particulate matter
5.6 Fabric filter and Baghouse

5.7 Electro-static precipitator (ESP)

5.8 Carbon Dioxide

5.9 Green house effect and Global arming

5.10 Emission of Carbon Monoxide

5.11 Pollution by Sulphur dioxide (SO2) and Hydrogen Sulphide H2S

5.12 Emission of Nitrogn Oxides

5.13 Acide Rains, Acid Snow, Acidic Fog and Dry Acidic Deposits

5.14 Acid Fog

5.15 Dry Acidic Deposition

5.16 FGD and SCR Systems of Cleaning Flue Gases

Reference Books:

1.	Generation of Electrical Energy	B.R. Gupta
2.	Energy Technology	S.Rao,Dr.B.B.Parullkar
3.	An Overview of Environment Engineering	Kapoor

DIPEE606: POWER SYSTEM DESIGN LAB

1. Generating station design: Design considerations and basic schemes of hydro, thermal, nuclear and gas power plants. Electrical equipment for power stations.
2. Auxiliary power supply scheme for thermal power plant.
3. Distribution system Design: Design of feeders & distributors. Calculation of voltage drops in distributors. Calculation of conductor size using Kelvin's law.
4. Methods of short term, medium term and long term load forecasting.
5. Sending end and receiving end power circle diagrams.
6. Instrument Transformers: Design considerations of CTs & PTs for measurement and protection.
7. Substations: Types of substations, various bus–bar arrangements. Electricalequipment for substations.

DIPEE607: SWITCHGEAR AND PROTECTION LAB

List of Experiments:

1. Study of switchgear testing kit.
2. Study of Fuse, MCB & their testing
3. Study and testing of contactors
4. Study and testing of thermal overload relay for Induction Motor Protection
5. Study and plotting Characteristics of IDMT type Induction over current Relay
6. Percentage differential protection of transformer
7. Protection of alternator
8. Study of various LT switchgears like RCCB, timers

DIPEE608: ENERGY MANAGEMENTLAB

List of Experiments :

1: To perform symmetrical fault analysis in DC network analyser & perform the experiment for Unsymmetrical fault analysis on DC network.

2: To study the characteristics of the operation of Buchholz relay.

3: To study the characteristics of the microprocessor based DMT/IDMT over current relay and determines the time current characteristics.

4: Testing of negative Sequence relay using the negative sequence kit against negative sequence current balanced and unbalanced load condition.

5: To study the characteristics of Electromechanical over current relay.

6: To study microcontroller base over/ under voltage relay.

7: To study characteristics of microcontroller based earth fault relay.

8: To study characteristics of electromechanical earth fault relay.

9: To find out the string efficiency across the string of insulators.

DIPEE609: Technical Seminar

Student seminars in the field of engineering diploma serve multiple purposes. Firstly, they provide a platform for students to showcase their research, projects, and innovative ideas, fostering presentation and communication skills. Additionally, seminars facilitate knowledge exchange, exposing students to diverse perspectives and advancements in the engineering domain. Engaging in seminars enhances critical thinking, research abilities, and overall academic and professional development, preparing students for the challenges and opportunities in their future careers.

DIPEE610: Practical Training cum Project

Engaging in a major project is pivotal for diploma engineering students as it provides a hands-on application of theoretical knowledge, enhancing practical skills and problem-solving abilities. This experiential learning fosters critical thinking, teamwork, and project management skills, preparing students for real-world challenges and bolstering their employability in the competitive engineering landscape.

DIPEE611: Discipline and Extra Co curricular Activities. Practical Training cum Project

This course aims to cultivate self-confidence, leadership, and community responsibility. It influences academic and personal development, fostering civic responsibility. Students grasp the value of social work and discipline's significance. They contribute to social up-gradation through engagement in organizations, blood donation, awareness programs, and personality development initiatives.

6. ATTENDANCE PROVISION FOR END TERM SEMESTER EXAMINATION

6.1 No student shall be allowed to appear in the end term semester examination in a paper if he/ she has not attended minimum of **75%** of the classes held in the paper concerned including tutorials, special lectures, study visits, practical trainings etc. conducted in respect of that paper.

6.2 If a student for any exceptional reason fails to attend **75%** of the classes held in any paper, the Dean / HoD of the department may allow him/ her to take the examination if he/she attended at least 65% of the classes held in the paper concerned and attended 75% of classes in all the papers taken together.

Provided that if the percentage of attendance is deficient on account of:-

(i) Participation in Inter-University, University or Inter-Collegiate Sports tournaments/Youth Festivals /University Level Debates/ Cultural Activities, National and International Tournaments, with the previous sanction of the Dean/HoD of Faculty Engineering & Technology

(ii) Voluntary donation of blood certified by a Government Doctor of Gazetted rank or University medical officer.

(iii) Attendance and/or participation in International/National / State level competitions;

(iv) Attendance at the extension lecture (s) organized by the Faculty of Engineering & Technology.

Credit may be given for the number of days on which lectures were delivered or sessional or sessional/practical work done during the period of attendance or participation aforesaid, provided that the total period of absence shall not exceed 15 days in a semester.

7. CRITERION FOR AWARDING GRADING SYSTEM

7.1 CRITERION for Awarding SGPA and CGPA: The criterion for awarding the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) for the entire professional programme shall be as follows:

a) The criterion for passing in a subject is that a student should secure minimum 40% marks in individual paper.

b) A student obtaining less than pass marks as specified above, in each subject (sum of internal and End-Term examinations) he will be declared fail in that subject and will have to re-appear in a End-Term examination of the course in subsequent odd / even semester end term examination, subject to maximum permissible period of n+2 years / n+4 semesters to complete the course.

c) The University has adopted Absolute Grading System for converting marks into grades. The formula of 10- point grading system for conversion of marks obtained into Letter Grades and converting Letter Grades to Grade Point is given below:

Table 1: Marks, Letter Grades and Grade Points

Marks	Letter Grade	Grade Points
91-100	O (Outstanding)	10
81-90	A+(Excellent)	9
71-80	A(Very Good)	8
61-70	B+(Good)	7
51-60	B(Above Average)	6
46-50	C(Average)	5
40-45	P (Pass)*	4
0-39	F(Fail)	0
-	AB (Absent)	0

***Passing Marks: Diploma- 40% in individual paper**

d) ***While converting the marks into Letter Grade, the rounding off marks must be considered.***

e) A student obtaining Grade F shall be considered failed and will be required to reappear in the examination.

f) For non credit courses "Satisfactory" or Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

7.2 Computation of SGPA and CGPA : The university has adopted UGC recommended procedure for computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA)

a) The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the papers/ courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

SGPA (Si) = Σ (Ci x Gi) / ΣCi

Where Ci is the number of credits of the i^{th} course and Gi is the grade point scored by the student in the i^{th} course. The university shall issue Semester Grade Card to the student.

b) The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.

CGPA = Σ (Ci x Si) / Σ Ci

Where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

c) The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

Illustration of Computation of SGPA and CGPA and Format for Transcripts

a) Computation of SGPA and CGPA

Illustration for SGPA

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit x Grade)
Course/Paper 1	3	A	8	3x8=24
Course/Paper 2	4	B+	7	4x7=28
Course/Paper 3	3	B	6	3x6=18
Course/Paper 4	3	O	10	3x10=30
Course/Paper 5	3	C	5	3x5=15
Course/Paper 6	4	B	6	4x6=24
	20			**139**

Thus, SGPA= 139/20= 6.95

b) Illustration for CGPA

Semester-1	Semester-2	Semester-3	Semester-4	Semester-5	Semester-6
Credit: 20 SGPA:6.9	Credit: 22 SGPA:7.8	Credit: 25 SGPA:5.6	Credit: 26 SGPA:6.0	Credit: 26 SGPA:6.3	Credit: 25 SGPA:8.0

Thus, CGPA= $\frac{20x6.9+22x7.8+25x5.6+26x6.0+26x6.3+25x8.0}{144}$ = **6.73**

8. CRITERION FOR CREDIT

(a) In case a student secures minimum passing marks (40% and above) in a Theory / Practical paper, he / she will earn the assigned credit of that particular paper.

(b) A student is eligible for the award of diploma, if he / she earn minimum credits required for that particular programme. However if the student has not acquired minimum credits required for obtaining the diploma, he / she will have to appear in some of the papers in which he has not got credit to fulfill the minimum requirement of Credits.

(c) **MAXIMUM & MINIMUM CREDITS**

The total number of the credits of the Diploma 3-Year Programme is 153

Each student shall be required to appear for examination in all courses. However, for the award of the Diploma a student should secure at least 153 credits.

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