आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

IFTM University, Moradabad, Uttar Pradesh

NAAC ACCREDITED

IFTM UNIVERSITY

N.H.-24, Lodhipur Rajput, Delhi Road, Moradabad, Uttar Pradesh-244001
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Study & Evaluation Scheme of
Diploma (Electrical Engineering)
[Session 2020-21]

Programme:	***Diploma (Electrical Engineering)***
Course Level:	***Diploma***
Duration:	***Three Years (six semesters) Full Time***
Medium of Instruction:	***English/Hindi***
Minimum Required Attendance:	***75%***
Maximum Credits:	***158***

Programme Outcomes (POs):

Students completing this programme will be able to:

- Diploma engineers will be able to demonstrate knowledge of electrical and electronics engineering.
- Diploma engineers will demonstrate an ability to identify, formulate and solve industrial, community & research problems.
- Diploma engineers will demonstrate an ability to analyze and interpret experiments for mathematical modeling and maintenance of the electrical systems.
- Diploma engineers will demonstrate skills to use modern devices, software and equipment to analyze & solve problems.
- Diploma engineers will be able to communicate effectively both verbally and in writing.
- Diploma engineers will be able to understand the impact of Electrical engineering on the society and contemporary issues.

UNIVERSITY POLYTECHNIC
DEPARTMENT OF ELECTRICAL ENGINEERING
IFTM UNIVERSITY, MORADABAD

Diploma (Electrical Engineering)

STUDY & EVALUATION SCHEME (Effective from Session 2020-21)
YEAR I, SEMESTER-I

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	DPH -101	Elementary Physics-I	3	1	0	20	10	30	70	100	4
2.	DMA -101	Elementary Mathematics -I	3	1	0	20	10	30	70	100	4
3.	DCH -101	Elementary Chemistry-I	3	1	0	20	10	30	70	100	4
4.	DME -101	Elementary Engineering Mechanics	3	1	0	20	10	30	70	100	4
5.	DME -102 / DEE - 101	Workshop Technology / Basic Electrical & Electronics Engineering	3	1	0	20	10	30	70	100	4
6.	FEC -101/ DCS-101	Fundamentals of English Communication / Computer fundamentals & Programming in C	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
7.	DME -151 / DCS-151	Engineering Drawing Lab / Computer Programming Lab	0	0	2	20	10	30	70	100	1
8.	DPH -151	Physics-I Lab	0	0	2	20	10	30	70	100	1
9.	DCH -151	Chemistry-I Lab	0	0	2	20	10	30	70	100	1
10.	DME -152 / DEE - 151	Workshop Lab / Basic Electrical & Electronics Engineering Lab	0	0	2	20	10	30	70	100	1
11.	DGP -101	General Proficiency	-	-	-	-	-	100	-	100	1
		TOTAL	**18**	**06**	**08**	**-**	**-**	**-**	**-**	**1100**	**29**

UNIVERSITY POLYTECHNIC
DEPARTMENT OF ELECTRICAL ENGINEERING
IFTM UNIVERSITY, MORADABAD

Diploma (Electrical Engineering)

STUDY & EVALUATION SCHEME (Effective from Session 2020-21)
YEAR I, SEMESTER-II

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	DPH -201	Elementary Physics-II	3	1	0	20	10	30	70	100	4
2.	DMA -201	Elementary Mathematics -II	3	1	0	20	10	30	70	100	4
3.	DCH -201	Elementary Chemistry-II	3	1	0	20	10	30	70	100	4
4.	DME -201	Elementary Mechanical Engineering	3	1	0	20	10	30	70	100	4
5.	DEE -201 / DME - 202	Basic Electrical & Electronics Engineering / Workshop Technology	3	1	0	20	10	30	70	100	4
6.	FEC -201/ DCS-201	Fundamentals of English Communication / Computer Fundamentals & Programming in C	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
7.	DPH -251	Physics-II Lab	0	0	2	20	10	30	70	100	1
8.	DEE -251 / DME - 252	Basic Electrical & Electronics Engineering Lab / Workshop Lab	0	0	2	20	10	30	70	100	1
9.	DCS -251 / DME-251	Computer Programming Lab / Engineering Drawing Lab	0	0	2	20	10	30	70	100	1
10.	DCH - 251	Chemistry – II Lab	0	0	2	20	10	30	70	100	1
11.	DGP -201	General Proficiency	-	-	-	-	-	100	-	100	1
		TOTAL	**18**	**06**	**08**	**-**	**-**	**-**	**-**	**1100**	**29**

UNIVERSITY POLYTECHNIC
DEPARTMENT OF ELECTRICAL ENGINEERING
IFTM UNIVERSITY, MORADABAD

Diploma (Electrical Engineering)

STUDY & EVALUATION SCHEME (Effective from Session 2020-21)
YEAR II, SEMESTER-III

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Internal Exam			End Sem Exam		
			L	T	P	Mid Sem Exam	AS +AT	Total			
THEORY											
1.	DEE-301	Electrical Measurements & Measuring Instruments-I	3	1	0	20	10	30	70	100	4
2.	DEE-302	Transmission & Distribution of Electrical Power	3	1	0	20	10	30	70	100	4
3.	DEE-303	Basic Network Systems	3	1	0	20	10	30	70	100	4
4.	DEE-304	Power Plant Engineering	3	1	0	20	10	30	70	100	4
5.	DEE-305	Elementary Digital Electronics	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
6.	DEE-351	Electrical Measurement-I Lab	0	0	2	20	10	30	70	100	1
7.	DEE-352	Network Systems Lab	0	0	2	20	10	30	70	100	1
8.	DEE-353	Electrical Power Lab	0	0	2	20	10	30	70	100	1
9.	DEE-354	Digital Electronics Lab	0	0	2	20	10	30	70	100	1
10.	DGP-301	General Proficiency	-	-	-	-	-	100	-	100	1
		TOTAL	**15**	**05**	**08**	**-**	**-**	**-**	**-**	**1000**	**25**

UNIVERSITY POLYTECHNIC
DEPARTMENT OF ELECTRICAL ENGINEERING
IFTM UNIVERSITY, MORADABAD

Diploma (Electrical Engineering)

STUDY & EVALUATION SCHEME (Effective from Session 2020-21)
YEAR II, SEMESTER-IV

	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Internal Exam			End Sem Exam		
			L	T	P	Mid Sem Exam	AS +AT	Total			
THEORY											
1.	DEE-401	Introduction to Microprocessors	3	1	0	20	10	30	70	100	4
2.	DEE-402	Introduction to Power Electronics	3	1	0	20	10	30	70	100	4
3.	DEE-403	Electrical Design Drawing & Estimating-I	3	1	0	20	10	30	70	100	4
4.	DEE-404	Electrical Machine-I	3	1	0	20	10	30	70	100	4
5.	DEE-405	Electrical Measurements & Measuring Instruments-II	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
6.	DEE-451	Microprocessor Lab	0	0	2	20	10	30	70	100	1
7.	DEE-452	Power Electronics Lab	0	0	2	20	10	30	70	100	1
8.	DEE-453	Electrical Design Drawing & Estimating-I Lab	0	0	2	20	10	30	70	100	1
9.	DEE-454	Electrical Machine-I Lab	0	0	2	20	10	30	70	100	1
10.	DGP-401	General Proficiency	-	-	-	-	-	100	-	100	1
		TOTAL	**15**	**05**	**08**	**-**	**-**	**-**	**-**	**1000**	**25**

UNIVERSITY POLYTECHNIC
DEPARTMENT OF ELECTRICAL ENGINEERING
IFTM UNIVERSITY, MORADABAD

Diploma (Electrical Engineering)

STUDY & EVALUATION SCHEME (Effective from Session 2020-21)
YEAR III, SEMESTER-V

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Internal Exam			End Sem Exam		
			L	T	P	Mid Sem Exam	AS +AT	Total			
THEORY											
1.	DEE-501	Industrial Management & Entrepreneurship Development	3	1	0	20	10	30	70	100	4
2.	DEE-502	Elective-I	3	1	0	20	10	30	70	100	4
3.	DEE-503	Electrical Machine-II	3	1	0	20	10	30	70	100	4
4.	DEE-504	Installation, Maintenance and Repair of Electrical Machines	3	1	0	20	10	30	70	100	4
5.	DEE-505	Electrical Design Drawing Estimation-II	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
6.	DEE-551	Installation, Maintenance and Repair of Electrical Machines Lab	0	0	2	20	10	30	70	100	1
7.	DEE-552	Electrical Design Drawing & Estimation-II Lab	0	0	2	20	10	30	70	100	1
8.	DEE-553	Electrical Machine-II Lab	0	0	2	20	10	30	70	100	1
9.	DEE-554	Electrical Measurement-II Lab	0	0	2	20	10	30	70	100	1
10.	DGP-501	General Proficiency	-	-	-	-	-	100	-	100	1
		TOTAL	**15**	**05**	**08**	**-**	**-**	**-**	**-**	**1000**	**25**

DEPARTMENT OF ELECTRICAL ENGINEERING
IFTM UNIVERSITY, MORADABAD

Diploma (Electrical Engineering)

STUDY & EVALUATION SCHEME (Effective from Session 2020-21)
YEAR III, SEMESTER-VI

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Internal Exam			End Sem Exam		
			L	T	P	Mid Sem Exam	AS +AT	Total			
THEORY											
1.	DEE-601	Utilization of Electrical Energy	3	1	0	20	10	30	70	100	4
2.	DEE-602	Industrial Electronics & Control	3	1	0	20	10	30	70	100	4
3.	DEE-603	Switch Gear and Protection	3	1	0	20	10	30	70	100	4
4.	DEE-604	Environmental Education & Disaster Management	3	1	0	20	10	30	70	100	4
5.	DEE-605	Elective-II	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
6.	DEE-651	Seminar	0	0	2	50	50	100	-	100	1
7.	DEE-652	Industrial Electronics & Control Lab	0	0	2	20	10	30	70	100	1
8.	DEE-653	Power System Lab	0	0	2	20	10	30	70	100	1
9.	DEE-654	Project	0	0	2	20	10	30	70	100	1
10.	DGP-601	General Proficiency	-	-	-	-	-	100	-	100	1
		TOTAL	**15**	**05**	**08**	**-**	**-**	**-**	**-**	**1000**	**25**

LIST OF ELECTIVE-I

1. Fundamentals of High Voltage Engineering (DEE-502) (A)

2. Industrial Control (DEE502) (B)

3. Control of Electrical Machines (DEE502) (C)

LIST OF ELECTIVE-II

1. Electric Traction (DEE-605) (A)

2. Renewable Sources of Energy (DEE-605) (B)

3. Process Control & Instrumentation (DEE-605) (C)

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - I Year (I Semester)
DPH 101: ELEMENTARY PHYSICS-I

Objective: This aim of this course is to impart knowledge in basic concepts of physics like unit, dimension, work, energy and power etc and their applications.

UNIT I **(08 Sessions)**

Unit and Dimensions

Physical quantities, Fundamental and derived units, Systems of unit (CGS, MKS and SI units), Dimensions and dimensional formulae of physical quantities (area, volume, velocity, acceleration, momentum, force, impulse, work, power, energy, surface tension, coefficient of viscosity and strain) , Dimensional equations and their uses with examples, Limitations of dimensional analysis.

UNIT II **(10 Sessions)**

Force and Motion

Scalar and vector quantities - examples, addition and multiplication of vectors, scalar product and vector product of vectors, Force, resolution and composition of forces – resultant, friction, law of friction and type of friction, Newton's Laws of motion – concept of momentum, determination of force equation from Newton's second law of motion, Newton's third law of motion Conservation of momentum, impulse and impulsive forces, simple numerical problems, Circular motion (Definition), Relation between linear and angular velocity and linear acceleration and angular acceleration , Centripetal force (derivation) and centrifugal force Banking of roads, Definition of torque ,Planetary Motion, Newton's law of gravitation, Kepler's law of planetary motion, Escape velocity (derivation)

UNIT III **(08 Sessions)**

Work, Power and Energy

Work: definition and its units, Work done against friction in moving an object on horizontal and inclined plane (incorporating frictional forces),

Power: definitions and its units, calculation of power in simple cases,

Energy: Definitions and its units: Types: Kinetic energy and Potential energy, with examples and their derivation.

UNIT IV **(08 Sessions)**

Temperature and its measurement

Difference between heat and temperature on the basis of K.E. of Molecules, Principles of measurement of temperature and different scales of temperature, Transfer of Heat, Modes of transfer of heat (conduction, convection and radiation with examples), Coefficient of thermal conductivity, Properties of heat radiation. Prevost's theory of heat exchange, Laws of black body radiations: Stefan's law, Kirchhoff's law, Wien's law.

UNIT V **(10 Sessions)**

Properties of Matter

Elasticity, stress and strain, Different types of modulus of elasticity, Surface tension- its units, measurement of surface tension by capillary tube method, applications of surface tension, effect of temperature and impurity on surface tension, Fluid motion, stream line and turbulent flow, Viscosity and coefficient of viscosity.

Course Outcomes:

Students completing this course will be able to:

- Identify different systems of units and convert units from one system to another as well as conversant with practical units.
- Understand equations of motion and their applications.
- Differentiate between work, energy and power
- Explain Mode of heat transfer and black body radiation.
- Define stress, strain, elasticity, surface tension and their applications.

Suggested Readings:

1. Concept of Physics, Prof. H.C. Verma, Part-1 (BhartiBhawan)
2. Concept of Physics, Prof. H.C. Verma, Part-2 (BhartiBhawan)
3. A Text Book of Applied Physics: Eagle Prkashan, Jullandhar

Website Sources:

- https://thefactfactor.com
- https://i1.dainikbhaskar.com
- https://hplgit.github.io
- https://worldwidescience.org
- https://courses.lumenlearning.com
- https://www.machinedesign.com
- http://teacher.pas.rochester.edu

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - I Year (I Semester)
DMA 101: ELEMENTARY MATHEMATICS-I

Objective: - To understand basics and applications of algebra, determinants, vectors, trigonometry and complex numbers. The focus of these topics in field to impart their knowledge in particular area of engineering branches and Comprehensive knowledge of basic mathematics.

UNIT I **(08 Sessions)**

Series : AP and GP; Sum of n terms, Partial fractions, Exponential and Logarithmic series, Binomial theorem for positive, Negative and fractional index (without proof) Application of Binomial theorem, Permutation & combination.

UNIT II **(10 Sessions)**

Determinants: Elementary properties of determinants of order 2 and 3, Consistency and solution of system of algebraic equation by Cramer's rule, Matrices, Type of matrix, Properties (addition, subtraction, multiplication, adjoint, inverse) of matrix.

UNIT III **(06 Sessions)**

Vector algebra: Dot and Cross product, Scalar and vector triple product, Application to work done, Moment of a force.

UNIT IV **(08 Sessions)**

Trigonometry: Relation between sides and angles of a triangle, Statement of various formulae showing relationship between sides and angles of a triangle, trigonometrically equations, Inverse trigonometric function.

UNIT V **(08 Sessions)**

Complex numbers, Representation, Modulus and amplitude De-moiver'stheorem and its application in solving algebraic equations, Mod, Function and its properties.

Course Outcomes:

The student is able to

- Remember terminologies and formulae in algebra, determinants, vectors, trigonometry and complex numbers.
- Understand and interpret the concepts of algebra, determinants, vectors, trigonometry and complex numbers.
- Compare and analyse the methods in algebra, determinants, vectors, trigonometry and complex numbers.
- Predict and evaluate the problems in algebra, determinants, vectors, trigonometry and complex numbers.

Suggested Readings:

1. R.D. Sharma: Mathematics (I& II-XI), Dhanpat Rai Publication, Delhi.
2. B.S. Grewal :Engg. Mathematics by khanna Publishers, New Delhi.
3. H.R. Luthra : Applied Mathematics by Bharat Bharti Prakashan & Co. Meerut
4. Kailash Sinha : Applied Mathematics by Bharat Publication, Meerut
5. NCERT (XI & XII)

Website Sources:

- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- onlinecourses.nptel.ac.in
- en.wikipedia.org

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - I Year (I Semester)
DCH 101: ELEMENTARY CHEMISTRY-I

Objectives: To emphasize the relevance of fundamentals and applications of chemistry for diploma holders and student will learn appropriate combinations of old and new emerging concepts. Also to bring potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

UNIT I **(08 Sessions)**

Structure Of Atom: Basic concepts of atomic structure, Matter wave concept, Schrodinger wave equation (excluding derivation) Quantum number, Heisenberg's Uncertainty Principle, Shapes of orbitals.

Chemical Bonding: Basic concepts, Hydrogen bonding, Valence bond theory, Hybridization, VSEPR theory, Molecular orbital theory as applied to diatomic homo nuclear molecules of first and second period elements, Co-ordination bond.

UNIT II **(08 Sessions)**

Periodic Classification Of Elements: Classification of elements (s, p, d and f block elements), Modern Periodic law, Periodic properties: Ionization energy electro negativity, Electron affinity,

UNIT III **(08 Sessions)**

Electro Chemistry: Arrhenius Theory of electrolytic dissociation, Transport number, Electrolytic conductance, Ostwald dilution law. Concept of Acid and bases: Bronsted, Arrhenius and Lewis theory. pH. Buffer solutions, Indicators, Solubility product, Common ion effect with their applications, Redox reactions, Electrode potential (Nernst Equation), Electro-chemical cells (Galvanic and Electrolytic). EMF of a cell and free energy change. Standard electrode potential, Electro chemical series and its applications., Laclanche's or dry cell, Acid storage cell (Lead accumulator) and Alkali stroge cell (Edison accumulator), Solar cell (Photovoltaic cell), Numerical problems based on topics.

UNIT IV **(08 Sessions)**

Chemical Kinetics: Introduction, rate of reaction, rate constant order and molecularity of reaction. Activation energy, Zero order First order and Second order (when initial concentration of both the reacrants are same) reactions.

Catalysis: Definition, Characteristics of catalytic reactions, Catalytic promoters and poison, Autocatalysis and Negative catalysis, Theory of catalysis, Application.

UNIT V **(08 Sessions)**

Solid State and Colloids

Solid State: Types of solids (Amorphous and Crystalline), Classification (Molecular, Ionic, Covalent, Metallic), Band theory of solids (Conductors, Semiconductors and Insulators), types of Crystals, FCC, BCC, Crystal imperfection

Colloids: Colloids and its types, Different system of colloids, Dispersed phase and dispersion medium. Methods of preparation of colloidal solutions, Dialysis and electro-dialysis. Properties of colloidal solution with special reference to adsorption, Brownian Movement, Tyndal effect, Electrophoresis and coagulation. Gold number, Application of colloids.

Course Outcome:

- Students will able to understand and relate electrochemistry and corrosion.
- They will analyze the basic knowledge of various types of colloids, their properties and Industrial Applications
- Can apply the science for understanding the solid state and its various application in making semiconductors.

Suggested Readings:

1. Liquid Crystals and Plastic Crystals, vol.-I, edited by G.W. Gray and P.A. Winsor, Ellis Harwood Series in Physical Chemistry, New York.
2. Corrosion Engineering by M.G. Fontana McGraw Hill Publications.
3. Engineering Chemistry by J C Kuriacose and J. Rajaram, Tata McGraw-Hill Co, New Delhi (2004).

4. Chemistry of Engineering Materials by C.P. Murthy, C.V. Agarwal and A. Naidu BS Publication Hyd.

Website Sources:

- http://www.commonchemistry.org/
- https://uri.idm.oclc.org/login?url=https://www.engineeringvillage.com/search/quick.url?CID=quickSearch&database=1
- https://www.technicalsymposium.com/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - I Year (I Semester)
DME 101: ELEMENTARY ENGINEERING MECHANICS

Objective:
The primary objectives of elementary engineering mechanics course are to help the student develop this ability to visualize. This is so vital to problem formulation purpose of the study of elementary engineering mechanics. To develop the capacity to predict the effects of force and motion while carrying out the creative design functions of engineering.

UNIT I **(08 sessions)**
Introduction: Mechanics and its utility. Concept of scalar and vector quantities. Effect of a force. Tension & compression. Rigid body. Principle of physical independence of force. Principle of transmissibility of a force.

UNIT II **(08 sessions)**
System of Forces: Concept of co-planer and non-co-planer forces including parallel forces. Concurrent and non-concurrent forces. Resultant force. Equilibrium of forces. Law of parallelogram of forces. Law of triangle of forces and its converse. Law of polygon of forces. Solution of simple engineering problems by analytical and graphical methods such as simple wall crane, jib crane and other structures. Determination of resultant of any number of forces in one plane acting upon a particle, conditions of equilibrium of co-planer concurrent force system.

UNIT III **(08 sessions)**
Moment & couple: Concept of Varignon's theorem. Generalized theorem of moments. Application to simple problems on levers-Bell crank lever, compound lever, steel yard, beams and wheels, lever safety valve, wireless mast, moment of a couple; Properties of a couple ; Simple applied problems such as pulley and shaft.

UNIT IV **(08 sessions)**
General Condition of Equilibrium: General condition of equilibrium of a rigid body under the action of co-planer forces, statement of force law of equilibrium, moment law of equilibrium, application of above on body.
Friction: Types of friction: statically, limiting and dynamical friction, statement of laws of sliding friction, Coefficient of friction, angle of friction; problems on equilibrium of a body resting on a rough inclined plane, simple problems on friction. Conditions of sliding and toppling.

UNIT V **(08 sessions)**
Stresses and strains: Concept of stress and strain. Concept of various types of stresses and strains. Definitions of tension, compression shear, bending, torsion.Concept of volumetric and lateral strains, Poisson's ratio. Changes in dimensions and volume of a bar under direct load (axial and along all the three axes).Ultimate stress, working stress. Elasticity, Hook's law, load deformation diagram for mild steel and cast iron. Definition of modulus of elasticity, yield point, modulus of rigidity and bulk Modulus. Stresses and strains for homogeneous materials and composite sections.

Course Outcomes:
Students completing this course will be able to:

- Makes the students able to recognize different force systems, moments and couples.
- The ability to draw Free Body Diagram and label the reactions to it.
- Makes the students' abilities to apply equilibrium equations in statics.
- The ability to understand Newton's law in motion, and recognize different kinds of particle motions.
- The ability to find the moment and the couple.
- Acquire knowledge about stress and strain and how to find in different parts in different conditions.

Suggested Reading:

1. Engineering Mechanics by Irving H. Shames, Prentice-Hall
2. Mechanics of Solids by Abdul Mubeen, Pearson Education Asia.
3. Mechanics of Materials by E.P.Popov, Prentice Hall of India Private Limited.
4. Engineering Mechanics by R.K Bansal
5. Applied Mechanics by J.K.Kapoor, Bharat BhartiPrakashan.

Website Sources:

- www.onlinecourses.nptel.ac.in
- www.pdfdrive.com/engineering-mechanics-books.html
- https://en.wikibooks.org/wiki/Engineering_Mechanics
- http://library.iitj.ac.in/sp/subjects/guide.php?subject=ERL

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - I Year (I/II Semester)
DME 102 / DME 202: WORKSHOP TECHNOLOGY

Objective: The subject aims at imparting knowledge and skill components in the field of basic workshop technology. It deals with different hand and machine tools required for manufacturing simple metal components and articles. The primary objectives of this subject are to understand how different objects can be made from the given raw material by using different mechanical machines and tools.

UNIT I **(08 sessions)**

GENERAL INTRODUCTION: Scope of subject "Workshop Technology" in engineering. Different shop activities and broad division of the shops on the basis of nature of work done such as (i) Wooden Fabrication (Carpentry) (ii) Metal Fabrication (shaping and Forming, Smithy, Sheet metal and Joining-welding, Riveting, Fitting and Plumbing.

UNIT II **(08 sessions)**

CARPENTRY: Timber, seasoning of timber, types of seasoning. Common Carpentry Tools-Their classification, size, specification (name of the parts and use only)., Fundamental wood working operations, Marking & Measuring, Holding & Supporting, Cutting & Sawing, Drilling & Boring, Turning, Jointing;

UNIT III **(08 sessions)**

METAL FABRICATION: Metal Shaping-Smithy: Operations involved (concept only. Tools and equipment used (Names, size, specification for identification only). Defects likely to occur during and after operations their Identification and Remedy. Defects due to wrong operation, wrong tool and wrong heating. Safety of Personnel, Equipment & Tools to be observed. Sheet metal working: Tools and Operations involved (Names and concept only); Sheet metal joints - Lap, seam, Locked seam, hemp, wire edge, cup or circular, Flange, angular and cap. Common defects -Their identification and remedy. Defects due to wrong operation or wrong tool. Safety of Personnel, Equipment & Tools to be observed.

Metal Joining During Fabrication: Permanent Joining-Welding methods-Forge welding, gas welding (high and low pressure-oxyacetylene welding, types of flames. Electric Arc welding- D.C. & A.C., Connected tools, operation, materials and safety measures. Soldering & Brazing:

Familiarity with the use of Various Tools Used in Mechanical Engineering Workshop: Marking & Measuring, Holding Tools. Cutting Tools.

Hack saw (Fixed and Adjustable frame), chisels. Finishing tools-Files. Drills and Allied Tools. Miscellaneous Tools.

UNIT IV **(08 sessions)**

MACHINE SHOP: Introduction to machine tools viz lathe, drilling machine, shaper and planer simple line and block diagram of components and their functions. Brief concept of NC and CNC machines.

UNIT V **(08 sessions)**

Foundry: Basic idea of types of sands, patterns, moulds, furnaces and simple green sand moulding process.

Course Outcomes:

Students completing this course will be able to:

- Practice workshop safety rules effectively.
- Acquire knowledge and use simple hand tools.
- Acquire knowledge and use of carpentry work.
- Acquire knowledge and use of the metal fabrication work.
- Acquire knowledge about different machines: Lathe, Drilling, Shaper and Planer etc.
- Makes the students' ability to understand about the basics of the foundry.

Suggested Reading:

1. Manufacturing Process by- B.S Raghuvanshi (Dhanpat Rai & Co.)
2. Elementary Workshop Technology by- S.K HazraChaudhary (Media Promoters)
3. Workshop Practice by- S.K Garg (University Science Press)
4. Elementary Workshop Technology by J.K. Kapoor, Bharat Bharti Prakashan.

Website Sources:

- www.onlinecourses.nptel.ac.in
- https://www.pdfdrive.com/introduction-to-basic-manufacturing-processes-and-workshop-technology-e33408290.html
- https://books.google.co.in/books/about/Workshop_Technology.html?id=m6lDDAAAQBAJ&redir_esc=y

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - I Year (I/II Semester)

DEE 101/ DEE 201: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Objective: The objective of this course is to provide an understanding of basic terms related to the electrical and electronics engineering. It provides knowledge of basic elements used in electrical and electronics circuits, to develop the capability of analyzing and design simple electrical networks, an understanding of basic principle of various network theorems, an introductory knowledge of single phase and three phase AC supply, an introductory knowledge of semiconductor materials and devices manufactured by them like a PN junction diode and Bipolar Junction Transistor.

UNIT I **(08 Sessions)**

Basic Terminology & Their Concepts : Current, EMF, Potential difference, Resistance, Resistivity, & their units, Variation of resistance with temperature, Series & parallel connection of resistors, conductors and insulators, Electrical power & energy, Concept of inductance & mutual inductance, mutually induced emf and its role in electric circuits. Energy stored in an inductor, Concept of capacitor, parallel plate capacitor & its capacitance, energy stored in a capacitor, Dielectric and its influence on the capacitance of a capacitor. Charging & discharging of capacitor. Simple numerical problems

UNIT II **(08 Sessions)**

D.C. Circuits: Kirchoff's laws-KCL & KVL, simple numerical problems.

Network Theorems- Thevenin's theorem, Norton's theorem, Superposition & Maximum power transfer Theorem, Simple numerical problems based on them

UNIT III **(08 Sessions)**

A.C. Circuits: Instantaneous value, RMS value, Peak value, Average value. Form factor & peak factor of a sine wave. Concept of phase, phase difference & phasor representation of ac voltage & current, R-L, R-C, R-L-C circuits, Active & Reactive power, power factor Simple numerical problems.

Poly-phase Systems: Advantages of a 3 phase system over single phase system, Star & Delta connections & their conversion, Relationship between phase & line values of currents and voltages, Power in 3 phase system

UNIT IV **(08 Sessions)**

Magnetic Circuits: Magnetic circuit concepts- magnetic field intensity, magneto motive force, magnetic flux density**,** Permeability, Reluctance, Determination of Ampere turns, Kirchhoff's Law for magnetic circuit, Analogy between magnetic and electric circuits, Composite magnetic circuits, B-H characteristics, Hysteresis loss

UNIT V **(08 Sessions)**

Semiconductors: Classification of solids- conductors, Insulators & semiconductors, Intrinsic & Extrinsic semiconductors, P-N junction- biasing, VI characteristics of a diode.

Bipolar Junction Transistors: Biasing, working of NPN & PNP transistor, Transistor configurations- common emitter, common base common collector configurations and their characteristics, Transistor as an Amplifier, Simple numerical problems, Transistor as a switch-use of transistor as a switch for logic gates.

Combinational logic circuits: Logic gates- AND, OR, NOT, Exclusive OR, NAND & NOR gates with their truth tables

Course Outcomes:

Students completing this course will be able to:

- The students are able to explain the various types of electrical and electronics circuits.

- Can solve a simple type of electrical network problems.
- It imparted the understanding of single phase and three phase AC supply and also the superiority of three phase supply over single phase supply.
- Students got an idea about magnetic field and how it is utilized.
- The students have got an understanding of applications of semiconductor materials and devices based on them.

Suggested Readings:

1. Electrical Engineering- Ashfaq Hussain, Dhanpat Rai & Co.
2. Electrical Engineering- J.S. Katre. Tech. Max Publications.
3. Electrical Engineering-Vol.-1. B.L. Thareja-Technical Publications.
4. I.J. Nagarath, " Basic Electrical Engineering" Tata McGraw Hill
5. Electrical and Electronics Engineering by S.K. Sahdev

Web Resources:

- www.engineering.nyu.edu
- www.elprocus.com/basics-of-network-theorems-in-electrical-engineering/
- www.electricalclassroom.com
- www.electronics-tutorials.ws/electromagnetism
- https://nptel.ac.in/courses/108/108/108108076/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - I Year (I/II Semester)

FEC 101/ FEC 201: FUNDAMENTALS OF ENGLISH COMMUNICATION

Objectives: The objectives of Fundamentals of English Communication are:

- To develop knowledge and understanding of grammar.
- To develop abilities to make use of the grammar in own writing English.
- To increase understanding and recall of what is read and listen including facts and main idea.
- To enhance competencies in writing paragraph, gist or abstract/précis of the passage in own words/ language and in writing letters and applications of different kinds.

UNIT I: Basic Applied Grammar and Usage **(06 Sessions)**

The Sentences: Kinds of Sentences; Subject and Predicate
Phrases & Clauses, Idioms & Proverbs

UNIT II: Basic Applied Grammar Continued **(08 Sessions)**

Nouns: Kinds; Singular/Plural; Gender; Possession
Pronouns: Kinds; Usage
Adjectives: Kinds; Degrees of Comparison; Usage
Determiners: Kinds, Usage of Adjectives and Determiners

UNIT III: Basic Applied Grammar Continued **(08 Sessions)**

Articles: Kinds, Omission of Articles, Repetition of Articles, Spotting the Errors
Verbs: Kinds-Transitive and Intransitive, Finite and Non Finite Verbs
Tenses:Kinds; Usage

UNIT IV: Basic Applied Grammar Continued **(06 Sessions)**

Adverbs: Kinds; Position of Adverbs; Usage
Prepositions: Kinds; Correct Usage, Fill in the Blanks
Conjunctions:Kinds, Conversion of Compound to Complex Sentences and Vice-versa
Interjections: Definition and Types

UNIT V: Comprehension and Précis Writing **(10 Sessions)**

Reading Comprehension

Precis Writing:Techniques of Précis Writing and Exercises

Formal Letter Writing:Leave Application (for different reasons), Application for Fee Concession and Invitation (for family and friends)

Suggested Readings:

(1) Professional Communication by MaltiAgarwal, Krishna Publications.
(2) High School English Grammar & Composition by Wren & Martin, S. Chand & Company LTD., New Delhi.

Course Outcomes: After completing this course, Students will be able to:

- Develop knowledge and understanding of grammar and abilities to make use of the grammar in own writing English.
- Increase understanding and recall of what is read and listen including facts and main idea.
- Enhance competencies in writing paragraph, gist or abstract/précis of the passage in own words/ language and in writing letters and applications of different kinds.

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - I Year (I/II Semester)

DCS 101/ DCS 201: COMPUTER FUNDAMENTALS AND PROGRAMMING IN C

Objective: To study about understanding of basic concepts of computer fundamentals, operating system, primary and secondary memory in detail, peripheral devices and basic concepts of C programming language.

UNIT I **(09 Sessions)**

Introduction to Computer: Definition, Characteristics, Generation of Computers, Capabilities and Limitations, Introduction to Operating System, Concept of Bios, Booting Files, Basic Components of a Computer System- Control Unit, ALU, Input/output functions and characteristics. Memory Introduction, Classifications- Volatile Memory and Non- Volatile, Flash Memory, ROM, RAM, EPROM, PROM, EEPROM other types of memory.

UNIT II **(07 Sessions)**

Input/output and storage Units: Computer Keyboard, Pointing Devices: Mouse, Trackball, Touch Panel, and Joystick, Light Pen, Scanners, Various types of Monitors, Touch-sensitive screens, Optical Recognition System, Pen based systems, Digitizers, MICR, OCR, OMR, Bar-code Reader, digital camera. Hard Copy Devices:- Impact and Non- Impact Printers- Daisy Wheel, Dot Matrix, Line Printer, Chain Printer, Comb Printers, Non Impact Printers- DeskJet, Laser Printer, Thermal Transfer Printer, Barcode Printers, Electro static printers and plotters, High Level Language and Low-Level Language, Firmware, Compiler, Interpreter and Assembler.

UNITIII **(12 Sessions)**

Introduction and Features of "C" language: The structure of "C" program , Identifiers and Keywords, Constants, Variables, Scope of variables, Typedef, Type Conversion, Arithmetic Operators, Library Functions, Input/output Statements, getchar(), Putchar(), scanf, printf, Compound statements and block. Relational Operators, Logical Operators, Bitwise Operators, Unary Operators, if-else Statement, Operators, Switch statement, go to statement and Label, Iteration statements: For Loop, While Loop, Do While Loop, Nested Loop, Continue and Break statements.

UNITIV **(06 Sessions)**

Array and Structures: Declaration, Concept of One Dimensional and Multi Dimensional arrays, Defining Structure, Declaration of Structure Variable, Accessing Structure members, nesting of structures, Array of structures.

UNITV **(08 Sessions)**

Difference between Union and Structure: Functions: Need of "C" function, User Defined and Library Functions, Prototype of Function, Call by Value, Call by Reference, Nesting of Functions, Recursion, Array as Function Argument, Structure as Function Argument.

Course Outcomes:

Students after this course will be able to:

- Define computer, its characteristics and generation of computer.
- Explain about detailed description of the computer's memory and its types.
- Describe about the operating system and its functions.
- Explain about input and output devices.
- Explain the features of the C language, keyword, data type and statements in C.
- Make C programs with the help of array, structure and nesting of structure.
- Differentiate between structure and union.

Suggested Readings:

1. Computer Fundamentals B. Ram
2. Computer fundamentals P.K Sinha (BPB Publications)
3. Programming in Ansi C E. balagurusamy (3rd edition McGraw Hill)

Website Sources:

- https://www.tutorialspoint.com/computer_fundamentals/index.htm
- https://www.javatpoint.com/computer-fundamentals-tutorial
- https://www.w3schools.in/c-tutorial/
- https://www.geeksforgeeks.org/difference-between-input-and-output-devices/
- https://en.wikipedia.org/wiki/C_(programming_language)
- https://www.cprogramming.com/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - I Year (I/II Semester)

DME 151 / DME 251: ENGINEERING DRAWING LAB

Objective:

1. To get the primary concept of Engineering Drawing.
2. To know about equipments in Engineering Drawing.
3. To know various signs, lines and dimensions.
4. To know about the Principles of Projection: Orthographic Projections, Isometric Projection.

1. Drawing, instruments and their uses.
1.1 Introduction to various drawing, instruments.
1.2 Correct use and care of Instruments.
1.3 Sizes of drawing sheets and their layouts.

2. **(a) Lettering Techniques**
Printing of vertical and inclined, normal single stroke capital letters.
Printing of vertical and inclined normal single stroke numbers.Stencils and their use. (**1 Sheet)**

(b) Introduction to Scales Necessity and use, R F Types of scales used in general engineering drawing. Plane, diagonal and chord scales.**(1 Sheet)**

3. Conventional Presentation :
Thread (Internal and External), Welded joint, Types of lines, Conventional representation of materials, Conventional representation of machine parts. (**2 Sheet)**

4.(a) Principles of Projection
Orthographic, Pictorial and perspective.Concept of horizontal and vertical planes.Difference between I and III angle projections.Dimensioning techniques. (**1 Sheet)**
(b) Projections of points, lines and planes. (**1 Sheet)**

5.(a) Orthographic Projections of Simple Geometrical Solids Edge and axis making given angles with the reference planes. Face making given angles with reference planes. Face and its edge making given angles with reference planes.
(b) Orthographic views of simple composite solids from their isometric views.
(c) Exercises on missing surfaces and views (**3 Sheet)**

6. Section of Solids Concept of sectioning Cases involving cutting plane parallel to one of the reference planes and perpendicular to the others. Cases involving cutting plane perpendicular to one of the reference planes and inclind to the others plane, true shape of the section(**1 Sheet)**

7. Isometric Projection. (**2 Sheet)**
Isometric scale Isometric projection of solids.

8. ORTHOGRAPHIC PROJECTION OF MACHINE PARTS: (**2 Sheet)**
Nut and Bolt, Locking device, Wall bracket

Course Outcome:
After successful completion of this course, students will able to

- Identify and use differing drawing tools/instruments.
- Use the concept of projection for Mechanical Engineering Drawings.
- Prepare engineering drawing manually with given geometrical dimensions using prevailing drawing standards using proper scale.
- Visualize and draw the shape of simple object form orthographic view to vice versa

Suggested Reading:

1. Engineering Drawing by- B. Agrawal and C.M. Agrawal (McGraw Hill Education (India) Pvt. Ltd..).
2. Engineering Drawing by K. Venkata Reddy (BS Publication).
3. Engineering DrawingbyR. K. Dhawan (S Chand)

Website Sources:

- https://www.google.co.in/books/edition/Engineering_Drawing/VRf-AwAAQBAJ?hl=en&gbpv=1&printsec=frontcover
- https://www.engbookspdf.com/Drawing/textbook-of-engineering-drawing-second
- https://www.google.co.in/books/edition/A_Textbook_of_Engineering_Drawing_In_Fir/vTd3cJ91-RwC?hl=en&gbpv=1&printsec=frontcover

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - I Year (I/II Semester)

DCS 151 / DCS 251: COMPUTER PROGRAMMING LAB

Objective: To study about understanding of basic concept of Windows Operating System, understanding of the fundamentals of programming such as data types, keywords, variables, array, structure, conditional and iterative execution, methods, etc.

List of Experiments:

1. Introduction to GUI using Windows Operating System, DOS Commands,
2. Introduction to Word, Introduction to MS-Excel.
3. WAP in C to print your name.
4. WAP in C for adding, subtraction, multiplication & division of two numbers.
5. WAP in C to calculate the area of a circle, rectangle and triangle.
6. WAP to Convert Celsius to Fahrenheit.
7. WAP to find out whether the given year is a leap year or not.
8. WAP in C to find whether the given number is even or odd.
9. WAP to use switch statement display Monday to Sunday.
10. WAP to print table of given number.

Course Outcomes:

Students after this course will be able to:

- Explain about GUI using windows operating system and DOS commands.
- Make simple C programs.
- Explain about statements in C language and how to use arrays and functions in C programs.
- Make C programs with the help of array, structure and nesting of structure.
- Make C programs with the help of functions.

Suggested Readings:

1. Computer Fundamentals B. Ram
2. Computer fundamentals P.K Sinha (BPB Publications)
3. Programming in Ansi C E. balagurusamy (3rd edition McGraw Hill)

Website Sources:

- https://www.programiz.com/c-programming#introduction
- https://www.javatpoint.com/c-programming-language-tutorial
- https://www.w3schools.in/c-tutorial/
- https://www.tutorialspoint.com/cprogramming/index.htmhttps://en.wikipedia.org/wiki/C_(programming_language)
- https://www.cprogramming.com/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - I Year (I/II Semester)
DPH 151: PHYSICS-I LAB

Objective: The main goal of this course is to share the knowledge to the students about the experiments so that students will get a better understanding of the concepts studied by them in the theory course and correlate with experimental observations.

List of Experiments:

1. To find the surface tension of a liquid by Jaeger's method.
2. To find volume of solid cylinder and hollow cylinder using a Vernier caliper.
3. To determine the atmospheric pressure at a place using Fortin's Barometer.
4. To determine the thickness of glass strip and radius of curvature of a concave surface using aspeedometer.
5. To determine the time period of simple pendulum and plot a graph between l & t
6. To determine the acceleration due to gravity with the help of a Bar Pendulum.
7. To determine the coefficient of viscosity of water with the help of Poissuille method.
8. Verify parallelogram Law of forces.
9. To determine the modulus of rigidity (η) of the material of wire with the help of torsional pendulum using the inertia table
10. To find the thickness of wire using a screw gauge.

Course Outcomes:

Students completing this course will be able to:

- Use the different measuring devices and meters to record the data with precision
- Measurement of surface tension, volume and atmospheric pressure.
- Determine coefficient of viscosity and modulus of rigidity
- Measurement of thickness of wire.

Suggested Readings:

1. Concept of Physics, Prof. H.C. Verma, Part-1 (BhartiBhawan)
2. Concept of Physics, Prof. H.C. Verma, Part-2 (BhartiBhawan)
3. A Text Book of Applied Physics: EgaleParkashan, Jullandhar

Website sources:

- http://dspace.wbpublibnet.gov.in
- https://www.scribd.com
- http://www.brainkart.com
- https://dkpandey.weebly.com
- https://images.topperlearning.com

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - I Year (I/II Semester)

DCH 151: CHEMISTRY-I LAB

Objectives: Practical implementation of fundamental concepts of qualitative and quantitative analysis. Student will gain the knowledge on existing future upcoming devices, materials and methodology used in chemistry practical. They will rely on elementary treatment and qualitative analysis. These practical will provide an overview of quantitative analysis.

List of Experiments:

1. To analyse inorganic mixture for two acid and basic radicals from following radicals
A. Basic Radicals: NH_4^+, Pb^{++}, Cu^{++}, Bi^{++}+, Cd^{++}, As^{+++}, Sb^{+++}, Sn^{++}, Al^{+++}, Fe^{+++}, Cr^{+++}, Mn^{++}, Zn^{++}, Co^{++}, Ni^{++}, Ba^{++}, Sr^{++}, Ca^{++}, Mg^{++}
B. Acid Radicals: CO_3^{--}, S^{--}, SO_3^{--}, CH_3COO^-, NO_2^-, NO_3^- , Cl^-, Br^- , I^- , SO_4^{--}
2. To determine the percentage of available Chlorine in the supplied sample of bleaching powder.
3. To determine the total hardness of water sample in terms of $CaCO_3$ by EDTA titration method using Eriochroma black-T indicator.
4. To determine the strength of given HCl solution by titration against NaOH solution using Phenolphthalium as indicator.
5. To determine the Chloride content in supplied water sample by using Mohr's methods.
6. Determination of temporary hardness of water sample by O- Hener's method.

Course Outcome:

- Students are able to analyse different anions and cations .
- Ability to know the quantitative analysis .
- Ability to know the strength of an acid by using alkali.

Suggested Readings:

1. Applied Chemistry by R. S. Katiyar& J.P. Chaudhary Publication B.B.P. & Co. Meerut
2. March's Advanced Organic Chemistry: Reactions, Mechanisms and Structure Smith, Michael B./March, Jerry, John Willey & sons, 6th Edition, 2007.
3. Elements of Physical Chemistry, Glasstonne, Samuel B. ELBS, 2005.
4. Organic Chemistry, Finar, I.L.: Addision – Wesley Longman, Limited, 2004.
5. Principles of Physical Chemistry, by Puri B.R., Sharma L.R., S. Nagin& Company, Delhi

Website Sources:

- https://www.gopracticals.com/basic-engineering/
- https://edu.rsc.org/resources/practical
- https://play.google.com/store/apps/details?id=com.softwareindiavinod.chemistrypracticals&hl=en&gl=US

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - I Year (I/II Semester)

DME 152 / DME 252: WORKSHOP LAB

Objective:

1. To understand how different objects can be made from the given raw material by using different mechanical tools.
2. To introduce students to the basic concepts of manufacturing via shaping, forming, machining
3. To develop a knowledge of appropriate parameters to be operationsused for various machining.
4. To develop a knowledge of workshop practice and basic use of machine tools and workshop equipment.

1. Carpentry Shop:

EX-1 Introduction & demonstration of tools used in carpentry shop
EX-2 Planning and sawing practice
EX-3 Making of lap joint
EX-4 Making of mortise and tenon joint
Ex-5 Making of briddle joint
EX-6 Making of dovetail joint
Ex-7 Making of any one utility article such as wooden picture frame, hanger, peg, name plate, etc.

2. Sheet Metal Working and Soldering Shop:

EX-1 Introduction & demonstration of tools used in Sheet metal working shop.
EX-2 Cutting, shearing and bending of sheet.
EX-3 To prepare a soap case by the metal sheet.
EX-4 To make a funnel with thin sheet and to solder the seam of the same.
EX-5 To make a cylinder and to solder the same.
EX-6 Preparation of different type of joints such as Lap joint-single seam, double seam. Hemp and wired joints.
EX-7 Study and sketch of various types of stakes/anvil.
EX-8 To braze small tube/conduit joints.

3. Fitting Shop :

EX-1 Introduction & demonstration of tools used in Fitting Shop.
EX-2 Hack sawing and chipping of M.S. flat.
EX-3 Filing and squaring of chipped M.S. job.
EX-4 Filing on square or rectangular M.S. piece.
EX-5 Making bolt & nut by tap and die set.
Ex-6 To drill a hole in M.S. Plate and taping the same to create threads as per need.
EX-7 Utility article-to prepare a screw driver or paper weight, double open mouth spanner for 18" hexagonal head of a bolt.

4. Plumbing Shop:

EX-1 Cutting and threading practice for using socket, elbow and tee etc. and to fit it on wooden practice board.
EX-2 Study of-bib cock, cistern or stop cock, wheel valve and gate valve etc.

5. Smithy Shop :

EX-1 Study & Sketch of Tools used in smithy shop.
EX-1 To prepare square or rectangular piece by the M.S.rod.
EX-2 To braze M.S. Flats/Tipped tools on M.S. shank.
EX-3 To make a screw driver with metallic handle.
EX-4 To make a square or hexagonal head bolt.
EX-5 To make a ring with hook for wooden doors.
EX-6 Utility article-to prepare a ceiling fan hook.

6. Welding Shop :

EX-1 Welding practice-gas and electric.
EX-2 Welding for lap joint after preparing the edge.
EX-3 Welding of Butt joint after preparation of the edge.

EX-4 'T' joint welding after preparation of edge.
EX-5 Spot welding, by spot welding machine.
EX-6 Welding of plastic pieces by hot strip method.
EX-7 Welding practice by CO2 gas welding

7. Machine Shop
EX-1 Study & sketch of lathe machine.
Ex-2 Plain and step turning & knurling practice.
Ex-3 Study and sketch of planning/Shaping machine and to plane a Rectangle of cast iron.
8. Fastening Shop
EX-1 Practice of bolted joints
EX-2 To prepare a rivetted joint
EX-3 To make a pipe joint
EX-4 To make a threaded joint
EX-5 Practice of sleeve joint
Course Outcome:
After successful completion of this course, students will able to

- Acquire skills in basic engineering practice.
- Identify the hand tools and instruments, gain measuring skills and Obtain practical skills in the trades.
- Read and use a manufacturing drawing as a definition for the manufacturing of a part.
- Select proper tools and cutting data for a given material and manufacturing process.

Suggested Reading:

1. A Textbook of Workshop Technology: Manufacturing Processes by R.S Khurmi and J.K Gupta (S Chand).
2. Introduction to Basic Manufacturing Processes and Workshop TechnologybyRajender Singh

Website Sources:

- https://www.abebooks.com/servlet/BookDetailsPL?bi=30061491479&cm_sp=rec-_-pd_hw_i_1-_-bdp&reftag=pd_hw_i_1
- https://www.google.co.in/books/edition/Introduction_to_Basic_Manufacturing_Proc/ky7r-BclY8cC?hl=en&gbpv=1&pg=PP1&printsec=frontcover

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - I Year (I/II Semester)

DEE-151/ DEE-251: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB

Objective: The objective of this lab is to provide an understanding of basic electrical and electronic components used in various types of circuits, to know how the basic principles of electrical and electronic engineering like Ohm's Law, KCL, KVL work. To know about how the electricity consumed in a circuit is measured by the energy meter. To know how the resistance of a filament varies according to temperature, to know the working of electronic devices like a PN junction diode and NPN/PNP transistors and logic gates.

List of Experiments:

1. To study and identify the various components.
2. To verify Ohm's Law.
3. To verify Kirchhoff's Current Law (KCL).
4. To verify Kirchhoff's Voltage Law (KVL).
5. To observe the variation of resistance of a lamp with temperature by plotting V-I curve for 60 W and 100 W filaments lamp.
6. To study Star to Delta and Delta to Star conversion.
7. To verify the truth table of OR, AND, NOT, NAND, NOR and EXOR logic gates.
8. To study and plot V-I characteristics of a PN junction diode.
9. To study the biasing and working of NPN/PNP transistor.
10. To study a single phase Induction type energy meter.

Course Outcomes:
Students completing this course will be able to:

- The students are able to know the identification and application of the various types of components used in electrical and electronics circuits.
- Can understand how Ohm's Law works and its limitations.
- It imparted the understanding of KCL, KVL and their applications.
- Students got an idea about the variation of resistance with temperature and working principle of an energy meter & its use.
- The students have got an understanding of working and application of semiconductor devices.

Suggested Readings:

1. Handbook of laboratory experiments in electronics engineering by A.M. Zungeru
2. Basic electrical and electronics lab by Bharat Bhushan Jain
3. Laboratory Manual for Introductory Electronics Experiments by L.K. Maheshwari.

Website Sources:

- www.concept-of-physics.com/electromagnetism/verification-of-ohmas-law-using-voltmeter-and-ammeter.php
- www.jetir.org
- www.digitalelectronicsforstudents.files.wordpress.com
- www.mist.ac.in
- www.educompijre.files.wordpress.com

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - I Year (II Semester)

DPH 201: ELEMENTARY PHYSICS-II

Objective: The objective of this course is to provide an understanding of optics, electrostatistics and semiconductors etc.

UNIT-I **(08 Sessions)**

Waves and Vibrations: Introduction, Types of wave motion with examples, Relation between velocity of wave, frequency and wave length of a wave ($v = \eta\lambda$) , Simple harmonic motion: definition, expression for displacement, Velocity, acceleration, time period, frequency in S.H.M., Vibration of spring mass system, Free, forced and resonant vibrations with examples.

UNIT-II **(08 Sessions)**

Optics :Concept of mirrors, lenses, reflection & refraction of light, refractive index, lens formula (no derivation), real and virtual image, magnification, Power of lens, Simple and compound microscope, magnifying power and its calculation (in each case) , Total internal reflection

UNIT-III **(10 Sessions)**

Electrostatics: Coulomb's law, Gauss's Law, Electric field intensity and electric potential, Electric field of point charge, charged sphere, Capacitance, types of capacitors, capacitance of parallel plate capacitor, series and parallel combination of capacitors, Dielectric and dielectric constant.

UNIT-IV **(10 Sessions)**

Current Electricity :Ohm's law, Resistance of a conductor, specific resistance, Series and Parallel, Combination of resistors, effect of temperature on resistance, Kirchhoff's laws, Wheatstone bridge principle and its applications, Heating effect of current and concept of electric power.

UNIT-V **(08 Sessions)**

Semi Conductor Physics:Energy bands, Intrinsic and Extrinsic semi conductor, p-n junction diode and its characteristics, Diode as rectifier-half wave and full wave rectifier.

Course Outcomes:

Students completing this course will be able to:

- Differentiate between wave and vibrations
- Understand mirror, lens, reflection and refraction
- Understand Simple microscope and compound microscope
- Coulomb's law, Gauss Law and their applications
- Apply Ohms law to solve problems.
- Understand semiconductors and diodes.

Suggested Readings:

1. Concept of Physics Prof. H.C. Verma, Part-1 (BhartiBhawan)
2. Concept of Physics, Prof. H.C. Verma, Part-2 (BhartiBhawan)
3. A Text Book of Applied Physics: Eagle Parkashan, Jullandhar

Website sources:

- https://courses.lumenlearning.com
- https://en.wikipedia.org
- https://cnx.org
- http://www.sakshieducation.com
- https://www.toppr.com
- https://opentextbc.ca
- https://www.askiitians.com/
- https://www.askiitians.com

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - I Year (II Semester)

DMA 201: ELEMENTARY MATHEMATICS-II

Objective: - The course is aimed to develop the basic Mathematical skills of diploma engineering students that are imperative for effective understanding of engineering subjects. To understand basics and applications of differential & integral Calculus and coordinate geometry.

UNIT I **(08 Sessions)**

DIFFERENTIAL CALCULUS-I: Functions, Limits, Continuity, Functions and their graphs, Range and domain, Elementary methods of finding limits (right and left), Elementary test for continuity and differentiability. Methods of finding derivative, Function of a function, Logarithmic differentiation, Differentiation of implicit functions.

UNIT II **(08 Sessions)**

Higher order derivatives, Leibnitz's theorem. Special functions (Exponential, Logarithmic, Hyperbolic, Inverse and circular function), Definition, Graphs, Range and Domain and Derivations of each of these functions.

UNIT III **(08 Sessions)**

Application - Finding Tangents, Normal, Points of maxima and minima, Increasing and Decreasing functions, Sketching of some simple curves (without assumptions, question, not to be asked in the examination), Rate, Measure, Velocity, Acceleration, Errors and approximations.

UNIT IV **(08 Sessions)**

INTEGRAL CALCULUS-I: Methods of indefinite integration:- Integration by substitution, by partial fraction and by parts, Integration of special functions Meaning and properties of definite integrals, Evaluation of definite integrals.

UNIT V **(08 Sessions)**

CO-ORDINATE GEOMETRY: Standard form of curves and their simple properties-Parabola Ellipse, Hyperbola, Tangent and normals, Straight lines, Planes and Spheres in space-distance between two points in space, Direction cosines and direction ratios, Finding equation of a straight line and Shortest distance between two lines under different conditions equation of a plane, Relation between lines and Planes, Sphere.

Course Outcomes:

The student is able to

- Remember terminologies and formulae differential, integral calculus and coordinate Geometry.
- Understand and interpret the concepts of differential, integral Calculus and Coordinate Geometry.
- Compare and analyse the methods in differential, integral Calculus and Coordinate Geometry.
- Predict and evaluate the problems in differential, integral Calculus and Coordinate Geometry.

Suggested Readings:

1. R.D. Sharma: Mathematics (I& II-XI) [DhanpatRai Publication, Delhi.]
2. B.S. Grewal :Engg. Mathematics by [khanna Publishers, New Delhi.]
3. H.R. Luthra : Applied Mathematics:[Bharat BhartiPrakashan& Co. Meerut]
4. KailashSinha : Applied Mathematics: [Nav Bharat Publication, Meerut]
5. NCERT (XI & XII)

Website Sources:

- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- onlinecourses.nptel.ac.in
- en.wikipedia.org

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - I Year (II Semester)

DCH 201: ELEMENTARY CHEMISTRY-II

Objectives: To emphasize the relevance of fundamentals and applications of chemistry for diploma holders and student will learn appropriate combinations of old and new emerging concepts. Also to bring potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

UNIT I **(08 Sessions)**

Lubricants: Definition, classification, Necessity and various kinds of lubricants. Function and mechanism of action of lubricants with examples. Properties of lubricants, Importance of additive compounds in lubricants, Synthetic lubricants and cutting fluids.

UNIT II **(08 Sessions)**

Fuels and Environmental Pollution: Definition of fuel, its classification and their composition, Knocking, Anti-knocking agents, Octane number and Cetane number. Cracking and its type, Gaseous Fuel - Water gas, Bio gas, LPG, CNG and solar energy.

Concept and various types of environmental pollution, air pollution and water pollution. General measures to control environmental pollution. Depletion of Ozone layer, Green house effect, Acid rain, Smog formation.

UNIT III **(08 Sessions)**

Water Treatment and Corrosion: Concept of hard and soft water, Hardness of water, Softening method (Only Ion exchange resin process). Disadvantages of hard water in different industries, Boiler feed water.

Corrosion- Concept of metallic corrosion, factors affecting the corrosion rate, Prevention of corrosion by various methods.

UNIT IV **(08 Sessions)**

Glass and Ceramics: Concept of glass and its constituents, Classification and uses of different glass, Elementary idea of manufacturing process of glass.

UNIT V **(08 Sessions)**

Organic Chemistry:

Isomerism- Types of isomerism

1. Structural isomerism
2. Stereoisomerism (a) Geometrical (b) Optical

A. Electrophiles and nucleophiles

B. Reaction Intermediates

i. Free radical

ii. Carbocation

iii. Carbanion

Polymers:

1. Basic terms used in polymer chemistry and Polymerisation.
2. Characteristics of Polymers and their classification

Course Outcome:

- Students will also be able to understand the chemistry of fuels and lubricants.
- Students will analyze the basic knowledge of various types of organic reactions and their applications
- Students will understand the preparation and properties of glass and ceramics.

Suggested Readings:

1. Liquid Crystals and Plastic Crystals, vol.-I, edited by G.W. Gray and P.A. Winsor, Ellis Harwood Engineering Chemistry by J C Kuriacose and J. Rajaram, Tata McGraw-Hill Co, New Delhi (2004)
2. Chemistry of Engineering Materials by C.P. Murthy, C.V. Agarwal and A. Naidu BS Publication Hyd.

Website Sources:

- http://www.commonchemistry.org/
- https://uri.idm.oclc.org/login?url=https://www.engineeringvillage.com/search/quick.url?CID=quickSearch&database=1
- https://www.technicalsymposium.com/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - I Year (II Semester)

DME 201: ELEMENTARY MECHANICAL ENGINEERING

Objective:
To provide a comprehensive knowledge of basic mechanical systems, basic concepts from mechanical engineering sciences. Modern engineering tools (machine-tools) and related subjects to design mechanical engineering components.

UNIT I **(08 sessions)**

Thermal Engineering: A. SOURCES OF ENERGY; Basic ideas, conventional and nonconventional forms-Thermal, Hydel, Tidal, wind, Solar, Biomass and Nuclear and their uses. B. FUELS & COMBUSTION; Introduction to common fuels - solid, liquid and gases and their composition. Combustion of fuels- their higher and lower calorific values. Combustion equations for carbon, sulphur, hydrogen and their simple compounds. Calculation of minimum amount of air required for complete combustion. Combustion analysis on mass basis and on volume basis. Concept of excess air in a boiler furnace combustion. Heat carried away by flue gases. Analysis of flue gases by Orsat apparatus. Simple numerical problems Idea of specific properties of liquid fuels such as detonation, knock resistance (cetane and octane numbers), viscosity, solidification point, flash point and flame point.

UNIT II **(08 sessions)**

MACHINE COMPONENTS: Brief Idea of loading on machine components. (i) Pins, Cotter and Knuckle Joints. (ii) Keys, Key ways and spline on the shaft. (iii)Shafts, Collars, Cranks, Eccentrics.(vi) Couplings and Clutches. (v) Bearings-Plane, Bushed, Split-step, ball, Roller bearing, Journal bearing, Foot step bearing, thrust bearing, collar bearing and Special type bearings and their applications. Selection of ball bearing and roller bearing for given application using design data book.

UNIT III **(08 sessions)**

(i) Gears : Different types of gears, gear trains and their use for transmission of motion. Determination of velocity ratio for spur gear trains; spur gear, single and double helical gears, Bevel gears, Mitre wheel, worms, Rack and Pinion. Simple and compound and epicyclic gear trains and their use. Definition of pitch and pitch circle & module. (ii) Springs: Compression, Tension, Helical springs, Torsion springs, Leaf and Laminated springs. Their use and material. Selection of spring by design data book, simple numerical problem.

UNIT IV **(08 sessions)**

MECHANISMS: Definition of link, Frame and mechanism. Difference between machine and mechanism, kinematic pairs, lower and higher pairs. Velocity diagram for four bar mechanism, slider crank mechanism, quick return mechanism. Introduction to Cam and its use.

UNIT V **(08 sessions)**

LUBRICATION: Different lubrication system for lubricating the components of machines. Principle of working of wet sump and dry sump system of lubrication. (Explained with simple line diagram). Selection of lubricant based on different application (Requirement with the help of manufacturer catalogue).

Course Outcomes:
Students completing this course will be able to:

- Acquire knowledge about thermal engineering with different energy sources .
- Understand about different mechanical components with their applications.
- Acquire knowledge about different mechanisms used in mechanical machines.
- Acquire knowledge about lubrication systems.

Suggested Reading:

1. Elements of Mechanical Engineering by J.K.Kapoor (Bharat BhartiPrakashan).
2. Elements of Mechanical Engineering by R.P.Garg, BBP Pub. Pvt. Ltd, Meerut.

Website Sources:

- www.onlinecourses.nptel.ac.in
- https://khannapublishers.in/index.php?route=product/category&path

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - I Year (II Semester)

DCH 251: CHEMISTRY-II LAB

(20 Sessions)

Objectives: Practical implementation of fundamental concepts of qualitative and quantitative analysis. Student will gain the knowledge on existing future upcoming devices, materials and methodology used in chemistry practical. They will rely on elementary treatment and qualitative analysis. These practicals will provide an overview of quantitative analysis.

List of Experiments

1. Determination of pH of Common Substances.
2. Measurement of soil suspension pH (1:5 or 1:2).
3. Preparation of Soap.
4. Determination of the Strength of Ferrous Sulphate using Standard Ferrous Ammonium sulphate and Potassium Dichromate as Intermediate Solution.
5. Looking at Acid's Effects on Metals.
6. Paper Chromatography of dyes.
7. Determination of the Strength of Copper Sulphate Solution using a Standard Solution of sodium thiosulphate solution.
8. Extract synthetic coloring agents in food products and identify them by paper chromatography.
9. To determine the pH level of both city water and well water to determine which is more basic and which is more acidic.
10. Determination of temporary and permanent hardness of water sample.

Course Outcome:

- Students are able to prepare the goods like soaps for cottage industry and self employability.
- Ability to know the separation methods to separate different dyes.
- Ability to calculate the temporary and permanent hardness of different samples of water.

Suggested Readings:

1. Applied Chemistry by R. S. Katiyar & J.P. Chaudhary Publication B.B.P. & Co. Meerut
2. March's Advanced Organic Chemistry: Reactions, Mechanisms and Structure Smith, Michael B./March, Jerry, John Willey & sons, 6th Edition, 2007.
3. Elements of Physical Chemistry, Glasstonne, Samuel B. ELBS, 2005.
4. Organic Chemistry, Finar, I.L.: Addision – Wesley Longman, Limited, 2004.
5. Principles of Physical Chemistry, by Puri B.R., Sharma L.R., S. Nagin& Company, Delhi

Website Sources:

- https://www.gopracticals.com/basic-engineering/
- https://edu.rsc.org/resources/practical
- https://play.google.com/store/apps/details?id=com.softwareindiavinod.chemistrypracticals&hl=en&gl=US

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - II Year (III Semester)
DEE 301: ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS -I

Objective: To introduce students to monitor, analyze and control any physical system. To understand students how different types of meters work and their construction. To enhance the knowledge of students by designing and create

novel products and solutions for real life problems. To introduce students a knowledge to use modern tools necessary for electrical projects.

UNIT I **(08 Sessions)**

Philosophy of Measurement: Dimensions & Standards:-Scientific Notations, Elect. Units-C.G.S & MKS systems, The practical units, MKS system , S.I system, Dimensions & standards of measurement- International standards ,Primary standards, Secondary standards and Working standards, Measurement of Errors.

UNIT II **(08 Sessions)**

Basic Concept of Measuring Instruments: Analog Measuring Instruments- Classifications, Types of Torques-deflecting torque, controlling torque and damping torque, Galvanometers, Ammeters and Voltmeters- Moving iron, Moving coil (PMMC & dynamometer), Electrostatic & induction type, Range extension of Indicating instruments using shunts and Multipliers, Instruments Transformers.

UNIT III **(08 Sessions)**

Measurement of Resistance: Classifications– low, medium and high resistances, Measurement of low resistance-Kelvin's Double bridge, Measurement of medium resistance- Wheat-stone's bridge, Measurement of high resistance- Guard wire method and Megger.

UNIT IV **(08 Sessions)**

Measurement of Resistance: Classifications –low, medium and high resistances, Measurement of low resistance-Kelvin's Double bridge, Measurement of medium resistance –Wheat-stone's bridge, Measurement of high resistance –Guard wire method and Megger

UNIT V **(08 Sessions)**

Potentiometric Measurements and Testing of Cables: Simple D.C. Potentiometers, Crompton Potentiometer, Applications of potentiometer for the measurement of current voltage and resistance, Testing of Cables: Methods of locating the faults in cables– Murray loop test and Varley loop test.

Course Outcomes:

Students completing this course will be able to:

- To use the techniques and skills for electrical projects.
- Design a system, component or process to meet desired needs in electrical engineering.
- Measurement of R, L, C, Voltage, Current, Power factor, Power, Energy.
- Ability to balance bridges to find unknown values.
- Ability to measure frequency, phase with an oscilloscope.
- Ability to use Digital voltmeters.
- Ability to measure strain, displacement, Velocity, Angular Velocity, temperature, Pressure, Vacuum, and Flow

Suggested Readings:

1. G.K. Banerjee," Electrical & Electronic Measurement", PHI Learning . India
2. A.K. Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons ,India .
3. E.W. Golding & F.C. Widdis, "Electrical Measurement & Measuring Instrument", A.W. Wheeler& Co. Pvt. Ltd. .
4. M.B. Stout ,"Basic Electrical Measurement" Prentice hall of India, India.
5. Electrical Measurements by Buckingham and Price, PrenticeHall
6. D.V.SMurthy, "Transducers and Instrumentation", Prentice Hall of India, 2nd edition,2009.
7. A.S Morris, "Principles of Measurement and Instrumentation", Pearson/Prentice Hall of India, 2nd edition, 1994.
8. H.S.Kalsi, "Electronic Instrumentation", Tata McGraw-Hill Edition, 1995,1st Edition, 1995.

Website Sources:

- https://www.m-tutor.com/login.php
- https://nptel.ac.in/courses/108/108/108108076/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - II Year (III Semester)
DEE 302: TRANSMISSION & DISTRIBUTION OF ELECTRICAL POWER

Objective:

To understand and estimation of transmission line parameters.

1) To obtain the equivalent circuits of the transmission lines for determining voltage regulation and efficiency.
2) To gain knowledge on the design of insulators & their performance.
3) To discuss about different types of cables.
4) To impart knowledge on various types of distributor and calculate the voltage drops in distributors.

UNIT I **(08 Sessions)**

Introduction- Energy Consumption, Production of Electric Power, Delivery System (Different Types of Delivery System and Comparison), Single Line Diagram of Power System, Brief Description of Power System Elements (Synchronous Machine, Transformer, Transmission Line, Busbar, Circuit Breaker and Isolator) Units and Power in Alternating System (Pure Resistive Network, Pure Inductive Network, Pure Capacitive Network).

UNIT II **(08 Sessions)**

Transmission of Electrical Power- Configuration of Transmission Line, Types of Conductors, Resistance of Line, Skin Effect, Kelvin's Law, Proximity Effect, Power Cables (Construction, Current Rating, Thermal Breakdown, Oil Filled Cables, Gas Filled Cables, Cross Linked Polyethylene Cables, Power Cables Installation).

UNIT III **(08 Sessions)**

D.C. & A.C. Distribution Systems- Types of D.C. Distributions, Distributors Fed at One End & at Both Ends, 3-Wire D.C Systems, A.C. Distribution Calculations, Methods of Solving A.C. Distribution Problems (No Numerical Problems).

Power Factor- Concept of power factor, Reasons and disadvantages of low power factor, Methods for improvement of power factor using capacitor banks, Static VAR Compensator (SVC).

UNIT–IV **(08 Sessions)**

Mechanical Design of Transmission Line- Sag & Tension, Calculation of Sag Using Centenary Method, Effects Of Wind & Ice Loading, Sag Template, Vibration Dampers, ACSR Conductors (No Numericals).

Electrical Design of Transmission Lines- Design Consideration of EHV Transmission Lines, Choice of Voltage, Number of Circuits, Conductor Configuration, Design of Insulation, Necessity of Neutral Grounding, Various Methods of Neutral Grounding (No Numericals).

UNIT–V **(08 Sessions)**

Substations: Brief Idea of Substations; Out Door Grid Sub-Station 220/132 KV, 66/33 KV Outdoor Substations, Pole Mounted Substations and Indoor Substation, Layout of 33/11 KV & 220/33KV Distribution Substation.

Course Outcomes:

Students completing this course will be able to:

- Analyse the transmission line models and evaluate its performance parameters.
- Design the transmission lines under various working conditions.
- Describe and select the configurations of different line insulators and evaluate their performance.
- Supervise the laying of cables and fault detection in cables.
- Design the distribution system network.

Suggested Readings:

1. Wadhwa,C.L.,'Electrical power systems', New age International Pvt Ltd.publishers,1995.

2. Gupta B.R.,' Power system Analysis & Design', Wheeler Publishing, 2006.
3. Cotton,H.,'Transmission and distribution of electrical Energy', ELBS,1985.
4. Chakrabarti ,P. V. Gupta , Soni M, Text Book on 'Power System Engineering', Wheeler Publishing .2009.
5. V.K. Mehta, Rohit Mehta, 'Principles of power system' Chand publications, 4th Edition. ONLINE RESOURCES: 1.
6. Deepak. S .Bankar , 'Elements of Power System' , TECH-NEO PUBICATIONS
7. Ashfaq Hussain , 'Electrical Power Systems' Dhanpat Rai & co.

Website source:

- http://www.worldcat.org/title/transmission-and-distribution-of-electrical-energy-revised edition/oclc/477100844?referer=di&ht=edition.
- http://www.home.iitk.ac.in/Padiyar.pdf

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - II Year (III Semester)
DEE 303: BASIC NETWORK SYSTEMS

Objective: The objective of this course is to make the students capable of analyzing any given electrical network. To make the students learn how to synthesize an electrical network from a given impedance/admittance function.

UNIT I **(08 Sessions)**

Signals and its types, Linear & Nonlinear Networks, Basic Circuit Elements (e.g. Resistors, Capacitors, Inductors.), Series combination of resistances, inductances and capacitances, Parallel combination of resistances, inductances and capacitances, Simple numerical problems.

UNIT II **(08 Sessions)**

Basic Network Circuit and Theorems: Classification of Networks, Kirchhoff Voltage Law, Kirchhoff Current Law, Source Conversion (V–I, I–V), Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Delta & Star Networks, Delta to Star & Star to Delta Transformation, Nodal Analysis, Mesh Analysis, Simple Numerical Problems.

UNIT III **(10 Sessions)**

Introduction to AC Network Concepts: A.C. Fundamentals- Alternating voltage and current, variables relating to alternating quantities, AC through pure resistance, inductance and capacitance, Energy stored in a inductance, and Energy stored in a capacitance, Simple numerical problems.

UNIT IV **(07 Sessions)**

Introduction to RL, RC and RLC Circuits: Series circuit, Parallel circuit, Series-parallel circuit, Conditions of Resonance, Simple numerical problems.

UNIT V **(07 Sessions)**

Introduction to Laplace Transforms: Laplace transformations to some basic functions, Partial fraction expansion method, Application of Laplace transformation in Electric circuits, Concepts of Poles and Zeros, Simple numerical problems.

Course Outcomes:

After studying this course the students would gain enough knowledge to

- Apply the knowledge of basic circuital law and simplify the network using reduction techniques.
- Analyze the circuit using Kirchhoff's law and Network simplification theorems.
- Evaluate transient response, Steady state response, network functions.
- Obtain the maximum power transfer to the load, analyze the series resonant and parallel resonant circuit.

Suggested Redings:

1. Hayt W. H., Kemmerly J. E. and Durbin S. M., "Engineering Circuit Analysis", 6th Ed., Tata McGraw-Hill Publishing Company Ltd.,2008.
2. Network Systems - D. Roy Chaudhary.
3. An introduction to Network Systems - A.K.Chakraborty

Website Sources:

- https://nptel.ac.in/courses/108/105/108105159/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - II Year (III Semester)
DEE 304: POWER PLANT ENGINEERING

Objective: Power Plant Engineering basically focuses on power generation principles for real world applications. The main purpose of implementing this course in the curriculum is to learn about how the power is generated in a power plant and its applications. The course objective to introduce students to different aspects of power plant engineering, to familiarize the students to the working of power plants based on different fuels and to expose the students to the principles of safety and environmental issues.

UNIT I **(08 Sessions)**

Introduction of Power and Energy: Sources of Energy: Conventional and Non – Conventional sources of Energy, Types of fuels: Solid, Liquid, and Gaseous Fuels, Types of power station.

Introduction of Thermal Power Plants: General Layout of Steam Power Plant, Power Plant Equipment and Their Working: Boiler, Turbine Ash Handling Plant, Economizer, Air Pre-Heater, Condenser, Cooling Tower, Advantages and Disadvantages, Efficiency: Thermal and Electrical.

UNIT II **(08 Sessions)**

Introduction of Hydropower Plants: Advantages and Disadvantages, Classification of Hydropower Plant, General layout of Hydro power plant, Working of Different Components Used in Hydropower Plant.

UNIT III **(08 Sessions)**

Nuclear Power: Principles of Nuclear Energy, Lay Out of Nuclear Power Plant, Nuclear Power Station, Nuclear Reactor, Nuclear Waste Disposal, Site Selection of Nuclear Power Plants.

UNIT IV **(07 Sessions)**

Non Conventional Sources of Energy: Non-Conventional Power Plants: Introduction to Non-Conventional Power Plants (Solar, Wind, Geothermal, Tidal) etc.

UNIT V **(09 Sessions)**

Economics of Generation: Economic Consideration Load Estimation, Load Curves, Load Duration Curve, Demand Factor, Load Factor, Diversity Factor, Plant Capacity Factor and Utilization Factor, Simple Problems involving Interpretation and Application of Above Factors. Cost of Generation, Fixed Cost, Running Cost, Cost per Unit, Effect of Load and Diversity Factor on Over-all Cost of Generation. Economic Load Division between Power Stations for a given Load Duration Curve.

Course Outcomes:

At the end of the course, a student will be able to:

- Able to get the basics of Power Plants.
- Able to get the idea about the power generation by renewable and non-renewable energy resources.
- Analyze the working and layout of thermal power plants and discuss about its economic and safety impacts.
- Describe the working principle and basic components of the nuclear power plant and the economic and safety principles involved with it.
- Discuss the working principle and basic components of the hydropower plants and the economic principles and safety precautions involved with it.

Suggested Readings:

1. Power Plant Engineering- Soni Gupta Bhatnagar
2. Power Plant Engineering- R. K. Rajpoot
3. Power Plant Engineering- B.R. Gupta

Website Sources:

1. https://nptel.ac.in/courses/108/108/108108078/
2. https://nptel.ac.in/courses/108/105/108105058/

3. https://nptel.ac.in/courses/108/102/108102047/
4. https://nptel.ac.in/courses/108/105/108105104/
5. http://nptel.ac.in/courses/112105051/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - II Year (III Semester)
DEE 305: ELEMENTARY DIGITAL ELECTRONICS

Objective: Learn and understand the basics of digital electronics, Boolean algebra, and able to design the simple logic circuits and test/verify the functionality of the logic circuits.

UNIT I **(10 Sessions)**

Digital system and binary numbers: Introduction to analog and digital systems and signals, number system (binary, decimal, octal, hexadecimal), conversions from one number system to another, complements (1's complement, 2's complement 9's complement and 10's complement), binary addition and subtraction (subtraction using 1's complement method and 2's complement method), signed binary numbers, representation of negative numbers using 1's complement and 2's complement method , BCD code, Excess-3 code, Gray code, ASCII code.

UNIT II **(08 Sessions)**

Logic Gates: Introduction to logic gates, AND gate, OR gate, NOT gate, universal gates (NAND and NOR), EX-OR, and EX-NOR gate, Boolean Relations and their applications, DeMorgan's Theorems, Canonical form representations, karnaugh map (k-map) upto 4 variables.

UNIT III **(08 Sessions)**

Combinational Logic: Basic of Combinational circuits, design of combinational circuits, half adder, full adder, half subtractor, full subtractor, decimal adder, binary magnitude comparator (upto 2 bit), multiplexer (2-to-1 multiplexer, 4-to1 multiplexer), demultiplexer (1-to-2 demultiplexer, 1-to-4 demultiplexer), encoder and decoder, Display Devices (LED, LCD and 7-segment display).

UNIT IV **(08 Sessions)**

Sequential Circuits: Flip-flops (RS flip flop, JK flip flop, D flip flop and T flip flop), various types of registers and counters and design.

UNIT V **(06 Sessions)**

Memory: Introduction of memory, basic memory operation, classification of memory, RAM, ROM, Masked ROM, PROM, EPROM, EEPROM.

Course Outcomes:

Students completing this course will be able to:

- Understand number representation and conversion between different representation in digital electronic circuits.
- Distinguish between analog and digital systems.
- Apply boolean laws and K-map to simplify the digital circuits.
- Analyze, design and implement combinational logic circuits.
- Understand the characteristics of memory and their classification.

Suggested Readings:

1. Mano, M.M.: Switching Circuit & Logic Design, Wiley.
2. Jain, R.P.: Modern Digital Electronics, Tata McGraw Hill.
3. Donald, P.L., Malvino, A.P., and Saha, G.: Digital Principles and Applications, Tata McGraw Hill.
4. Ronald J.T., Neal S. W., and Gregory L.M.: Digital Systems Principles and Applications, Pearson Publication.

Website Sources:

- https://nptel.ac.in/courses/108/105/108105132/
- https://en.wikipedia.org/wiki/Digital_electronics

- http://www.asic-world.com/digital/index.html
- https://www.electrical4u.com/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - II Year (III Semester)
ELECTRICAL MEASUREMENT-I LAB
DEE 351: ELECTRICAL MEASUREMENT-I LAB

Objective:

- To learn how to visualize and work on laboratory and multidisciplinary tasks.
- To demonstrate various bridges & sensors using simulation and hardware setups.
- To Measure Voltage, Current, Power factor, Power, Energy.

List of Experiments:

1. To study the construction of a permanent magnet moving instrument.
2. To calibrate an ammeter with the help of a standard ammeter.
3. To calibrate a voltmeter with the help of a standard voltmeter.
4. To study the construction of a dynamometer wattmeter
5. To calibrate a wattmeter with the help a standard wattmeter.
6. To measure an unknown resistance using ammeter-voltmeter method.
7. To measure power and power factor in a load using ammeter-voltmeter and wattmeter.
8. To measure resistance using Wheatstone bridge.
9. To study Megger and measure insulation resistance using it.
10. To measure low resistance using Kelvin's double bridge.

Course outcome:

Students completing this course will be able to:

- Have knowledge, to demonstrate the designing and conducting experiments, to analyze and interpret data.
- Provides the ability to visualize and work on laboratory and multidisciplinary tasks.
- Measurement of R, L, C, Voltage, Current, Power factor, Power, Energy.
- Measurement of Magnetic Circuits.
- Measurement uses PMMC and Moving Iron type Instruments.
- Measurement of power using LPF and UPF methods.
- Ability to balance, AC bridges to find unknown values.

Suggested Reading:

1) G.K. Banerjee," Electrical & Electronic Measurement", PHI Learning . India
2) A.K. Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons, India.
3) E.W. Golding & F.C. Widdis, "Electrical Measurement & Measuring Instrument", A.W. Wheeler& Co. Pvt. Ltd.
4) M.B. Stout, "Basic Electrical Measurement" Prentice hall of India, India.
5) Electrical Measurements by Buckingham and Price, PrenticeHall
6) D.V.S Murthy, "Transducers and Instrumentation", Prentice Hall of India, 2nd edition, 2009.
7) A.S Morris, "Principles of Measurement and Instrumentation", Pearson/Prentice Hall of India, 2nd edition, 1994.
8) H.S. Kalsi, "Electronic Instrumentation", Tata McGraw-Hill Edition, 1995, 1st Edition, 1995.

Website source:

1) https://www.m-tutor.com/login.php
2) https://nptel.ac.in/courses/108/108/108108076/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - II Year (III Semester)
DEE 352: NETWORK SYSTEMS LAB

Objective:

- To make the students capable of analyzing implementation and verification KVL and KCL of any electrical network.
- To make the students learn how to verify mesh and node network.
- To make the students learn how to Norton's, Thevenin's and Maximum Power Transfer Theorem, superposition theorem.
- To make the students capable of frequency response of a parallel/series R-L-C Circuit and determine resonance frequency.

List of Experiments

1. Implementation and verification of KVL.
2. Implementation and verification of KCL.
3. To verify superposition theorem.
4. To verify Norton's Theorem.
5. To verify Thevnin's Theorem.
6. To verify Maximum power transfer theorem.
7. To determine power and power factor of RLC series circuit.
8. To study frequency response of series R-L-C circuit and determine resonance frequency.
9. To study frequency response of a parallel R-L-C Circuit and determine resonance frequency.
10. To study star-delta transformation.

Course Outcomes:

Students completing this course will be able to:

- Apply the knowledge to verify Y-Δ and Δ-Y (star to delta and delta to star) conversion and simplify the network.
- Analyze the circuit using Kirchhoff's law and Network simplification theorems.
- Obtain the maximum power transfer to the load, and analyze the series resonant and parallel resonant circuit.

Suggested Readings:

1. A Chakraborty "Network Analysis and Synthesis", Dhanpat Rai & Co.
2. D. Roy Chaudhary, "Networks and Systems"- New age publications.
3. K M Soni, "Network analysis and systhesis"- Katson publication.
4. Valkenberg V., "Network Analysis", 3rd Ed., Prentice Hall International Edition. 2007.
5. Valkenberg V., "Network Synthesis.
6. Kuo F. F., "Network Analysis and Synthesis", 2nd Ed., Wiley India. 2008.

Website Sources:

- en.wikipedia.org
- onlinecourses.nptel.ac.in
- ndl.iitkgp.ac.in
- www.tutorialspoint.com
- www.vlab.co.in

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - II Year (III Semester)
DEE 353 Electrical Power Lab

Objective:

- To learn how to visualize and work on laboratory and multidisciplinary tasks.
- To introduce students to different aspects of power plant engineering.
- To familiarize the students to the working of power plants based on different fuels.

List of Experiments:

1. To study various types of relays.
2. To study circuit breakers.
3. To study Thermal power plant.
4. To study Hydro power plant.
5. To study Nuclear power plant.
6. To study Wind power plant.
7. To study of solar power plant.
8. To study the operation of an over current relay.
9. To determine the dielectric strength of transformer oil.
10. To study Buchholz relay.

Course Outcomes:

Students completing this course will be able to:

- Able to get the basics of Power Plants.
- Analyze the working and layout of thermal power plants.
- Discuss the working principle and basic components of the hydropower plants.
- Discuss the working principle and basic components of the solar power plants.
- Describe the working principle and basic components of the nuclear power plant.
- Discuss the operation of relays.

Suggested Readings:

1. Power Plant Engineering- Soni Gupta Bhatnagar
2. Power Plant Engineering- R. K. Rajpoot
3. Power Plant Engineering- B.R. Gupta

Website Sources:

- https://nptel.ac.in/courses/108/108/108108078/
- https://nptel.ac.in/courses/108/105/108105058/
- https://nptel.ac.in/courses/108/102/108102047/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - II Year (III Semester)
DEE 354: DIGITAL ELECTRONICS LAB

Objective: The objective of this lab is to familiarize with the functions of basic logic gates and to acquire the basic knowledge about the conversion of one number system to verify the truth table of gates on experiment kit or breadboard.

LIST OF EXPERIMENTS:

1. To study digital ICs and their nomenclature.
2. To study and verify the truth table of basic logic gates (OR, AND, and NOT).
3. To study and verify the truth table of universal gates (NAND, NOR) and EX-OR gate.
4. To study and verify the SOP.
5. To study and verify POS.
6. To construct the half adder circuit using EX-OR and AND gate and verify its operation.
7. To construct the half subtractor circuit using EX-OR, NOT and AND gate and verify its operation.
8. Implementation of 4x1 multiplexer using logic gates.
9. To convert gray code to binary code.
10. To convert binary code to gray code.

Course Outcomes:
Students completing this course will be able to:

- To develop practical knowledge about theories of digital IC's
- Analyse and verification of Truth Table of various IC's.
- To verify and implementation of the different combinational circuit.

Suggested Reading:

1. M. Morris Mano, Hill & Peterson, "Switching Circuit & Logic Design", Wiley
2. R.P Jain, "Modern Digital Electronics", TMH.

Website Sources:

- en.wikipedia.org
- onlinecourses.nptel.ac.in
- www.vlab.co.in

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - II Year (IV Semester)
DEE 401: INTRODUCTION TO MICROPROCESSOR

Objective: To illustrate the architecture of 8085 and 8086 microprocessors. To introduce the programming techniques of 8085 microprocessor. To provide a strong foundation for designing real world applications using microprocessors and microcontrollers. To acquire the basic knowledge of the number system.

UNIT I **(08 Sessions)**

Introduction to microprocessor, Evaluation of Microprocessors, Computer Generations, Single-Chip Microcomputers, CPU, Memory, Input & Output Device, Memory: RAM (Static & Dynamic), SDRAM, SGRAM, ROM, PROM, EPROM, EEPROM, Flash Memory, Magnetic Memory.

UNIT II **(08 Sessions)**

Introduction to Intel 8085: Architecture of 8085, ALU, Timing and Control Unit, Registers, Data and Address Bus, Pin Configuration, Intel 8085 Instructions, Opcode and Operands, Instruction Word Size. Instruction Cycle: Fetch operation, Execute Operation, Machine Cycle and State, Instruction and Data Flow.

UNIT III **(08 Sessions)**

Instruction Set of Intel 8085: Instruction and Data Formats, Addressing Modes: Direct Addressing, Register Addressing, Register Indirect Addressing, Immediate Addressing and Implicit Addressing. Intel 8085 Instructions: Data Transfer Group, Arithmetic Group, Logical Group, Branch Group, Stack, I/O and Machine Control Group.

UNIT IV **(08 Sessions)**

Programming of Microprocessor: Assembly Language, Low-Level Language, High-Level Language, Area of Application of Languages, Interpreter, Assembler & Compiler, Addition of two 8-bit numbers using Intel 8058, Subtraction of two 8-bit numbers using Intel 8058.

UNIT V **(08 Sessions)**

Introduction to Intel 8086, Architecture of 8086, Memory Segmentation, Applications of Microprocessors in Electrical Engineering

Course Outcomes:

Students completing this course will be able to:

- Apply a basic concept of digital fundamentals to Microprocessor based personal computer system.
- Assess and solve basic binary math operations using the microprocessor and explain the microprocessor's internal architecture and its operation within the area of manufacturing and performance.
- Apply knowledge and demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor and microcontroller.
- Analyze assembly language programs.
- Train their practical knowledge through laboratory experiments.

Suggested Readings:

1. Introduction to Microprocessor – A. P. Mathur (Tata Mcgraw Hill, Delhi)
2. Fundamentals of Microprocessors & Microcomputers – S. Gaonkar
3. Microprocessor – Rafiquzzaman (Prentice Hall of India, Delhi)

Website Sources:

- https://nptel.ac.in/courses/108/103/108103157/
- https://nptel.ac.in/courses/108/105/108105102/
- https://nptel.ac.in/courses/108/107/108107029/
- https://nptel.ac.in/courses/106/108/106108100/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - II Year (IV Semester)
DEE 402: INTRODUCTION TO POWER ELECTRONICS

Objective: The objective is to understand and acquire knowledge about various power semiconductor devices. To prepare the students to analyze and design different power converter circuits**.**

UNIT I **(08 Sessions)**

Introduction to SCR: Construction and working principle of an SCR, Characteristics 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 **(09 Sessions)**

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, Dual converters.

UNIT III **(07 Sessions)**

Choppers: Introduction to Choppers and their working principles & applications, Time Ratio Control, Types of Choppers: Type-A, Type-B, Type-C and Type-D, Thyristor chopper circuit: Voltage-commutated chopper, Current-commutated chopper, Load-commutated chopper.

UNIT IV **(07 Sessions)**

Inverters: Introduction, applications, Single-phase voltage source inverter, Three-phase bridge inverter, Pulse-width modulated inverter, Voltage source inverter, Current source inverter, Series inverters, Parallel inverters.

UNIT V **(09 Sessions)**

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

Course Outcomes:

Students completing this course will be able to:

- Acquire knowledge about fundamental concepts and techniques used in power electronics.
- Ability to analyze various single phase and three phase power converter circuits and understand their applications.
- Foster ability to identify basic requirements for power electronics based design application.
- To develop skills to build, and troubleshoot power electronics circuits.
- Foster ability to understand the use of power converters in commercial and industrial applications.

Suggested Readings:

1. Introduction to Power Electronics- Dr. P. S. Bhimbra, Khanna Publishers.
2. Power Electroncis- M. S. Jamil Asghar, PHI Pvt. Ltd.
3. Power Electronics- P. C. Sen, McGraw Hill Education.

Website Sources:

- https://nptel.ac.in/courses/108/102/108102145/
- https://nptel.ac.in/courses/108/105/108105066/
- https://onlinecourses.nptel.ac.in/noc20_ee97/preview

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - II Year (IV Semester)
DEE 403: ELECTRICAL DESIGN DRAWING & ESTIMATING –I

Objective: To understand and estimation of transmission line parameters. To obtain the equivalent circuits of the transmission lines for determining voltage regulation and efficiency. To gain knowledge on the design of insulators & their performance. To discuss about different types of cables. To impart knowledge on various types of distributor and calculate the voltage drop in distributors.

UNIT I **(08 Sessions)**

Electrical Symbols & Diagrams: List of Symbols for Electrical Equipments & Accessories Used in Electrical Lighting, Fan & Power Circuits, Alarm & Indicating Circuit, Contactor Control Circuits as per I.S.S., Type of Diagrams- Wiring Diagrams (Multiple & Single Line Representation) & Schematic Diagrams as per I.S.S.

UNIT II **(08 Sessions)**

Wiring Materials & Accessories: Brief Description, General Specifications as per I.S.S. & Approximate Cost of Different Types of Wires, Switches, Distribution Boards, Switchboards, Junction Boxes, Batten & its Accessories, Conduit & its Accessories, Lamp Holders, Socket Outlets, Plugs, Ceiling Roses & Fuses. Energy Meters used in Domestic & Power Wiring Installations, Brief Description & Specifications. Approximate Cost of Switches Push Buttons, Bells, Indicating Lights, Indicating Panels, Relays etc used in Alarm Circuits, Study of Materials & Accessories in Workshop.

UNIT III **(08 Sessions)**

Light & Fan Circuits: Schematic Wiring Diagrams (Multiple & Single Line Both) using Junction Boxes & Looping Systems for Following Types of Circuits: Lights & Fans Controlled by Necessary Switches & Regulators, Stair Case Wiring, Corridor Lighting. One Lamp Controlled by Three or More Switches.

UNIT IV **(08 Sessions)**

Alarm Circuits: Reading, Designing & Drawing Schematic & Wiring Diagrams of following Alarm Circuits: Circuits Meant to Convey Information by Means of Light Only – By Means of Bell Signals Only, Bell Respond Circuit Using One Bell & Relay. Bell Respond Circuit of an Office or Three Rooms. Circuits Meant to Convey Information by Means of Bell & Light Both for Call Signals. Circuits Meant to Convey Information by Means of Bell & Light to Give 'Stop' & 'Go' Signals. Traffic Control Light System for two Road Crossing. Light Circuit that gets Connected Automatically to DC Supply in case of Power Failure.

UNIT V **(08 Sessions)**

Design and Drawing of Panel Boards: Introduction, Design consideration, Standard Sizes of boards. Some Examples: Design and Drawing a panel board to contain two switches and one fan regulator for concealed conduit wiring, Design and Drawing a panel board that contains four switches, One 5A socket outlet and one fan regulator.

Course Outcomes:

Students completing this course will be able to:

- Recognize various electrical devices and their symbols.
- Recognize various electrical devices placed on the panels/distribution boards and to design the panels.
- Recognize the internal details of various electrical machines and devices.
- Read schematic and wiring diagrams of electrical devices.
- Read and interpret electrical installation plan.
- Communicate about circuits and devices through sketches and drawings.
- Determine various types of wiring systems and their use.
- Practice and execute any type of wiring.
- Estimate and determine the cost of wiring installation

Suggested Readings:

1. Electrical Design Drawing & Estimating - T. D. Bisht. , Bharat Prakashan, Allahabad.
2. Electrical Estimating & Costing - Surjit Singh (Dhanpat Rai & sons)
3. Electrical Engineering Design and Drawings by Surjeet Singh, Dhanpat Rai and Co, New Delhi
4. Electrical Engineering Design and Drawings by SK Bhattacharya, SK Kataria and Sons, New Delhi.
5. Electrical Engineering Design and Drawings by Ubhi & Marwaha, IPH, New Delhi.
6. Electrical Design and Drawing by SK Sahdev, Uneek Publications, Jalandhar .
7. Electrical Engineering Drawing by Surjit Singh, SK Kataria and Sons, New Delhi

Website Sources:

- http://swayam. gov.in

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - II Year (IV Semester)
DEE 404: ELECTRICAL MACHINE-I

Objective: Electrical machines course is one of the important courses of the Electrical discipline. In this course the different types of transformers, DC generators and motors which are widely used in industry are covered and their performance aspects will be studied.

UNIT I **(06 Sessions)**

D.C. Machines: Principle of Electromechanical Energy Conversion, Construction of D.C. Machines- Field Magnet, Armatures, Windings, Commutator & Brush Gear, Action of Commutator, E.M.F. Equation, Armature Reaction.

UNIT II **(10 Sessions)**

D.C. Generator: Constructional Details & Working Principle of D.C. Generators, Types of D.C. Generators- Separately Exited D.C. Generators, Self Excited D.C. Generator- Series, Shunt & Compound Generator, Cumulatively Compounded and Differentially Compounded D.C. Generator, Condition for Self Excitation, Characteristics of D.C. Generator, Operation of D.C Generator in Series and Parallel, Application of D.C. generator, Losses and efficiency of D.C. generator.

UNIT III **(08 Sessions)**

D.C. Motors: Back E. M. F., Speed of D.C. Motor, Torque Equation, Types of D.C. Motors- Series, Shunt & Compound D.C. Motors, Cumulatively Compounded and Differentially Compounded D.C. Motor, Characteristics of D.C. Motor, Speed Control of D.C. Motor- Armature Control & Field Control Method, Losses & Efficiency, Testing of D.C. Machines- Direct & Indirect Method (Brake Test & Swinburne's Test), Electric Braking of D.C. motors.

UNIT IV **(08 Sessions)**

Transformer: Constructional Details, Types of Transformers, Ratio of Transformation, Primary No Load Current, Mutual and leakage fluxes, leakage reactance, Phasor Diagram on No Load & Load, Equivalent Circuit, Equivalent Resistance & Reactance, Open circuit and short circuit test, Losses & Efficiency Condition for Maximum Efficiency, Commercial Efficiency & All Day Efficiency, Voltage Regulation.

UNIT V **(08 Sessions)**

Transformer (Continued): Division of Load Between Two Transformers In Parallel, Auto Transformer- construction, working and application, Three Phase Transformer, Construction of three phase transformers, Three Phase Transformer Connections, Maintenance of Transformer, Cooling of transformer.

Course Outcomes:

Students completing this course will be able to:

- Acquire knowledge about the fundamental principles and classification of electromagnetic machines.
- Acquire knowledge about the constructional details and principle of operation of DC machines.
- Acquire knowledge about the working of DC machines as generators and motors.
- Acquire knowledge about testing and applications of DC machines.
- Acquire knowledge about the constructional details, principle of operation, testing and applications of transformers.

Suggested Readings:

1. Bhimbra, P.S.: Electrical Machines, Khanna publishers.
2. Clayton & Hancock: Performance and Design of DC Machines, BPB Publishers.
3. Kothari, D.P., and Nagarth, I.J.: Electrical Machines, Tata McGraw Hill.
4. Husain, A.: Electric Machines, Dhanpat Rai & Co.

Website Sources:

- https://nptel.ac.in/courses/108/105/108105155/
- https://en.wikipedia.org/wiki/Electric_machine

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - II Year (IV Semester)
DEE 405: ELECTRICAL MEASUREMENT AND MEASUREMENT INSTRUMENTS II

Objective: To introduce students to monitor, analyze and control any physical system. To understand students how different types of meters work and their construction. To provide a student a knowledge to design and create novel products and solutions for real life problems. To introduce students a knowledge to use modern tools necessary for electrical projects.

UNIT- I **(08 Sessions)**

Measurement of Energy: Measurement of energy in D.C. circuits using Electrolytic meters, Measurement of energy in A.C. circuits using Motor meters – Errors in motor meters, Single phase induction type energy meters-principle of operation, Errors in Energy meters and their compensation Testing of energy meters, Principle of operation of Clock meters.

UNIT- II **(08 Sessions)**

Instrument Transformers: Current Transformers (C.T.) and Potential Transformers (P.T.), Errors in current transformers and Potential Transformers-Ratio error and phase angle error (No Derivations) Connections of C.T. and P.T. in circuits Measurement of power using C.T. and P.T. (No numerical problems).

UNIT- III **(08 Sessions)**

A.C. Bridges: Measurement of self -inductance-Maxwell's Inductance Bridge, Maxwell's capacitance Bridge, Hay's Bridge, Anderson's Bridge, Measurement of capacitance – De Sauty's Bridge, Wein's Bridge, Schering Bridge, Apparatus used in conjunction with A.C. Bridge, (No numerical problems).

UNIT- IV **(08 Sessions)**

Cathode Ray Oscilloscope: Basic block diagram of a Cathode Ray Oscilloscope, Signal display on Oscilloscope, Display subsystems, Electrostatic focusing, and Electrostatic deflection, Oscilloscope controls, Measurement of voltage current and frequency using Oscilloscope. (No numerical problems).

UNIT- V **(08 Sessions)**

Measurement of Non-Electrical Quantities: Transducers-Measurement of strain using Strain gauge, Gauge factor, Displacement transducers-Capacitive transducer, Inductive transducer, L.V.D.T., Potentiometric transducer, Piezoelectric transducer, Measurement of temperature using RTD, Thermocouples, Thermistors (No numerical problems).

Course Outcomes:

Students completing this course will be able to:

- To use the techniques and skills for electrical projects.
- Design a system, component or process to meet desired needs in electrical engineering.
- Measurement of R, L, C, Voltage, Current, Power factor, Power, Energy.
- Ability to balance Bridges to find unknown values.
- Ability to measure frequency, phase with an oscilloscope.
- Ability to use Digital voltmeters.
- Ability to measure strain, displacement, Velocity, Angular Velocity, temperature, Pressure ,Vacuum, and Flow

Suggested Readings:

1. G.K. Banerjee, "Electrical & Electronic Measurement", PHI Learning. India
2. A.K. Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons, India.

3. E.W. Golding & F.C. Widdis, “Electrical Measurement & Measuring Instrument”, A.W. Wheeler& Co. Pvt. Ltd.
4. M.B. Stout, “Basic Electrical Measurement” Prentice hall of India, India.
5. Electrical Measurements by Buckingham and Price, PrenticeHall
6. D.V.SMurthy, “Transducers and Instrumentation”, Prentice Hall of India, 2nd edition,2009.
7. A.S Morris, “Principles of Measurement and Instrumentation”, Pearson/Prentice Hall of India, 2nd edition, 1994.
8. H.S.Kalsi, “Electronic Instrumentation”, Tata McGraw-Hill Edition, 1995, 1st Edition, 1995.

Website Sources:

- https://www.m-tutor.com/login.php
- https://nptel.ac.in/courses/108/108/108108076/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - II Year (IV Semester)
DEE 451: MICROPROCESSOR LAB

Objective: To learn how to visualize and work on laboratory and multidisciplinary tasks. To illustrate the architecture of 8085 and 8086 microprocessors. To introduce the programming techniques of 8085 microprocessor. To provide a strong foundation for designing real world applications using microprocessors and microcontrollers.

List of Experiments:

1. To study 8085 microprocessor.
2. To study 8086 microprocessor.
3. To add two 8-bit binary number using 8085 microprocessor.
4. To add two Hexadecimal numbers using 8085 microprocessor.
5. To subtract two 8-bit Hexadecimal number using 8085 microprocessor.
6. To subtract two 8-bit binary number using 8085 microprocessor.
7. To multiply two 8-bit binary number using 8085 microprocessor.
8. To divide two 8-bit binary number using 8085 microprocessor.
9. Write a program to find out the smallest number in an array of data.
10. Write a program to find out the largest number in an array of data.

Course Outcomes:

Students completing this course will be able to:

- Assess and solve basic binary math operations using the microprocessor and explain the microprocessor's internal architecture and its operation within the area of manufacturing and performance.
- Apply knowledge and demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor and microcontroller.
- Analyze assembly language programs.
- Train their practical knowledge through laboratory experiments.

Suggested Readings:

1. Introduction to Microprocessor – A. P. Mathur (Tata Mcgraw Hill, Delhi)
2. Fundamentals of Microprocessors & Microcomputers – S. Gaonkar
3. Microprocessor – Rafiquzzaman (Prentice Hall of India, Delhi)

Website Sources:

1. https://nptel.ac.in/courses/108/103/108103157/
2. https://nptel.ac.in/courses/108/105/108105102/
3. https://nptel.ac.in/courses/108/107/108107029/
4. https://nptel.ac.in/courses/106/108/106108100/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - II Year (IV Semester)
DEE 452: POWER ELECTRONICS LAB

Objective: The objectives are to study and gain practical knowledge about various power semiconductor devices. To prepare the students to analyze and design different power converter circuits**.**

List of Experiments:

1. To draw and study V-I Characteristics of SCR.
2. To study the operation of Power Transistor as a Switch.
3. To study the operation of SCR as a Switch.
4. To test the performance of Half Wave rectifier circuit.
5. To test the performance of Full Wave (Centre Tapped) rectifier circuit.
6. To test the performance of Full Wave bridge rectifier circuit.
7. To study the control of Power using DIAC.
8. To study the control of Power using TRIAC.
9. To study the R-C firing circuit of SCR.
10. To study UJT firing Circuit of SCR.

Course Outcomes:

Students completing this course will be able to:

- Acquire knowledge about fundamental concepts and techniques used in power electronics.
- Ability to analyze various single phase and three phase power converter circuits and understand their applications.
- Foster ability to identify basic requirements for power electronics based design application.
- To develop skills to build, and troubleshoot power electronics circuits.
- Foster ability to understand the use of power converters in commercial and industrial applications.

Suggested Readings:

1. Introduction to Power Electronics- Dr. P. S. Bhimbra, Khanna Publisher
2. Introduction to Power Electronics- Dr. A. K. Gupta, Khanna Publisher

Website Sources:

- https://nptel.ac.in/courses/108/102/108102145/
- https://nptel.ac.in/courses/108/105/108105066/
- https://onlinecourses.nptel.ac.in/noc20_ee97/preview

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - II Year (IV Semester)
DEE 453: ELECTRICAL DESIGN AND ESTIMATING –I

Objective: To acquaint with the fundamental concepts of electrical wiring, their estimation, costing.

List of Experiments:

1. To study types of switches, holders and tools used in common wiring.
2. To study various types of wiring systems such as batten wiring, cleat wiring and conduit wiring.
3. To study joint box system and looping-in system of wiring.
4. To control one light lamp using one single-way switch.
5. To control one light lamp and one fan using two single-way switches.
6. To control one light lamp, one tube light and one fan using three single-way switches.
7. To design staircase wiring system with the help of two 2-way switches.
8. To design connection circuit of a tube light with a choke and a starter.
9. To study the working and connection diagram of a relay.
10. To design a switch board which is having four switches, one 5A socket out let and one fan regulator.

Course Outcomes:

Students completing this course will be able to:

- At the closing stage of the course, the students will be able to know the fundaments of different electrical wiring.
- They will be able to understand the estimating and costing of electrical equipment, contracting procedure in electrical engineering etc.

Suggested Readings:

1. Electrical Design Drawing & Estimating - T. D. Bisht. , Bharat Prakashan, Allahabad.
2. Electrical Estimating & Costing - Surjit Singh (Dhanpat Rai & sons)
3. Electrical Engineering Design and Drawings by Surjeet Singh, Dhanpat Rai and Co, New Delhi
4. Electrical Engineering Design and Drawings by SK Bhattacharya, SK Kataria and Sons, New Delhi.
5. Electrical Engineering Design and Drawings by Ubhi & Marwaha, IPH, New Delhi.
6. Electrical Design and Drawing by SK Sahdev, Uneek Publications, Jalandhar .
7. Electrical Engineering Drawing by Surjit Singh, SK Kataria and Sons, New Delhi

Website source:

- http://swayam. gov.in

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - II Year (IV Semester)
DEE 454: ELECTRICAL MACHINE-I LAB

Objective: To enable, train and evaluate the ability of the students to perform the analysis of any electromechanical system. To empower students to determine the parameters of DC machines and transformers by performing experiments on these machines. To enable students to identify and solve DC machine and transformer related problems.

List of Experiments:

1. To study and run a D.C. shunt motor.
2. To run a D.C. machine & change its direction of rotation.
3. To control the speed of a D.C. shunt motor using Armature control method.
4. To control the speed of a D.C. shunt motor using field control method.
5. To determine the magnetization characteristics of a D.C. generator.
6. To determine the load characteristics of a D.C. shunt motor.
7. To study and run the DC series motor with starter.
8. To perform brake test on a D.C. machine & determine its efficiency.
9. To study a transformer & determine its transformation ratio.
10. To perform open circuit and short circuit test on a transformer and determine the efficiency.

Course Outcomes:

Students completing this course will be able to:

- Formulate and then analyze the working of any electrical machine using mathematical models under loaded and unloaded conditions.
- Troubleshoot the operation of an electrical machine.
- Conduct testing and experimental procedures on different types of electrical machines.
- Select a suitable measuring instrument for measuring electrical and non electrical quantities for a given application.

Suggested Readings:

1. Kothari, D.P. and Umre, B.S..: Laboratory Manual for Electrical Machines, I K International Publishing House Pvt. Ltd.
2. Chaturvedi, D.K.: Electrical Machines Lab Manual with MATLAB Programs, Laxmi Publications.
3. Bhimbra, P.S.: Electrical Machines, Khanna publishers

Website Sources:

- https://nptel.ac.in/courses/108/105/108105155/
- https://en.wikipedia.org/wiki/Electric_machine

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - III Year (V Semester)
DEE 501: INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

Objective: The objective of this course to familiar with the organizational structure, Industrial Management, importance of human resources and develop their analytical skills.

UNIT I **(08 Sessions)**

Principles of Management: Definition of Management, Administration Organization, Functions Management, Industrial Ownership, Leadership, Need for Leadership, Communication: Importance, Processes, Barriers to Communication and types of communication, Concept of Stress Management.

UNIT II **(09 Sessions)**

Human Resource Management: Introduction, Recruitment, Selection and Training. Enterprise financing: Rising, Managing capital, shares, Debentures, and bonds. **Human Resource Development**: Introduction, Staff development and Career development. **Human and Industrial Relations:** Industrial Relations and Disputes.

UNIT III **(09 Sessions)**

Inventory Management: Introduction, Objective, and Types **Objective** of a Good Stock Control System - ABC Analysis, Economic Order Quantity: Reorder Level and Lead Time Various Types of Taxes - Production Tax, Local Tax, Trade Tax, Excise duty, Income Tax.

UNIT IV **(06 Sessions)**

Entrepreneurship: Definition, Requirements to be an entrepreneur, Entrepreneur and Manager Entrepreneurial Motivation: Motivating Factors, Motivation Theory- Maslow's Need Hierarchy theory**,** Entrepreneurship Development.

UNIT V **(06 Sessions)**

Project Planning & control: Project planning and project control **Business planning:** Project identification & Selection, Project Report Preparation. **Intellectual Property Rights:** Introduction to IPR (Patents, Copy Right, Trade Mark), Concept and History of Patents.

Course Outcomes:

Students completing this course will be able to:

- Exhibit the attitude and skill required for the application of Industrial Management.
- Understand the human factors affecting the management in the industrial environment.
- Differentiate various organizational structures in terms of their merits and demerits.
- Select, analysis and inventory control models based upon given data.
- Understand how the production planning and control is carried out in the industries.
- Understand faster values positive attitude and interpersonal relations.

Suggested Readings:

1. Fundamentals of Management -Stephen & Robbins
2. Management theory & Practice -C.B. Gupta
3. Supply Chain management- Parikshit Joshi
4. Industrial relations and Labour laws- S.C.Srivastsva
5. Organizational Behavior- Stephen & Robbins
6. Entrepreneurships – Michel and Peter

Website Sources:

- https://nptel.ac.in/courses
- https://en.wikipedia.org
- https://www.unleashedsoftware.com
- https://www.bigcommerce.com/
- https://entrepreneurhandbook.co.uk/entrepreneurship/
- https://www.ecosys.net/reference/what-is-project-controls/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - III Year (V Semester)
DEE 502(A): FUNDAMENTALS OF HIGH VOLTAGE ENGINEERING

Objective: To know about generation voltages and currents to test the electrical equipment. To acquire the knowledge of high voltage techniques and overvoltage phenomena in electrical power transmission systems.

UNIT I **(10 Sessions)**

Basic Process of Conduction and Break Down in Solid Dielectrics: Classification of insulating materials, Dielectric constant, Properties of dielectrics, Dielectric Break-down: Intrinsic break-down and test apparatus to measure strength of solids, Frohlic theory of break-down for crystalline dielectric, Band theory of break-down for amorphous dielectric, Thermal break-down and time to thermal break-down, Discharge Break-down, Electro Chemical Break-down, Measurement of dielectric loss or loss angle, Commonly used solid dielectrics.

UNIT II **(08 Sessions)**

Basic Process of Conduction and Break Down in Liquid and Gaseous Dielectrics: Properties of transformer oil, Conductivity of fluids, Repeated discharges through liquids, Behavior of fluids under non-uniform fields, Corona voltage, visual corona and corona at sub-critical voltage, Effects of corona, Discharge through gases, Gases under varying pressure and temperatures, Gases under high vacuum, Some common gaseous dielectric.

UNIT III **(06 Sessions)**

High Voltage Generation: Power Frequency High Voltage Generation, High Voltage Transformers, Cascaded Transformers, Series Resonance Method, Resonance Transformers.

UNIT–IV **(08 Sessions)**

Measurement of High Voltages: Power Frequency Measurement, Transformer Ratio, Potential transformers, Potential dividers - Resistance Potential Dividers, Capacitance Potential Dividers, Ryall crest voltmeter Sphere-gap method, Uniform field gap method, Rod gap, Needle gap, Electrostatic Voltmeters Quadrant Electrometer, Ellipsoidal Voltmeters Measurement of DC High Voltage - Generating Voltmeter, Measurement of impulse voltages.

UNIT–V **(08 Sessions)**

High Voltage Testing: Transformer Testing, Line Insulators Testing Mechanical Strength- Porosity- Power Frequency Dry Flashover Voltage- Power Frequency Wet Flashover Voltage- Impulse Voltages Flashover Test- Puncture Voltage Testing of Power Cables- Type approval Tests.- Development Tests. Testing of Power transformers - Connection for transformers, Impulse Voltage Test- Power Frequency Voltage Test-Dry Test Power Frequency Voltage -Wet Test Current Transformer Testing- Power Frequency High Voltage Test- Impulse Voltage Test. Testing of voltage transformer-induced voltage test.

Course Outcomes:

Students completing this course will be able to:

- Understand the general aspects of electrical testing methods.
- Design and analysis of high voltage.
- Understand the need for testing and procedures of the electrical devices.
- Understand the significance of high voltages and high currents.
- Understand the need for high voltages, high currents and testing methods.

Suggested Readings:

1. Ray, S.: An Introduction to High Voltage Engineering, Prentice Hall India Learning Private Limited.
2. Wadhwa, C.L.: High Voltage Engineering, New Age International Publishers.

3. Naidu, M.S. and Kamaraju, V.: High-Voltage Engineering, Tata McGraw Hill.

Website Sources:

- https://nptel.ac.in/courses/108/104/108104048/
- https://encyclopedia2.thefreedictionary.com/High-Voltage+Engineering
- https://www.sciencedirect.com/book/9780750636346/high-voltage-engineering-fundamentals
- https://www.electrical4u.com/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - III Year (V Semester)
DEE 502(B): INDUSTRIAL CONTROL

Objective: Learn and understand the control components and basics of different conventional and solid-state control of D.C. motors, induction motors, synchronous motor, etc.

UNIT I **(10 Sessions)**

Speed Control of D.C. Motors:(a) Conventional Control: Methods of Speed control, Armature circuit resistance control, Field control, Motor voltage control (Ward Leonard methods only), **(b) Solid State Control:** Half controlled and fully controlled rectifier fed schemes (Single Phase and Three Phase) for D.C. separately excited and Series motors, Solid state Ward-Leonard schemes, Chopper control scheme (Time Ratio Control Only), Block diagram speed feedbacks, Comparison, Current and Speed feedbacks, Comparison of proportional and proportional plus integral control.

Speed Control of Three Phase Induction Motors:(a) Conventional Control: Methods of speed control, Variable terminal voltage control, Variable frequency control, Pole changing control, Rotor resistance control, Concept of emf injection in rotor circuit, **(b) Solid State Control:** Line A.C. voltage controller scheme, Voltage source fed scheme, Pulse width modulated fed inverter scheme, Comparison of VSI fed and CSI fed schemes, Cycloconverter fed scheme, Static rotor resistance scheme, Slip power recovery scheme, Block diagram explanation of closed loop control scheme, Applications of various schemes.

UNIT-II **(08 Sessions)**

Solid State Control of Synchronous Motor: Self commutated inverter fed scheme, Voltage source inverter fed scheme, Block diagram explanation of closed loop scheme.

UNIT-III **(06 Sessions)**

Solid State Control of FHP AC Motors/DC Motors: D.C. Motor Control, Half wave and Full wave single thyristor schemes.

A. C. Motor Control: TRIAC Control Scheme, Single phase A.C. voltage controller scheme.

UNIT-IV **(08 Sessions)**

Control Components: Relays (General purpose, Over load, Timing), Contactors (Solenoid Type, Clapper Type), Fuses and combination fuse switch units, Miniature circuit breaker, Push buttons, Limit switches, Phase failure relay, Selector switch, Master controller and Drum switches.

UNIT-V **(08 Sessions)**

Electromagnetic Controllers: Symbols for various components, Schematic control diagram, Wire control diagram, Forward/reverse operation of three phase squirrel cage induction motor, Slip ring induction motor starter plugging of squirrel cage induction motor, dc shunt motor starter, Synchronous motor starter, Starter for capacitor type split phase motor, Reversal of universal motor

Course Outcomes:

Students completing this course will be able to:

- Understand the conventional and solid state control.
- Understand the different control components.
- Apply the control components on different electric motors like D.C. motor, induction motor, synchronous motor, etc.

Suggested Readings:

1. Nagrath I.J. & Gopal M.: Control Systems Engineering, New Age International Publishers.
2. Chakrabarti A.: Fundamentals of Power Electronics & Drives, Dhanpat Rai & Company.

Website Sources:

- https://nptel.ac.in/courses/108/108/108108077/
- https://en.wikipedia.org/wiki/Category:Electric_motor_control
- https://www.electrical4u.com/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - III Year (V Semester)
DEE 502 (C): CONTROL OF ELECTRICAL MACHINES

Objective: Learn and understand the control components, control diagrams, A.C. control circuit, industrial control circuit and basic concept of PLC.

UNIT-I **(10 Sessions)**

Control Components: Fuses and combination fuse switch units, Miniature circuit breaker, Contactors: Solenoid type, Clapper type, **Over-load relays:** Thermal over-load relay, Ratchet type over load relay, Magnetic over-load relay, Dash pot type oil filled relay, **Timing relays:** Thermal time delay relay, Pneumatic time delay relay, Synchronous motor-driven timer, Solid state timer, Phase failure relay, Push-buttons selector switches (two position) (three position) limit switch, Single side actuation type, Double side actuation type, Rotary cam type, Heavy duty limit switch, Proximity switches, Solenoid valve, Master controllers & Drum switches, Pressure switches, Temperature controller (thermostat), Float switches, Mechanical brakes for motors control, Transformer, Rectifiers, Reactors, Capacitors symbols for various components, **Control diagram:** Two wire control circuit, Three wire control circuit.

UNIT-II **(08 Sessions)**

A.C. Control Circuit: forward/reversing of 3 phase motors with push-button, inter-locking with auxiliary contact, inter-locking sequence, starting of motors, starting of multispeed squirrel cage motor, dynamic braking of squirrel cage induction motor, plugging of squirrel cage induction motor, over-load protection of motors, single phase protection, over-temperature protection, voltage stabilizer for 3 phase and single phase motors, control of synchronous motors, principle of acceleration, motor starter with field application by definite time relay, motor starter with field control by polarized field frequency control. Motor starter with field application by slip frequency relay over-load protection scheme.

UNIT-III **(08 Sessions)**

Control of single phase motors across the line starter, reversal of universal motor, speed control of universal motor, starter for capacitor type split phase motor, dynamic braking.

UNIT-IV **(08 Sessions)**

Industrial control circuit, heater control, compressor motor control, skip hoist control, walking beam battery operated truck conveyor system, control lift circuit, trouble shooting in control circuits, analyzing the problems, major trouble spots fuse base loose connections faulty contacts incorrect wire markers combination problems, low-voltage grounds procedures used in trouble-shooting, trouble shooting practice should be done in the lab.

UNIT-V **(06 Sessions)**

Basic concept and application of PLC, Basic operation and principles of PLC, Advantages of PLC.

Course Outcomes:

Students completing this course will be able to:

- Understand the A.C. control circuit for electric motors.
- Understand the different control components.
- Understand the different industrial control circuit.
- Understand the PLC.

Suggested Readings:

1. Bimbhra P.S.: Electrical Machinery, Khanna Publishers.
2. Katre J.S.: Electrical Drives, Tech-Max Publications.
3. Paul B.: Industrial Electronics and Control, PHI Learning.

4. Singh A. & Chhabra A. K.: Fundamental of Digital Electronics and Microprocessors, S. Chand & Company Pvt. Ltd.

Website Sources:

- https://www.electrical4u.com/control-of-electrical-drives/
- https://www.slideshare.net/venkatdon/control-of-electrical-machines
- https://www.electrical4u.com/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - III Year (V Semester)
DEE 503: ELECTRICAL MACHINE-II

Objective: To acquire knowledge about the constructional details and principle of operation of three phase and single phase induction motors. To acquire knowledge about the starting and speed control of induction motors. To acquire knowledge about testing and applications of induction motors, working of synchronous machines as generators and motors, testing and applications of synchronous machines.

UNIT I **(06 Sessions)**

Induction Motor: Production of Rotating Magnetic Field in a Three Phase winding, Construction and Working of 3-Phase Induction Motor (Squirrel Cage and Wound Rotor Motor), Rotor Frequency, Rotor E.M.F., Rotor Current and Rotor Power Factor, Torque Equation, Torque-slip Characteristics, Effect of rotor resistance upon the torque slip curve.

UNIT II **(10 Sessions)**

Induction Motor (Cont.): Principle and Methods of Speed Control of 3-Phase Induction Motor, Methods of Starting of 3-Phase Induction Motor (Direct-on-Line, Auto Transformer, Star Delta Starters), Starter for Slip Ring Induction Motor, Double Squirrel Cage Induction Motor, Application of 3-phase Induction Motor, Testing of 3-phase Induction Motor (No-load and Blocked Rotor Test), Losses and Efficiency of 3-phase Induction Motor, Harmonics and its effects, cogging and crawling in Induction Motors, (Simple Problems Only)

UNIT III **(09 Sessions)**

The Alternator: Construction, Working Principle- Stator Windings, Concept of distribution factor and coil span factor, emf equation, Armature reaction at unity, lag and lead power factor, Equivalent circuit diagram of synchronous machine, Determination of Voltage Regulation, Parallel Operation, Necessary Conditions for Successful Parallel Operation, Simple Numerical Problems.

UNIT IV **(09 Sessions)**

Synchronous Motor: Construction, Working Principle, Starting Methods, Effect of Load on Synchronous Motor, Effect of Change in Excitation on the Performance of Synchronous Motor, V-Curves, Torque & Mechanical Power Developed, Condition for Maximum Mechanical Power, Synchronous Condenser, Hunting and its Elimination, Comparison between Induction Motor and Synchronous Motor, Uses of Synchronous Motor, Simple Numerical Problems.

UNIT V **(06 Sessions)**

F.H.P. Motors: Classification of F.H.P. Motors, Construction Working and application of Capacitor Motor (All Types) Shaded Pole Motor -Single Phase Synchronous Motor, Single Phase Series and Universal Motor, Servo Motor.

Course Outcomes:

Students completing this course will be able to:

- To understand the construction and operation of different types of motors.
- To calculate emf value along with the calculations of losses.
- To obtain the performance characteristics of different motors.
- To identify the effects of loading of motors.
- To formulate and then analyze the working of any electrical machine using mathematical models under loaded and unloaded conditions.
- To analyze the response of any electrical machine.
- To troubleshoot the operation of an electrical machine.

Suggested Readings:

1. Electrical Machinery - Dr. P.S. Bhimbra
2. Electrical Drives - J.S. Katre
3. Electrical Machines –Ashfaq Hussain

Website Sources:

- https://nptel.ac.in/courses/108/102/108102146/
- https://nptel.ac.in/courses/108/105/108105155/
- https://nptel.ac.in/courses/108/105/108105131/
- https://nptel.ac.in/courses/108/106/108106023/
- https://nptel.ac.in/courses/108/105/108105017/
- https://nptel.ac.in/courses/108/106/108106071/
- https://nptel.ac.in/courses/108/106/108106072/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - III Year (V Semester)
DEE 504: INSTALLATION, MAINTENANCE AND REPAIR OF ELECTRICAL MACHINES

Objective: The aim of this course is to enable the students to acquire and apply the knowledge and skills related to low current, circuits of lighting and heavy current installation. This course includes conductors and insulators, cable laying equipment, low-current materials, and types of electrical circuits, application circuits of low current installation, lighting and power socket circuit elements, making high current installations, assembling header cable and making underground line cables. The aim of this course is to teach the students about the equipment used in electricity transmission and distribution and to enable the students to acquire and apply their knowledge on installation of the structure, operation and maintenance procedures. This course includes installations to make compensation, lightning installations, grounding installations, safety systems installation.

UNIT I **(08 Sessions)**

Scope and Organization of Electrical Maintenance Department: Requirement of Electrical Maintenance Department, Organization of Work of Electrical Machine Department, Office Work and Record Keeping of Electrical Maintenance Department, History & Plant Maintenance Log Book & Job Cards.

UNIT II **(08 Sessions)**

Installation and Commissioning: General Guidelines for Loading and Unloading of Heavy Electrical Machines, Brief Description of the Accessories Used for Loading and Unloading of Heavy Electrical Equipment, Precautions to be Taken While Executing Such Jobs, Handling & Transport of Electrical Machine, Equipment & Line Accessories to Site, Installation (Testing and Commissioning) of Electrical Equipment Like Motors/Generator, Transformers, Switch Gears, Transmission and Distribution Lines etc.

UNIT III **(08 Sessions)**

Preventive Maintenance of Electrical Equipment and other Installations: Meaning of Preventive Maintenance, Advantages of Programmed Preventive Maintenance, Preparation of Preventive Maintenance Schedule for Transformers, Transmission Lines, Induction Motors, Circuit Breakers, Underground Cables, Storage Batteries etc.

Troubleshooting: Causes for Failure of Electrical Equipments, Classification of Faults Under (i) Electrical, (ii) Magnetic (iii) Mechanical, Tool and Instruments used for Trouble Shooting and Repair, Use of Trouble Shooting Charts, Diagnosis of Faults in (i) D.C. Machines (ii) Synchronous Machines (iii) Transformers, (iv) Induction Motors, (v) Circuit Breakers, (vi) Overhead & Underground Distribution Lines, (vii) Storage Batteries (Viii) Other Appliances.

UNIT IV **(08 Sessions)**

Earthing Arrangements: Reasons for Earthing of Electrical Equipment, Earthing Systems, Permissible Earth Resistance for Different Types of Installations, Methods of Improving the Earth Resistance, Measurement of Earth Resistance, System Earthing and Equipment Earthing.

Insulation Testing: Classification of Insulation as per ISS 1271/1958, Insulation Resistance Measurement, Reasons for Determination of Insulation Resistance, Methods of Improving Insulation Resistance, Vacuum Impregnation, Transformer Oil Testing and Interpretation of the Test Results.

UNIT V **(08 Sessions)**

Electrical Accidents and Safety: Classification of Electrical Accidents, Statutory Regulations (IS 5216-1969), Treatment for Electric Shock, Artificial Respiration, Types and Use of Different Types of Fire Extinguishers, Effect of Current on Human Body, Important Indian Electricity Rules.

Course outcome:

Students completing this course will be able to:

- After studying this course the students, graduates or technicians get the skills to install, maintain and repair of different electrical equipment and machines.
- Both technical college graduates in rural and urban cities agree that all the electrical installation and maintenance work skills are needed for job creation and self reliance.
- Installation skills like planning the layout and installation of wiring, testing of electrical work safety, competence with tools, effectives use of materials, inspection of electrical installation, interpretation of wiring drawing and the likes are highly needed for the job creation.
- Students understand the electrical maintenance skills like diagnosing basic faults and recognize the associated signs, use electrical test equipment effectively, understand the basic regulatory requirements in maintenance.
- It is believed that when these skills are taught, it would facilitate job creation and self reliance.

Suggested Readings:

1) R.P. Gupta, "Installation, Maintenance & Repair of Electrical Machines"

2) Madhvi Gupta, "Installation, Maintenance & Repair of Electrical Machines and equipment" S.K. Kataria & Sons

3) Tarlok Singh, "Installation Commissioning & Maintenance of Electrical Equipments" S.K. Kataria & Sons

4) S.Rao, "Testing Commissioning Operations & Maintenance Electrical Equipments", Khanna Publishers.

Website Sources:

- https://www.usbr.gov/power/data/fist/fist4_1B/4-1B%20Maintenance%20Scheduling%20for%20Electrical%20Equipment%20(November%202005).pdf
- https://www.archsd.gov.hk/media/11269/e102.pdf
- https://library.e.abb.com/public/ae2141fea4bfa9d748257a700024a579/1SDC010002D0206.pdf
- https://www.worldskillsindia.co.in/worldskill/file/Electrical-Installations.pdf

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - III Year (V Semester)
DEE 505: ELECTRICAL DESIGN DRAWING & ESTIMATING II

Objective: The objective of this course is to read, understand and interpret electrical engineering drawings. Communicate and correlate through sketches and drawings. Prepare working drawings of electrical circuits, motor control, earthing and motor parts.

UNIT I **(08 Sessions)**

Design Consideration of Electrical Installation: Electrical supply system, three phase four wire system, protection of electrical installation against overload, short circuit and earth fault, Earthing, General requirements of electrical installations, Neutral and earth wire, Types of loads.

UNIT II **(09 Sessions)**

Design Consideration of Electrical Installation (Cont.): System of wiring, Service mains, sub-circuits. Location of outlets, Location of control switches, Location of main board and distribution board. Guidelines for installation of fittings, Load assessments, Permissible voltage drops and sizes of wires, Estimating and costing of electrical installations, Drawings of at least two sheets.

UNIT III **(08 Sessions)**

Electrical Installation for Different Types of Small Residential Flats: Introduction, Installation plan, schematic and wiring diagram, Selecting the number of Sub-circuits and size of wires, Calculation of length of wire required, Estimating the cost of electrical wiring installation for residential buildings. Some solved examples.

Preparation of Tender Documents: Tender- constituents, finalization, specimen tender, Procedure to take financial loans from banks for taking contracts.

UNIT IV **(07 Sessions)**

Estimation of Service Connections: Service connection, types of service connections-overhead and underground for single story and double story buildings, estimate of materials required for giving service connection to domestic consumers, commercial consumers and industrial consumers at L.T. and H.T. costing of material and work in above cases.

UNIT V **(08 Sessions)**

Design of Small Transformer and Chokes: Theory of transformer design, Design of small transformer, Making of small transformer, Design of chokes, Schematic and wiring diagrams of three phase Induction Motor control circuits.

Course Outcomes:

Students completing this course will be able to:

- Recognize contactor and its use in various applications of 3 phase induction motor.
- Recognize different types of earthing.
- Read and interpret key diagrams.
- Read and interpret schematic and wiring diagrams
- Prepare estimate of wiring installation.

Suggested Redings:

1. Electrical Design and Drawings by Raina & Bhattacharya
2. Electrical Design & Drawings by Sarabjeet Singh
3. IEEE Guide 80 for Earthing, IEEE Publication, New York
4. Electrical Design and Drawing by Surjit Singh, North Publication, Jalandhar

5. Electrical Engineering Design, Drawing & Estimation by Ankit Agarwal, Madhavi Gupta

Website Sources:

- http://swayam.gov.in

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - III Year (V Semester)
DEE 551: INSTALLATION, MAINTENANCE AND REPAIR OF ELECTRICAL MACHINES LAB

Objective: To gain knowledge of testing, installation and maintenance of electrical appliances, their trouble shooting and electrical safety.

List of Experiments:

1. Commissioning of electrical equipments.
2. To study of troubleshooting of AC machines.
3. To determine polarity of single phase transformer.
4. To determine voltage ratio of single phase transformer.
5. Study of troubleshooting of Induction Machines.
6. To measure the Earth Resistance.
7. Study of troubleshooting of DC Machines.
8. To test Dielectric Strength of Transformer oil.
9. To study preventive maintenance schedule of circuit breaker.
10. To study preventive maintenance schedule of transformer.

Course Outcomes:

Students completing this course will be able to:

- At the closing stage of the course, the students will be able to know the installation, commissioning and maintenance of different electrical components.
- They will be able to understand concepts of commissioning, maintenance, electrical safety, installation and maintenance of domestic appliances.

Suggested Reading:

1. R.P. Gupta, “Installation, Maintenance & Repair of Electrical Machines”
2. Madhvi Gupta, “Installation, Maintenance & Repair of Electrical Machines and equipment” S.K. Kataria & Sons
3. Tarlok Singh, “Installation Commissioning & Maintenance of Electrical Equipments” S.K. Kataria & Sons
4. S. Rao, “Testing Commissioning Operations & Maintenance Electrical Equipments”, Khanna Publishers.

Website source:

- https://www.usbr.gov/power/data/fist/fist4_1B/4-1B%20Maintenance%20Scheduling%20for%20Electrical%20Equipment%20(November%202005).pdf
- https://www.archsd.gov.hk/media/11269/e102.pdf
- https://library.e.abb.com/public/ae2141fea4bfa9d748257a700024a579/1SDC010002D0206.pdf
- https://www.worldskillsindia.co.in/worldskill/file/Electrical-Installations.pdf

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - III Year (V Semester)
DEE 552: ELECTRICAL DESIGN DRAWING & ESTIMATING II LAB

Objective: The objective of this course is to read, understand and interpret connection diagrams of various motors. Communicate and correlate through sketches and drawings. Design small transformers.

List of Experiments:

1. To study connection diagram of 3-phase induction motor and starter.
2. To study connection diagram of 1-phase induction motor (Fan Motor).
3. To study connections diagrams of a 3-phase transformer.
4. Estimating and costing of electrical wiring of a small residential flat.
5. Estimating and costing of electrical wiring of a three storied building.
6. To study earthing of electrical equipments.
7. To study the constructional details and wiring diagram of sodium lamp.
8. To study connection diagram of D.C. motor using 3 point starter.
9. To study connection diagram of 3-phase synchronous motor.
10. To study design of a small Transformer.

Course Outcomes:

Students completing this course will be able to:

- Recognize contactor and its use in various applications of 3 phase induction motor
- Recognize different types of earthing
- Read and interpret key diagrams
- Read and interpret schematic and wiring diagrams
- Prepare estimate of wiring installation of various types of Buildings.

Suggested Readings:

1. Electrical Design and Drawings by Raina & Bhattacharya
2. Electrical Design & Drawings by Sarabjeet Singh
3. IEEE Guide 80 for Earthing, IEEE Publication, New York
4. Electrical Design and Drawing by Surjit Singh, North Publication, Jalandhar
5. Electrical Engineering Design,Drawing & Estimation by Ankit Agarwal, Madhavi Gupta

Website Sources:

- http://swayam.gov.in

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - III Year (V Semester)
DEE 553: ELECTRICAL MACHINE-II LAB

Objective: To learn how to visualize and work on laboratory and multidisciplinary tasks. To acquire knowledge about the principle of operation of three phase motor. To acquire knowledge about the starting and speed control of induction motors. To acquire knowledge about testing of induction motors.

List of Experiments:

1. To run a three phase induction motor and change it direction of rotation.
2. To run a three phase induction motor and determine its slip at various loads.
3. To connect and start a three phase induction motor using DOL starter and auto-transformer starter.
4. To determine load characteristics of a poly phase induction motor.
5. To perform no-load test and blocked rotor test on a three phase induction motor and to determine its efficiency.
6. To draw torque Vs slip characteristics of a three phase slip ring induction motor.
7. To study and run three-phase synchronous generator.
8. To determine the load characteristics of three-phase synchronous generator.
9. To study and run three phase synchronous motor.
10. To study a single phase induction motor and its various starting methods.

Course Outcomes:
Students completing this course will be able to:

- To understand the construction and operation of different types of motors.
- To calculate emf value along with the calculations of losses.
- To obtain the performance characteristics of different motors.
- To identify the effects of loading of motors.
- To formulate and then analyze the working of any electrical machine using mathematical models under loaded and unloaded conditions.
- To analyze the response of any electrical machine.

Suggested Readings:

1. Electrical Machinery - Dr. P.S. Bhimbra
2. Electrical Machines –Ashfaq Hussain

Website Sources:

- https://nptel.ac.in/courses/108/102/108102146/
- https://nptel.ac.in/courses/108/105/108105155/
- https://nptel.ac.in/courses/108/105/108105131/
- https://nptel.ac.in/courses/108/106/108106023/
- https://nptel.ac.in/courses/108/105/108105017/
- https://nptel.ac.in/courses/108/106/108106071/
- https://nptel.ac.in/courses/108/106/108106072/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - III Year (V Semester)
DEE 554: ELECTRICAL MEASUREMENT-II LAB

Objective:

1. To learn how to visualize and work on laboratory and multidisciplinary tasks.
2. To introduce the basic principles of all measuring instruments.
3. To deal with the measurement of voltage, current, power factor, power, energy and magnetic measurements.

List of Experiments:

1. To study the construction of an Induction type energy meter.
2. To calibrate an Induction type energy meter with the help of a standard wattmeter and a stop watch.
3. To measure an unknown inductance using Maxwell's bridge.
4. To measure an unknown inductance using Hay's bridge.
5. To measure an unknown capacitance using Schering bridge.
6. To measure an unknown capacitance using Wien's bridge.
7. To study a Cathode Ray Oscilloscope.
8. To measure phase difference and frequency using a CRO.
9. To study a strain gauge transducer and measuring pressure using it.
10. To study LVDT and measure displacement using it.

Course Outcomes:

Students completing this course will be able to:

- Understand different types of measuring instruments, their construction and operation.
- Identify the instruments suitable for typical measurements.
- Understand different types of transducers.
- To balance, AC bridges to find unknown values.

Suggested Readings:

1. G.K. Banerjee, "Electrical & Electronic Measurement", PHI Learning. India
2. A.K. Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons, India .
3. E.W. Golding & F.C. Widdis, "Electrical Measurement & Measuring Instrument", A.W. Wheeler& Co. Pvt. Ltd.
4. M.B. Stout, "Basic Electrical Measurement" Prentice hall of India, India

Website Sources:

- https://nptel.ac.in/courses/108/105/108105153/
- https://nptel.ac.in/courses/108/106/108106172/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - III Year (VI Semester)
DEE 601: UTILIZATION OF ELECTRICAL ENERGY

Objective: To focus on the recent illumination practices adopted. To provide the understanding of the concepts of Electrolysis processes and illumination engineering. To provide the understanding of the heating and welding methods for industrial applications. To provide the understanding of electric traction systems and drives.

UNIT I **(09 Sessions)**

Illumination: Nature of light, curve of relative sensitivity of human eye and wave length, **Definitions:** Flux, Solid Angle, Luminous Intensity, Illumination, Luminous Efficiency, Depreciation Factor Coefficient of Utilization, Space to Height Ratio, Reflection Factor, Laws of Illumination. Calculation of Number of Light Points for Interior Illumination; Calculation of Illumination at Different Points; Considerations Involved in Simple Design Problems and Illumination Schemes; Levels of Illumination. Methods To Increase Illumination Efficiency Different Sources of Light: Difference in Incandescent and Discharge Lamps- Their Construction & Characteristics, Fittings Required for Filament Lamp, Mercury Lamp, Fluorescent Lamp Sodium Lamp, Neon Lamp. Main Requirements of Proper Lighting; Illumination Level, Absence of Flare, Contrast and Shadow.

UNIT II **(08 Sessions)**

Electric Heating: Introduction, Advantages of Electrical Heating, Heating Methods: Resistance Heating (Direct Resistance Heating, Indirect Resistance Heating, Electric Ovens, Their Temperature Range) Salt Bath Heaters Properties of Heating Elements, Domestic Water Heaters and other Heating Appliances, Induction Heating, Principle, Core Type and Coreless Induction Furnace, Electric Arc Heating, Direct and Indirect Arc Heating, Arc Furnace. Di-electric Heating, Applications in Various Industrial Fields, Microwave Ovens, Simple Design Problems of Resistance Heating Element.

UNIT III **(09 Sessions)**

Electric Cooling: Concept of Refrigeration and Air-Conditioning, Brief Description of Vapour Compression Refrigeration Cycle, Description of Electrical Circuit Used in Refrigerator, Air-Conditioner and Water Cooler.

Electric Welding: Welding Methods, Principles of Resistance Welding, Welding Equipments, Electric Arc Welding Principle, Characteristics of Arc, Carbon and Metallic Arc Welding, Power Supply, Advantage of Coated Electrode, Comparison of AC And DC Arc Welding, Welding Equipment.

UNIT IV **(09 Sessions)**

Electrochemical Processes: Need of Electro-Deposition, Faraday's Laws in Electro Deposition, Objectives of Electroplating, Description of Process for Electroplating, Factors Governing Electro Deposition, Equipments and Accessories for Electroplating Plant, Principle of Anodizing and its Applications Electroplating on Non-conducting Materials.

UNIT V **(05 Sessions)**

Energy Conservation: Need for Energy Conservation, Over View of Energy Management, Basic Idea about Energy Audit.

Tariffs: Meaning of Different Tariffs and their application, Block Rate, Flat Rate, Maximum Demand and Two Part Tariffs, Bill Preparation.

Course Outcomes:

Students completing this course will be able to:

- Able to maintain electric drives used in industries.
- Able to identify a heating/ welding scheme for a given application.
- Able to maintain/ Troubleshoot various lamps and fittings in use.
- Able to figure-out the different schemes of traction schemes and its main components.
- Able to identify the job/higher education / research opportunities in the electric utilization industry.
- Able to discuss specify energy consumption.

Suggested Readings:

1. Utilisation of Electrical Energy- R. K. Rajput
2. Utilisation of Electrical Energy – H. Partab (Dhanpat Rai & Sons)

Website Sources:

- https://nptel.ac.in/courses/108/106/108106022/
- https://nptel.ac.in/courses/108/108/108108078/
- https://nptel.ac.in/courses/108/105/108105060/
- https://nptel.ac.in/courses/108/105/108105061/
- https://nptel.ac.in/courses/108/104/108104140/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - III Year (VI Semester)
DEE 602: INDUSTRIAL ELECTRONICS & CONTROL

Objective: To make the students understand all the processes involved in the industries, the various unit operations and be able to apply control schemes to these processes to get the output with desired specifications.

UNIT I **(10 Sessions)**

Introduction to Control System: Types of control system, Open loop and closed loop system, Advantages and disadvantages of open loop and closed loop control system, Components of closed loop system, Effects of feedback, Transfer function.

UNIT II **(08 Sessions)**

Thyristor Control of Electric Motors: Speed control of DC shunt motor, Speed control of DC series motor, Speed control of Induction motor by stator voltage control method, Closed-loop speed control system for 3-phase Induction motors.

UNIT III **(06 Sessions)**

Heating Control: Introduction and advantages of electrical heating, Principle of induction heating, Effect of supply frequency and source voltage on induction heating, Applications of induction heating, Principle of dielectric heating, Effect of supply frequency and source voltage on dielectric heating, Applications of dielectric heating, Difference between induction heating and dielectric heating.

UNIT IV **(08 Sessions)**

Welding Control: Theory of resistance welding, Classification of resistance welding, Control in resistance welding.
AC Power Conditioner: Introduction, Power supply noise, Servo System: Servo motor, Servo controlled voltage stabilizer, AC generator voltage regulator, Uninterruptible Power Supply (UPS).

UNIT V **(08 Sessions)**

Programmable Logic Controller: Introduction, Functions of PLC, Application of PLC, Advantages and disadvantages of PLC over conventional relay type of control, Functional block diagram of PLC, Sequence of operations in PLC.

Course Outcomes:

Students completing this course will be able to:

- Get a complete overview of strategies for process control
- Know all the industrial processes and demonstrate their knowledge in designing the control loops for these processes.
- Know the applications of power electronic equipments in industries.

Suggested Readings:

1. Bhattacharya, S. and Chatterjee, S.: Industrial Electronics and Control, Tata McGraw Hill.
2. Paul, B.: Industrial Electronics and Control, PHI Learning Pvt. Ltd.
3. Bimbhra, P.S.:Power Electronics, Khanna Publishers.
4. Nagrath, I.J. and Gopal, M.: Control Systems Engineering, New Age International Publishers.

Website Sources:

- https://nptel.ac.in/courses/108/107/108107128/
- https://nptel.ac.in/courses/108/105/108105088/
- https://en.wikipedia.org/wiki/Power_electronics
- https://www.designingbuildings.co.uk/wiki/Electrical_control_systems

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - III Year (VI Semester)
DEE 603: SWITCH GEAR AND PROTECTION

Objective: To introduce students to power system protection and switchgear. To teach students the theory and applications of the main components used in power system protection for electric machines, transformers, bus bars, overhead and underground feeders. To teach students the theory, construction, applications of main types circuit breakers, relays for the protection of generators, transformers and protection of feeders from over- voltages and other hazards. To develop an ability and skill to design the feasible protection systems needed for each main part of a power system in students.

UNIT I **(07 Sessions)**

Faults: Types of faults, Three-phase symmetrical faults, effects of faults on system reliability and stability abnormalities, short circuits and their effects, representation of fault conditions through single line diagrams.

UNIT II **(09 Sessions)**

Switch Gear: Purpose of protective gear, characteristics of a protection system. **Classification of fuses:** H.V. Fuses, application and working, grading and coordination L.V. fuses, election of fuses, characteristics. **Isolators and switches:** Outdoor isolators, functions, air break switches braking capacity of switches. **Circuit Breakers:** Requirements of circuit breakers, definition of terms associated with circuit-breakers, reasons for arc formation, principles of arc extinction, types of circuit-breakers, comparison with oil circuit breaker classification, rating of circuit breakers, working of different types of air and oil circuit breaker, specification of circuit breakers, maintenance schedule, SF-6 and Vacuum circuit breakers. **Relays:** Requirement of relays, operation principles induction type over current, directional over current, differential, percentage differential relays, working, applications and characteristics, basic principles of static relays. Introduction of distance relay.

UNIT III **(08 Sessions)**

Protective Schemes: Protection of alternators, stator faults, rotor faults, mechanical conditions, external faults their reasons, effect and protections used

Protection of power transformer: Types of faults, its effects, types of protective schemes over current earth fault, differential protection, Buckholtz devices, winding temperature protection. Motor protection: types of faults and protection in motors, thermal relays, protection of small motors, under voltage protection.

Protection of feeders : radial, parallel and ring feeders protection, directional time and current graded schemes differential protection.

UNIT IV **(08 Sessions)**

Protection against Over Voltages: Causes of over voltages, travelling waves earth wire, protective zone, lightening arrestors, space-gap and electrolytic arrestors, surge absorber, location and rating of lightening arrestors. Thyrite lightening arrestor.

UNIT V **(08 Sessions)**

Different Type of Sub-Stations: Layout, single line diagram bus bar arrangement, equipments their functions, accessories, study of protective schemes, etc. batteries and their maintenance, operation of small sub-station.

Reactors: Types of reactors, Busbar reactor, Tuning reactor, arc-suppression reactor, connection of reactors in power stations, Uses of reactors.

Neutral grounding: Types of grounding solid grounding, reactance grounding, arc suppression coil grounding, choice of method of neutral earthing, grounding of sub-station, grounding of line structure and substation equipment. Concept of G.I.S. (Gas Insulated Substation).

Course Outcomes:

Students completing this course will be able to:

- Student gains knowledge on different Protective Equipments or Power Systems.
- Know about various protective systems- how it works and where it works?
- Different applications of the relays, circuit breakers for different elements of power system is also discussed on the subject.
- Ability to express Oil circuit Breaker, Air Blast circuit Breakers, SF6 Circuit Breaker.
- Ability to identify DMT, IDMT type relays.
- Ability to identify Rotor, Stator Faults and their protection.

Suggested Readings:

1. Sunil S Rao "Switchgear Protection & Power Systems", Khanna Publlishers.
2. Badari Ram & D.N Viswakarma "Power System Protection and Switchgear", TMH publications.
3. Paithankar and S.R.Bhide, "Fundamentals of Power System Protection", PHI, 2003.
4. T S Madhav Rao, "Power System Protection: Static Relays", Tata McGraw-Hill, 2nd edition R3: C R Mason, "Art & Science of Protective Relaying", Wiley Eastern Ltd.
5. Cl Wadhwa, "Electrical Power Systems", New Age international (P) Limited, Publishers, 3rd editon.
6. "Hand Book of Switchgears by BHEL", TMH Publications.

Website Sources:

- https://www.m-tutor.com/login.php
- https://nptel.ac.in/courses/108/108/108108076/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - III Year (VI Semester)
DEE-604: ENVIRONMENTAL EDUCATION & DISASTER MANAGEMENT

Objective: The objective of this course to familiar with the environment, environmental policies, the importance of human resources and provide every person with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment. To create new patterns of behavior of individuals, groups, and society as a whole towards the environment.

UNIT I **(08 Sessions)**

Introduction: Basics of ecology, Ecosystem, Biodiversity Human activities and its effect on ecology and eco system, different development i.e. irrigation, urbanization, road development and other engineering activities and their effects on ecology and eco system, Mining and deforestation and their effects. Lowering of water level, Urbanization. Biodegradation and Biodegradability, composting, bio remediation, Microbes. Use of biopesticidies and biofungicides. Global warning concerns, Ozone layer depletion, Green house effect, Acid rain, etc.

UNIT II **(08 Sessions)**

Pollution: Sources of pollution, natural and manmade, their effects on living environments and related legislation.

Water Pollution: Factors contributing water pollution and their effect. Domestic waste water and industrial waste water, Heavy metals, microbes and leaching metal, Physical, Chemical and Biological Characteristics of waste water.Indian Standards for qulity of drinking water.Indian Standards for quality of treated waste water, Treatment methods of effluent (domestic waste water and industrial/mining waste water), its reuse/safe disposal.

UNIT III **(08 Sessions)**

Air Pollution: Definition of Air pollution, types of air pollutants i.e. SPM, NOX, SOX, GO, CO2, NH3, F, CL, causes and its effects on the environment Monitoring and control of air pollutants, Control measures techniques. Introductory Idea of control equipment in industries i.e., Settling chambers, Cyclones, Scrubbers (Dry and Wet), Multi Clones, Electro Static Precipitations Bog Fillers, Ambient air quality measurement and their standards, Process and domestic emission control Vehicular Pollution and Its control with special emphasis of Euro-I, Euro-II, Euro-III and Euro IV, **Noise Pollution:** Sources of noise pollution, its effect and control, **Radioactive Pollution:** Sources and its effect on human, animal, plant and material, means to control and preventive measures, **Solid Waste Management:** Municipal solid waste, Biomedical waste, Industrial and Hazardous waste, Plastic waste and its management.

UNIT IV **(08 Sessions)**

Legislation: Preliminary knowledge of the following Acts and rules made there under- The Water (Prevention and Control of Pollution) Act - 1974, The Air (Prevention and Control of Pollution) Act - 1981.The Environmental Protection (Prevention and Control of Pollution) Act -1986. Rules notified under EP Act - 1986 The Manufacture, Storage and Import of Hazardous (Amendment) Rules, 2000 The Hazardous Wastes (Management and Handling) Amendment Rules, 2003. Bio-Medical Waste (Management and Handling) (Amendment) Rules, 2003, The Noise Pollution (Regulation and Control) (Amendment) Rules, 2002. Municipal Solid Wastes (Management and Handling) Rules, 2000, The Recycled Plastics Manufacture and Usage (Amendment) rules, 2003. **Environmental Impact Assessment (EIA):** Basic concepts, objective and methodology of EIA. Objectives and requirement of Environmental Management System (ISO-14000) (An Introduction).

UNIT V **(08 Sessions)**

Disaster Management: Definition of disaster - Natural and Manmade, Type of disaster management, How disaster forms, Destructive power, Causes and Hazards, Case study of Tsunami Disaster, National policy- Its objective and main features, National Environment Policy, Need for central intervention, State Disaster Authority- Duties and

powers, Case studies of various Disaster in the country, Meaning and benefit of vulnerability reduction, Factor promoting vulnerability reduction and mitigation, Emergency support function plan. Main feature and function of National Disaster Management Frame Work, Disaster mitigation and prevention, Legal Policy Frame Work, Early warning system, Human Resource Development and Function, Information dissemination and communication.

Course outcomes:

Students completing this course will be able to:

- Students will possess the intellectual flexibility necessary to view environmental questions from multiple perspectives, prepared to alter their understanding as they learn new ways of understanding.
- Students will solve problems systematically, creatively, and reflexively, ready to assemble knowledge and formulate strategy.
- Understand core concepts and methods from ecological and physical sciences and their application in environmental problem-solving.
- Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.

Suggested Readings:

1. Environmental Education and Disaster Management: Varun Dutt Sharma, CBS Publishers.
2. Environmental Education: Dr. R. K. Sharma, Bookman Publication.
3. Environmental Education by Rajesh Makol, Rajesh Makol Publication.
4. Disaster Management and Mitigation" by Prof. R B Singh, Rawat Publications.
4. Natural Hazards and Disaster Management: Vulnerability and Mitigation by Prof. R B Singh.
5. Fundamentals of Environmental Studies by Mahua Basu, Cambridge University.

Website Sources:

- https://nptel.ac.in/courses
- https://en.wikipedia.org
- https://ndma.gov.in/en/
- https://www.ndmindia.nic.in/
- http://legislative.gov.in/
- https://www.cseindia.org/understanding-eia-383
- https://www.biologydiscussion.com/environment/environmental-impact-assessment-eia-definition-process-and-importance/16777

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - III Year (VI Semester)
DEE-605(A): ELECTRIC TRACTION

Objective: The objective of this course is to provide the students the fundamental concepts of drives and types of drives used in traction. To train the students with a good engineering breadth so as to analyze the accessing techniques for braking system implementation.

UNIT I **(08 Sessions)**

Electric Traction Drives: Introduction, Types of electric traction systems & its advantages, Suitability of electric traction drives- D.C. Series motor, A.C. series motor, 3 phase induction motor, characteristics of electric traction drives, methods of starting and speed control, different methods of braking, plugging, rheostatic, regenerative.

UNIT II **(09 Sessions)**

Power supply of Electric Traction: Different systems of power supplies, power supply arrangement i.e. traction substation major equipment transformer, circuit breaker, interrupter, protection system.

UNIT III **(08 Sessions)**

Mechanics of Traction: System of units, speed time curves, their construction, simplification and interpretation for main line, suburban routs, tractive effort, specific energy consumption and factors effecting it, Weight transfer due to torque coefficient of adhesion.

UNIT IV **(08 Sessions)**

Overhead Equipments & Track Circuits: Over head equipments, catenary and its types, Working & maintenance of over head equipments, current collection system, D.C. and A.C. track circuits, signals for traffic control.

UNIT V **(07 Sessions)**

Supervisory Remote Control: System of remote control, its advantages, mimic diagram, remote control system and network remote control centre (R.C.C.). Rail and Return Path, Earth return protection of underground equipment, Negative booster, Voltage distribution on rails.

Course Outcomes:

Students completing this course will be able to:

- Express work of Electric Drives
- Design Electric Traction
- Ability to discuss the mechanics of Train movement.
- Ability to plot trapezoidal and quadrilateral speed time curves.
- Ability to discuss specify energy consumption

Suggested Readings:

1. Modern Electric Traction: H. Partab, Dhanpat Rai & Co.
2. Utilization of Electric Power & Electric Traction- J. B. Gupta, S.K. Kataria & Sons.
3. An Introduction to Electric Traction- Sachidananda Mallik & Rupali G. Nazar, S.K. Kataria & Sons.
4. Electric Traction- J. Upadhyay & S.N. Mahendra, Allied Publishers Pvt. Ltd.

Website Sources:

- https://www.irfca.org/faq/faq-elec.html
- https://en.wikipedia.org/wiki/Railway_electric_traction
- http://www.railway-technical.com/infrastructure/electric-traction-power.html

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - III Year (VI Semester)
DEE-605 (B): RENEWABLE SOURCES OF ENERGY

Objective: The objective of this course is to understand the various forms of conventional energy resources. Learn the present energy scenario and the need for energy conservation. Outline division aspects and utilization of renewable energy sources for both domestics and industrial application. Analyze the environmental aspects of renewable energy resources.

UNIT-I

Global Energy Scenario: Depletion Trends of Fossil Fuels, Need for Alternative Sources of Energy, Differences Between Renewable and Non-Renewable Sources of Energy.

Solar Energy: Concept, Solar Radiation, Solar Radiation at the Earth Surface, Direct and Diffused Radiation, Solar Constant, Basic Earth Angle, Altitude and Latitude Angle , Solar Radiation Geometry, Declination Angle, Azimuth Angle, Zenith Angle, Solar Altitude Angle, Tilt Angle, Hour Angle, Sun Rise Time and Sun Set Time and Day Length

UNIT-II

Solar Radiation Measurement: Pyroheliometer, Pyranometer, Solar Radiation Data, Estimation of Solar Radiation(Hourly, Daily And Monthly), Fundamental Heat Transfer Equation**, Flat Plate Collector:** Working Principle**,** Types of Plate Collector**,** Sources of Losses From a Flat Plate Collector**,** Collector Efficiency(Concept)**,** Concentrating Collector**,** Application of Flat Plate Collector, Basic Principles of These Devices**,** Solar Cooker**,** Solar Water Heater**,** Solar Dryer**,** Solar Distillation Unit**,** Advantages and Disadvantages of Concentrating Collector Over Flat Plate Collector, Application of Solar Concentrating Collector Like Solar Water Heating, Space Heating and Cooling and Electric Power Generation(Basic Principles)**, Solar Photo-Voltaic System:** Principle and Physics of PV Cells**,** PV Module, Panel and Array**,** Series and Parallel Connection**,** Power Output Calculations**,** Operation and Maintenance of PV Systems**,** Solar Battery- Construction, Operation, Maintenance and Effect of Sp. Gravity of Electrolyte.

UNIT-III

Biomass: Introduction To Biomass Energy and Photosynthesis Sources of Biomass Fuel Characteristics of Biomass-Moisture Content, Proximate and Ultimate Analysis of Fuel Biomass Conversion: Thermal/Biological Biomass Pyrolysis Charcoal Making Process Gasification and Main Types of Gasifiers Combustion of Biomass: Review of CombustionEquations- Calculations of Air Requirement Flue GasAnalysis Working of Anaerobic Digestors Different Types of Bio Gas Generating PlantFixed Dome Type, Floating Dome Type.

UNIT-IV

Wind Energy: Wind Map of India Intensity of Wind Energy Types of Windmills Vertical Axis Windmills, Darrius and Sarious Types, Horizontal Axis Windmills Applications of Wind Energy Water Pumping Electric Power Generation.

Micro-Hydel Energy: Meaning and Concept of Micro-Hydel Power Site Selection for a Micro-hydel Project Methods of Power Generation in a Micro-Hydel Power Station

Tidal Energy: Meaning of Wave and Tidal Power Methods of Power Generation from Waves Methods of Power Generation from Tides.

UNIT-V

Geothermal Energy: Potential and Classification of Geothermal Energy, Conversion of Geothermal Energy into Electric Power Components of a Power Station (Geothermal) Study of Battery Storage System Multipurpose Uses Crop Drying Bathing Refrigeration Appropriate Technology: Introduction: Concept of Appropriate Technology,

Modern Technology V/S Appropriate Technology, Its Need, Review of The Traditional Technologies and Their Possible Modifications.

Water Lifting Devices: Traditional Methods Used in the Rural Areas for Lifting Water.Rahat, Inertia Pumps, Low Lift Pumps, Diaphragm Pumps, Use of Appropriate Technology in Their Design and Construction. Hand and Pedal Operated Devices, Water Pumping Wind Mills.

Course Outcomes:

Students completing this course will be able to:

- Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations.
- Know the need of renewable energy resources, historical and latest developments.
- Describe the use of solar energy and the various components used in the energy production
- Appreciate the need of Wind Energy and the various components used in energy generation and know the classifications.
- Understand the concept of Biomass energy resources and their classification, types of biogas Plants-applications
- Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitations.
- Acquire the knowledge of fuel cells, wave power, tidal power and geothermal principles and applications.

Suggested Readings:

1. Renewable Energy Sources & Emerging Technologies- D. P. Kothari, Prentice Hall India Learning Private Limited.
2. Renewable Energy Technologies- C. S. Solanki, Prentice Hall India Learning Private Limited.
3. Wind Power Plants & Project Developments- J. Earnest& T. Wizelius, Prentice Hall India Learning Private Limited.

Website Sources:

- https://en.wikipedia.org/wiki/Renewable_energy
- https://www.nrdc.org/stories/renewable-energy-clean-facts
- https://www.nationalgeographic.org/encyclopedia/renewable-resources/

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - III Year (VI Semester)
DEE-605 (C): PROCESS CONTROL & INSTRUMENTATION

Objectives: The objective of the course is to make the students familiar with different process dynamics in Process industries and different control schemes generally used to get best output. It also makes students aware of various analysis and design methods for multivariable systems.

UNIT-I

Introduction: Block Diagram of a General Open and Closed Loop Process, Control System and Application.

Control System Components : Brief Description and Working of a Potentiometer, Differential Transformer Servo Motors, Tacho-Generator, Eddy Current Clutches Relay Contactors Timing Relay Temperature Switches Saturable Core Reactors & Its Use As Magnetic Amplifier.

Instrument Transformer: Theory of Current And Potential Transformers Ratio & Phase Angle Errors, Effect of Variation of Power Factor, Secondary Burden and Testing of C.T. & P.T.

UNIT-II

Transducers: Definition of Transducers, Classification of Transducers &its Application. Active & Passive Type Their Use For Measurement of Mechanical And Electrical Quantities, Such As Speed Pressure Strain Displacement Volume Temperature Magnetic Flux And Humidity, Application of Transducers for Instrumentation & Control. Selection Criteria Based on Static and Dynamic Characteristics.

UNIT-III

Process Instrumentation: Functional Block Diagram of Instrumentation System, Description of each Block. Description Of Practical Circuits For The Following: **Temperature Measurements:** General, Heat Transfer Modes, Temperature Measuring Devices Like Thermocouples, Pyrometer, Resistance Thermometer.

UNIT-IV

Flow Measurement: General, Flow Meters: Venturi Meter, Orifice Plate, Pitot Tube, Rotameter, Turbine Meter, Electromagnetic Meter & Mass Flow Measurement. **Pressure Measurements:** General, Dynamic Performance, Pressure Receiver and Transmission Line, Input Impedance, Energy Level Of Pressure Pickups, Pressure Pickups. Manometer, Pressure Elements Differential Pressure.

UNIT-V

Vibration Measurements: Vibration Measurement Systems, Analysis of Acceleration Data.

Strain Measurements: Requirements for Strain Measurement, Strain Gauges, Selection of Gauges, General Strain Measurements.

Course Outcomes:

Students completing this course will be able to:

- The students will be able to handle any kind of process by framing it in block diagram, mathematical model and different process variables.
- The students will be able to handle different types of controller like electronic, pneumatic and hydraulic.
- The students will be able to implement different control schemes to various processes.
- The students will be able to design relay logic for various processes.

Suggested Readings:

1. Process Control Instrumentation Technology- Curtis D. Johnson, Pearson.
2. Transducers & Instrumentation- D. V. S. Murty, Prentice Hall India Learning Private Limited.
3. Instrumentation & Process Control- D. C. Sikdar, Khanna Publishing.
4. Electrical Instrumentation and Process Control- J. P. Navani, S. Chand and Company Pvt. Ltd.

Website Sources:

- https://nptel.ac.in/courses/103/105/103105064/
- http://www.nptelvideos.in/2012/11/process-control-and-instrumentation.html
- http://www.pc-education.mcmaster.ca/Lecture_Slides/Chap_01_Marlin_2002.pdf

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - III Year (VI Semester)

DEE 652: INDUSTRIAL ELECTRONICS & CONTROL LAB

Objective: To make the students understand all the processes involved in the industries, the various unit operations and be able to apply control schemes to these processes to get the output with desired specifications.

List of Experiments:

1. To study the effect of loading on the speed of motor in open loop.
2. To study the effect of loading on the speed of motor in closed loop.
3. Testing of electronic fan speed regulator.
4. To plot the characteristics of SCR.
5. To study various triggering circuits used in SCR.
6. To study the operation of a Time Delay-Relay using SCR & UJT.
7. To study the speed control of D.C. motor.
8. To study the speed control of A.C. motor using TRIAC.
9. To study the design and working of Uninterruptible Power Supply (UPS).
10. To study the working of Programmable Logic Controller (PLC).

Course Outcomes:

Students completing this course will be able to:

- Get a complete overview of strategies for process control
- Know all the industrial processes and demonstrate their knowledge in designing the control loops for these processes.
- Know the applications of power electronic equipments in industries.

Suggested Readings:

1. Bhattacharya, S. and Chatterjee, S.: Industrial Electronics and Control, Tata McGraw Hill.
2. Paul, B.: Industrial Electronics and Control, PHI Learning Pvt. Ltd.
3. Bimbhra, P.S., Power Electronics, Khanna Publishers.
4. Nagrath, I.J. and Gopal, M.: Control Systems Engineering, New Age International Publishers.

Website Sources:

- https://nptel.ac.in/courses/108/107/108107128/
- https://nptel.ac.in/courses/108/105/108105088/
- https://en.wikipedia.org/wiki/Power_electronics
- https://www.designingbuildings.co.uk/wiki/Electrical_control_systems

IFTM University, Moradabad
Diploma (Electrical Engineering) Programme
Diploma (EE) - III Year (VI Semester)

DEE 653: POWER SYSTEM LAB

Objective: To analyze the performance of power system networks by conducting various experiments. To study different power system protective equipment by conducting suitable experiments. To develop computer programs for analysis of power systems.

List of Experiments:

1. To study various parameters of transmission line and their effect on transmission of electrical power.
2. To study working of various types of Relays.
3. To study working of various types of circuit breakers.
4. To study radial and ring distribution system.
5. To study operating characteristic of MCB fuse.
6. To study operating characteristic of HRC fuse.
7. To view an electrical installation and distribution system.
8. To determine location of fault in a cable using cable fault locator.
9. To determine the dielectric strength of transformer oil.
10. To study working model of a Buchholz Relay.

Course Outcomes:
Students completing this course will be able to:

- Analyze the performance of transmission lines and relays.
- Calculate the steady-state power flow in a power system.
- Analyze different types of short-circuit faults which occur in power systems.

Suggested Readings:

1. Kothari, D.P. and Nagrath, I.J..: Power System Engineering, McGraw Hill Education.
2. Wadhva, C.L.: Electrical Power Systems, Drawing & Estimation, New Age International Publishers.

Website Sources:

- https://en.wikipedia.org/wiki/Electric_power_system
- https://www.electrical4u.com/power-system/
- https://nptel.ac.in/courses/108/105/108105067/
- https://nptel.ac.in/courses/108/105/108105104/