

SYLLABUS
DIPLOMA IN ELECTRICAL ENGINEERING
(DAY COURSES)
w.e.f.: July, 2019



UNIVERSITY POLYTECHNIC
FACULTY OF ENGINEERING AND TECHNOLOGY
JAMIA MILLIA ISLAMIA
NEW DELHI - 110025

Contents

<i>Sr. No.</i>	<i>Code No.</i>	<i>Title of the Course</i>
1.	-	<i>Curriculum Structure (I & II Semesters)</i>
2.	-	<i>Curriculum Structure (III & IV Semesters)</i>
3.	-	<i>Curriculum Structure (V & VI Semesters)</i>
4.	DEES 101	<i>Communication Skills-I</i>
5.	DEEC 103	<i>Applied Chemistry</i>
6.	DEEM 104	<i>Applied Mathematics-I</i>
7.	DCE 105	<i>Applied Mechanics</i>
8.	DEE 106	<i>Fundamentals of Electrical Engineering</i>
9.	DME 117	<i>Engg. Drawing-I</i>
10.	DEEM 201	<i>Applied Mathematics-II</i>
11.	DEEP 202	<i>Applied Physics</i>
12.	DME 203	<i>Elements of Mechanical Engineering</i>
13.	DEE 204	<i>Electrical Engineering Materials</i>
14.	DEL 206	<i>Basic Electronics</i>
15.	DME 217	<i>Workshop Practice</i>
16.	DEE 302	<i>Measurements & Measuring Instruments</i>
17.	DEL 305	<i>Digital Electronics and Microprocessors</i>
18.	DCA 305	<i>Computer Applications</i>
19.	DEE 306	<i>Electrical Design Drawing & Estimating</i>
20.	DME 306	<i>Thermo Fluids</i>
21.	DEES 401	<i>Communication Skills-II</i>

22.	DEE 402	Generation of Electrical Energy
23.	DEE 403	Network Analysis
24.	DEE 404	Electrical Machines-I
25.	DEE 405	Power Electronics
26.	DEE 501	Electrical Machines –II
27.	DEE 502	Electrical Troubleshooting
28.	DEE 503	Control System Engg
29.	DEE 504	Electrical Instrumentation
30.	DME 506	Industrial Management
31.	DEE 601	Transmission & Distribution
32.	DEE 602	Switch Gear & Protection
33.	DEE 603	Special Purpose Machines
34.	DEE 604	Utilization & Traction
35.	DEE 605	Electrical Energy Management

First Semester

S. No	Code No	Subject	Credit Hrs	Sessional	Univ. Exam	Total	Periods/Week
Theory Courses							
1	DEES 101	Communication Skills-I	04	40	60	100	04
2	DEEC 103	Applied Chemistry	04	40	60	100	04
3	DEEM 104	Applied Mathematics-I	04	40	60	100	04
4	DCE 105	Applied Mechanics	04	40	60	100	04
5	DEE 106	Fundamentals of Electrical Engg	04	40	60	100	04
Practical Courses							
1	DEEC 113	Applied Chemistry	02	30	20	50	02
2	DCE 115	Applied Mechanics	02	30	20	50	02
3	DEE 116	Fundamentals of Electrical Engg	02	30	20	50	02
4	DME 117	Engg. Drawing-I	02	30	20	50	03
Total			28	320	380	700	29

Second Semester

S. No	Code No	Subject	Credit Hrs	Sessional	Univ. Exam	Total	Periods/Week
Theory Courses							
1	DEEM 201	Applied Mathematics-II	04	40	60	100	04
2	DEEP 202	Applied Physics	04	40	60	100	04
3	DME 203	Elements of Mechanical Engg	04	40	60	100	04
4	DEE 204	Electrical Engg. Materials	04	40	60	100	04
5	DEL 206	Basic Electronics	04	40	60	100	04
Practical Courses							
1	DEEP 212	Applied Physics	02	30	20	50	02
2	DME 213	Elements of Mechanical Engg	02	30	20	50	02
3	DEL 216	Basic Electronics	02	30	20	50	02
4	DME 217	Workshop Practice	02	30	20	50	03
Total			28	320	380	700	29

Third Semester

S. No	Code No	Subject	Credit Hrs	Sessional	Univ. Exam	Total	Periods/Week
Theory Courses							
1	DEE 302	Measurements & Measuring Instruments	04	40	60	100	04
2	DEL 305	Digital Electronics & Microprocessor	04	40	60	100	04
3	DCA 305	Computer Applications	04	40	60	100	04
4	DEE 306	Electrical Design Drawing & Estimating	04	40	60	100	04
5	DME 306	Thermo Fluids	04	40	60	100	04
Practical Courses							
1	DEE 312	Measurements & Measuring Instruments	02	30	20	50	02
2	DEL 313	Digital Electronics & Microprocessor	02	30	20	50	02
3	DCA 315	Computer Applications	02	30	20	50	02
4	DME 316	Thermo Fluids	02	30	20	50	02
Total			28	320	380	700	28

Fourth Semester

S. No	Code No	Subject	Credit Hrs	Sessional	Univ. Exam	Total	Periods/Week
Theory Courses							
1	DEES 401	Communication Skills-II	04	40	60	100	04
2	DEE 402	Generation of Electrical Energy	04	40	60	100	04
3	DEE 403	Network Analysis	04	40	60	100	04
4	DEE 404	Electrical Machines-I	04	40	60	100	04
5	DEE 405	Power Electronics	04	40	60	100	04
Practical Courses							
1	DEE 413	Network Analysis	02	30	20	50	02
2	DEE 414	Electrical Machines-I	02	30	20	50	02
3	DEE 415	Power Electronics	02	30	20	50	02
4	DEE 416	Electrical Workshop	02	30	20	50	02
Total			28	320	380	700	28

Fifth Semester

S. No	Code No	Subject	Credit Hrs	Sessional	Univ. Exam	Total	Periods/Week
Theory Courses							
1	DEE 501	Electrical Machines –II	04	40	60	100	04
2	DEE 502	Electrical Troubleshooting	04	40	60	100	04
3	DEE 503	Control System Engg	04	40	60	100	04
4	DEE 504	Electrical Instrumentation	04	40	60	100	04
5	DME 506	Industrial Management	04	40	60	100	04
Practical Courses							
1	DEE 511	Electrical Machines –II	02	30	20	50	02
2	DEE 512	Electrical Troubleshooting	02	30	20	50	02
3	DEE 513	Control System Engg	02	30	20	50	02
4	DEE 514	Electrical Instrumentation	02	30	20	50	02
Total			28	320	380	700	28

Sixth Semester

S. No	Code No	Subject	Credit Hrs	Sessional	Univ. Exam	Total	Periods/Week
Theory Courses							
1	DEE 601	Transmission & Distribution	04	40	60	100	04
2	DEE 602	Switch Gear & Protection	04	40	60	100	04
3	DEE 603	Special Purpose Machines	04	40	60	100	04
4	DEE 604	Utilization & Traction	04	40	60	100	04
5	DEE 605	Electrical Energy Management	04	40	60	100	04
Practical Courses							
1	DEE 612	Switch Gear & Protection	02	30	20	50	02
2	DEE 613	Special Purpose Machines	02	30	20	50	02
3	DEE 620	Project	08	120	80	200	06
4	DEE 630	Industrial Training & Visits	02	50	-	50	-
Total			34	430	420	850	30

NOTE: Project Topics (DEE 620) shall be assigned to the students at the commencement of 5th Semester.

COMMUNICATION SKILLS-I
DEES-101

Unit	Topic	Marks
I	Reading <i>a. Comprehension (Beginner)</i>	10
II	Grammar <i>a. Tenses, Active & Passive</i> <i>b. Vocabulary</i>	20
III	Structure <i>a. Sentence Formation</i> <i>b. Word Formation</i>	10
IV	Writing-I <i>a. Report Writing</i> <i>b. Curriculum Vitae</i>	10
V	Writing-II <i>a. Application</i> <i>b. Business Letter</i>	10

APPLIED CHEMISTRY

DEEC-103

Unit-I: Problem based on Volumetric Gravimetric Analysis

1. Molecular-mass, mole, weak and strong electrolytes, Equivalent mass and Gram equivalent.
2. Strength, Normality and Molarity of a solution, Normality equation.
3. Problem base on Volumetric and Gravimetric Analysis.

Unit-II: Analysis and treatment of water

1. Impurities in water, Hardness, Units of Hardness and Calcium carbonate equivalent.
2. Estimation of dissolved oxygen, Alkalinity and Hardness by EDTA method.
3. Problems in boilers, Ion Exchange process for softening of water.

Unit-III: Fuel and Combustion

1. Units of heat, Characteristics of good fuel, Calorific value, Calculation and determination of calorific value, types of Coal, Petroleum, LPG, CNG, Producer gas, Water gas and Coal gas.
2. Problem based on combustion of solid, Liquid and Gaseous Fuel, Analysis of Flue gases by Orsat apparatus.

Unit-IV: Corrosion and Lubricant

1. Dry and Wet corrosion, Galvanic corrosion, Concentration corrosion, Pitting corrosion, Stress corrosion.
2. Protection of corrosion by proper designing, Alloying, Cathode protection and coating methods.
3. Types and Mechanism of Lubricant, Characteristics of Lubricants like Viscosity, Acid value, Saponification value, Cloud point, Pour point, Flash and Fire point.

Unit-V: Atomic Structure and Bonding

1. Bohr's theory, Quantum no, Electronic configuration of first 36 elements, AUFBAU Principle, Pauli Exclusion Principle and Hund's Rule.
2. Electrovalent, Co-valent Compounds, Intermolecular Forces.
3. Metallic bonding and Free Electron theory.

Text Book:

1. Engineering Chemistry By S.S. Dara, S. Chand Publishing.

Reference Books:

1. Chemistry of Engineering Materials by C. V. Agarwal, C. P. Murthy, A. Naidu, Wiley India
2. Engineering Chemistry by Shikha Agarwal, Cambridge University Press.

APPLIED CHEMISTRY LAB
DEEC 113

List of Experiments:

1. To determine the purity percentage of oxalic acid in a given impure mixture.
2. To analysis a mixture of NaOH and KOH (given a solution containing 2.5g mixture of NaOH and KOH per litre)
3. To estimate the calcium and magnesium hardness in the given water sample.
4. To estimate the Chloride ion (Cl^-) in the given water sample.
5. To estimate the free Chlorine (Cl_2) in the given water sample.
6. To estimate the dissolved Oxygen (D.O) in the given water sample.
7. To estimate the Alkalinity in the given water sample.
8. To estimate the temporary, permanent and total hardness in the given water sample by EDTA method.
9. To determine the viscosity of a lubricating oil by Redwood Viscometer.
10. To determine the moisture percentage in a given coal sample.

APPLIED MATHEMATICS-I

DEEM-104

UNIT I ALGEBRA

Arithmetic progression, its n th term, sum to n terms. Geometric progression, its n th term, sum to n terms and sum of infinite terms. Binomial theorem (without proof) for any index, General and middle term, terms independent of x , First and second binomial approximation.

UNIT II DETERMINANTS

Determinants (upto 3rd order only), minors, co-factors, Properties of determinants, solution of linear simultaneous equations in three variables by Cramer's rule.

UNIT III MATRICES

Definition and examples of matrices, types of matrices, basic operations, equality of matrices, addition, multiplication and scalar multiplication of matrices, transpose of a matrix, symmetric, skew-symmetric matrices, singular and non-singular matrices, cofactor matrix, adjoint of a matrix, inverse of a matrix, solutions of simultaneous equations in three variables by matrix inverse methods.

UNIT IV CO-ORDINATE GEOMETRY OF TWO DIMENSIONS

Definition of locus with problems, Equations of straight lines in various forms. Angle between two lines, Perpendicular distance formula, Conic sections, Circle, Parabola, Ellipse and Hyperbola.

UNIT V VECTORS

Scalar and vectors, addition and subtraction of vectors and their simple applications, multiplication of vector by scalar, Scalar and vector product of two vectors. Scalar product of three vectors, Geometrical interpretation.

Text Book:

1. A text book of Applied Mathematics, Vol I and II by Dr Neeraj Pant, King India Publishers.

Reference Book:

1. Applied Mathematics, Vol I and II by Dr Hari Arora, A Sachdev, S.K. Kataria & Sons.
2. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers.

APPLIED MECHANICS

DCE-105

Unit-I

Introduction: Concept of engineering mechanics, its importance and necessity. Giving suitable examples on bodies at rest and motion, concept of rigid bodies.

Laws of forces: Principles of mechanics-superposition, transmissibility etc, types of forces, systems of forces, principles of forces, resultant of forces. Parallelogram law, triangle law, polygon law of forces, resolution of forces, free body diagram. Equilibrium force and its determination, Lami's theorem.

Unit-II

Moments: Concept of moment, laws of moment, Varignon's theorem. Application of moment to simple mechanism, resultant of parallel / non-parallel forces, reaction at support in statically determinate beam due to point load, U. D. L and triangular load.

Unit-III

Centre of gravity: centre of gravity and centroid of regular body (cone, cylinder, sphere and hemisphere), areas (rectangle, circle and triangle), composite bodies, composite areas, remainder.

Moment of Inertia: Moment of inertia of Lamina-rectangular, circular (solid/hollow), triangular, parallel axis theorem, perpendicular axis theorem.

Unit-IV

Laws of motion: Newton's laws of motion, momentum, impulse, torque, linear and angular motion.

Circular motion: centripetal and centrifugal force.

Work, Power and Energy: Definition of terms, simple numerical problems.

Unit-V

Friction: Concept of friction, laws of friction-static and dynamic, limiting friction, coefficient of friction, angle of friction. Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane.

Simple Lifting Machines: Concept of machine, mechanical advantage, velocity ratio and efficiency of machine, their relationship, laws of machine, simple machine winch crab, wheel and axle, simple screw jacks. System of pulley-first, second and third system of pulley.

Text Books:

1. Applied Mechanics by A. K. Upadhyay, S. K. Kataria & Sons.

Reference Books:

1. A Text Book of Engineering Mechanics by R. K. Khurmi, S. Chand & Co.
2. A Text Book of Engineering Mechanics by A. R. Basu, Dhanpat Rai & Co.

APPLIED MECHANICS

DCE 115

List of Experiments:

1. To verify parallelogram law of forces with the help of Universal Force Table Apparatus.
2. To verify polygon law of forces with the help of Universal Force Table Apparatus.
3. To verify parallelogram law of forces with the help of Gravesands Apparatus.
4. To verify triangular law of forces with the help of Gravesands Apparatus.
5. To verify Lami's theorem with the help of Gravesands/ Universal Force Table Apparatus.
6. To verify the law of moments by Bell Crank Lever Apparatus.
7. To verify the law of moments by Rotating Disc Apparatus.
8. To determine the coefficient of friction between wood and glass surfaces by using Horizontal Plane Friction Apparatus.
9. To determine the coefficient of friction between wood and glass surfaces by using an Inclined Plane Friction Apparatus.
10. To determine the personal horse power by Rope Brake Dynamometer Apparatus. .
11. To determine the mechanical advantage, velocity ratio & efficiency of a Single Purchase Winch Crab Machine and plot graph between (a) Load vs Effort and (b) Load vs Efficiency.
12. To determine the mechanical advantage, velocity ratio & efficiency of a Double Purchase Winch Crab Machine and plot graph between (a) Load vs Effort and (b) Load vs Efficiency.
13. To determine the mechanical advantage, velocity ratio & efficiency of a Worm and Worm Wheel and plot graph between (a) Load vs Effort and (b) Load vs Efficiency.
14. To determine the mechanical advantage, velocity ratio & efficiency of a Differential Wheel and Axle and plot graph between (a) Load vs Effort and (b) Load vs Efficiency.
15. To determine the mechanical advantage, velocity ratio & efficiency of a Simple Screw Jack and plot graph between (a) Load vs Effort and (b) Load vs Efficiency.

FUNDAMENTALS OF ELECTRICAL ENGINEERING

DEE-106

Unit-I: D C Circuits

Current, Voltage, Power, Energy and their units, Ohm's law, Resistance, Resistances in series, Resistances in parallel, Laws of resistance, Temperature coefficient of resistance, Grouping of cells, Numerical problems.

Unit-II: Electromagnetism

Introduction to electromagnetism, Magnetic field around a straight current carrying conductor, Magnetic field at the axis of a circular conductor, Magnetic field at the axis of a solenoid, Methods for finding the direction of magnetic field of straight conductor and solenoid, Force on a current carrying conductor placed in the magnetic field, Force between two parallel current carrying conductors, Numerical problems.

Unit-III: Magnetic Circuits

Magnetic field, Flux, Flux density, Magneto motive force, reluctance, Laws of magnetic force, Absolute and relative permeability, Series and parallel magnetic circuits, Leakage flux, B-H curve, Magnetic hysteresis, Hysteresis loop, Hysteresis loss, Ampere-turns calculations, Comparison between electric and magnetic circuits, Numerical problems.

Unit-IV: Electromagnetic Induction

Faraday's laws of electromagnetic induction, Lenz's law, Fleming's rules, Principle of self and mutual induction, Self and mutually induced emf, Self-inductance and mutual inductance, Coefficient of coupling, Energy stored in inductor, Numerical problems.

Unit-V: D C Transients

Growth of current in an inductive circuit, Current in RL series circuit at different times, Time constant of RL series circuit, Decay of current in inductive circuit, charging of capacitor, Time constant of RC series circuit, Initial values, Final values, Discharging of capacitor, Numerical problems.

Text Books:

1. Electrical Technology by C R Dargan, Dhanpat Rai Publications

Reference Books:

1. Fundamentals of Electrical Engineering & Electronics by S.K. Sahdev, Dhanpat Rai & Co.
2. Fundamentals of Electrical Engineering by Ashfaq Husain, Dhanpat Rai Publications

FUNDAMENTAL OF ELECTRICAL ENGINEERING
DEE-116

List of Experiments:

1. To verify the Ohm's law. Draw its V-I Characteristics.
2. To verify the relation of $R_T = R_1 + R_2 + R_3 + \dots + R_N$
3. To verify the relation of $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots + \frac{1}{R_N}$
4. Find the inductance of coil.
5. Find the total inductance of series coils.
6. Find the total inductance of parallel coils.
7. To find for a filament lamp.
 - i) Variation of power with voltage.
 - ii) Variation of resistance with voltage.

ENGINEERING DRAWING-I

DME-117

Unit-I: Introduction

- a. **Drawing Instruments**, Drawing instruments, Sizes and layout of standard drawing sheet, Sizes on drawing boards.
- b. **Lines, Lettering and Dimensioning:**
Different types of lines and freehand sketching, Different types of lines in engineering drawing as per BIS specifications, Practice in freehand sketching of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles, small and large circles, parabolas, curves and ellipses.

Unit-II: Lettering Techniques and Practice

Instrumental single stroke (vertical and inclined) lettering of 3 to 7 mm height. Instrumental double stroke lettering of 35 to 50 mm height ratio of 7:4 (vertical).

Unit-III: Dimensioning

Necessity of dimensioning, terms and notations- methods and principles, dimensioning small components (mainly theoretical instructions), dimensioning of overall sizes circles, thread holes, chamfered surfaces, angles tapered surface holes equally spread on PCD, counter sunk and counter bored holes, cylindrical parts. Space and gaps radii curves and arches, chain and parallel dimensioning.

Unit-IV: Scales

Scales and their need and importance, definition of representative fraction (RF), calculating RF of a scale, types of scales, construction of plain and diagonal scales.

Unit-V:

Construction of curves such as ellipse, parabola, hyperbola, cycloids, epicycloid and hypocycloid, involute of simple curves.

Text Books:

1. Engineering Drawing by Basant Agrawal , C.M. Agrawal, McGraw Hill Education.

Reference Books:

1. Engineering Drawing by N. D. Bhatt, Charotar Publishing House Pvt.Ltd.
2. A Textbook of Engineering Drawing by Dr. RK Dahwan, S Chand & Company.

APPLIED MATHEMATICS-II

DEEM-201

UNIT-I DIFFERENTIAL CALCULUS

Limit and continuity (without problems), Differentiation of functions by First Principle, Differential of sum, product and quotient functions, Differential of a function of a function (Chain rule), Logarithmic differential, Higher order derivatives.

UNIT-II INTEGRAL CALCULUS

Indefinite integral, Integration of a function, standard formulae, the fundamental laws of integration, Integration by substitution method, by parts method and partial fractions method.

UNIT-III APPLICATIONS OF CALCULUS

Maxima and minima, Tangent and normal, Evaluation of definite integral. Properties of definite integral, Area bounded by a curve between two ordinates and x-axis.

UNIT-IV DIFFERENTIAL EQUATIONS

Differential equation, Order and degree of differential equations, Solution of differential equations of first order and first degree, variable separable, Homogeneous and linear differential equations, Solution of linear differential equations of 2nd order with constant coefficient.

UNIT-V COMPLEX NUMBERS

Complex Number, representation of a complex number (Argand Diagram), Complex number in rectangular, polar and exponential forms, Conversion from one form to another form. De Moivre's Theorem, Roots of complex number.

Text Book:

1. A text book of Applied Mathematics, Vol I and II by Dr Neeraj Pant, King India Publishers.

Reference Book:

1. Applied Mathematics, Vol I and II by Dr Hari Arora, A Sachdev, S.K. Kataria & Sons.
2. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers.

APPLIED PHYSICS

DEEP-202

UNIT – I

Unit and Dimensions

Fundamental and derived units (SI System), Dimension of various physical quantities, uses of dimensional analysis and its limitations. Accuracy and precision of measuring instruments, error in measurement.

UNIT – II

Electrostatics Coulomb's law, Electric field, electric field at a point due to Point charge, Electric flux, Gauss's theorem, electric field at a point due to a uniformly charged thin sheet, electric field intensity at a point due to a charged sphere, electric potential, potential due to a point charge, Equi potential surfaces, relation between electric potential and intensity.

UNIT – III

Capacitor Capacity of parallel plate capacitor, energy store in a capacitor, combination of capacitor (Series and Parallel)

D.C Circuit Kirchhoff's law, application of Kirchhoff's law to the wheat stone bridge, Post office Box, Meter bridge and potentiometer. Heating effect of current, Electric Power.

UNIT – IV

Electromagnetism Motion of charged particles in uniform magnetic field and electric field, Biot-savart law, Magnetic field due to straight wire, circular loop, Force experienced by moving charge and a current carrying conductor in a uniform magnetic field, Torque on current loop, force between two parallel current carrying conductors, Definition of an Ampere, Moving coil galvanometer, conversion of galvanometer into ammeter and voltmeter.

UNIT – V

Semi conductor physics Intrinsic Semiconductors, Conductivity, Atomic and Crystal structure of germanium and silicon, covalent bonds, generation and recombination, effect of temperature on conductivity of Intrinsic semi conductor, Energy level diagram of conductor, insulator and semi conductor, Extrinsic semi conductor, P and N type semiconductor and their conductivity.

Text Book:

1. Physics Vol 1 and Vol 2 by Halliday & Resnick, Wiley Publishers.

Reference Books:

1. Basic Applied Physics by H. R Meena, Neeraj Pant, Arjun Singh & Har Lal
2. Applied Physics By R. K Gaur, Dhanpat Rai Publications (P) Ltd.

APPLIED PHYSICS LAB
DEEP 212

List of Experiments:

1. To find the volume of metal used in a hollow cylinder closed at one end using vernier calipers
2. To Measure Density of a Wire using Screw gauge
3. To Measure Radius of Curvature of a Lens, Mirror using Spherometer.
4. To find the acceleration due to gravity using simple pendulum and to draw $\ell-T^2$ graph and hence to read the length of the second's pendulum
5. To find resistance of a given wire using metre bridge
6. To compare the EMF of two given primary cells using potentiometer.
7. To Determine Refractive Index of Glass using Prism.
8. To determine the focal length of a convex lens by two-pin method.

Reference Book:

- Lab Manual in Physics Vol-I & II, R.S. Mittal & S. Singal

ELEMENTS OF MECHANICAL ENGINEERING

DME- 203

Unit-I: Transmission of Power

Different modes of power transmission Belt Drive: Material of belt, flat belt V belt open belt and cross belt device, Length of belt (without derivation), Velocity ratio, Slip, Angle of contact, Derivation of tension ratio for flat belt, Power transmitted through belts.

Advantage of V belt over flat belt, Simple numerical problem. ($T_1/T_2=e^{\mu\theta}$)

Chain Drive: Classification, Clutch: Principal of clutch, comparison between chain and belt drive. Pulley: Introduction, type of pulleys, step pulley, split pulley, vee-groove pulley, rope pulley. Gears: Spur, Helical, Bevel, Spiral, Rack and Pinion, Gear Train: Simple and Compound gear train and simple numerical problems.

Unit-II: Steam Generators and Turbines

Steam generators: Introduction, classification, Difference between Fire tube and Water tube boilers. Simple vertical boiler, Babcock and Wilcox boiler, Cochran boiler, Boiler accessories and mountings.

Turbines: Introduction & classification of steam turbine, concept of reaction and simple impulse turbine, comparison between impulse and reaction turbines. Losses in steam turbine.

Hydraulic turbine: Classification, construction, working of Pelton wheel, Francis turbine and application of reaction and impulse turbine.

Unit-III: Internal Combustion Engines

- Classification and application if I.C. engine commonly used spark ignition engine
- Compression ignition (C.I) engines.
- Working principals of two stroke and four stroke petrol and diesel engine.
- Ignition system in petrol engine
- Simple carburetor.
- Cooling system of IC engine.

Lubrications: Introduction, Method of lubrication: Petrol System, mixed, (D), Splash and forced lubrication system.

UNIT-IV

Pumps: Construction and Working of reciprocating (single acting) centrifugal pump, Air compressor: Working of air compressor and applications of compressed air Material Handling: Tower and bridge crane. Jaw Crushers. Hydraulic jack and hydraulic Lift.

Unit -V

Refrigeration and Air Conditioning System: Introduction, unit of refrigeration, coefficient of performance, vapour compression cycle: Simple vapour absorption cycle & applications. Air conditioning System: Purpose of air conditioning, Factors affecting air conditioning, definition relating to psychometric parameters like dry bulb temp., wet bulb temp., humidity etc. room air conditioner (window & split type) and desert cooler.

Text Books:

1. Mechanical Engineering by H. R. Kapoor, Khanna Publishers.

Reference Books:

1. Basic Mechanical Engineering by T. S. Prabhu, SCITECH
2. Fundamentals of Mechanical Engineering by G. S. Sawhney, PHI

ELEMENTS OF MECHANICAL ENGINEERING LAB

DME-213

List of Experiments:

1. Study of the construction and working of simple vertical boiler.
2. Study of the construction and working of Cochran boiler.
3. Study of the construction and working of Babcock & Wilcox boiler.
4. Study of the construction and working of boiler mountings.
5. Study of the construction and working of boiler accessories.
6. Study of the construction and working of four stroke petrol engine.
7. Study of the construction and working of four stroke diesel engine.
8. Study of the construction and working of two stroke petrol engine.
9. Study of the construction and working of two stroke diesel engine.
10. Study of the construction and working of desert cooler.
11. Study of the construction and working of window air conditioner.
12. Study of different modes of power transmission.

ELECTRICAL ENGINEERING MATERIALS

DEE-204

Unit-I: Conducting Materials

Introduction, Resistivity and factors affecting resistivity, Classification of conducting materials into low resistivity and high resistivity materials, Low Resistivity Materials and their Applications, Copper, Aluminum, Stranded conductors, Bundled conductors, High Resistivity Materials and their Applications, Tungsten, Carbon, Platinum, Mercury.

Unit-II: Semiconducting Materials

Introduction, Semiconductors, Electron Energy and Energy Band Theory, Excitation of Atoms, Classification of Insulators, Semiconductors and Conductors, Semiconductor Materials, Intrinsic Semiconductors, Extrinsic Semiconductors, N-Type Materials, P-Type Materials, Minority and Majority Carriers, Semi-Conductor Materials, Applications of Semiconductor materials.

Unit-III: Insulating Materials

Introduction, General properties of Insulating Materials, Electrical properties, Visual properties, Mechanical properties, Thermal properties, Chemical properties, Ageing, Insulating Materials – Classification, properties, applications, Classification of insulating materials on the basis physical and chemical structure.

Unit-IV: Dielectric Materials

Introduction, Dielectric Constant of Permittivity, Polarization, Dielectric Loss, Electric Conductivity of Dielectrics and their Break Down, Properties of Dielectrics, Applications of Dielectrics.

Unit-V: Magnetic Materials

Introduction, Classification, Diamagnetism, Para magnetism, Ferromagnetism, Magnetization Curve, Hysteresis, Eddy Currents, Curie Point, Magnetostriction, Soft and Hard Magnetic Materials.

Materials for Special Purposes

Thermocouple materials, Bimetals, Soldering Materials, Fuse and Fuse materials.

Text Books:

1. K. B. Raina, S.K. Bhattacharya, T. Joneja, Electrical Engineering Material & Electronic Components, S. K. Kataria & Sons.

Reference Books:

1. G. K. Bainerjee, Electrical and Electronics Engineering Materials, PHI.
2. A Textbook of Electrical Engineering Materials by R.K. Rajput, Laxmi Publications.

BASIC ELECTRONICS

DEL-206

Unit-I

Introduction: Introduction to electronics engineering: Physical and applied electronics, Applications of electronics engineering in different fields, Electronic components: active and passive, Ideal and practical voltage and current sources.

Unit-II:

PN Junction Diode & Rectifiers: PN junction, Behavior of PN junction under forward and reverse bias condition, Semiconductor diode characteristics, Static and dynamic resistances, Their calculation from diode characteristics, Diode as half and full wave rectifier: Center-tap and Bridge type, Ripple factor and its value for half and full wave rectified output, Calculation of DC voltage, RMS voltage and rectification efficiency.

Unit-III

Filters & Special Purpose Diodes: Filters, Capacitor input filter, Choke input filter, L-type and π -type filter, Zener diode, Breakdown mechanisms: Zener and avalanche breakdown mechanism, Zener parameters, Application of Zener diode in voltage regulator, Varactor diode, LED.

Unit-IV

Bipolar Junction Transistor: Introduction of Bipolar Junction Transistor, PNP and NPN transistors their symbol and mechanism of current flow, Explanation of fundamental current relations, Concept of leakage current in CB, CE and CC configuration, Input and output characteristics, Determination of input and output resistances: static and dynamic, Comparison of CB, CE and CC configurations.

Unit-V

Amplifier & Biasing Circuits: Transistor as an amplifier in CE configuration, DC equivalent circuit, DC load line and operating point, Effect of temperature and replacement of transistor on operating point, Need for stabilization of operating point, effect of fixing operating point in cut-off and saturation region on the performance of amplifier, Transistor biasing circuits: Fixed biasing, Collector to base biasing, Self biasing and Emitter biasing circuits.

Text Book:

1. Basic Electronics and Linear Circuit: D C Kulshrestha, N N Bhargava & S C Gupta, McGraw Hill Education.

Reference Books:

1. Electronic Devices and Circuit Theory: by Robert Boylested& Louis Nashelsk, Pearson Education India.
2. Principles of Electronics: V K Mehta, S Chand Publications.

BASIC ELECTRONICS LAB

DEL-216

List of Experiments:

1. To draw V-I characteristics of p-n junction diode and calculate static and dynamic resistances in forward and reverse bias conditions.
2. To draw V-I characteristics of zener diode and calculate static and dynamic resistances in forward and reverse bias conditions.
3. To draw V-I characteristics of light emitting diode and calculate static and dynamic resistances in forward and reverse bias conditions.
4. To calculate ripple factor of half wave rectifier without and with filters.
5. To calculate ripple factor of centre-tap full wave rectifier without and with filters.
6. To calculate ripple factor of bridge-type full wave rectifier without and with filters.
7. To draw input characteristics for common base transistor and calculate input static and dynamic resistances.
8. To draw output characteristics for common base transistor and calculate output static and dynamic resistances.
9. To draw input characteristics for common emitter transistor and calculate input static and dynamic resistances.
10. To draw output characteristics for common emitter transistor and calculate output static and dynamic resistances.

WORKSHOP PRACTICE

DME-217

Machine shop: Introduction of lathe and its operation Introduction of drilling machine and its operations. Introduction of milling machine and its operations Introduction of shaping machine and its operations.

Carpentry shop: Introduction of carpentry tools such as Saws, C-Clamp, Chisels, Mallets, Carpenter's vices, marking gauges, Try-squares, steel rulers. Study about woods. Study about seasoning of wood. Making of various joints-Cross lap joint, half lap joint, Mortise and tenon joint, Dovetail joint.

Sheet Metal Shop: Introduction to sheet metal shop, use of hand tools and accessories e.g. hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material e.g. G I sheet. Preparation of seam joints such as lap seam/ standard seam/flat lock seam/grooved seam.

Black Smithy Shop: Introduction of tools hot working and cold working process. Different types of Hearths used in Smithy shop. Purpose, specifications, uses, care of various tools and equipments used in hand forging by segregating as cutting tools, supporting tools, holding tools, measuring tools etc. Types of fuel used and maximum temperature obtained. Types of raw materials used in Smithy shop Making of U clamp/fan hook.

Welding Shop: Introduction and importance of welding as compared to other material joining processes. Specifications and type of welding machines, classification and coding of electrodes, welding parameters, welding joints and welding positions. Materials to be welded, safety precautions. A/C welding and gas welding. Edge preparation of lap joint/butt joint. Preparation of Oxy acetylene gas welding joints.

Fitting shop: Introduction to fitting shop tools, marking and measuring devices/equipment. Identification of materials such as Iron, Copper, Stainless Steel, Aluminium etc. Identification of various steel sections (flat, angle, channel, bar etc.). Introduction to various fitting shop operations/processes (Hacksawing, Drilling, Chipping and Filing) and filing practice as per drawing Drilling.

Text Books:

1. Workshop Technology by HS Bawa, Tata McGraw Hill Publishers, New Delhi

Reference Books:

1. Workshop Technology I, II, III, by S K Hajra, Choudhary and A K Chaoudhary. Media Promoters and Publishers Pvt. Ltd., Bombay
2. Workshop Technology by Manchanda Vol. I, II, III India Publishing House, Jalandhar.

MEASUREMENT AND MEASURING INSTRUMENTS

DEE 302

Unit-I: Measurement of Voltage and Current

Important terms, classification of errors, classification of instruments, essentials of indicating instruments, controlling torque, types of controlling torque, damping torque and its type.

Unit-II: Construction of Instruments

Construction and working of PMMC, construction and working of MI instruments, Construction and working of electrostatic instruments.

Unit-III: Measurement of Power and Energy

Rectifier type instruments, construction and working of dynamo meter type wattmeter, construction and working of single phase induction type energy meter.

Unit-IV: Measurement of Resistance

Measurement of low, medium and high resistance, megger, single phase power factor meter.

Unit-V: AC Bridges

Basic principle of AC Bridges, Maxwell's Bridge, Hay's Bridge and Wien's Bridge extension of range of instruments.

Text Books:

1. A Course in Electrical and Electronic Measurement and Instrumentation. by A K Sawhney, Dhanpat Rai Publication.

Reference Books:

1. Electrical Measurement and Measuring Instruments. by Rajendra Prasad, Khanna Publisher.
2. Instrumentation: Devices and Systems by C. Rangan, G Sarma, V.S.V. Mani, McGraw Hill Education.

MEASUREMENTS AND MEASURING INSTRUMENTS LAB (DEE 312)

List of Experiments:

1. To calibrate single phase Energy meter.
2. To measure unknown inductance of a coil using Maxwell's Bridge.
3. To measure the frequency using Wien's Bridge.
4. To measure inductance using Anderson's bridge
5. To measure inductance using Hay's bridge.
6. To measure low resistance using Kelvin's bridge.
7. To measure unknown resistance with the help of Wheatstone's Bridge.
8. To measure voltage and current using Instrument Transformers.

DIGITAL ELECTRONICS AND MICROPROCESSOR

DEL-305

Unit -1

Number Systems: Binary number system, Binary to decimal conversion and decimal to binary conversion, octal and hexadecimal number system, Representation of Negative numbers, 1's complement and 2's complement representation.

Binary Codes :BCD code, Grey code and excess -3 code.

Unit -2

Logic Gate: symbol and truth table of AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR gates.

Application of NAND and NOR gates as Universal gate.

Boolean Algebra: Laws and theorems of Boolean algebra and their application, De-Morgan's theorem, minimization of logic expression by using Boolean laws, theorem and K- map.

Unit -3

Combinational circuits: Half and full Subtractor, multiplexer and demultiplexer, Encoder and decoder,

Flip Flop: Difference between Combinational and sequential circuits, Introduction of RS flip flop .JK flip flop , D -type flip flop.

Unit 4

Evolution of Microprocessors, 8085 architecture, ALU, Timing and control unit, Program counter, Registers, Flag registers, General Purpose Registers. Instruction set, PIN diagram of 8085 Microprocessor.

Unit-5

Memories: Concept of Random-Access Memory (RAM), static and dynamic RAM, Read Only Memory (ROM), PROM, EPROM.

Digital Waveform Generator: concept of timer IC 555 and its use for waveform generation.

Text Books:

1. Modern Digital Electronics by Jain, McGraw Hill Education.

Reference Books:

1. Digital Electronics : Circuits and Systems By Puri, McGraw Hill Education
2. Goankar: Microprocessors Architecture Programming and Applications with the 8085, Penram International Publishing.

DIGITAL ELECTRONICS AND MICROPROCESSOR LAB

DEL-315

List of Experiments:

1. To verify the truth tables of basic logic gates (AND, OR and NOT).
2. To verify the truth tables of universal logic gate (NAND and NOR).
3. To design and verify the truth tables of basic logic gates by using NAND gate.
4. To design and verify the truth table of basic logic gate by using NOR gate.
5. To design and verify truth table of the Ex-OR gate by using NAND gate.
6. To design and verify the truth table of Ex-NOR gate by using NOR gate.
7. To design and verify the circuit and truth table of Half Adder.
8. To design and verify the circuit and truth table of a Full Adder.
8. To design and verify the circuit and truth tables of a Half Subtractor.
10. To design and verify the circuit and truth table of Full Subtractor.

COMPUTER APPLICATIONS

DCA-305

UNIT-I

Digital Computer systems, Characteristics, History, Computer Generations, Types of computers & their classifications, application of Computer in various fields, Computer Hardware & Software, Elements of computer hardware-CPU, I/O devices, storage media, Computer Software-Types of Software, System Software, Application Software.

UNIT-II

Basic concept & functions of an operating system, textual Vs GUI Interface, type of Operating Systems, concept of multiprogramming, multitasking, multiprocessing, Introduction to disk operating system (DOS), Commands and utilities, working with MS Windows, Unix and Linux, Working knowledge of PC Software Word Processor.

UNIT-III

Computer Languages, Generation of Languages, Translators- Assemblers, Interpreters, Compilers, Algorithm, Pseudo-code, Flowcharts- rules & symbols, Structured Programming concepts, various techniques of programming, Use of programming.

UNIT-IV

Introduction to 'C', importance of C, basic structure of a C program, constants, variables and data types, operators and expressions, managing I/O operators, Control Statement: 'IF' statement and its various forms, goto statement, for, while and do-while loops, switch decision making statement, Arrays: Array notation, storage and representation, Functions: user defined functions and their use.

Text Books:

1. Fundamentals of Computers & Programming with C by A.K. Sharma- Dhanpat Rai Publications.

Reference Books:

2. Computing Fundamentals and C Programming by E Balagurusamy-Mc Graw Hill Education.
3. Programming in ANSI C by E Balagurusamy-Mc Graw Hill Education.

COMPUTER APPLICATION LAB

DCA-315

List of Experiments:

1. Given a PC, name its various components and list their functions.

2. Features of Windows Operating System:

- a. Start
- b. Shutdown and restore
- c. Creating and operating on the icons
- d. Opening, closing and sizing the windows
- e. Creating, saving, modifying, renaming, finding and deleting a file
- f. Creating and operating on a folder
- g. Changing setting like-date, time
- h. Using shortcuts
- i. Windows system Tools
- j. Control Panel

3. MS-WORD

- a. File Management: Opening, creating and saving a document, files, copying contents in some different file(s).
- b. Page Setup: Setting margins, tab setting, ruler, indenting.
- c. Editing a Document: Entering text, cut, copy and paste using toolbars.
- d. Formatting A Document: Using different fonts, changing font size and color, changing the appearance through bold/italic/underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods.
- e. Aligning of text in a document justification of document, inserting bullets and numbering.
- f. Use of headers, footers: inserting foot note, endnote, use of comments.
- g. Inserting date, time, special symbols, importing graphic images, drawing tools.
- h. Tables and border: Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table.
- i. Print preview, zoom, page setup, printing options.
- j. Using tools like: Spellchecker, help, use of macros, mail-merge, thesaurus word content and statistics, printing envelopes and labels.

4. MS-EXCEL

- a. Starting excel, open worksheet, enter and edit data, formulas to calculate values, format data, create chart, printing chart, save worksheet.
- b. Menu Commands: Create, format charts, organize, manage data, solving problem by analysing data.
- c. Editing a worksheet, copying, moving cells, pasting inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet.
- d. Creating a Chart: Working with chart types, changing data in chart, formatting a chart, use chart to analyse data.
- e. Using a list to organize data, sorting and filtering data in list.

5. MS-POWER POINT

- a. Preparing Presentation: Creating a new slide, sorting slides, inserting pictures, setting header and footer.
- b. Formatting: Setting fonts, alignments, slide design, slide layout.
- c. Slide Show: View show, Rehearse timing, action buttons, slide transition, animation skills.

6. PROGRAMMING IN C

- a. Write a program in C on defining variables and assigning values to variables.
- b. Write a program in C on formatting input/output using printf and scanf.
- c. Write a program in C on arithmetical, relational and logical operators.
- d. Write a program in C on if-else statement.
- e. Write a program in C on do-while statement/loop.
- f. Write a program in C on for statement/loop.
- g. Write a program in C on switch statement.
- h. Write a program in C on 1 dimensional array.
- i. Write a program in C on 2 dimensional arrays.
- j. Write a program in C on strings.
- k. Write a program in C on functions.

ELECTRICAL DESIGN DRAWING & ESTIMATING

DEE-306

Unit-I: Electrical Symbols and Simple Light and Alarm Circuits:

Electrical symbols used in electrical installation, Schematic and wiring diagrams, light and fan point controlled by individual switches, fluorescent tube controlled by one-way switch, one lamp controlled by two switches (staircase circuit) three lamps controlled by four switches (Corridor light circuit).

Unit-II: Alarm Circuits Without and with Relays:

One bell controlled by one push button, two ordinary bells (for day and night) used at a doctor's residence, bell response circuit using one bell and one relay, bell response circuit of an office (of three rooms). Traffic light control system for two road crossing, a Light circuit which automatically gets connected to DC supply in case of power failure.

Unit-III: Electrical Installation of Small Residential Buildings:

Internal Distribution system, Single-phase Light and Power Sub-Circuit, Systems of wiring, Installation plan, Multiline and Single line wiring diagrams, Design and Estimation of electrical installation of small residential buildings, list of material required along with cost by doing market survey, Description of various tests to test the wiring installation before commissioning.

Unit-IV: Electrical Installation of Commercial Buildings:

Internal Distribution system, Busbar chamber, Mains, installation plan, Single-Line wiring diagram, Design and Estimation of electrical installation of large commercial buildings, list of material required along with cost by doing market survey, commissioning of electrical installation, Introduction to Intelligent Lightning system.

Unit-V: Contractor Control Circuits:

Schematic diagram and complete wiring diagram of:

- i. DOL starting of three-phase induction motor.
- ii. Three-phase induction motor getting supply from selected feeder.
- iii. Reversing of three-phase induction motor.
- iv. Two speed control of three-phase induction motor.
- v. Sequential operation of two motors using Time-Delay Relay.
- vi. Automatic Star-Delta starter of three-phase induction motor.

Text Books:

1. Electrical Design Estimating and Costing, by K. B. Raina & S. K. Bhattacharya, New Age International Publishers.

Reference Books:

1. Course in Electrical Installation Estimating & Costing by Gupta J. B. Kataria, S. K., & Sons.
2. Electrical Wiring Estimating
3. & Costing by S. L. Uppal, Khanna Publishers.

THERMO FLUIDS

DME- 306

Unit-I

Introduction and application areas of thermo-fluid sciences, Property, system, and surroundings. Enthalpy and internal energy, state and equilibrium, processes and cycles, Laws of thermodynamics, reversible, irreversible processes, heat and work, Formation of steam, dryness fraction, specific volume, specific enthalpy, specific entropy of saturated and superheated steam, simple numerical problems.

Unit-II

Introduction to three modes of heat transfer (conduction, convection and radiation) and their governing equations, one dimensional steady state conduction. Thermal conductivity, thermal resistance, convective heat transfer coefficient, critical radius of insulation, Principle laws of thermal radiation, Kirchhoff 's law, Stefan Boltzmann's law, emissivity, absorptivity, reflectivity and transitivity, simple numerical problems.

Unit-III

Properties of Fluid: Mass, density, weight density (specific weight), specific volume, specific gravity, viscosity (kinematic & dynamic viscosity), surface tension, compressibility and their units, Newtonian fluids. **Pressure:** Intensity of pressure, pressure head, Pascal's law with, atmospheric pressure, gauge pressure, vacuum pressure, absolute pressure.

Measurement of pressure: Piezometer, simple manometer, differential manometer, inverted differential manometer. **Loss of Energy in pipe flow:** Loss of head during flow through pipelines, major & minor losses, Darcy's and Chezy's formula (without proof), loss of head in pipe due to sudden enlargement, sudden contraction, bend, elbow, obstruction (without Proof), power transmission through pipes, simple numerical problems.

Unit-IV

Types of fluid flow. Steady & unsteady, uniform & non-uniform. Laminar & turbulent flows. Reynold number and its significance, rate of flow, continuity equation, Bernoulli's theorem (without proof) and its limitations; discharge through venturimeter, pitot tube; and small orifice, vena contracta, coefficient of contraction(C_c), coefficient of velocity(C_v), coefficient of discharge(C_d), coefficient of resistance(C_r), simple numerical problems

Unit-V

Hydraulic machines: Introduction, selection of turbines, performance and Complex Number parameters, Complex Number of turbines: specific speed, unit speed. Unit discharge. Unit power, and efficiency, working principle and application of hydraulic coupling. Rotary air compressors, simple numerical problems.

Text books:

1. Engineering thermodynamics by P. K. Nag, McGraw Hill Education.

Reference Books:

1. Fundamentals of Thermodynamics by Sonntag, Borgnakke, Van Wylen, Wiley Publishers.

2. A Text Book of Fluid Mechanics and Hydraulic Machines - Dr. R. K. Bansal, Laxmi Publications.

THERMO FLUIDS LAB

DME 316

List of Experiments:

1. To verify the Bernoulli's theorem and plot the following graphs:
 - i. Static head vs Length of passage
 - ii. Velocity head vs Length of passage
 - iii. Total head vs Length of passage
2. To determine the coefficient of friction (f_a) of a given pipeline using 'DARCY' Formula.
3. To determine the coefficient of contraction (C_c) in a given pipeline.
4. To determine the head loss due to sudden enlargement.
5. To determine the coefficient of Bend (K_b) in a given pipeline.
6. To determine the coefficient of Elbow (K_e) in a given pipeline.
7. To determine the coefficient of Discharge (C_d) of a Venturi Meter.
8. To determine the coefficient of Discharge (C_d) of a Orifice Meter.
9. To determine the Values of Hydraulic Coefficient (C_c , C_v & C_d) through circular orifice.
10. To study transition from laminar to turbulent flow and to determine the critical Reynolds number.
11. To study the characteristic of pelton wheel turbine.
12. To determine the coefficient of discharge (C_d) through V-Notch apparatus.

COMMUNICATION SKILLS-II
DEES-401

Unit	Topic	Marks
I	Reading <i>a. Comprehension (Advanced)</i>	10
II	Grammar <i>a. Direct and Indirect</i>	05
III	Writing <i>a. Dialogue</i> <i>b. Paragraph</i>	15
IV	Speaking-I <i>a. Presentation Skills</i>	15
V	Speaking-II <i>a. Interview</i>	15

GENERATION OF ELECTRICAL ENERGY

DEE-402

Unit-I

Importance of electrical power in day today life, various sources of energy. Comparison of sources of power. Selection of site for thermal power stations, block diagram of thermal power station, operation of boiler, economizer, air preheater, super heater, steam prime movers, condensers, draft fans etc.

Unit-II

Classification of hydroelectric plants. General arrangement and operation of hydroelectric plant, layout diagrams, hydraulic turbines, selection of turbines, dams, spillways, penstock, surge tank, fore bay, reservoirs, catchment area.

Unit-III

Nuclear Power Plant, Diesel Power Plant and Gas Power Plant.

Unit-IV

Prospects of non-conventional power plants, solar power, wind power, tidal power, MHD generation.

Unit-V

Prediction of load, load curves, plant capacity factor, utilization factor, Components for total cost of generation per unit, Methods for depreciation calculation, Effect of load curves on cost per kWh.

Text Books:

1. A Course in Electrical Power by J. B. Gupta, S K Kataria and Sons.

Reference Books:

1. Non-Conventional Energy Sources by S. Hasan Saeed & D. K. Sharma, S.K. Kataria & Sons
2. Electrical Power Generation & Protection by M. L. Anand, Sangam Books Ltd.

NETWORK ANALYSIS

DEE-403

Unit-I: Network Terminology

Basic circuit element, dependent and independent sources, KCL & KVL, its application in solving D.C. circuits, Mesh and Nodal Analysis.

Unit-II: AC Fundamentals

Generation of alternating Voltage and Current, important terminology: Peak value, RMS value, Average value of current and voltage, Form Factor & Peak Factor, phase and phase difference, addition of alternating quantities, AC circuit containing pure resistance, pure inductance, pure capacitance. Numerical problems

Unit-III: Single Phase AC Circuits

RL, RC and RLC series and parallel circuit, impedance triangle, phasor algebra, rectangular and polar conversion, addition, subtraction, division and multiplication, different methods for solving series and parallel circuits, series and parallel resonance, numerical problems.

Unit-IV: Network Terminology

Concept of generation of 3-phase voltage, advantage of 3-phase over 1-phase, Star-Delta connection (relationship between phase and line values of current & voltage), Expression for power measurement by 2-Wattmeter Method & 3-Wattmeter Method, numerical problems.

Unit-V: Network Theorems

Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem and their applications, Conversion of circuits from Star to Delta and vice versa, and Numerical Problems.

Text Books:

1. Basic Electrical Engineering by V.K Mehta & Rohit Mehta, S Chand Publication.

Reference Books:

1. Fundamentals of Electrical Engineering by Ashfaq Husain & Haroon Ashfaq, Dhanpat Rai & Co.
2. Basic Electrical Engineering by C L Wadhwa, New Age International Publishers.

NETWORK ANALYSIS LAB
DEE-413

List of Experiments:

1. To Verify Superposition Theorem.
2. To Verify Thevenin's Theorem.
3. To Verify Norton's Theorem.
4. To Verify Maximum Power Transfer Theorem.
5. To study the Performance of R-L series circuit.
6. To Study the performance of R-C series circuit.
7. To Study the performance of R-L-C series circuit.

ELECTRICAL MACHINES-I

DEE-404

Unit-I: DC Generator

Construction, Working principle of d.c. generator, e.m.f. equation, Types of DC generator, Equivalent circuits, Lap & Wave windings, armature reaction & commutation, improving commutation, Separately excited, self excited, Shunt wound, Series wound, Compound wound, Characteristics of d.c. generator, Application of d.c. generator, Losses and efficiency of d.c. generator, Numerical problems.

Unit-II: DC Motors

Working principle, Back emf and its importance, equivalent circuit, e.m.f. equation, torque equation, types of d.c. motors, armature reaction and interpoles, Characteristics of d.c. motors, Application of d.c. motors, speed equation & speed control, starting, DOL Starter, 3-pin starter, losses & efficiency, Numerical problems.

Unit-III: Introduction to Single Phase Transformer:

Principle of operation of 1-phase transformers, Construction, e.m.f. equation, Ideal Transformer, voltage transformation ratio, turn ratio, current ratio, Transformer on no-load. Transformer on load, resistance and leakage reactance.

Unit-IV: Equivalent Circuit and Phasor Diagram for 1-Phase Transformer

Equivalent circuit and phasor diagram of 1-phase transformer at different power factors, referred values, application & simplified equivalent circuits with phasor diagrams, voltage regulation and calculation at different power factors, Losses, tests and efficiency, condition for maximum efficiency, All-day efficiency, cooling of transformer, Auto transformer, its construction, working and application, introduction to 3-phase transformer.

Unit-V: Introduction to Three- Phase AC Machine:

Working principle, Construction and types of 3-phase induction Motor, Concept of rotating magnetic field, slip and its importance, Construction and Working principle of Synchronous machines & their e.m.f. equations.

Text Books:

1. Electrical Machines by R. K. Rajput, Laxmi Publications Pvt Limited.

Reference Books:

1. Electrical Machines by J. B. Gupta, S. K. Kataria & Sons.
2. Electric Machines by Ashfaq Husain and Haroon Ashfaq, Dhanpat Rai & Co.

ELECTRICAL MACHINES-I LAB

DEE-414

List of Experiments:

1. To perform an open circuit test and short circuit test on a single phase transformer to obtain the following:
 - (a) Equivalent circuit diagram of transformer at no-load;
 - (b) Efficiency of transformer at different loads and power factors;
 - (c) Voltage regulation of transformer at different power factors.
2. To plot internal and external characteristics of DC shunt generator.
3. Study the speed control of DC shunt motor by
 - (a) Armature control method;
 - (b) Field control method.
4. To measure the power in a three phase balanced star/delta connected load by two wattmeter method & to calculate the power factor of load & resistance per phase of the load.
5. To determine percentage slip of three phase induction motor.
6. To draw the magnetization characteristics (OCC) for a 3 phase synchronous generator.

POWER ELECTRONICS

DEE 405

UNIT-I: INTRODUCTION TO SCR

Construction and working principle of an SCR, Characteristics of SCR, Two Transistor analogy of SCR, Construction and working principle of DIAC, TRIAC, UJT and MOSFET, Triggering circuits of Thyristor, Commutation of Thyristor, Series and Parallel operation of Thyristors.

UNIT-II: CONTROLLED RECTIFIERS

Introduction to Rectifiers and its applications, Single phase half wave-controlled rectifier with R-L load, Single phase full wave-controlled rectifier with R-L load, fully controlled full wave rectifier, 3-phase full wave half-controlled bridge rectifier, 3-phase full wave fully controlled bridge rectifier.

UNIT-III: INVERTERS

Introduction, applications, Series inverters, Parallel inverters, Bridge inverters, Voltage source inverter, Mc-Murray Bedford inverter, 3-phase inverter, Current source inverter

UNIT-IV: CHOPPERS

Introduction to Choppers and their working principles & applications, Types of Choppers, Jones Chopper, Morgan Chopper.

UNIT-V: CYCLO-CONVERTERS

Introduction to Cycloconverters, working principle and applications, 1- phase step up & step down Cycloconverters, 3- phase to 1-phase, 3- phase to 3-phase, 1-phase to 3-phase Cycloconverters.

Text Books:

1. Power Electronics, by Jamil Asghar, PHI Publishers.

Reference Books:

1. Power Electronics by PC Sen, McGraw-Hill Education.
2. Power Electronics by P S Bhimbra, Khanna Publishers

POWER ELECTRONICS LAB

DEE 415

List of Experiments:

1. To study and plot the V-I characteristics of SCR.
2. To study and plot the V-I characteristics of MOSFET.
3. To study and plot the V-I characteristics of IGBT.
4. To study and plot the V-I characteristics of TRIAC.
5. To study and plot the V-I characteristics of DIAC.
6. To study and plot the V-I characteristics of UJT.
7. To study and plot the V-I characteristics of PUT.

ELECTRICAL WORKSHOP

DEE 416

List of Experiments:

1. Study & construction of Series Test Board.
2. Study & construction of Parallel Test board with A.M. & V.M.
3. Staircase Wiring Practice.
4. Go-down Wiring Practice.
5. Cleat Wiring Practice.
6. Batten Wiring Practice.
7. Casing Caping Wiring Practice.
8. Conduit Pipe Wiring Practice.
9. Internal connection of tube lights.
10. Connection of Distribution Board with Energy Meter, Main Switch, Fuse & Distribution Box.

ELETRICAL MACHINES-II

DEE 501

UNIT-I: Three Phase Transformers:

Constructional details, Advantages of 3 phase transformers over 1-phase transformers, Applications of different connections and their advantages over one another, Condition for parallel operation.

UNIT-II: Three Phase Induction Motors:

Induced EMF & Torque Equations, Torque-Speed Characteristics, Speed control of 3 phase IM, Equivalent Circuit Model, Starting & Starters for 3 phase IM, Applications.

UNIT-III: Three Phase Alternators:

Voltage Regulation, Methods for determining voltage regulation, Open circuit & Short circuit characteristics, Concept of distribution and coil span factor, Operation of alternator when connected to an infinite bus-bar, Effect of load on synchronizing power, Parallel Operation, Load sharing by two alternators & calculations.

UNIT-IV: Three Phase Synchronous Motors:

Starting methods, Motor on load with constant excitation, Equivalent circuit, Power developed, Motor with different excitations, Effect of load increment with constant excitation, Effect of changing excitation with constant load, Different Torques, Effect of excitation on armature current and power factor, Hunting, Applications.

UNIT-V: Single Phase Motors (FKW motors)

Single phase motors - Principle of operation, classification

Single phase Induction Motors- [Split Phase Motors, Capacitor Motors, Shaded Pole motors & Reluctance Start Motors]

Single phase Synchronous Motors- [Reluctance Motor & Hysteresis Motor]

Single phase Commutator Motors- [AC Series Motor, Universal Motor & Repulsion Motor].

Text Books:

1. Electrical Machines by S. K. Bhattacharya, Tata McGraw-Hill Education.

Reference Books:

1. Electrical Machinery by P. S. Bhimbra, Khanna Publishers.
2. Electric Machines by Ashfaq Husain & Haroon Ashfaq, Dhanpat Rai & Co.

ELECTRICAL MACHINES-II LAB DEE-511

List of Experiments:

1. To draw the voltage vs speed characteristic curves for universal motor at AC and DC supply voltage.
2. To draw the equivalent circuit diagram of a 3-phase squirrel cage induction motor by conducting open circuit test, block rotor test & stator resistance test.
3. To determine the starting to full load torque ratio for an induction motor, the full load slip is 5%.
4. To study the short circuit characteristic of a 3 phase synchronous generator.
5. To determine the slip of a 3-phase slip ring induction motor in forward and reverse directions.

ELECTRICAL TROUBLE SHOOTING

DEE-502

Unit-I: General

Maintenance, Classification of maintenance, function of electrical maintenance department. Advantages and disadvantages of various maintenance system, common testing equipment.

Unit-II: Earthing Maintenance & Testing

Reasons for earthing, classification of earthing, factors influencing the earth resistance, inspection and maintenance of earth electrodes.

Unit-III: Maintenance of Machines

Causes for failure and diagnosis of faults in transformers, induction motors and circuit breakers.

Unit-IV: Testing of Insulation Resistance

Testing of electrical installation, testing of insulation resistance between conductors and between conductor and earth, Transformer oil testing

Unit-V: Maintenance of Batteries and Safety Measures

Maintenance of batteries, Shock treatment, artificial respiration and fire extinguishers.

Text Books:

1. Installation, Commissioning & Maintenance of Electrical Equipment, by P. P. Gupta, Dhanpat Rai Publications.

Reference Books:

1. Practical Troubleshooting of Electrical Equipment and Control Circuits by Mark Brown, Jawahar Rawtani, Dinesh Patil, Elsevier Science & Technology Books.
2. Industrial Electrical Troubleshooting by Lynn Lundquist Delmar Publishers Inc.

ELECTRICAL TROUBLESHOOTING LAB

DEE 512

List of Experiments:

1. To study the various part of single phase induction motor and to find out their trouble and remedies.
2. Study of the constructional details of a ceiling fan and to change its direction of rotation along with its trouble shooting.
3. To study the various part of a 5 hp induction motor and their trouble shooting.
4. To study the function of choke and starter of fluorescent lamp circuit and its trouble shooting.
5. To study the various types of wiring system and trouble shooting of new/old installation.
6. Study of battery charger along with its trouble shooting.
7. To study the various types of domestic electric appliances and their trouble shooting.
8. To study the function of emergency light and its trouble shooting.

CONTROL SYSTEM ENGINEERING

DEE503

Unit-I: Fundamental Elements and Components

Introduction to control system: Types, Open loop and Closed loop system, Basic elements of feedback control systems, Position control system, Effect of feedback.

Unit-II: Introduction to Laplace Transform

Laplace transform: General Laplace transform of algebraic and other functions, Partial fraction expansion, Inverse Laplace transform, Application of Laplace transform in solving second order differential equations, Initial and final value theorems.

Unit-III: Transfer Function & Modeling of Electrical Systems

Block diagram representation, Reduction techniques, Signal flow graph, Mason's gain formula, Transfer function, Transfer function of electrical system.

Unit-IV: Time Response Analysis

Standard signals, Steady state and transient response, Input test signals, Step signal, Ramp signal, Impulse signal and Parabolic signal, Transient response of control system, Rise time, Maximum overshoot, Peak time, Settling time, Steady state error.

Unit-V: Stability Analysis

Stability concept, Necessary conditions for stability, Hurwitz's stability criterion, Root locus plot, General rules for constructing root loci, Examples.

Text Books:

1. Automatic Control System by Hasan Saeed, S.K.Kataria & Sons.

Reference Books:

1. Modern Control Engineering by K. Ogata, PHI.
2. Control Systems Engineering by I. J. Nagrath, New Age International Pvt Ltd.

CONTROL SYSTEM LAB

DEE 513

List of Experiments:

- 1.** Introduction to MATLAB. To learn how to represent the polynomial in MATLAB, find its roots, create polynomials when roots are known, perform multiplication, division, differentiation, evaluation and obtain its partial fraction.
- 2.** Using MATLAB, represent a transfer function and perform series, parallel and feedback operations.
- 3.** Using MATLAB, compute the poles and zeros of a transfer function and plot them on pole zero map.
- 4.** Using MATLAB, compute the step and impulse response of first order system.
- 5.** Using MATLAB, compute the impulse response for a second order system with different damping ratios.
- 6.** Using MATLAB, compute the step response for a second order system with different damping ratios.

ELECTRICAL INSTRUMENTATION

DEE-504

Unit-I: Introduction

Important terms in measurement system, Errors, types of error, classification of errors
Advantages of electrical instrumentation, Data transmission & their classification, Principle of
telemetry system, Classification of telemetry system.

Unit-II: Sensors and Transducers

Introduction, Classification of transducers, advantages and disadvantages of electrical
transducers, resistance transducers, Inductive transducers, Primary sensing element, Proximity
sensors, Pneumatic sensors, Light sensors and selection of sensors.

Unit-III: Displacement Transducers

Potentiometric transducer, Inductive transducer, Capacitive transducer, LVDT, Photoelectric
transducer, Piezo-electric transducer.

Unit-IV: Strain Gauge and Thermoelectric Transducers

Principle of strain gauge and its applications, types of strain gauge, Resistance transducer and
thermistor, Thermocouples and thermopiles, Pyrometer.

Unit-V: Measurement of Non-Electric Parameters

Measurement of Displacement scheme, Measurement of velocity and acceleration, Measurement
of Force and Pressure, Measurement of Flow rate of liquid, Measurement of temperature.

Text Books:

1. A Course in Electrical and Electronic Measurement and Instrumentation. by A K Sawhney, Dhanpat Rai Publication.

Reference Books:

1. Electrical Measurement and Measuring Instruments. by Rajendra Prasad, Khanna Publisher.
2. Instrumentation: Devices and Systems by C. Rangan, G Sarma, V.S.V. Mani, McGraw Hill Education.

ELECTRICAL INSTRUMENTATION LAB DEE 514

List of Experiments:

1. Measurement of weight using Strain guage.
2. Measurement of torque using Strain guage.
3. Measurement of displacement using LVDT.
4. Measurement of temperature using Thermocouple.
5. Measurement of temperature using Thermistor.
6. To measure the velocity of air.

INDUSTRIAL MANAGEMENT

DME-506

Unit -I

Management, Industrial Management, Different functions of Management, Planning, Organizing, co-ordination, Controlling, Structure of an Industrial Organization, Functions of different departments, Human relations and performance in organization.

Unit -II

Trade Unions, Grievances, Handling of grievances, Agitations, Lockout. Labour welfare, Workers participation in management. Labour laws, and disputes. Wages: types of wages, wage & incentive plants. Factory Act 1948, Payment of Wages Act 1936. Industrial Dispute Act 1947.

Unit -III

Business ethics, Managerial ethics, Codes of ethics. Causes of accidents, Safety consciousness, Safety measures, Factors causing pollution, Effect of pollution on human health, Noise pollution.

Unit -IV

Entrepreneurship Development, Entrepreneur, Modern concept of entrepreneur, entrepreneurship, Qualities to become entrepreneur, Classifications of entrepreneurs. EDP training, Small Scale Industries, Classifications of Small Scale Industries, Project report guidelines, Content of project report, Project appraisal. Market survey, Preparation of project report, Role of financial institutions.

Unit -V

Types of Production, Job, Batch, Mass Production. Concept of Total Quality Management, Six Sigma Concept, Just in Time (JIT), ISO-14000 Series. Concept of intellectual property right and patents. Breakeven analysis, Marketing management, Price Analysis, Determination of Economic order.

Text Book:

1. Industrial Management by A. P. Verma, N. Mohan, S K Kataria and Sons.

Reference Books:

1. Industrial Engineering and Operations Management by Anmol Bhatia, S.K. Kataria & Sons.
2. Industrial Instrumentation Safety And Management by D. Chakraborty, CBS Publishers & Distributors.

TRANSMISSION AND DISTRIBUTION

DEE-601

Unit-I: Transmission Lines

Introduction to overhead transmission line, Classification and Comparison of AC/DC transmission systems. Main components of transmission line i.e. tower, conductors, and overhead line insulators. Potential distribution over suspension insulator string, string efficiency and methods of improving string efficiency, sag calculation of equal supports, effect of transmission voltage on efficiency and regulation of line. Kelvin law.

Unit-II: Line Parameters

Identification of Line parameters, R, L, C & G, Calculation of line parameters for 1-phase and 3-phase lines, Skin and Proximity effect, Ferranti effect, Corona, Corona losses and other effects.

Unit-III: Performance of Transmission Lines:

Parameters of performance of transmission lines, Efficiency and regulation of line, performance of 1-phase short transmission line, Effect of load power factor on performance, Medium transmission lines- Nominal **T** & **π** -models, A, B, C & D parameters of short, medium and long lines.

Unit-IV: Distribution of Electrical Energy:

Introduction, Classification of distribution system, A.C distribution, Connection schemes of distribution system, Requirements of Distribution systems, Design consideration, A.C. distribution calculation, Methods of solving A.C. 1-phase & 3-phase connected (balanced) distribution system, Underground cables, Introduction and requirements. Classification of cables, cable conductors, cable construction, cable insulation, Metallic sheathing and mechanical protection, Comparison with Overhead lines, Cable laying.

Unit-V: Substations:

Introduction, Classification of indoor & outdoor Sub-station, Advantages and Disadvantages, Selection and location of site, main connection schemes, Equipment's circuit elements of substations:-Incoming & Outgoing lines, Transformers, CT & PT, Relays, CB's, Fuses, Isolators, Batteries, lightning arresters. Insulators, Bus-bar's material types in detail, Connection Diagram and layout of Substation.

Text Books:

1. Principles of Power System by V K Mehta, S Chand & Co.

Reference Books:

1. Transmission and Distribution of Electrical Power by J. B. Gupta- S K Kataria & Sons.
2. Electrical Power System by Soni, Gupta & Bhatnagar- Dhanpat Rai Publishing Co.

SWITCHGEAR AND PROTECTION

DEE-602

Unit-I: Fault Analysis

Concept of fault, Symmetrical and Unsymmetrical fault calculations, Fault level.

Unit-II: Circuit Breakers

Fuses, Circuit breakers, Arc phenomenon, Theories of arc extinction, Methods of arc extinction, Important terms as applied to fuses and circuit breakers, Classification of circuit breakers, Construction and working of modern circuit breakers, Circuit breaker ratings, MCB, RCCB, ACB and ELCB.

Unit-III: Protective Relays and Relaying Circuitry

Faults, Types of fault, Nature of faults, Causes and consequences of faults, Requisites of protective system, Relays, Classification of relays- Induction type overcurrent relay, Induction type reverse power relay, Induction type directional overcurrent relay, Earth fault relay, Distance relays, Static relays and relaying circuitry.

Unit-IV: System Protection

Zones of protection, Types of protection, Principle of differential protection, Principle of distance protection, R-X diagram, Translay system, Principle of carrier protection. Protection of Generators, Transformers, Bus-bars, Lines and Induction motors.

Unit-V: Surge Protection and System Grounding

Surges, Protection against surges, Modern surge diverters, Purpose of neutral grounding, Methods of neutral grounding- Resonant, Solid and Impedance grounding, Earthing transformer, Earthing of all non-current carrying metallic parts, Introduction to lightning.

Text Books:

1. Principle of Power System by V K Mehta & Rohit Mehta- S Chand Publication.

Reference Books:

1. Power System Protection and Switchgear by Badri Ram & D Vishwakarma-Tata McGraw-Hill Education.
2. Electrical Power Systems by C L Wadhwa-New Age International Publishers.

SWITCHGEAR AND PROTECTION LAB

DEE 612

List of Experiments:

1. To study the construction and working principle of induction type non-directional over current relay and plot the curve between current and time at different current settings (c.s.) and time multiplier setting (TMS).
2. To study the construction and working principle of the induction type directional over current relay.
3. To study the protection of electrical equipments by relays in conjunction with circuit breakers.
4. To study the performance of solid state time delay relay.
5. To study the construction and working principle of the transformer differential relay.

SPECIAL PURPOSE MACHINES

DEE- 603

Unit-I

Three Brush Generator: Construction, working and applications.

Three Wire Generator: Construction, working and applications.

Boosters: Types, working and applications.

Cross field generator, Rotary amplifiers, Rototrol and Regulex.

Unit-II

Brushless motor: Introduction, applications.

Dynamotor: Construction, working and applications.

Printed circuit Motor: Introduction and applications.

The Osnos Motor (no lag motor): Introduction and applications.

Linear Motor: Construction, working and applications.

Unit-III

Induction Generator: Construction and working principle.

Induction voltage Regulator: Introduction types and applications.

Power Selsyn: Construction, working and applications.

Position Selsyn: Construction, working and applications.

Phase Advancer: Construction, working and applications.

Unit-IV

Frequency Changer: Construction and working.

Brushless Generator: Construction, working and applications

Eddy drives: Construction, working and applications.

Homopolar machines: Construction, working and applications.

Unit-V

Servo motor: Principle, construction, types and applications.

Stepper motor: Principle, Construction, Types, working and applications.

Schrage motor: Construction, working and applications.

Text Books:

1. Electrical Machines by S. K. Bhattacharya, Tata McGraw-Hill Education.

Reference Book:

1. Electrical Machines by P. K. Mukherjee & S Chakravorti, Dhanpat Rai Publications.
2. Electrical Machines by Ashfaq Hussain & Haroon Ashfaq, Dhanpat Rai Publications.

**SPECIAL PURPOSE MACHINE LAB
DEE 613**

List of Experiments:

1. To draw the speed-torque characteristics of chopper controlled dc motor drive in open loop.
2. To draw the speed torque characteristics of chopper fed dc motor drive in close loop.
3. To draw the characteristics of servo motor.
4. To draw the characteristics of induction generator.
5. To Study different types of stepper motor.
6. To study the cross field generator.
7. To study the linear induction motor.

UTILIZATION AND TRACTION

DEE-604

Unit-I: Illumination

Nature of light, definition, Measurement of candle power and MSCP, photometer bench, photometers, Principle of production of light, Sources of light, requirements of good lighting. Lamp fitting, basic principles of control. Factors affecting the design of indoor lighting installation, special precautions, street lighting, flood lighting and its design, various types of lamps, CFL, Mercury-vapour lamp, Sodium-vapour lamp, LED for lighting

Unit-II: Electric Heating

Classification of electric heating methods and their comparisons. Various types of resistance and arc furnaces, their power supplies and heat control, comparison of various furnaces, High frequency heating, induction heating, Core and coreless induction furnaces, choice of frequency and application of induction heating, high frequency generation, Dielectric heating, choice of voltage and frequency, Calculation of heating power, depth of penetration & Losses, Application and use of dielectric heating.

Unit-III: Electric Welding

Welding & its classifications, Various types of welding and power supply, Electron beam welding, Modern welding techniques, Electronic welding control, need for AC contactors, heat control unit, AC timer units, Sequence of welding timers.

Unit-IV: Electrolytic Processes

Principle of Electro-deposition, Laws of electrolysis. Electroplating, Anodizing and Electro-polishing.

Unit-V: Traction

Advantages of electric traction, requirements of an ideal traction system, train movement, mechanism of train movement, traction motors, traction motor control, Multi unit control, braking of electric motors, thyristors control of electric traction.

Text Books:

1. Utilization of Electrical Engineering by J. B. Gupta , S K Kataria & Sons.

Reference Book:

1. Partab H. "Art and Science of Electrical Energy", Dhanpat Rai & Sons.
2. Taylor E.O. "Utilization of Electric Energy", Pitman & Sons.

ELECTRICAL ENERGY MANAGEMENT

DEE-605

Unit-I: Economic Aspects of Power Generation:

Introduction, terms commonly used in system operations, factors affecting cost of generation, reduction of cost by interconnecting generators, choice of size and number of generator units, Input output curve, constraints of economic generation, economic loading of generator, load allocation among various generators, base load and peak load plants.

Unit-II: Operation and Control:

Criteria for distribution of load between units, unit commitment, load sharing, Tie line, transmission loss as a function of plant generation, loss coefficient and brief aspects of load dispatching.

Unit-III: Interchange of Power and Energy:

Introduction, economy interchange between interconnected utilities, power pool, energy banking, transmission effect and issues.

Unit-IV: Energy Audit:

Definition, need for energy audit, types of audit, procedures to follow, data and information analysis, energy consumption, finding of audit, action plans, bench marking energy performance, energy audit instruments, report writing.

Unit-V: Economic Aspects of power factor:

Importance of high power factor, Economic aspects of selection of power factor improvement, Different tariffs of power.

Text Book:

1. Electrical Energy Management in Power Delivery Systems: Virtual Power Plant Concept by Mahmoud Othman ,Almoataz Abdelaziz ,Yasser Hegazy, LAP LAMBERT Academic Publishing.

Reference Books:

1. Energy Management and Conservation by K.V. Sarma, I K International Publishing House.
2. Energy Engineering and Management by Amlan Chakrabarti, PHI.