

NETAJI SUBHAS UNIVERSITY



**SYLLABUS AND SCHEME OF EXAMINATION
FOR**

**DIPLOMA
IN**

**Electrical & Electronics Engineering
(EEE)**

(Effective from academic session:
2021-22)

First Year

Subject Code	SEMESTER 1	Subject Code	SEMESTER 2
DIP101	Basic Physics	DIP201	Communication Skills-II
DIP102	Basic Chemistry	DIP202	Engineering Mathematics-I
DIP103	Basic Mathematics	DIP203	Applied Science
DIP104	Communication Skills- I	DIP204	Engineering Mechanics
DIP105	Engineering Graphics	DIP205	Engineering Drawing
DIP106	Computer Fundamentals	DIP206	Basic Workshop Practice
DIP107L	Basic Physics LAB	DIP207L	Engineering Drawing LAB
DIP108L	Computer Fundamentals LAB	DIP208L	Chemistry LAB

Second Year

Subject Code	SEMESTER 3	Subject Code	SEMESTER 4
DIP301	Engg. Mathematics-II	DIP4EEE01	Electrical Circuits & Network
DIP302	Computer Programming Through "C"	DIP4EEE02	Electrical Machine - I
DIP3EEE03	Electrical Measurement	DIP4EEE03	Digital Electronics
DIP3EEE04	Electrical Power System-I	DIP4EEE04	Electrical Power System -II
DIP3EEE05	Basic Electronics	DIP4EEE05	Communication Engineering
DIP3EEE06L	LAB (ISP & C)	DIP4EEE01L	Electrical Circuits & Network Lab
DIP3EEE07L	Basic Electrical and Electronics Lab	DIP4EEE03L	Digital Electronics Lab

Third Year

Subject Code	SEMESTER 5	Subject Code	SEMESTER 6
DIP5EEE01	Electrical Estimation & Costing	DIP6EEE01	Control System
DIP5EEE02	Microprocessor	DIP6EEE02	Switchgear and Protection
DIP503	Environmental Science	DIP603	Industrial Management
DIP5EEE04	Electrical Machines-II	DIP6EEE04	Elective (Any One)
DIP5EEE05	Power Electronics	DIP6EEE05	Project & Viva
DIP5EEE05L	Power Electronics Lab	-	-
DIP5EEE02L	Microprocessor Lab	-	-

- Elective-** (i) Digital communication.
(ii) Electric Traction.
(iii) Industrial Automation

SEMESTER-1								
THEORY		PERIOD			Evaluation Scheme			Credit
CODE	NAME OF THE PAPER	LECTURES	TUTORIALS	PRACTICALS	IA	ESE	SUB-TOTAL	
DIP101	Basic Physics	3	1	0	30	70	100	4
DIP102	Basic Chemistry	3	1	0	30	70	100	4
DIP103	Basic Mathematics	3	1	0	30	70	100	4
DIP104	Communication Skills-I	3	0	1	30	70	100	4
DIP105	Engineering Graphics	3	1	0	30	70	100	4
DIP106	Computer Fundamentals	3	0	1	30	70	100	4
DIP107L	Basic Physics LAB	0	0	2	15	35	50	2
DIP108L	Computer Fundamentals LAB	0	0	2	15	35	50	2
							Total Credits	28

IA = Internal Assessment, **ESE** = End Semester Exam

Program Outcome

After undergoing this programme, students will be able to:

PO1: Apply knowledge of mathematics, science and algorithm in solving complex Computer engineering problems.

PO2: Communicate effectively in English with others, Apply basic principles of mathematics and physics to solve engineering problems.

PO3: Use cutting tools, equipment and tools for fabrication of jobs by following safe practices at the workplace.

PO4: Work on different software for word processing, PowerPoint presentation, spreadsheets and communicate ideas electronically.

PO5: Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.

PO6: Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.

PO7: Recognize the need, and have the ability, to engage in independent learning for continual development as a Computing professional.

PO8: Demonstrate knowledge and understanding of computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO9: Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

PO10: Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.

Programme Specific Outcomes

1. Understand the Opportunities and Challenges in Industry and to equip the students accordingly.
2. Apply effectively the principles and methods of Computer Technology to a wide range of applications.
3. Apply advanced algorithmic and mathematical concepts to the design and analysis of software.
4. Get proficiency of computing, and to prepare themselves for a continued professional development.

Course Outcome

1. Identify and analyze the computing requirements of a problem and to solve those using computing principles.
2. Understand and Apply mathematical foundation, computing and domain knowledge for the conceptualization of computing model of problems.
3. Use suitable architecture or platform on design and implementation with respect to performance.
4. Apply the management principles with computing knowledge to manage the projects in multidisciplinary environments.
5. Identify opportunities and use innovative ideas to create value and wealth for the betterment of the individual and society.
6. Expertise in developing application with required domain knowledge

DERIVING CURRICULUM AREAS FROM LEARNING OUTCOMES OF THE PROGRAMME

The following curriculum areas are subjects that have been derived from learning outcomes:

Sr. No.	Learning Outcomes	Curriculum Areas/Subjects
1.	Communicate effectively in English with others	– Communication Skill – Student Centered Activities
2.	Apply basic principles of mathematics and science to solve engineering problems	– Applied Mathematics – Applied Physics
3.	Use cutting tools, equipment and tools for fabrication of jobs by following safe practices at the workplace	Workshop Practice
4.	Work on different of two are forward processing, power-point presentation, spread sheets and communicate ideas electronically	Fundamentals of Computer and Information Technology
5.	Assemble, troubleshoot and maintain computer and peripherals and install various software	Computer Architecture and Hardware Maintenance
6.	Use appropriate procedures for energy conservation and for preventing environmental pollution	Environmental Studies
7.	Design page layouts for digital and electronic publications by combining different media elements	Internet and Web Technology
8.	Write, compile and debug programmes using different programming constructs	Concept of Programming Using C
9.	Identify the software process model for specific software application and interpret different phases of software development life cycle	Software Engineering
10.	Create, manage and secure data base	Database Management System
11.	Design, develop and host websites using internet technologies	Internet and Web Technology
12.	Plan and execute given task and project as a team member or a leader	Minor and Major Project Work
13.	Manage e-sources MIS/ ERP effectively at the workplace	Industrial Management and Entrepreneurship Development
14.	Implement OOPS concepts and data structure concepts.	Object Oriented Programming Using Java
15.	Use various functions and components of different operating systems	Operating Systems
16.	Set-up, diagnose problems, troubleshoot computer networks and maintain security of the networks	Data Communication and Computer Networks
17.	Write and debug simple as well as complex programmes in Python	Web Development using HTML/ CSS/ JS Computer Programming using Python
18.	Apply the acquired knowledge and skills in	– Minor Project Work
19.	Solving live problems in the Computer and I.T. industry	– Major Project Work

Basic Physics (DIP101)

Programme Specific outcomes

- 1) After completion of program, students have deep knowledge of basic concepts in Physics.
- 2) Students are expected to acquire core knowledge in Physics, including the major premises of Mechanics and Properties of matter, Modern Physics, Classical and Quantum mechanics, Electricity and Magnetism, Digital Electronics, Optics, Relativity, Heat and Thermodynamic, Solid State Physics, Mathematical and Statistical physics, Atomic, Molecular and Nuclear Physics, Laser and nonconventional energy sources.
- 3) Students are also expected to develop written and oral communication skills in communicating physics-related topics.
- 4) Students should learn how to design and conduct an experiment and understand the basic physics behind it.
- 5) Students will develop the proficiency in the handling of laboratory instruments.
- 6) Students will realize and develop an understanding of the impact of Physics on society and apply conceptual understanding of the physics in real life.

Course Outcomes

- 1) The syllabi are framed in such a way that it bridges the gap between the plus two and 11th levels of Physics by providing a more complete and logical framework in almost all areas of basic Physics.
- 2) By the end of the first year (2nd semester), the students should have attained a common level in basic mechanics, Optics, Heat and Thermodynamics and Electricity and Magnetism. They were developed their experimental and data analysis skills through experiments at laboratories.
- 3) Students should have been introduced to powerful tools for tackling a wide range of topics in, Modern Physics, General Electronics, Mathematical and Statistical Physics and Solid State Physics They develop their experimental and data analysis skills through a wide range of experiments through practical at laboratories.
- 4) Students should have developed their understanding of core Physics by covering a range of topics in almost all areas of physics including Classical and Quantum Mechanics, Electrodynamics, Laser, Fiber optics, semiconductor devices and Non-conventional Energy Sources.

Unit-1: Units And Measurements:

1.1 Need of Measurement in engineering and science, unit of a Physical quantity, requirements of standard unit, systems of units-CGS, MKS and SI, classification of physical quantities – Fundamental and Derived with their units.

1.2 Accuracy, Precision of instruments, Error sin measurement, Estimation of errors –Absolute error, Relative error and percentage error, significant figures. (Simple Problems).

Basic Measuring instruments- Vernier Caliper, Micrometer Screw gauge, inner & outer caliper thermometer, spherometer, and ammeter, voltmeter with their least count, range, accuracy and precision. Standard reference surfaces used in engineering measurements- surface plate, angle plate, V-block, Engineer's square.

Unit -2: General Properties of Matter

2.1 Elasticity: Deforming force, Restoring force, Elastic and plastic body, Stress and strain with their types, Hooke's law, Stress strain diagram, Young's modulus, Bulk modulus, Modulus of rigidity and relation between them (no derivation), (simple problems).

(Simple problems). Stress strain diagrams of H.T. Steel, Cast iron, Aluminum and Concrete, Ultimate and breaking stress, Factor of safety.

2.2 Surface Tension: Forces—cohesive and adhesive, angle of contact, shape of liquid surface in a capillary tube, capillary action with examples, relation between surface tension, capillary rise and radius of capillary (no derivation), (simple problem), effect of impurity and temperature on surface tension.

2.3 Viscosity : Velocity gradient, Newton's law of viscosity, coefficient of viscosity, streamline and turbulent flow, critical velocity, Reynold's number, (simple problems), Stokes law and terminal velocity (no derivation), buoyant (up thrust) force, effect of temperature & adulteration on viscosity of liquid.

Unit – 3:Heat

3.1 Transmission of heat and expansion of solids: Three modes of transmission of heat - conduction, convection and radiation, good and bad conductor of heat with examples, law of thermal conductivity, coefficient of thermal conductivity (simple problems), expansion of solids-linear, aerial and cubical and relation between them.

3.2 Gas laws and specific heats of gases: Boyle's law, Charles's law, Gay Lussac's law, absolute temperature, Kelvin scale of temperature, general gas equation (no derivation) (simple problems), molar or universal gas constant, universal gas equation, standard or normal temperature and pressure (N.T.P.), specific heat of gases, relation between two specific heat (simple problems), thermodynamic variables, first law of thermodynamics (statement & equation only), isothermal, isobaric, isochoric & adiabatic processes (difference among these processes and equations of state) (simple problems).

Unit – 4: Light

4.1 Properties of light: Reflection and refraction, Snell's law, physical significance of refractive index (simple problems), Total internal reflection, dispersion, diffraction and polarization of light (only introduction).

4.2 Wave theory of light & Interference: Newton's corpuscles theory of light, Huygens's wave theory, wave front, Types of wave front-spherical, cylindrical and plane Huygens's principle of propagation of wave front, Principle of super position of waves, Interference of light, constructive and destructive interference, Young's experiment. Analytical treatment of interference, conditions for stationary interference pattern.

4.3 Laser: Light amplification by stimulated emission of radiation, properties of laser, spontaneous and stimulated emission, population inversion, pumping methods, He-Ne laser- construction & working, recording and reconstructing of hologram by using He-Ne laser.

Unit-5: Modern Physics

5.1 Photo electricity : Plank's hypothesis, properties of photons, photo electric effect, laws and characteristics of photoelectric effect, Einstein's photoelectric equation, (simple problems), construction and working of photo electric cell, applications of photoelectric cell.

5.2 X-rays: Production of X-rays, types of X-ray spectra-continuous and characteristics, X-ray wavelength (simple problems), properties of X-rays, applications of X-rays-engineering, medicine and scientific research work.

Reference Books:

1. Physics-I by V. Rajendran Tata McGraw-Hill raw-Hill publication, New Delhi
2. Applied Physics by Arthur Beiser Tata McGraw- Hill raw-Hill publication, New Delhi
3. Engineering Physics by R.K. Gaur & S.L. Gupta Dhanpat Rai Publication, New Delhi
4. Physics by Resnick and Halliday
5. Concept of Physics Part-I & II by H.C. Verma
6. Basic Physics by Foundation Publishing House

Basic Chemistry (DIP102)

Programme Specific Outcome

- Inorganic Chemistry
- Methodology and Perspectives of Sciences and General Informatics
- Organic Chemistry
- Physical Chemistry
- Practical papers– Inorganic, Volumetric, Organic, Physical and Gravimetric experiments

Programme outcome:

Chemistry introduces basic concepts, experimental techniques and applications of chemical sciences and introduces chem. informatics, Green chemistry and micro analytical techniques.

Unit-1

Atomic Structure : Definition of Atom, Fundamental Particles of Atom –their Mass, Charge, Location, Definition of Atomic no, Atomic Mass no., Isotopes & Isobars, & their distinction with suitable examples, Bohr's Theory, Definition, Shape & Distinction between Orbits & Orbitals, Hund's Rule, Filling Up of the Orbitals by Aufbau's Principles (till Atomicno.30), Pauli's exclusion principle, Valency – Definition, types (Electro-valency & Covalency), Distinction, Octet Rule, Duplet Rule, Formation of Electrovalent & Covalent Compounds e.g. NaCl, CaCl₂, MgO, AlCl₃, CO₂, H₂O, Cl₂, NH₃, C₂H₄, N₂, C₂H₂.

Unit-2

Electro chemistry: Definition Ionisation & Electrolytic Dissociation, Arrhenius Theory of Ionisation, Significance of the Terms Involved in Electrolysis. Such as Conductors, Insulators or Dielectrics, Electrolyte, Non Electrolyte, Electrolysis, Electrolytic Cell, Electrodes, Current Density, Temperature, Mechanism of Electrolysis – Primary & Secondary Reactions at Cathode & Anode, Electro chemical Series for Cations & Anions, Electrolysis of CuSO₄ Solution by using Cu Electrode & Platinum Electrode, Electrolysis of NaOH solution & fused NaCl, Faraday's first & second law of Electrolysis & Numericals, Electrochemical Cells & Batteries, Definition, Types (Primary & Secondary Cells), e.g. Construction, Working & Applications of Dry Cell / Laclanche Cell & Lead – Acid Storage Cell, Applications of Electrolysis such as Electroplating & Electro refining, Electro metallurgy & electrotyping Conductivity of Electrolyte– Ohms Law, Definition & Units of Specific Conductivity, Equivalent Conductivity, specific resistance.

Unit-3

Metals & Alloys Metals : Occurrence of Metals, Definition Metallurgy, Mineral, Ore, Gangue, Flux & Slag, Mechanical Properties, Processing of Ore, Stages of Extraction of Metals from its Oresin Detail i.e. Concentration, Reduction, refining. Physical Properties & Applications of some commonly used metals such as Fe, Cu, Al, Cr, Ni, Sn, Pb, Zn, Co, Ag, W.

Alloys: Definition of Alloy, Purposes of Making alloy Preparation Methods, Classification of Alloys such as Ferrous & Non Ferrous, examples. Composition, Properties & Applications of Alnico, Duralumin, Dutch Metal, German Silver /Nickel Silver, Gun Metal, Monel-metal, Wood's Metal, Babbitt Metal.

Unit-4

Non Metallic Materials Plastics : Definition of Plastic, Formation of Plastic by Addition & Condensation Poly-merisation by giving e.g. of Poly ethylene & Back elite plastic Respectively, Types of Plastic, Thermos of tening & Thermo setting Plastic, with Definition, Distinction & e.g. Compounding of Plastics – Resins, Fillers, Plasticizers, Accelerators, Pigments, Engineering Applications of Plastic based on their Properties.

Rubber: Natural Rubber: Its Processing, Drawbacks of Natural Rubber, Vulcanisation of Rubber with Chemical Reaction. Synthetic Rubber: Definition, & e.g., Distinction Between Natural & Synthetic Rubber.

Thermal Insulating Materials: Definition, Characteristics & Applications of Glass, Wool, Thermocole, Asbestos, Cork.

Unit-5

Environmental Effects (Awareness Level): Introduction, Definition, Causes of Pollution, Types of Pollution, Such as Air & Water Pollution.

Air Pollution: Definition, Types of Air Pollutions their Sources & Effects, Such as Gases, Particulates, Deforestation, Radio Active Gases, Control of Air Pollution, Air Pollution Due to Internal Combustion Engine & Its Control Methods, Causes & Effects of Ozone Depletion & Green House Effects.

Water Pollution: Definition, Causes & Methods of Preventing Water Pollution, Types of Waste such as Domestic Waste, Industrial Waste, their Physical & Biological Characteristics, BOD, COD, Biomedical Waste & E-Waste, their Origin, Effects & Control Measures. Preventive Environmental Management (PEM) Activities.

Reference Books:

1. Engineering Chemistry by Jain & Jain Dhanpat Rai and Sons
2. Engineering Chemistry by S.S. Dara S. Chand Publication
3. Industrial Chemistry by B.K. Sharma
4. Environmental Chemistry & Pollution Control by S.S. Dara S. Chand Publication.

Basic Mathematics (DIP103)

Programme Outcome

Formulate and develop mathematical arguments in a logical manner. Also when there is a need for information, the student will be able to identify, locate, evaluate, and effectively use that information for handling issues or solving problems at hand. Acquire good knowledge and understanding in advanced areas of mathematics and its applications.

Programme Specific Outcome

Will be able to apply critical thinking skills to solve problems that can be modelled mathematically, to critically interpret numerical and graphical data, to read and construct mathematical arguments and proofs, to use computer technology appropriately to solve problems and to promote understanding, to apply mathematical knowledge to a career related to mathematical sciences thus cultivating a proper attitude for higher learning in mathematics.

Unit-1

ALGEBRA

1.1 Revision:

- 1.1.1 Laws of Indices
- 1.1.2 Formula of factorization and expansion $[(a^2-b^2), (a+b)^2$ etc.]
- 1.1.3 Laws of logarithm with definition of Natural and Common logarithm.

1.2 Partial Fraction:

- 1.2.1 Definition of polynomial fraction proper & improper fractions and definition of partial fractions.
- 1.2.2 To Resolve proper fraction into partial fraction with denominator containing non repeated linear factors, repeated linear factors and irreducible non repeated quadratic factors.
- 1.2.3 To resolve improper fraction into partial fraction.

1.3 Determinant And Matrices:

Determinant

- 1.3.1 Definition and expansion of determinants of order 2 and 3.
- 1.3.2 Cramer's rule to solve simultaneous equations in 2 and 3 unknowns.

Matrices

- 1.3.3 Definition of a matrix of order $m \times n$ types of matrices.
- 1.3.4 Algebra of matrices such as equality, addition, Subtraction, scalar multiplication and multiplication.
- 1.3.5 Transpose of a matrix.
- 1.3.6 Minor, cofactor of an element of a matrix, adjoint of matrix and inverse of matrix byad joint method.
- 1.3.7 Solution of simultaneous equations containing 2 and 3 unknowns by matrix inversion method.

1.4 Binomial Theorem:

- 1.4.1 Definition of factorial notation, definition of permutation and combinations with formula.
- 1.4.2 Binomial theorem for positive index.
- 1.4.3 General term.
- 1.4.4 Binomial theorem for negative index.
- 1.4.5 Approximate value (only formula)

Unit-2

TRIGONOMETRY

2.1 Revision:

- 2.1.1 Measurement of an angle (degree and radian). Relation Between degree and radian.
- 2.1.2 Trigonometric ratios of $0^\circ, 30^\circ, 45^\circ$ etc.
- 2.1.3 Fundamental identities.

2.2 Trigonometric Ratios of Allied, Compound, Multiple & Sub-multiple Angles

(Questions based on numerical computations, which can also be done by calculators, need not be asked particularly for allied angles).

2.3 Factorization And Defactorization Formulae:

2.4 Inverse Trigonometric Ratios:

- 2.4.1 Definition of inverse trigonometric ratios, Principal values of Inverse trigonometric ratios.
- 2.4.2 Relation between inverse trigonometric ratios.

2.5 Properties of Triangle

- 2.5.1 Sine, Cosine, Projection and tangent rules (without proof)
- 2.5.2 Simple problems.

Unit-3

COORDINATE GEOMETRY

3.1 Point And Distances:

- 3.1.1 Distance formula, Section formula, midpoint, centroid of triangle.
- 3.1.2 Area of triangle and condition of collinearity.

3.2 Straight Line:

- 3.2.1 Slope and intercept of straight line.
- 3.2.2 Equation of straight line in slope point form, slope-intercept form, two-point form, two-intercept form, normal form. General equation of line.
- 3.2.3 Angle between two straight lines condition of parallel and perpendicular lines.
- 3.2.4 Intersection of two lines.
- 3.2.5 Length of perpendicular from a point on the line and perpendicular distance between parallel lines.

3.3 Circle:

- 3.3.1 Equation of circle in standard form, centre – radius form, diameter form, two –intercept form.
- 3.3.2 General equation of circle, its centre and radius.

Unit-4

VECTORS

- 4.1 Definition of vector, position vector, Algebra of vectors (Equality, addition, subtraction and scalar multiplication)
- 4.2 Dot (Scalar) product with properties.
- 4.3 Vector (Cross) product with properties.
- 4.4 **Applications**
- 4.4.1 Work done and moment of force about a point & line

Reference Books:

1. Mathematics for Polytechnic by S.P. Deshpande Pune Vidyarthi Griha
2. Trigonometry by S.L. Lonely S. Chand Publication
3. Higher Algebra by H.S. Hall & S.R. Knight Metric edition, Book Palace, New Delhi
4. College Algebra by Frc. G. Valles Charotar Publication
5. Matrices by Aryes Schuam series, McGraw Hill
6. Higher Engineering Mathematics by B.S. Grewal Khanna Publications New Delhi
7. Engineering Mathematics by S.S. Sastry Prentice Hall of India

Communication Skills-I (DIP104)

Course Objectives:

1. To make the students confident of speaking in English impeccably and with utmost enthusiasm.
2. To familiarize the students with different styles of communication.
3. To enlighten the students with the seven concepts of communication.
4. To make the students understand the nuances of communication.
5. To train the students and make them comprehend various aspects of Interview skills.

Course Outcomes:

At the end of the course, the students would be able to:

1. Develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others.
2. Understand and practice different techniques of communication.
3. Practice and adhere to the 7Cs of Communication.
4. Familiarize with different types of Communication.
5. Understand and practice Interview Etiquettes.

Contents: Theory

Unit-1

Introduction: Definition, Objectives, Stages of Communication, Essentials of Good/ Effective Communication, Benefits of Good Communication, Gaps in Communication, Communication and Information Technology. Business Correspondence: Structure of a Letter, Inquiry Letter, Sales Letter, Order Letter, Complaints, Complaint Handling, Telemarketing.

Unit-2

Government Correspondence: Noting, Routine Letter, Demi-Official Letter Memorandum, Circular, Telegrams, Newsletter. Writing Skills: Report Writing, Scientific Paper Writing, Writing Small Paragraphs & Essays.

Unit-3

2-3 classic short stories, 2-3 great short stories by Indian writers. Preparation for Job: Writing Applications for Jobs, Preparing Curriculum Vitae, Preparing for Interviews, Preparing for Group Discussions.

Unit-4

Grammar:

Sentence Structure, Idiomatic Usage of Language, Tenses, Direct & Indirect Parts of Speech, Active & Passive Voice, Vocabulary.

Unit-5

Preparation for Job:

Writing Applications for Jobs, Preparing Curriculum Vitae, Preparing for Interviews, Preparing for Group Discussions.

Reference Books:

1. Organizations- Structures, Processes and Outcomes; Richard Hall; Prentice Hall India.
2. English for the Secretary; Yvonne Hoban; Tata McGraw Hill.
3. Technical Communication: M. Raman & S. Sharma; Oxford University Press.
4. Business Communication Process and Product: M.E. Guffey; Thomson Learning.
5. Human Behavior at Work; John W Newsom & Keith Davis; Tata McGraw Hill.
6. The Most Common Mistakes in English Usage; Thomas Elliot Berry, Tata McGraw Hill
7. Business Communication: R.K. Madhukar; Vikas Publication.

Engineering Graphics (DIP105)

Course Objectives:

1. To improve imagination skills.
2. Increase ability to communicate with people.
3. Learn to sketch and take field dimensions.
4. Learn to take data and transform it into graphic drawings.
5. Learn basic engineering drawing formats.
6. Prepare the student for future Engineering positions.

Course Outcomes:

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

1. Get acquainted with the knowledge of various lines, geometrical constructions and construction of various kinds of scales, and Ellipse.
2. Improve their imagination skills by gaining knowledge about points, lines and planes.
3. Become proficient in drawing the projections of various solids.
4. Gain knowledge about orthographic and isometric projections.

Contents (Theory)

Unit -1

Drawing Instruments and their uses:

- 1.1 Letters and numbers (single stroke vertical)
- 1.2 Convention of lines and their applications.
- 1.3 Scale (reduced, enlarged & full size) plain scale and diagonal scale.
- 1.4 Sheet layout.
- 1.5 Introduction to CAD (Basic draw and modify Command).
- 1.6 Geometrical constructions.

Unit -2

Engineering

- 2.1 **Curves & Loci of Point: To drawn ellipse by:**
 - 2.1.1 Directrix and focus method
 - 2.1.2 Arcs of circle method.
 - 2.1.3 Concentric circles method.
- 2.2 **To draw a parabola by:**
 - 2.2.1 Directrix and focus method
 - 2.2.2 Rectangle method
- 2.3 **To draw a hyperbola by:**
 - 2.3.1 Directrix and focus method
 - 2.3.2 Passing through given points with reference to asymptotes.
 - 2.3.3 Transverse Axis and focus method.
- 2.4 **To draw involutes of circle & polygon (up to hexagon)**
- 2.5 **To draw a cycloid, 21 picycloids, hypocycloid To draw Helix & spiral.**
- 2.6 **Loci of Points:**
- 2.7 **Loci of points with given conditions and examples**
 - 2.7.1 Related to simple mechanisms.

Unit -3

Orthographic projections:

- 3.1 Introduction to Orthographic projections.

- 3.2 Conversion of pictorial view into Orthographic Views (First Angle Projection Method Only).
- 3.3 Dimensioning technique as per SP-46.

Unit –4

Isometric projection:

- 4.1 Isometric scale.
- 4.2 Conversion of orthographic views into isometric View/ projection (Simple objects)
- 4.3 Projection of Straight Lines and Planes. (First Angle Projection Method only).

Unit –5

- 5.1 Line sinC line to one reference plane only and limited to both end sin one quadrant.
- 5.2 Projection of simple planes of circular, square, rectangular, rhombus, pentagonal, and hexagonal, inclined to one reference plane and perpendicular to the other.

Reference Books:

1. Engineering Drawing by N.D. Bhatta Charotar Publishing House
2. Engineering Drawing by R. K. Dhawan S. Chand Co.
3. Engineering Drawing by P.J.Shah
4. Engineering Graphics by K.R. Mohan Dhanpat Rai and Publication Co
5. Engineering Graphics by Dharmendra Kumar Foundation Publishing House

Computer Fundamentals (DIP106)

Objectives:

- To understand basics of computer and working with OS
- To develop working skills with productivity tools, graphics designing and Internet.
- To acquire basic programming skills.
- To apply computing in problem solving.

Course Outcomes

- After successfully completing this course, a student will be able to:
- Converse in basic computer terminology
- Formulate opinions about the impact of computers on society
- Possess the knowledge of basic hardware peripherals
- Know and use different number systems and the basics of programming

Contents: Theory

Unit-1

Evolution of computer, Data and Information, Characteristics of computers, Various fields of application of computers, various fields of computer (Hardware, Software, Human ware and Firmware), Advantages and Limitations of computer, Block diagram of computer Function of different units of computer, Classification of computers Types of software (System and Application), Compiler and Interpreter, Generation of language (Machine Level, Assembly, High Level, 4GL).

Unit-2

Input and Output Devices, Computer Memory: & Number System (Logic gates) Primary Memory (ROM and it's type- PROM, EPROM, EEPROM, RAM) Secondary memory-SASD, DASD Concept, Magnetic Disks-Floppy disks, Hard disks, Magnetic Tape, Optical disks - CD ROM and it's type (CD ROM, CD ROM-R, DVD, Flash Memory. Introduction to Number System, Conversion of Number System, Signed and Unsigned Numbers, Binary Coding, Logic gates, Boolean algebra, Combination of Logic Gates.

Unit-3

Operating System Concept:

Introduction to operating system; Function of OS, Types of operating systems, Booting Procedure, Start-up sequence, Dos - History, Files and Directories, Internal and External Commands, Batch Files

Unit-4

Editors and Word Processor S5

Basic Concepts: MS-Word, Introduction to desktop publishing Spread sheets and Data base packages: Purpose, usage, commands- MS-Excel Creation of files in MS- Access, MS-PowerPoint

Unit-5

Concept of Data Communication and Networking: Networking Concepts, Types of networking (LAN, MAN AND WAN), Communication Media, Mode of Transmission (Simplex, Half Duplex, Full Duplex), Analog and Digital Transmission. Synchronous and Asynchronous Transmission, Different Topologies

Reference Books:

1. Leon and Leon; Introduction to Information Technology, Leon Tech World.
2. Microsoft Office-2000 Complete-BPB Publication.
3. Sinha, Kr. Pradeep and Preeti Sinha; Foundations of Computing, BPB Publication.
4. Jain, V.K.; Computers and Beginners

SEMESTER-2

THEORY		PERIOD			Evaluation Scheme			Credit
CODE	NAME OF THE PAPER	LECTURES	TUTORIALS	PRACTICALS	IA	ESE	SUB-TOTAL	
DIP201	Communication Skills-II	3	1	0	30	70	100	4
DIP202	Engineering Mathematics-I	3	1	0	30	70	100	4
DIP203	Applied Science	4	0	0	30	70	100	4
DIP204	Engineering Mechanics	4	0	0	30	70	100	4
DIP205	Engineering Drawing	3	0	1	30	70	100	4
DIP206	Basic Workshop practice	3	0	1	30	70	100	4
DIP207L	Engineering Drawing Lab	0	0	2	15	35	50	2
DIP208L	Chemistry LAB	0	0	2	15	35	50	2
							Total Credits:	28

Communication Skills-II (DIP201)

Course Objectives:

1. Ability to be comfortable with English in use while reading or listening.
2. Ability to use receptive skills through reading and listening to acquire good exposure to language and literature.
3. Ability to write and speak good English in all situations.
4. Students should develop style in speech and writing and manipulate the tools of language for effective communication.
5. The course should provide exposure to the learners in Good Prose texts and Poems and expose the learners to value based ideas.

Course Outcomes:

1. Students can read and understand any text in English listening to the inputs given by the teacher in the classroom.
2. Students imbibe the rules of language unconsciously and tune to deduce language structure and usage.
3. Students write paragraphs, essays, and letters.
4. Students decipher the mechanism of language and use it for success in competitive examinations and job related speaking and writing tasks.

Contents Theory

Unit-1

Introduction to communication:

- 1.1 Definition, Communication Cycle/Process,
- 1.2 The elements of communication: sender-message- channel-Receiver-Feedback & Context.
- 1.3 Definition of Communication Process.
- 1.4 Stages in the process: defining the context, knowing the audience, designing the message, encoding, selecting proper channels, transmitting, receiving, decoding and giving feedback.

Unit-2

Types of communication:

2.1 Forma l- Informal, Verbal- Non verbal, Vertical- Horizontal- Diagonal.

Unit-3

Principals of effective communication:

3.1 Definition of Effective Communication.

3.2 Communication Barriers & how to over come them.

3.3 Developing effective messages: Thinking about purpose, knowing the audience, structuring the message, selecting proper channels, minimizing barriers & facilitating feedback.

Unit-4

Non verbal- graphic communication:

4.1 Noun- verbal codes: A- Kinesics, B- Proxemics, C – Haptics, D- Vocalics, E- Physical appearance. F- Chronemics, G- Artifacts Aspects of Body Language Interpreting Visuals & illustrating with Visuals like Tables, Charts & graphs.

Unit-5

Formal written skills:

5.1 Office Drafting: Circular, Notice, and Memo.

5.2 Job Application with resume.

5.3 Business correspondence: Enquiry, Order letter, Complaint letter, and Adjustment letter.

5.4 Report writing: Accident report, falling production, Progress/ Investigative.

5.5 Defining & describing objects & giving Instructions.

Reference Books:

1. Developing Communication Skills by Krushna Mohan, Meera Banerji Macmillan
2. Communication Skills by Joyeeta Bhattacharya Reliable Series
3. Everyones guide to effective writing by Jayakaran Apple Publishing
4. Communication Skills-II by Foundation Publishing House
5. Effectual Communication Skills by Bhupender Kour S.K. Kataria & Sons.
6. The Functional Aspects of Communication Skills by Dr.P.Prasad S.K. Kataria & Sons.
7. Technical Communication for Engineers by Shalini Verma Vikas Publishing Home Pvt. Ltd.
8. Professional Communication by Dr. Raavee Tripathi S.K. Kataria & Sons.

Engineering Mathematics-I (DIP202)

Course Objectives:

- To recall and remember basics of matrices, complex numbers, and differential calculus.
- To understand the concepts of basic mathematical methods for matrices, complex numbers and differential calculus.
- To apply methods to solve engineering problems.
- To analyze engineering problems and evaluate.
- To solve and evaluate the problems using matrices, complex numbers, and differential calculus. Course

Outcomes:

- Students will be able to remember terminologies and formulae in matrices, complex numbers, and differential calculus.
- Students will be able to understand and interpret the concepts of matrices, complex numbers, and differential calculus.
- Students will be able to compare and analyze the methods in matrices, complex numbers, and differential calculus.
- Students will be able to predict and evaluate the problems in matrices, complex numbers, and differential calculus.

Contents theory

Unit-1

Function and Limit:

1.1 Function

- 1.1.1 Definitions of variable, constant, intervals such as open, closed, semi-open etc.
- 1.1.2 Definition of Function, value of a function and types of functions, Simple Examples.

1.2 Limits

- 1.2.1 Definition of neighborhood, concept and definition limit.
- 1.2.2 Limits of algebraic, trigonometric, exponential and logarithmic functions with simple examples.

Unit-2

Derivatives:

- 2.1 Definition of Derivatives, notations.
- 2.2 Derivatives of Standard Functions
- 2.3 Rules of Differentiation. (Without proof). Such as Derivatives of Sum or difference, scalar multiplication, Product and quotient.
- 2.4 Derivatives of composite function (Chain rule)
- 2.5 Derivatives of inverse and inverse trigonometric functions.
- 2.6 Derivatives of Implicit Function
- 2.7 Logarithmic differentiation
- 2.8 Derivatives of parametric Functions.
- 2.9 Derivatives of one function w.r.t another function
- 2.10 Second order Differentiation.

Unit-3

Statistics And Probability:

3.1 Statistics

- 3.1.1 Measures of Central tendency (mean, median, mode) for ungrouped and grouped frequency distribution.
- 3.1.2 Graphical representation (Histogram and Ogive Curves) to find mode and median.
- 3.1.3 Measures of Dispersion such as range, mean deviation, Standard Deviation, Variance and coefficient of variation.
Comparison of two sets of observations.

3.2 Probability

- 3.2.1 Definition of random experiment, sample space, event, Occurrence of event and types of events (impossible, mutually exclusive, exhaustive, equally likely).
- 3.2.2 Definition of Probability, addition and multiplication theorems of Probability

Unit-4

4.1 Applications of Derivative

- 4.1.1 Geometrical meaning of Derivative, Equation of tangent and Normal.
- 4.1.2 Rates and Motion
- 4.1.3 Maxima and minima
- 4.1.4 Radius of Curvature

4.2 Complex number

- 4.2.1 Definition of Complex number. Cartesian, polar, Exponential forms of Complex number.
- 4.2.2 Algebra of Complex number (Equality, addition, Subtraction, Multiplication and Division)
- 4.2.3 De- Moivre's theorem (without proof) and simple problems. Euler's form of Circular functions, hyperbolic functions and relations between circular & hyperbolic functions

Reference Books:

1. Mathematics for Polytechnic by S.P. Deshpande Pune Vidyarthi Griha Prakashan Pune.
2. Calculus single Variable by Robert T Smith Tata McGraw Hill
3. Advanced Engineering Mathematics by Dass H.K. S. Chand Publication, New Delhi
4. Fundamentals of Mathematical Statistics by S.C. Gupta and Kapoor S. Chand Publication New Delhi
5. Higher Engineering Mathematics by B.S. Grewal Khanna Publication, New Delhi
6. Applied Mathematics by P.N. Wartikar Pune Vidyarthi Griha Prakashan, Pune.
7. Engineering Mathematics by Sindhu Prasad Foundation Publishing House

Applied Science (DIP203)

Programme Specific outcomes

- 1) After completion of program, students have deep knowledge of basic concepts in Physics.
- 2) Students are expected to acquire core knowledge in Physics, including the major premises of Mechanics and Properties of matter, Modern Physics, Classical and Quantum mechanics, Electricity and Magnetism, Digital Electronics, Optics, Relativity, Heat and Thermodynamic, Solid State Physics, Mathematical and Statistical physics, Atomic, Molecular and Nuclear Physics, Laser and nonconventional energy sources.
- 3) Students are also expected to develop written and oral communication skills in communicating physics-related topics.
- 4) Students should learn how to design and conduct an experiment and understand the basic physics behind it.
- 5) Students will develop the proficiency in the handling of laboratory instruments.

Course Outcomes

- 1) The syllabi are framed in such a way that it bridges the gap between the plus two and 11th levels of Physics by providing a more complete and logical framework in almost all areas of basic Physics.
- 2) By the end of the first year (2nd semester), the students should have attained a common level in basic mechanics, Optics, Heat and Thermodynamics and Electricity and Magnetism. They were developed their experimental and data analysis skills through experiments at laboratories.
- 3) Students should have been introduced to powerful tools for tackling a wide range of topics in, Modern Physics, General Electronics, Mathematical and Statistical Physics and Solid State Physics They develop their experimental and data analysis skills through a wide range of experiments through practical at laboratories.

(A) PHYSICS

Unit-1

1. Kinematics

Rectilinear Motion

Equations of Motions- $v = u + at$, $S = ut + \frac{1}{2}at^2$, $V^2 = u^2 + 2as$ (only equation), Distance traveled by particle in n^{th} second, Velocity Time Diagrams- uniform velocity, uniform acceleration and uniform retardation, equations of motion formation under gravity.

Angular Motion

Definition of angular displacement, angular velocity, angular acceleration, Relation between angular velocity and linear velocity, Three equations of circular motion (no derivation) angular distance traveled by particle in n^{th} second (only equation), Definition of S.H.M. and S.H.M. as projection of uniform circular motion on any one diameter, Equation of S.H.M. and Graphical representation of displacement, velocity, acceleration of particle in S.H.M. for S.H.M. starting from mean position and from extreme position.

Unit-2

2. Kinetics

Definitions of momentum, impulse, impulsive force, Statements of Newton's laws of motion and with equations, Applications of laws of motion—Recoil of gun, Motion of two connected bodies by light inextensible string passing over smooth pulley, Motion of lift.

Work, Power, Energy

Definition of work, power and energy, equations for P.E.K.E., Work energy principle, Representation of

work by using graph, Work done by a torque (no derivation).

Unit -3

Non– destructive testing of Materials.

Testing methods of materials -Destructive and Non destructive, Advantages and Limitations of N.D.T., Names of N.D.T. Methods used in industries, Factors on Which selection of N.D.T. depends, Study of Principle, Setup, Procedure.

Working, Advantages, limitations, Applications and Application code of following N.D.T. methods - Penetrant method, Magnetic particle method, Radiography, Ultrasonic, Thermography.

Unit-4

Acoustics and Indoor Lighting of Buildings

Acoustics

Weber and Fletcher's law, limit of intensity and loudness, echo, Reverberation and reverberation time (Sabine's formula), Timbre (quality of sound), Pitch or Frequency of sound. Factors affecting Acoustical planning of auditorium-- echo, reverberation, creep, focusing, standing wave, coefficient of absorption, sound insulation, noise pollution and the different ways of controlling these factors.

Indoor lighting

Definition of luminous intensity, intensity of illumination with their SI units, Inverse square law and Photometric equation, Bunsen's photometer—ray diagram, working and applications, Need of indoor lighting, Indoor lighting schemes and Factors Affecting Indoor Lighting.

Reference Books:-

1. Physics–I by V. Rajendran Tata McGraw-Hill
2. Applied Physics by Arthur Beiser Tata McGraw –Hill
3. Engineering Physics by R.K. Gaurand and S.L. Gupta Dhanpat rai
4. Physics by Resrie and Holliday
5. Concept of Physics Part-I,II by H.C. Verma
6. Applied science by Roshan Kr. Sinha Foundation Publishing House

(B) CHEMISTRY

Programme Specific Outcome

- Inorganic Chemistry
- Methodology and Perspectives of Sciences and General Informatics
- Organic Chemistry
- Physical Chemistry
- Practical papers– Inorganic, Volumetric, Organic, Physical and Gravimetric experiments

Programme outcome:

Chemistry introduces basic concepts, experimental techniques and applications of chemical sciences and introduces cheminformatics, Green chemistry and micro analytical techniques.

Unit-1

Electrochemistry

Definition of Electrolyte & Conductor, Difference between Metallic & Electrolytic Conduction, Ionisation, Degree of Ionisation & Factors Affecting Degree of Ionisation, Conductivity of Electrolytes.

Definition of Electrochemical Cell, Battery, Charge, Discharge, Closed Circuit Voltage, Open Circuit Voltage, EMF, Internal Resistance, Separator, Classification of Batteries such as Primary, Secondary &

Reserve with Examples.

Industrial Application of Electrolysis– Metallic or Protective Factors for Selection of Method of Coating, Process of Electroplating, Electro refining, Electrometallurgy (Applications of Electroplating), Impregnated Coating or Cementation on Base Metal Steel-Coating Metal Zn (Sheradizing), Cr (Chomozing), Al (Colorizing), Applications, Advantages & Disadvantages.

Unit-2

Non Metallic Engineering Materials

(Plastic, Rubber, Insulators, Refractories, Composite Material, Ceramics)

1. Engineering Plastic:

Special Characteristics & Engineering Applications of Polyamides or Nylons, Polycarbonates (Like Lexan, Merlan), Polyurethanes (Like Perlon – U), Silicons, Polyacetals, Teflon, Laminated Plastic, Thermocole, Reinforced Plastic.

2. Ceramics:

Definition, Properties & Engineering Applications, Types – Structural Ceramics, Facing Material, Refractories, Fine Ceramics, Special Ceramics.

3. Refractories:

Definition, Properties, Applications & Uses of Fire Clay, Bricks, Silica Bricks.

4. Composite Materials:

Definition, Properties, Advantages, Applications & Examples.

Unit-3

Metals & alloys

Metals – Metallurgy of Iron, Terms Involved in Metallurgy, Indian Resources of Fe, Imp Ores, Extraction, Smelting in Blast Furnace, Chemical Reactions in Blast Furnace, Products of Blast Furnace, their Composition, Application, Commercial Forms of Iron, (Pig Iron /Cast Iron, Wrought or Malleable Steel), their Composition, Properties & Applications, Types of Casting (Chilled Casting, Centrifugal Casting & Malleable Casting), Heat Treatment, Heat Treatment of Cast Iron & Steel.

Alloys–Definition, Types, Ferrous Alloys– Steel, Composition, Properties & Applications of Plain Carbon Steel (Low Carbon, Medium Carbon, High Carbon & Very Hard Steel) & Alloy Steels, (Heat Resisting, Shock Resisting, Magnetic, Stainless, Tool Steel & HSS), Effect of Various Alloying Elements (Cr, W, V, Ni, Mn, Mo, Si) etc. on Steel.

Non-Ferrous Alloys – Copper Alloy – Brass, Bronze, Nickel Silver or German Silver, their Composition, Properties & Applications, Aluminium Alloy–Duralumin, Bearing Alloy–Babbitt Metal, Solders–Soft Solder, Brazing Alloy, Tinamann’s Solder, Nickel Alloy – Monel Metal, Low Melting Alloys–Woods Metal.

Unit-4

Corrosion

Definition, Types, Atmospheric or Chemical Corrosion, Mechanism, Factors Affecting Atmospheric, Corrosion & Immersed Corrosion or Electrochemical Corrosion, Mechanism, Protection of Metals by Purification of Metals, Alloy Formation, Cathode Protection, Controlling the External Conditions & Application of Protective Coatings i.e. Galvanising, Tinning, Metal Spraying, Sherardizing, Electroplating, Metal Clodding, Cementation or Diffusion Method, their Definition, Procedure, Uses, Advantages & Disadvantages, Examples of Non Corrosive Materials, Protection of Corrosion by the Use of Organic Coating Like Paint, Lacquer, Enamels, Emulsion Paints, Special Paints, their Properties & Uses.

Special Paints – Heat Resistant, Cellulose Paint, Coaltar Paint, Anti fouling Paint their constituents & applications.

Unit-5

Lubricant

Lubricant, Types, Lubrication Mechanism by Fluid Film, Boundary, Extreme Pressure, Physical Characteristics of Lubricants Such as Viscosity, Viscosity Index, Oilness, Volatility, Flash & Fire Point,

Cloud & Pour Point, Chemical Characteristics such as Acid Value or Neutralization Number, Emulsification, Saponification Value, Selection of Lubricants for Various Types of Machineries.

Reference Books:-

1. Engineering Chemistry by Jain & Jain Dhanpat Rai and Sons
2. Engineering Chemistry by S.S. Dara S. Chand Publication
3. Industrial Chemistry by B.K. Sharma Goel Publication
4. Environmental Chemistry & Pollution Control by S.S. Dara S. Chand Publication

Engineering Mechanics (DIP204)

Course Objectives:

1. Understand the scalar representation of forces and moments.
2. Describe static equilibrium of particles and rigid bodies in two dimensions including the effect of friction.
3. Analyse the properties of surfaces and solids in relation to moment of inertia.
4. Illustrate the laws of motion, kinematics of motion and their relationship.
5. Study the mechanical vibration without and with damping of SODF and MDOF.

Course Outcomes:

After successful completion of this course, the students should be able to:

CO1: Construct free body diagram and calculate the reactions necessary to ensure static equilibrium.

CO2: Study the effect of friction in static and dynamic conditions.

CO3: Understand the different properties of surfaces in relation to moment of inertia.

CO4: Analyse and solve different problems of kinematics and kinetics.

Contents Theory

Unit-1

Force

1. **Fundamentals:**-Definitions of mechanics, statics, dynamics. Engineering Mechanics, body, rigid body, mass, weight, length, time, scalar and vector, fundamental units, derived units, S.I. units.
2. **Force:** - Definition of a force, unit force, Newton, S.I. unit of a force, representation of a force by vector and by Bow's notation method. Characteristics of a force, effects of a force, principle of transmissibility.
3. **Resolution of a force:** Definition, Method of resolution, Types of component forces, Perpendicular components and Non- perpendicular components.
4. **Moment of a force:**- Definition, measurement of moment of a force, S. I. unit, geometrical meaning of moment of a force, classification of moments according to direction of rotation, sign convention, law of moments Varignon's theorem of moment and it's use, couple –definition, S.I. unit, measurement of a couple, properties of couple.
5. **Force system:**- Definition, classification of force system according to plan and line of action
6. **Composition of Forces:**- Definition, Resultant force, methods of composition of forces,
I – Analytical method:– (i) Trigonometric method (law of parallelogram of forces) (ii) Algebraic method (method of resolution),
II – Graphical method:- Introduction, space diagram, vector diagram, polar diagram, and funicular polygon. Resultant of concurrent, non-concurrent and parallel force system by analytical and graphical method.

Unit -2

Equilibrium:

Definition, conditions of equilibrium, analytical and graphical conditions of equilibrium for concurrent, non-concurrent and parallel force system, free body and free body diagram.

Lami's Theorem – statement and explanation, Application of Lami's theorem for solving various engineering problems.

Equilibrant–Definition, relation between resultant and equilibrant, equilibrant of concurrent and non-concurrent force system.

Beams– Definition, Types of beams (cantilever, simply supported, overhanging, fixed, continuous), Types of end supports (simple support, hinged, roller), classification of loads, point load, uniformly distributed load. Reactions of a simply supported and over hanging beam by analytical and graphical method.

Unit-3

Friction:

- 3.1 Definition of friction, force of friction, limiting frictional force, coefficient of friction, angle of friction, angle of repose, relation between angle of friction angle of repose and coeff. of friction. Cone of friction, types of friction, laws of friction, advantages and disadvantages of friction.
- 3.2 Equilibrium of bodies on level plane—external force applied horizontal and inclined up and down.
- 3.3 Equilibrium of bodies on inclined plane – external forces is applied parallel to the plane, horizontal and incline to inclined plane.
- 3.4 Ladder friction, Wedge and block.

Unit-4

Centroid and Centre Of Gravity:

- 4.1 **Centroid:** Definition of centroid. Moment of an area about an axis. Centroid of basic geometrical figures such as square, rectangle, triangle, circle, semicircle and quarter circle. Centroid of composite figure.
- 4.2 **Center of gravity:** Definition, center of gravity of simple solids such as cylinder, sphere, hemisphere, cone, cube, and rectangular block. Centre of gravity of composite solids.

Unit-5

Simple Machines:

- 5.1 Definitions of simple machine, compound machine , load , effort ,mechanical advantage, velocity ratio, input on a machine, output of a machine ,efficiency of a machine , expression for mechanical advantage, velocity ratio and efficiency of a machine. Ideal machine, ideal effort and ideal load, friction in machines, effort lost in friction and frictional load.
- 5.2 Law of machine, maximum mechanical advantage and maximum efficiency of a machine, reversibility of a machine, condition for reversibility of a machine, self-locking machine.

Reference Books:-

1. Engineering Mechanics by Beer-Johnson Tata McGraw Hill, Delhi
2. Engineering Mechanics by Basu Tata McGraw Hill, Delhi
3. Vector Mechanics for Engineers Vol.-I & II by Joslph F.Shelley Tata McGraw Hill, Delhi
4. Engg. Mechanics by Ram Manohar Pandey Foundation Publishing House

Engineering Drawing (DIP205)

Course Objectives

To understand techniques of drawings in various fields of engineering

Course Outcomes (COs)

CO1: To know about different types of lines & use of different types of pencils in an engg. Drawing

CO2: To know how to represent letters & numbers in drawing sheet

CO3: To know about different types of projection

CO4: To know projection of points, straight lines, solids etc.

CO5: To know development of different types of surfaces.

CO6: To know about isometric projection.

Contents (Theory)

Unit-1

Projections of Solids

Projections of Prism, Pyramid, Cone, Cylinder, Tetrahedron, Cube with their axes inclined to reference plane and parallel to other, Resting on their base on HP. (Draw in sheet and software).

Unit-2

Isometric Projection

Conversion of Orthographic Views into Isometric view/ projection (Including rectangular, cylindrical objects, representation of slots on sloping as well as plane surfaces). (Draw in sheet and software).

Unit-3

Developments of Surfaces

Developments of Lateral surfaces of cube, prisms, cylinder, pyramids, cone and their applications such as tray, funnel, Chimney, pipe, bends etc.

Unit - 4

Threads: Thread terminology, Types of thread (Acme, Buttress, Square, Sellers, Whitworth, Knuckle, Metric, Unified)

Unit -5

Free Hand Sketches

Free hand sketches of nuts, bolts, rivets, split pin, foundation bolts.

Text Books:-

1. Engineering Drawing by N.D. Bhatta Charotkar Publishing House
2. Engineering Drawing by R.K. Dhawan S. Chand Co.
3. Engineering Drawing by P.J. Shah
4. Machine Drawing by N.D. Bhatta Charotkar Publishing House
5. Engineering Drawing and Graphics + Auto CAD by K. Venugopal New Age Publication
6. Engineering Graphics by K.R. Mohan Dhanpat Rai and Publication Co.
7. Machine Drawing by R.K. Dhawan S. Chand Co.
8. Engineering Drawing by Dharmendra Kumar Foundation Publishing Hou

SEMESTER-3								
THEORY		PERIOD			EVALUATION SCHEME			Credit
CODE	NAME OF THE PAPER	LECTURES	TUTORIALS	PRACTICALS	IA	ESE	SUB-TOTAL	
DIP301	Engineering Mathematics-II	3	1	0	30	70	100	4
DIP302	Computer Programming Through "C"	3	1	0	30	70	100	4
DIP3EEE03	Electrical Measurement	4	0	0	30	70	100	4
DIP3EEE04	Electrical Power System-I	4	0	0	30	70	100	4
DIP3EEE05	Basic Electronics	3	0	1	30	70	100	4
DIP3EEE06L	LAB (ISP&C)	0	0	2	15	35	50	2
DIP3EEE07L	Basic Electrical and Electronics Lab	0	0	2	15	35	50	2
							600	
							Total Credits:	24

Engineering Mathematics-II (DIP301)

Unit 1: Integration: (18 Hrs.)

Definition of integration as anti derivative, Integration of standard function, Rules of integration (Integrals of sum, difference, scalar multiplication), Methods of Integration, Integration by substituting, Integration of rational functions, Integration by partial fractions, Integration by trigonometric transformation, Integration by parts, Definite Integration, Definition of definite integral, Properties of definite integral with simple problems, Applications of definite integrals, Area under the curve. Area bounded by two curves, Volume of revolution, Centre of gravity of a rod, plane lamina, Moment of Inertia of uniform rod, rectangular lamina, Theorems of parallel and perpendicular axes.

Unit 2: Differential Equation: (10 Hrs.)

Definition of differential equation, order and degree of differential equation. Formation of differential equation for function containing single constant, Solution of differential equations of first order and first degree such as variable separable type, reducible to Variable separable, Homogeneous, Non homogeneous, Exact, Linear and Bernoulli equations. Applications of Differential equations, Recti linear motion (motion under constant and variable acceleration), Simple Harmonic Motion.

Unit 3: Probability Distribution: (8 Hrs.)

Binomial distribution, Poisson's distribution, Normal distribution, Simple examples corresponding to production process.

Unit 4: Numerical Methods: (6 Hrs.)

Solution of algebraic equations Bisection method, Regula-falsi method and Newton – Raphson method. Solution of simultaneous equations containing 2 and 3 unknowns Gauss elimination method. Iterative methods- Gauss Seidal and Jacobi's methods.

Reference Books:

1. S. P. Deshpande, Mathematics for Polytechnic”, Pune Vidyarthi Griha Prakashan.
2. Robert T. Smith, Calculus: Single variable”, Tata McGraw Hill.
3. Lipschutz, Laplace Transform”, Schaum outline series.
4. Brown, Fourier series and boundary value Problem”, Tata McGraw Hill.
5. B.S. Grewal, Higher Engineering Mathematics”, Khanna Publication New Delhi.

Computer Programming through 'C' (DIP302)

Course Objectives :

- Programming basics and the fundamentals of C.
- Data types in C.
- Mathematical and logical operations.
- Using if statement and loops.
- Arranging data in arrays.
- Implementing pointers.
- File management and dynamic memory allocation

Course Outcomes (CO)

- Develop a C program.
- Control the sequence of the program and give logical outputs.
- Implement strings in your C program.
- Store different data types in the same memory.
- Manage I/O operations in your C program.
- Repeat the sequence of instructions and points for a memory location.

Contents: Theory

Unit-1: Introduction To Programming:(3 Hrs.)

The Basic Model of Computation, Algorithms, Flow-charts, Programming, Languages, Compilation, Linking and Loading, Testing and Debugging, Documentation. Programming Style-Names, Documentation & Format, Refinement & Modularity.

Unit-2: Algorithm For Problem Solving: (8 Hrs.)

Exchanging values of two variables, summation of a set of numbers. Reversing digits of an integer, GCD (Greatest Common Division) of two numbers. Test whether a number is prime. Organize numbers in ascending order. Find square root of a number, factorial computation, Fibonacci sequence. Compute sine Series. Check whether a given number is Palindrome or not. Find Square root of a quadratic equation. multiplication of two matrices.

Unit-3: Introduction To 'C' Language: (8 Hrs.)

Character set, Variable and Identifiers, Built-in Data Types, Variable Definition, Declaration, C Key Words-Rules & Guidelines for Naming Variables. Arithmetic operators and Expressions, Constants and Literals, Precedence & Order of Evaluation. Simple assignment statement. Basic input/output statement. Simple 'C' programs of the given algorithms.

Unit-4: Conditional Statements And Loops: (7 Hrs.)

Decision making within a program Conditions, Relational Operators, Logical Operator. If statement, if-else statement. Loop statements, Break, Continue, Switch.

Unit-5: Arrays: (7 Hrs.)

What is an Array?, Declaring an Array, Initializing an Array. One dimensional arrays: Array manipulation: Searching, Insertion, Deletion Of an element from an array; Finding the largest/smallest element in array; Two dimensional arrays, Addition/Multiplication of two matrices.

Unit-6: Functions: (7 Hrs.)

Top-down approach of problem solving. Modular programming and functions, Definition of Functions

Recursion, Standard Library of C functions, Prototype of a function: Formal parameter list, Return Type, Function call, Passing arguments to a Function: call by reference; call by value.

Unit-7: Structures And Unions: (4 Hrs.)

Basic of Structures, Structures variables, initialization, structure assignment, Structures and arrays: arrays of structures.

Unit-8: Pointers: (6 Hrs.)

Concept of Pointers, Address operators, pointer type declaration, pointer assignment, pointer initialization pointer arithmetic.

Reference Books:

1. Programming with C. Second Edition. Tata McGraw-Hill,2000-Byron Gottfried
2. How to solve by Computer, Seventh Edition, 2001, Prentice hall of India. –R G. Dromey
3. Programming with ANSI-C, First Edition,1996,Tata McGraw hill.-E. Balaguruswami
4. Programming with ANSI & Turbo C. First Edition, Pearson Education.-A. Kamthane
5. Pointer sinC, BPB publication, New Delhi. –Yashwant Kanetkar

Electrical Measurement (DIP3EEE03)

Course Outcomes (CO)

- Develop the knowledge of theoretical and mathematical principles of electrical measuring instruments.
- Examine various real life situations in domestic or industrial scenario where measurements of electrical quantities like Current and Voltage are essential.
- Choose the proper type and specification of measuring procedure and measuring instruments for different industrial/commercial/domestic Power applications.
- Know about the knowledge of various types of other meters.
- Recognize basic Measurement of Circuit Parameters.

Contents: Theory

Unit 1: Fundamentals of Measurement:

Purpose of measurement and significance of measurement, Various effects of electricity employed in measuring Instruments. Desirable qualities of measuring instruments. Classification of Instruments. Types of errors, Different types of torque in Analog Instruments.

Unit 2 : Measurement of Current and Voltage:

Construction and principle of PMMC, MI & Dynamometer type Instrument. Production of torque :methods. Principles of Voltage and Current measurement. Range Extension of Ammeter and Voltmeter, Different Methods of range extension of Ammeter and Voltmeter. Calibration of Ammeter and Voltmeter. Instrument transformers (CT & PT)

Unit 3: Measurement of Power :

Concept of power in A.C .Circuit, Principle and Construction of dynamometer type wattmeter. Errors and their compensation. Poly phase wattmeter. Multiplying factor of wattmeter. Measurements of power in 3 phase circuit for balanced and unbalanced load by one wattmeter method, two wattmeter method. Effect of power factor variation on wattmeter readings in two wattmeter method. Measurement of reactive power in three phase balance load by one wattmeter method and two wattmeter method. Digital Wattmeter.

Unit 4: Constructional features and working principles of other Meters:

Single phase and three phase Power Factor Meter (only dynamometer type). Frequency meter (Weston and Ferro dynamic type). Synchroscope. Phase sequence Indicator.(Rotating type only),Clip-on-ammeter, Q-meter.

Unit 5: Measurement of Circuit Parameters:

Classification of Resistance, Low, Medium and High. Methods of Measurements of Low, Medium and High. Resistance (Kelvin Double bridge, wheat-stone bridge and Megger) Measurement of Earth resistance- Earth tester (Analog & Digital) Digital Multimeter. Introduction to A.C. Bridges. L.C.R. Meter.

Reference Books:

1. Electric & Electronic Measurement and Instrumentation, A.K. Sawhney”, Dhanpat rai & Sons.
2. Electronic Instrumentation & measurement Techniques, By Copper & Heltrick,” Prentice Hall of India.
3. Instrumentation Devices and System, By Rangan Mani & Sarma,” Tata McGraw Hill.
4. Electronic Instrumentation, By Kalsi,” Tata McGraw Hill.
5. Industrial Instrumentation & control, By S.K. Singh,” Tata McGraw Hill.

Electrical Power System–I (DIP3EEE04)

Course Outcomes (CO)

- Ability to analyze the basics of power generation by various sources of energy.
- Develop the ability to implement the appropriate safety equipments for design of electrical power system with enhancing the efficiency of the transmission and distribution system with environment friendly technology for thermal power station & Nuclear Power Stations.
- Ability to implement the knowledge of basic mathematical, physical and electrical principles to formulate significant electrical hazards for Hydro Power Stations & Diesel Power Stations.
- Judge the suitability of installing overhead and underground power transmission strategies considering electrical, mechanical, environmental, performance, safety and economic constraints Non-Conventional Energy Sources.
- Chose the appropriate type of power generating station following norms and guidelines related to cost, environment, societal and ethical issues Economics of Power Generation

Contents: Theory

Unit 1: Basics of Power Generation:

Importance of electrical power in day to day life, Various sources of energy, Overview of method of electrical power generation, Comparison of Sources of power. Nonconventional method so of power generation.

Unit 2: Thermal Power Stations & Nuclear Power Stations:

Selection of site for thermal power stations, Block diagram of thermal power stations. Quality of fuel and its effect on quality of power generation, Operation of components, Numericals. Selection of site for nuclear power station, Block diagram and Working of Nuclear Power Station, Construction and working of Nuclear Reactor, Nuclear Reactor classification, Numerical

Unit 3: Hydro Power Stations & Diesel Power Stations:

List of Hydro Power stations with the capacities & number of units in the state, Selection of site and Classification Layout of hydro Power stations, Types of Turbines & generators used, Selection of turbine and alternator according to water head and capacity, Numericals. List of Hydro Power stations with the capacities & number of units in the state, Selection of site and Classification Layout of hydro Power stations, Types of Turbines & generators used, Selection of turbine and alternator according to water head

and capacity, Numericals

Unit 4: Non-Conventional Energy Sources:

Types of non-conventional energy sources. Solar Energy, Potential of solar energy. Photovoltaic effect – for solar energy. Construction & materials used in solar photo-voltaic cells. Working & applications of solar energy. Wind Energy. Selection of site for wind mills, Principle of electricity generation with the help of wind energy. Block diagram and working of Wind energy plant and its applications, List of major wind farm in the state with the approximate capacities, Bio-mass & Bio-gas energy. Composition of Bio-gas & Its calorific value. Traditional ;non-traditional Biogas plants. Bio-mass based power generation plants & their capacities. Geo-thermal Energy and its Applications. Ocean energy. Ocean thermal Electric conversion. Energy from tides, Site requirements, Advantages and Limitations of Tidal power generation. Fuel Cells: Construction, working and applications

Unit 5: Economics Of Power Generation:

Economics of power generation, cost of electrical energy, expressions for cost of electrical energy, desirable characteristics of a tariff, types of tariff, Numericals.

Reference Books:

1. Electrical Power, By Dr. S. L. Uppal
2. A course in Electrical Power by Soni – Gupta – Bhatnagar
3. Nonconventional Energy sources Prof. G. D. Rai
4. A course in Power Plant Engineering Prof. Arora and Dr. V. M. Domkundwar

Basic Electronics (DIP3EEE05)

Course Objectives :

- This course provides the student with the fundamental skills to understand the basic of semiconductor and components like diode, transistor, BJT, Rectifiers, Regulated Power Supply & Filters and operational amplifier.
- It will build mathematical and numerical background for design of electronics circuit & component value.
- Students equipped with the knowledge and training provided in the course will be able to participate in design , development and operation in the different area of electronics system .

Course Outcomes (CO)

- To study basics of semiconductor & devices and their applications in different areas.
- To study different biasing techniques to operate Rectifiers & Filters
- Analyze output in different operating modes of different semiconductor devices like Transistors.
- To study basics of semiconductor & devices and their applications in different areas for BJT.
- To understand the concepts of regulated power supplies in the Electronics area.

Contents: Theory

Unit 1: Semiconductor & PN Junction diode : (10 Hrs.)

Difference between conductor, Insulator and Semiconductor Rectifying diode, Review of P-type and N-

type semiconductor, Junction of P-type & N-type i.e. PN junction Barrier voltage, depletion region, Junction Capacitance. Forward biased & reversed biased junction, Diode symbol, circuit diagram for characteristics (forward & reversed), Characteristics of PN junction diode. **Zener Diode:** Symbol, circuit diagram for characteristics (forward & reversed), Avalanche & zener breakdown, **Special Diodes:** Point contact diode, Schottky diode, **Optical Diodes:** LED, IRLED, photo diode, laser diode. Symbol, operating principle & applications of each.

Unit 2: Rectifiers & Filters : (8 Hrs.)

Need of rectifier, definition, Types of rectifier –Half wave rectifier, Full wave rectifier (Bridge & centre tapped) Circuit operation: Input/output waveforms for voltage & Current, Average (dc) value of current & voltage (node rivation), Ripple, ripple factor, ripple frequency, PIV of diode used, transformer utilization factor, efficiency of rectifier. Comparison of three types of rectifier, Need of filters, Types of filters, shunt capacitor, Series inductor, LC filter, π filter, Circuit operation, dc output voltage, ripple factor, (formula), ripple frequency, Dependence of ripple factor on load. Input/output waveforms, limitations & advantages.

Unit 3: Transistors: (12 Hrs.)

Bipolar Junction Transistor (BJT), Introduction, Basic concept, Types of transistors, structure & symbols, Transistor operation Conventional current flow, relation between different currents in transistor, Transistor amplifying action Transistor configurations:- CB, CE & CC Circuit diagram to find the characteristics Input / output characteristics, Transistor parameters- input resistance, output resistance, α & β relation between them. Comparison between three configurations, Transistor specifications: VCE Sat, IC Max, VCEO, ICEO, α , β VCE Breakdown, Power dissipation (to be explained during practical using datasheets), Testing of transistor using multimeter (To be shown during practical), Construction, working principle, characteristics of Photo Transistor Unipolar Transistor (JFET) Construction, working principle & characteristics. Uni-junction Transistor (UJT), Construction, working principle & characteristics

Unit 4: BJT : (10 Hrs.)

Introduction, need of biasing, concept of dc load-line, selection of operating point (Q point), need of stabilization of Q point, (thermal run away concept), Types of biasing circuits, Fixed biased circuit, Base biased with emitter feedback, Base biased with collector feedback, Voltage divider, Emitter biased, Circuit operation of each circuit

Unit 5: Regulated Power Supply: (8 Hrs.)

What is a regulator?, Need of regulators, voltage regulation factor, Concept of load regulation & line regulation, Basic zener diode voltage regulator, Linear Regulators, Basic block diagram of dc power supply, Transistorised series & shunt regulator –circuit diagram

Reference Books:

1. Basic Electronics & Linear Circuits By N. N. Bhargava, D.C. Kulashreshtha, S.C. Gupta –TTTI Chandigarh Tata McGraw Hill.
2. Electronic Principles By Albert Malvino, David J. Bates Tata McGraw Hill.
3. Electronic Devices & Components Allen. Motters head Prentice Hall of India.
4. Basic Electronics & Devices NIIT Prentice Hall of India
5. Basic Electronics Grob Bernard Tata McGraw Hill
6. Electronics Devices & Circuits David J. Bell Prentice Hall of India

SEMESTER-4

THEORY		PERIOD			EVALUATION SCHEME			Credit
CODE	NAME OF THE PAPER	LECTURES	TUTORIALS	PRACTICALS	IA	ESE	SUB-TOTAL	
DIP4EE01	Electrical Circuits & Network	3	1	0	30	70	100	4
DIP4EE02	Electrical Machine - I	3	1	0	30	70	100	4
DIP4EE03	Digital Electronics	4	0	0	30	70	100	4
DIP4EE04	Electrical Power System -II	4	0	0	30	70	100	4
DIP4EE05	Communication Engineering	3	1	0	30	70	100	4
DIP4EE01L	Electrical Circuits & Network Lab	0	0	2	15	35	100	2
DIP4EE03L	Digital Electronics Lab	0	0	2	15	35	50	2
							600	
							Total Credits:	24

Electrical Circuits & Network (DIP4EE01)

Course Outcomes (CO)

- To develop an understanding of the fundamental laws and elements of electrical circuits.
- Analyze the single phase ac circuits and also the series and parallel resonant circuits.
- Infer and evaluate transient response, steady state response of series, Poly phase AC Circuits.
- Understand mesh and nodal analysis for both DC and AC.
- Analyze dc and ac circuits network simplification theorems.

Contents: Theory

Unit 1: Review of Basic concepts of Electrical Circuit: (6 Hrs.)

Electric Current, E.M.F., Resistance, Ohms Law, Power, Electric Circuit Elements R, L, C Energy Sources, KCL, KVL, Series Circuits, Parallel Circuits, A.C. waveform and definition of various terms associated with it,

Unit 2: Single phase AC Circuits: (12 Hrs.)

Series AC circuit R-L, R-C and R-L-C circuits. Impedance, reactance, phasor diagram, impedance triangle, power factor, Average power, Apparent power, Reactive power, Power triangle (Numerical), Series Response, quality factor (Numerical), Parallel AC circuit R-L, R-C and R-L-C circuit, Admittance, Susceptance, solution by admittance method, phasor diagram and complex Algebra method. (Numerical), Parallel resonance, quality factor. comparison of series and Parallel circuit.

Unit 3: Poly phase AC Circuits: (10 Hrs.)

Generation of three phase e.m.f, Phase sequence, polarity marking, Types of three-phase connection, Concept of unbalanced load and balanced load. Line, phase quantities and power in three phase system with balanced star and delta connected load & their interrelationship, Advantages of poly-phase circuits

over single phase circuits

Unit 4: Principles of circuit Analysis (AC and DC circuits): (8 Hrs.)

Mesh analysis (Numerical), Node analysis with voltage current source (Numerical), Star/ Delta & Delta / Star transformations (simple numericals)

Unit 5: Network Theorems (Statement, procedure, applications and Areas of applications, Simple Numerical) : (10 Hrs.)

Superposition Theorem, Thevenin's Theorem, Norton's Theorem, source conversion/Ideal voltage and current source, Maximum power transfer Theorem

Reference Books:

- 1 Introductory circuit Analysis By Boylested R.L. Wheeler, New Delhi
- 2 Schaum online series By Edminister T.M.G.H., Newyork
- 3 Circuit and network By A. Sudhakar Tata McGraw Hill
- 4 Basic Electrical Engineering. By V.N. Mittle Tata McGraw Hill
- 5 Electrical Technology Volume-I By B. L. Theraja S. Chand &Co.

Electrical Machines-I (DIP4EEE02)

Course Objectives :

- The working principles of electrical machines using the concepts of electromechanical energy conversion principles.
- Derive expressions for generated voltage and torque developed in various Electrical Machines

Course Outcomes (CO)

- CO1: define the basic terms related to term magnetic circuits, electromagnetic force production, DC machines and Transformers.
- CO2: explain the behavior of magnetic circuits, electromagnetic force production process, operating principle of D.C machines and Transformers.
- CO3: calculate the performance parameters of various kinds of D.C machines and 1-phase and 3-phase transformers.
- CO4: analyze the performance characteristics of various types of D.C machines and Transformers.

Contents: Theory

Unit 1: D.C. Generators :

Principles of operation, Constructional feature. Armature winding, Back-pitch, Front-pitch, Resultant pitch and comment at or pitch Simple Lap and wave winding (problems on winding diagram), Different types of D.C. Machines, Shunt, Series and Compound machines, Armature reaction in D.C. machine and Commutation.

Unit 2: D.C. Generators

Methods of improving commutation (Resistance and emf commutation), Interpoles and compensating winding Characteristics of D.C. Generators and uses of Different types of D.C. Generators. Concept of critical resistance, causes of failure of Development of emf. Losses and efficiency of D.C. Machines, condition for maximum efficiency. Parallel operation of D.C. Generators.

Unit 3: D.C. Motors:

D.C. Motor principles, Voltage equation of Motor, Torque (equation of armature torque and shaft torque), Performance characteristics of shunt, series and compound motors and their application. Methods of starting shunt, series and compound, Motors, study of starters (3-point, 4-point starters and Drum controller type, problems in starter, Speed control of D.C. shunt motors, Flux control Method, Armature voltage (rheostatic) control method. Ward Leonard method, Speed control of series motors — Flux control method and series parallel control method. Efficiency of DC machine by brake test, Efficiency of DC machine by Swinburne's test. Losses & efficiency and condition for maximum power.

Unit 3: Single Phase Transformer :

Working principles, Transformer construction, Types of cooling methods, Care and maintenance, EMF equation, Transformer on no load and on load Phasor diagrams. Equivalent resistance, reactance and impedance. Phasor diagram of Equivalent circuit, Regulation at various loads and power factor, Different types of losses in a Transformer, Open circuit test, Short circuit test, Efficiency, parallel operation of single phase transformer, introduction to auto-transformer, its advantage and applications.

Unit 4: Introduction To Three Phase Transformer:

Construction, principle of operation, parallel operation, connections, applications. Various connections and groups, choice of connection, star-delta connections, Scott connection, three phase to two phase conversion and vice versa, applications.

Reference Books:

1. Electrical Technology by B.L. Thareja and A.K. Thareja S. Chand
2. Electrical Technology by J.B. Gupta Katsonbooks
3. Electrical Machine by P.S. Bhimbra P.S. Bhimbra
4. Electrical Machine by Ashfaq Husain Dhanpat Rai & co.
5. Electrical Machines by D.P. Kothari & I .J Kothari Sigma Series

Digital Electronics (DIP4EEE03)

Course Objectives :

- The objective of this course is to introduce the organization of a computer and its principal components, viz, ALU, Control, Memory and Input/output.
- The course will also enable the student to understand the design components of a digital subsystem that required realizing various components such as ALU, Control, etc.

Course Outcomes (CO)

- An ability to understand theory of Digital Design and Computer Organization to provide an insight of how basic computer components are specified.
- An ability to understand the functions of various hardware components and their building blocks
- An ability to understand and appreciate Boolean algebraic expressions to digital design
- An in depth understanding of sequential! Combinational circuits
- An in depth understanding of realization of different combinational/sequential circuits
- An in depth understanding of different stages of an instruction execution
- An in depth understanding of how different hardware components are related and work in coordination
- An ability to understand computer buses and input/output peripherals

Contents: Theory

Unit 1: Number System:

Introduction to digital system. Number System - Introduction to Binary, Octal, Decimal, Hexadecimal number system, Conversion of number systems, 1's complement and 2's complement, Binary arithmetic (addition, subtraction, division, multiplication), Codes-BCD codes, 9's and 10's complement, 8421BCD codes, Excess-3 code, gray code, BCD arithmetic (addition, subtraction).

Unit 2: Logic Gates:

Fundamental concepts of Boolean algebra - Basic laws: Cumulative, Complement, Associative, Distributive, De Morgan's theorems. Logic gates - Basic gates: NOT, AND, OR (Symbol, Truth table, Applications), EX-OR, EX-NOR (Symbol, Truth table, Application), Universal gates: NOR, NAND. NOR as Universal gate, NAND as universal gate.

Unit 3: Combinational Logic Circuits:

Introduction to combinational logic circuit. Standard representation of Canonical forms (SOP & POS, Minterm, Max term)- Conversion between SOP & POS, Numericals based on above topic, Don't care conditions. K-map reduction techniques, Realization using K-map techniques of Half adder, full adder, Half subtractor, full subtractor, gray to binary, binary to gray converter. Multiplexer - Necessity of multiplexer, Types of multiplexers with realization, Applications of multiplexer. Demultiplexer-Necessity and Principle of Demultiplexer, Types and realization of DeMux

Unit 4: Sequential Logic Circuit:

Introduction to Sequential Logic Circuit - Difference between combinational and sequential circuit. Triggering methods (edge & level Trigger). One bit memory cell - RS latch-using NAND & NOR. Flip Flops-SR Flip-flop, Clocked SR flip flop with preset and clear, Drawbacks of SR Flip flop, Clocked JK Flip flop with preset & clear, Race a round condition in JK flip flop, Master slave JK flip-flop. D and T flip flop. Excitation table of flip flops.

Unit 5: Logic Families :

Characteristics of logic gates: propagation delay, power dissipation, MOS families - Introduction to PMOS, NMOS & CMOS logic, Comparison of different logic families, How can we use this as amplifier/ Inverter, etc.

Reference Books:

1. Digital Principles, Latest Edition, 2000, TataMcGraw Hill Publishing Company Ltd., New Delhi by Malvino & Leach
2. Modern Digital Electronics, Second Edition, 2000, TataMcGrawHill Publishing Company Ltd., New Delhi by R. P. Jain
3. Digital Electronics, First Edition, 2000, Tata McGraw Hill Publishing Company Ltd., New Delhi by V. K. Puri

Electrical Power System-II (DIP4EEE04)

Course Objectives :

- Analyze Faults in Over Head transmission lines
- Classify relaying system and explain construction and principles of relays
- Classify switchgear and functions, testing and selection of circuit breakers
- Explain protection of power system and its components
- Classification of substations, concept of neutral grounding and voltage control method

Course Outcomes (CO)

- Prepare the model of transmission line, generator and transformer of power system for single line

diagram representation and per unit quantity calculation.

- Evaluate performance of short, medium and long transmission lines.
- Analyze symmetrical and unsymmetrical faults in power system.
- Describe various aspects of over-voltages and corona in power transmission. 12 5. Describe travelling wave and transients in power system.

Contents: Theory

Unit 1: Basics of Transmission:

Introduction to transmission. Necessity of transmission of electricity. Classification & comparison of different transmission systems.

Unit 2: Transmission Line Components:

Introduction to line components. Types of conductors- Copper, Aluminum & state their trade names. Solid, Stranded & bundled conductors. Line supports-requirements, types, and field of applications. Line insulators –requirements, types, and field of applications. Failure of insulator & reasons of Failure. Distribution of potential over a string of suspension insulators. Concept of string efficiency, Methods of improving string efficiency. Corona – corona formation, advantages & disadvantages, factors affecting corona, important terms related to corona. Spacing between Conductors. Calculation of Span length & sag Calculation

Unit 3: Transmission Line Parameters:

R, L & C of 1-ph & 3-ph transmission line & their effects on line. Skin effect, proximity effect & Ferranti effect. Concept of transposition of conductors & necessity.

Unit 4: Performance of Transmission Line :

Classification of transmission lines. Losses, Efficiency & Regulation of line. Performance of single phase short transmission line (Numerical based on it), Effect of load power factor on performance. Medium transmission lines-End condenser, Nominal T & Nominal π Network with vector diagram. General circuit & Generalized Circuit Constants (A,B,C,D)

Unit 5: Extra High Voltage Transmission:

Introduction & Requirement. EHVAC Transmission, Reasons for adoption & limitations. HVDC Transmission –Advantages, Limitations.

Unit 6: Components of Distribution System:

Introduction. Classification of distribution system A. C distribution. Connection schemes of distribution systems. Requirements of Distribution systems. Design consideration. A.C. distribution calculations.

Reference Books:

1. A Course in electrical power by Soni-Gupta-Bhatnagar Dhanpat Rai
2. Principles of power system by V. K. Mehta S. Chand & Company
3. A Course in electrical power by S. L. Uppal.S.K. Khanna
4. Transmission & distribution of electrical energy by J.B. Gupta S. K. Khanna

Communication Engineering (DIP4EEE05)

Unit 1: Networks, Antenna and Propagation:

Networks: Symmetrical and Asymmetrical networks, characteristics impedance and propagation constant. Equalizer: Definition, types and application, Attenuator: Definition, types- symmetrical T and Π attenuators- simple problem- application. Filters: Definition, types- circuit elements and cut off frequencies

of LPF, HPF and BPF - problem application

Unit 2: Introduction to Modulation and Amplitude Modulation:

Introduction to Modulation: Definition- Need for modulation - Frequency spectrum- relationship between wavelength and frequency. Amplitude modulation: Definition simple signal amplitude modulation, Expression for amplitude modulation, expression for modulation index- sidebands: DSB, SSB and VSB. AM Transmitter: Types of transmitter: high level AM transmitter, low level AM transmitter and SSB transmitter. AM Receiver: Types of receiver- TRF receiver, super heterodyne receiver and SSB receiver- selection of IF- AGC types simple and delayed AGC.

Unit 3: Frequency and Pulse Modulation:

Frequency modulation: Definition simple signal diagram for frequency modulation, Expression for frequency modulation, expression for modulation index. FM Transmitter: Types of transmitters: Direct FM transmitter, Indirect FM transmitter and stereophonic FM transmitter, FM Receiver: stereophonic FM receiver- AFC Comparison of FM and AM, Pulse modulation: Definition - Types: Generation and detection of PAM, PWM, PCM & DPCM

Unit 4: Audio systems:

Microphones: Definition- Construction and performance of the following microphones: carbon, condenser, piezo-electric, Loud speakers: Definition- Constructional details of dynamic cone types, Horn types and electro-static cloud speakers, woofer, midrange and tweeter.

Unit 5: Introduction to cellular mobile communication

Reference Books:

1. Communication System by Simon Haykin John Wiley & Sons.
2. Electronic Communication System by Kennedy & Davis Tata McGraw Hill
3. Principle of Communication Engineering by Sombir Singh Jai Prakash Publication

SEMESTER-5

THEORY		PERIOD			Evaluation Scheme			Credit
CODE	NAME OF THE PAPER	LECTURES	TUTORIALS	PRACTICALS	IA	ESE	SUB-TOTAL	
DIP5EE E01	Electrical Estimation & Costing	3	1	0	30	70	100	4
DIP5EE E02	Microprocessor	3	1	0	30	70	100	4
DIP503	Environmental Science	3	1	0	30	70	100	4
DIP5EE E04	Electrical Machines-II	3	1	0	30	70	100	4
DIP5EE E05	Power Electronics	3	1	0	30	70	100	4
DIP5EE E05L	Power Electronics Lab	0	0	2	15	35	50	2
DIP5EE E02L	Microprocessor Lab	0	0	2	15	35	50	2
							Total Credits :	24

Electrical Estimation & Costing (DIP5EEE01)

Course Objectives :

- Knowledge about Elements of Electrical Engineering , Engineering Drawing, Electrical Wiring and Professional Ethics.
- To enable the students to prepare the schedule of materials with specifications and estimates for different types of electrical installations.

Course Outcomes (CO)

- Summarize the importance of estimation, specification and earthing.
- Prepare the schedule of materials with specifications and estimates for service mains.
- Draw the wiring plan for residential buildings, Prepare the schedule of materials with specifications and estimates for lighting Installations.
- Draw the layout of machines with wiring plan for workshops. Prepare the schedule of materials with specifications and estimates for power insulation.
- Prepare the schedule of materials with specifications for Distribution lines and estimates for transformer centre.
- Prepare the schedule of materials with specifications for transmission lines and substations.

Contents: Theory

Unit 1: Drawing and IE rules:

Classification of Electrical Installation. General requirement of Electrical Installation. Reading and Interpretation of Electrical Engineering Drawings. Various diagrams, plans and layout, Important definitions related to Installation, IE rules related to Electrical Installation & Testing.

Unit 2: Service Connection:

Concept of service connection. Types of service connection & their features. Methods of Installation of service connection. Estimates of Underground & overhead service connections.

Unit 3: Residential Building Electrification:

General rules guidelines for wiring of Residential, Installation and positioning of equipment. Principles of circuit design in lighting and power circuits. Procedures for designing the circuits and deciding the number of circuits. Method of drawing a single line diagram. Selection of type of wiring and rating of wires & cables. Load calculations and selection of size of conductor. Selection of rating of main switch, distributions board, protective switchgear ELCB and MCB and wiring accessories. Earthing of Residential Installation.

Unit 4: Electrification of commercial Installation:

Concept of commercial Installation. Differentiate between electrification of Residential and commercial Installation. Fundamental considerations for planning of an electrical Installation system for commercial building. Design considerations of electrical Installation system for commercial building. Selection of type wire, wiring system & layout.

Unit 5: Electrification of factory unit Installation:

Concept of Industrial load. Concept of Motor wiring circuit and single line diagram. Important guidelines about power wiring and Motor wiring. Design consideration of Electrical Installation in small Industry/Factory/workshop. Sequence to be followed to prepare an estimate. Preparations of detailed estimate and costing of a small factory unit/ workshop.

Unit 6: Testing of Installation:

Testing of wiring Installation for verification of current; earthing, insulation resistance and continuity as per IS

Unit 7: Contracts, Tenders and Execution (OPTIONAL):

Concept of contracts and Tenders, Contracts, types of contracts, contractors. Valid Contracts, Contract

documents. Tender and tender notices. Procedure for submission and opening tenders. Comparative statements, criteria for selecting contractors, General conditions in order form. Principles of Execution of works, Administrative approval, Technical sanctions. Billing of executed work.

Reference Books:

1. Electrical Design; Estimating and costing by K.B. Raina S.K. Bhattachary, New Age International (p) Limited
2. Electrical Estimating and costing by Surjit Singh, Dhanpat Rai and company
3. Electrical Estimating and costing by N. Alagappan, Tata McGraw Hill Publication
4. Electrical wiring Estimating and costing by S.L. Uappal, Khanna Publication.

Microprocessor (DIP5EEE02)

Course Objectives :

- To introduce students with the architecture and operation of typical microprocessors and microcontroller.
- To familiarize the students with the programming and interfacing of microprocessors and microcontroller.
- To provide strong foundation for designing real world applications using microprocessors and microcontroller.

Course Outcomes (CO)

- Assess and solve basic binary math operations using the microprocessor and explain the microprocessor's and Microcontroller'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.
- Compare accepted standards and guidelines to select appropriate Microprocessor (8085 & 8086) and Microcontroller to meet specified performance requirements.
- Analyze assembly language programs; select appropriate assemble into machine a cross assembler utility of a microprocessor and microcontroller.
- Design electrical circuitry to the Microprocessor I/O ports in order to interface the processor to external devices.
- Evaluate assembly language programs and download the machine code that will provide solutions real-world control problems.

Contents: Theory

Unit 1: Introduction to 8085 Microprocessor:

Evolution of microprocessors Terminology used in microprocessor- Hardware, Software, Firmware, Bus, Address Bus, Data bus, Control bus, Comparison of machine language, assembly language and high level language. Architecture and features of 8085, Pin diagram, Control signals, 8085 Addressing mode and interrupts

Unit 2: Microprocessors:

Overview of 8086 Family (till Inteliseries), the microprocessor-based personal computer system.

Unit 3: 8086 Microprocessor:

8086 CPU Architecture, Machine language Instructions, concept of interpreter, compiler and debugger, Instruction execution timing.

Unit 4: Memory System Design & I/O Interfacing:

Interfacing SRAM, ROM and DRAM to 8086, Address decoding & Timing, I/O interfacing in 8086: Serial

communication interface includes Synchronous & Asynchronous Protocols, parallel communication Interfaces includes I/O Mapped I/O, Memory Mapped I/O, Handshaking Signals

Unit 5: 8051 Microcontrollers:

Architecture of 8051, Signals, Operational features, Memory and I/O addressing, Interrupts, Instruction set, Applications.

Reference Books:

1. Microprocessor and Interfacing-Douglas V Hall, SSSP Rao, 3rd edition TMH, 2012.
2. Microcomputer systems- The 8086/8088 Family-Y.C. Liu and A. Gibson, 2nd edition, PHI-2003.
3. The 8086 Microprocessor: Programming & Interfacing the PC-Kenneth J Ayala, CENGAGE Learning.
4. The Intel Microprocessor, Architecture, Programming and Interfacing- Barry B. Brey, 6e, Pearson Education

Environmental Science (DIP503)

Course Objectives :

- Analyze the interrelationship between living organism and environment.
- Understand the importance of environment by assessing its impact on the human world.
- Enrich the knowledge on themes of biodiversity, natural resources, pollution control and waste management.
- Understand the constitutional protection given for environment.

Course Outcomes (CO)

- CO 1: Discover knowledge in ecological perspective and value of environment.
- CO 2: Understand the significance of various natural resources and its management.
- CO 3: Demonstrate a comprehensive understanding of the world's biodiversity and the importance of its conservation.
- CO 4: Categorize different types of pollutions and their control measures. Discover effective methods of waste Management. Analyze global environmental problems and come out with best possible solutions.
- CO 5: Understand environmental laws and sustainable development.

Contents: Theory

Unit 1: Ecosystems and how they work:

Structure and function of an ecosystem, Types of Eco-Systems, Producers, Consumers and Decomposers, Food chains, food webs and ecological pyramids, Energy flow in the ecosystem. Introduction, Types, Characteristic features, Structure and Function of Forest ecosystem, Desert ecosystem, Aquatic ecosystems Lithosphere, Biosphere and Hydrosphere, Major issues of Biodiversity, Biosphere reserves, National Parks and sanctuaries.

Unit 2: Concept of sustainability and international efforts for environmental protection:

Concept of Sustainable Development, Emergence of Environmental Issues, International Agreement on Environmental Management. Human Population Growth and its effects on the environment: Problem of Population growth, poverty and environment, Population Explosion, Family Welfare Programme.

Unit 3: Renewable and non-renewable resources:

Defining resources, classification of resources, soil and land degradation, economic development and resources use, natural resources accounting. Energy needs, renewable and non-renewable energy resources, Solar energy and its availability, wind power and its potential, hydropower as a clean source of energy, coal, oil, natural gas etc., bio fuel.

Unit 4: Pollution and Public Policy:

Water Pollution: Water resources of India, Hydrological Cycle, methods of water conservation and management, ground and surface water pollution. Recycling and management of water and wastewater (domestic and industrial). Water borne diseases and health related issues.

Air Pollution: Air pollution and air pollutants, sources of air pollution, its effect on human health and vegetation. Greenhouse effect, global warming and climate change. Ambient air quality standards, steps taken by Government to control air pollution.

Noise pollution and its impacts on human health.

Solid Waste: Municipal Solid Waste Management, segregation, disposal methods, composting, land fill sites etc. Hazardous waste management, biomedical waste management.

Unit 5: Environmental Impact Assessment (EIA) and Environmental Management System (EMS):

Introduction to EIA, its impact and case study, environmental information system (EIS), role of information technology in environment.

Unit 6: Indian Environmental laws: Legal framework:

Constitutional provisions, the Indian Penal Code, Role of Judiciary in Environmental Protection, Wild Life (Protection) Act, 1972, Water (Prevention and Control of Pollution) Act, 1974, Environment (Protection) Act, 1986, Air (Prevention & Control of Pollution) Act, 1981, Forest Conservation Act

Text Books:

1. Gupta N.C.; Social Auditing of Environmental Law in India, edited book, New Century Publications, Delhi-2003.
2. Divan, Shyam and Rosen Ceranz; Armin. Environmental Law and Policy in India, Cases, materials and statutes, second edition, Oxford University Press, 2001.
3. Uberoi, N.K.; Environmental Management, Excel Books, New Delhi, 2000.

Electrical Machines-II (DIP5EEE04)

Course Objectives :

- To make students conversant about the underlying energy conversion theory between electrical and mechanical systems by introducing electromechanical energy conversion principles.
- To expose the students to the concepts of various types of electrical machines and applications of electrical machines.
- To acquaint the student with the concept of generation of electricity in power plant.

Course Outcomes (CO)

- CO1. Use concepts in trigonometry, complex algebra, phasor operations and principles of electromagnetism to find correct solutions to electrical machine performance questions. Select proper materials and methods for design and construction of electrical machines with in the realm of manufacturing, economic, performance, efficiency and environmental constraints.
- CO2. Use modeling/simulation parameters with standard equivalent circuit models to predict correctly the expected performance of various general-purpose electrical machines.
- CO3. Compare accepted standards and guidelines to select appropriate electrical machines to meet specified performance requirements.
- CO4. Demonstrate an understanding of the fundamental control practices associated with rotating machines (starting, reversing, braking, speed control etc.).
- CO5. Set up testing strategies to evaluate performance characteristics of electrical machines. Design of autonomous systems using special electrical machines. Justify contemporary issues within and outside the electrical engineering profession.
- CO6. Access the techniques, skills, and modern engineering tools necessary for electrical engineering practice. Choose the scope of applicability of various types of electrical machines in real life multi-disciplinary usages

Contents: Theory

Unit 1: Synchronous Machines :

Main constructional features of commutator and brushless excitation system, Generation of three phase emf, Production of rotating magnetic field in a three phase winding, Concept of distribution factor and coil span factor and emf equation, Armature reaction on unity, lag and lead power factor, Operation of single synchronous machine independently supplying a load - Voltage regulation by synch-impedance method, Need and necessary conditions of parallel operation of alternators Synchronizing an alternator (Synchroscope method) with the bus bars, Operation of synchronous machine as a motor –its starting methods, Applications of synchronous machines

Unit 2: Induction Motors:

Salient constructional features of squirrel cage and slip ring 3-phase induction motors, Principle of operation, slip and its significance and connection of submersible motor (mono block), Rotor current frequency, Rotor resistance, inductance, emf and current, Rotor Torque, Starting torque and condition for maximum torque, Torque under running conditions and condition for maximum torque under running condition, Power flow diagram of an induction motor, Torque-slip curve, stable and unstable zones Effect of rotor resistance upon the torque slip relationship, Double cage rotor motor and its applications, starting of 3-phase induction motors, DOL, star-delta, auto transformer Equivalent circuit of 3-phase induction motor at any slip.

Unit 3: Fractional Kilo Watt (FKW) Motors:

Single phase induction motors; Construction characteristics and applications, Nature of field produced in single phase induction motor. Split phase induction motor, Capacitors start and run motor, Shaded pole motor, Reluctance start motor, Alternating current series motor and universal motors, Single phase synchronous motor.

Unit 4: Special Purpose Machines:

Construction and working principle, DC & AC Servomotor motor, stepper motor ,Brushless DC motor.

Text Books:

1. Electrical Machines by S.K. Bhattacharya Tata McGraw Hill, New Delhi
2. Electrical Machines by SK Sahdev Unique International Publications, Jalandhar
3. Electrical Machines Nagrath and Kothari Tata McGraw Hill, New Delhi
4. Electrical Engineering by JB Gupta SK Kataria & sons, New Delhi

Power Electronics (DIP5EEE05)

Course Objectives :

- To introduce students to the basic theory of power semiconductor devices and passive components, their practical applications in power electronics.
- To familiarize students to the principle of operation, design and synthesis of different power conversion circuits and their applications.
- To provide strong foundation for further study of power electronic circuits and systems.

Course Outcomes (CO)

- Relate basic semiconductor physics to properties of power devices, and combine circuit mathematics and characteristics of linear and non-linear devices.
- Describe basic operation and compare performance of various power semiconductor devices, passive components and switching circuits
- Design and Analyze power converter circuits and learn to select suitable power electronic devices by assessing the requirements of application fields.
- Formulate and analyze a power electronic design at the system level and assess the performance.
- Identify the critical areas in application levels and derive typical alternative solutions, select suitable power converters to control Electrical Motors and other industry grade apparatus.
- Recognize the role power electronics play in the improvement of energy usage efficiency and the applications of power electronics in emerging areas.

Contents: Theory

Unit 1: Power Semiconductor Devices:

Thyristor (SCR), Construction, Operation and Symbol, V-I Characteristics, Thyristor Turn Methods: Voltage Triggering, Gate Triggering, dv/dt Triggering and Light Triggering. Gate Control: DC Gate Signal, AC Gate Signal and Pulse Heat Sinks and Mountings, Thyristor Family: Symbols & V-I Characteristics.

Unit 2: Converters:

Introduction, Single Phase Fully Controlled Half Wave Converter, (With Resistive Load, With RL Load and Freewheeling Diode, Single. Phase Fully Controlled Full Wave Converter, With Resistive Load, With RL Load, Single Phase Fully Controlled Bridge Converter, With Resistive Load, With RL Load

Unit 3: Inverters:

Introduction, Classification: 1 ϕ Inverters, External Control of AC Voltage and Internal Control Pulse Width Modulation (PWM) Method: - Single Pulse Width Modulation - Multiple Pulse Width Modulation - Sinusoidal Pulse Width Modulation Waveform Control (Harmonic Reduction) By Single Pulse Width Modulation - By Transformer Connections By Using Filter(LC, Resonant, and OTT Filter)

Unit 4: Choppers:

Introduction, Chopper Principle, Control Techniques:-Constant Frequency System, - Variable Frequency System, Classification of Choppers: Class A, Class B, Class C, Class D and Class E, Commutations

Methods for Choppers: Auxiliary Commutation, Load Commutation, Jones Chopper, Step Up Chopper

Unit 5: A.C. Voltage Controller:

Types of AC voltage controllers, Sequence control of AC Voltage Controllers, Numericals basics of AC Voltage controller

Ref. Books:

1. Power Electronics, Lauder CW 3rd Edn. MHI1993
2. Power Electronics, 3.Sen PC TMH
3. Power Electronics, P. S Bimbhra Khanna Publisher

SEMESTER-6								
THEORY		PERIOD			EVALUATION SCHEME			Credit
CODE	NAME OF THE PAPER	LECTURES	TUTORIALS	PRACTICALS	IA	ESE	SUB-TOTAL	
DIP6EE E01	Control System	3	1	0	30	70	100	4
DIP6EE E02	Switchgear and Protection	3	1	0	30	70	100	4
DIP603	Industrial Management	4	0	0	30	70	100	4
DIP6EE E04	Elective (Any One)	4	0	0	30	70	100	4
DIP6EE E05L	Project & Viva	4	0	4	100	100	200	8
							Total Credits:	24

Control System (DIP6EEE01)

Course Objectives:

- To introduce different types of system and identify a set of algebraic equations to represent and model a complicated system into a more simplified form to interpret different physical and mechanical systems in terms of electrical system to construct equivalent electrical models for analysis.
- To employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions and identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system
- Formulate different types of analysis in frequency domain to explain the nature of stability of the system.

Course Outcomes (CO)

- Categorize different types of system and identify a set of algebraic equations to represent and model a complicated system into a more simplified form.
- Characterize any system in Laplace domain to illustrate different specification of the system using transfer function concept.
- Interpret different physical and mechanical systems in terms of electrical system to construct equivalent electrical models for analysis.
- Employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions.
- Formulate different types of analysis in frequency domain to explain the nature of stability of the system.
- Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system.

Contents: Theory

Unit 1: Overview of Control system :

Control system – definition and practical example, Open loop & closed loop systems – definition, block

diagram, practical example, and Comparison, Laplace transform – Significance in control system, Linear time varying and time in varying systems – definition, developing differential equations of R-C and R- L-C electric circuits. Transfer function – definition, derivation of transfer function for close loop control system, Order of a system – definition, 0, 1, 2 order system standard equation, practical examples, Block diagram representation of a system- need, reduction rules, problems.

Unit 2: Dynamic Analysis of a system :

Dynamic analysis of measurement systems- definition, time domain and frequency domain analysis. Time domain analysis – Transient and steady state response, steady state error. Standard test inputs - step, ramp, parabolic & impulse. Need of them, significance, and corresponding Laplace representation, Poles & zeros – definition. Analysis of first order control system for unit step input; concept of time constant, Analysis of second order control system for unit step input; concept, definition & effect of damping; Time response specifications (no derivations) ; problems on time response specifications

Unit 3: Stability & frequency response analysis :

S-plane – Introduction, stability - stable, unstable, critically stable & conditionally stable system; relative stability; Root locations in S-plane for stable and unstable systems, Routh's stability criterion-different cases & conditions (statement method); problems (Time response analysis), Introduction, advantages & disadvantages of frequency response analysis; frequency response specifications

Unit 4: Control actions & process controllers:

Process control system – block diagram, elements, Role of controllers in process industry; concept of sequencing & modulating controllers; Control actions: discontinuous & continuous modes; on off controllers: neutral zone proportional controllers (offset, proportional band) integral & derivative controllers; composite controllers; PI, PD, PID controllers, Control actions of electronic controllers with circuits & equations (with op amp)

Unit 5: Servo Systems :

Servo system –definition, block diagram, AC & DC servo systems- comparison, practical example, schematic diagram , concept and principle, Servo components: Potentiometer as error detector b) Synchro as error detector, Rotary encoder, Stepper motor- variable reluctance type, comparison of stepper motor with DC servo motor, DC servo motor- characteristic, difference from a normal DC motor, comparison between armature controlled and field controlled DC servo motors(with TF)

Text Books:

1. Digital Control System M. GopalTata McGraw-Hill
2. Control system Engg. By J.J. Nagrath & M. GopalTata McGraw-Hill
3. Control System by M. Gopal Tata McGraw-Hill
4. Modern control Engg. by K. Ogata Tata McGraw-Hill
5. Control systems by Kumar Tata McGraw-Hill

Switchgear and Protection (DIP6EEE02)

Course Objectives :

- To understand the need of protection of electric equipment and their protection schemes.
- To understand operations & characteristics of various electromagnetic and static relays.
- To understand the operations of various types of circuit breakers and their ratings.
- To understand the unit protection and over voltage protection of different apparatus in power system.

Course Outcomes (CO)

- Explain the working of different types of switchgear equipments like circuit breakers and

relays.

- Design the ratings for fuses according to the requirement.
- Elucidate various protection schemes of various power system components like alternators, transformers and bus-bars.
- Explain various methods of over voltage protection in power systems.

Contents: Theory

Unit 1: Fundamental:

Necessity & functions of protective system, Normal & abnormal conditions, Types of faults & their causes, Short circuit calculations (Symmetrical faults only), Use of current limiting reactors & their arrangements.

Unit 2: Circuit interrupting devices :

Fuses -Construction, Working of Semi enclosed & HRC fuse, characteristics, selection and applications, related terms – Arc voltage, Recovery voltage & Restriking voltage, Circuit breakers- Concept, Classification, Working principle, Construction, Specification & Applications, Selection and rating of circuit breakers.

Unit 3: Protective Relaying :

Fundamental Requirements (Qualities), Electromagnetic induction type – Operation of Shaded pole type and Watt hour meter type relays, Block diagram , Operation, Advantages & disadvantages of Static and μ P based relays, CT and PT as Protective transformers, Over current relay-Time current characteristics, Operation of Static over current relay with block diagram, Operation of μ P based over current relay with block diagram, Distance relaying- Principle, Operation of – Definite distance relay, Time distance relay and MHO relay, Directional relay- The need of directional relay, construction, operation of Induction type directional over current relay, Differential Relay

Unit 4: Protection of Alternator and Motor:

Abnormalities & Faults, Differential protection , % Differential protection, Over current, earth fault, inter turn fault, negative phase sequence, overheating protection, Reverse power protections, (Simple numerical on differential protection) Short circuit protection, Overload protection, Single phase preventor.

Unit 5: Protection of Transformer :

Abnormalities & faults. Differential, Biased differential, Over current, Earth fault, Inter turn, Restricted earth fault, Overheating protection. Buchholz relay, (Simple numerical on differential protection)

References Book:

1. Switchgear & protection by S. Rao. Khanna Publications
2. A text book on electrical power system by Soni Gupta & Bhatnagar. Dhnapat Rai & Sons
3. The art & science of protective relaying by Mason C.R. Dhnapat Rai & Sons
4. A text book of Electrical power S. L. Uppal. Khanna Publishers, Delhi.
5. Power System Protection & Switchgear by Badriram & Vishwakarma TMH, New Delhi

Industrial Management (DIP603)

Course Objectives :

- Conceive, design, implement and operate integrated systems, focus on appropriate measures of performance at strategic, tactical and operational levels.
- Develop competency to adapt to changing roles for achieving organizational excellence.
- Design and develop sustainable technologies and solutions for betterment of society.

- Pursue entrepreneurial venture with a focus on creativity and innovation for developing newer products, processes and systems

Course Outcomes (CO)

- Design, develop, implement and improve integrated systems that include people, materials, information, equipment and energy.
- Apply statistical and simulation tools, optimization and meta heuristics techniques for analysis of various systems leading to better decision making.
- Demonstrate the engineering relationships between the management tasks of planning, organization, leadership, control, and the human element in various sectors of economy.

Contents: Theory

Unit 1: Overview of Business:

Types of Business, Service, Manufacturing, Trade Industrial sectors, Introduction to Engineering Industry, Process Industry, Textile Industry, Chemical Industry, Agro Industry, Globalization, Introduction, Advantages & disadvantages w.r.t India, Intellectual Property Rights (IPR), Concept, Types of IPR

Unit 2: Management Process :

What is Management?, Evolution, Various Definitions, concept of Management, Levels of Management, Administration and Management, Scientific Management by F W Taylor, Principles of Management (14 principles of Henry Fayol) Functions of Management: Planning, Organizing, Coordinating, Directing, Controlling, Decision Making

Unit 3: Organizational Management :

Organization, Definition, Steps in forming organization, Types of Organization, Line, Line & Staff, Functional, Project type Departmentation, Centralized & Decentralized, Authority & Responsibility, Span of Control (Management), Forms of ownerships, Proprietorship, Partnership, Joint stock company, Co-operative society, Govt. Sector

Unit 4: Human Resource Management:

Personnel Management- Introduction, Definition, function, Staffing, Introduction to HR, Introduction to HR Planning, Recruitment procedure, Personnel – Training & Development- Types of training, Induction,- Skill enhancement. Leadership & Motivation, Leadership- Styles & type, Motivation –Definition , Intrinsic & Extrinsic, Maslow's theory of Motivation and its significance, Safety Management, Causes of Accidents, Safety Procedures - Introduction, Objectives & features of Industrial Legislation such as, Factory Act, ESI Act, Workman Compensation Act, Industrial Dispute Act.

Unit 5: Financial Management (No Numericals):

Financial Management-Objectives & Functions, Capital Generation & Management, Types of capitals, Sources of finance Budget and Accounts-Types of Budgets, Production Budget (including Variance Report), Labour Budget, Introduction to Profit & Loss Account (Only concept), Balance sheet etc. Introduction to Various Taxes- Excise Service Tax, Income Tax, VAT, Custom Duty.

Unit 6: Materials Management- Inventory Management (No Numericals)-

Meaning & Objectives, ABC Analysis, Economic Order Quantity: Introduction & Graphical Representation. Purchase Procedure- Objectives of Purchasing, Functions of Purchasing Department, Steps in Purchasing. Modern Techniques of Material Management-Introductory treatment to Just in Time (JIT) /System Applications & Products (SAP) / Enterprise Resource Planning (ERP)

Unit 7: Project Management (Simple /Elementary Numericals):

Project Management- Introduction & Meaning, Introduction to CPM/PERT Techniques (simple network problems), Concept of Break Even Analysis and its significance. Quality Management- Definition of Quality, Concept of Quality, Quality, Circle, Quality Assurance- Introduction to TQM, Kaizen, 5'S' & Six Sigma

References Book:

1. Industrial Engg. & Management by Dr. O.P. Khanna Dhanpal Rai & sons
2. Business Administration & Management by Dr. S.C. Saksena Sahitya Bhavan Agra
3. The process of Management by W.H. Newman Prentice- Hall of India

Electric Traction (DIP6EEE04)

Course Objectives :

- Distinguish different traction systems and latest trends in traction systems.
- Com Differentiate services of traction system based on speed time curve.
- Control different types of traction motors
- Use various traction system auxiliaries.
- Explain the distribution system of a traction system.

Course Outcomes (CO)

- Identify different traction systems.
- Differentiate speed time curve of different services of traction system.
- Use traction system auxiliaries.
- Calculate energy consumption of traction system.
- Use various speed control methods applicable to traction motors.
- Get exposure with modern trends in traction.

Contents: Theory

Unit 1: Power Supply Arrangements:

Introduction, High Voltage Supply, Constituents of Supply System, Major Equipments at Substation, Location and Spacing of Substations.

Unit 2: Overhead Equipments:

Overhead Equipments, Principles of Design of OHE, Automatic Weight Tension and Temp. Compensation, Uninsulated Overlaps, Insulated Overlaps, Neutral Section, Section Insulator, Isolator, Polygonal OHE, Effect of Speed on OHE, OHE Supporting Structure, Different types of signal boards of OHE, Maintenance of OHE.

Unit 3: Current Collecting Equipments:

Introduction, Systems of Supplying Power, Current Collectors for Overhead System, Types of Pantographs, Construction of Faiveley Type Pantograph, Methods of Raising and Lowering of Pantograph, Maintenance of Pantograph.

Unit 4: Signalling And Supervisory Control:

Requirements of Signalling System, Types of Signals, Colour Light Signals, Three and Four Aspects of Colour Light Signals, Track Circuits, DC Track Circuit, AC Track Circuit, Supervisory Control, Signalling.

Unit 5: Train lighting:

Systems of Train Lighting, Special Requirements of Train Lighting, Method of obtaining Unidirectional Polarity, Method of obtaining Constant Output, Single Battery System, Double Battery Parallel Block System, Failure of Under frame Generating Equipments, End on Generation, Railway Coach Air Conditioning, Types of Installations, Air Conditioned Rolling Stock, Air Conditioning Equipments on Coaches.

References Book:

1. S. K. Pillai –A first course on Electric Drives.
2. M. V. Deshpande- Electrical Motors applications and control
4. S. L. Uppal- Electrical power
5. J. B. Gupta- Electrical power

Digital Communication

Course Objectives :

- Design digital communication systems (e.g., choose modulation scheme, coherent vs. non-coherent), given constraints on data rate, bandwidth, power, and bit error rate;
- Analyze the performance of a digital communication link when additive noise is present in terms of the signal-to-noise ratio and bit-error-rate.
- Compute the power and bandwidth requirements of modern communication systems, including those employing Amplitude-Shift Keying (ASK), Phase-Shift Keying (PSK), Frequency-Shift Keying (FSK), and Quadrature-Amplitude Modulation (QAM) modulation formats;
- Determine the auto-correlation function of a line code and determine its power spectral density (PSD);
- Determine the power spectral density of bandpass digital modulation formats.

Course Outcomes (CO)

- Compare different types of pulse code modulations technique.
- Select the relevant digital modulation technique for specific application.
- Choose the coding technique for minimum errors in transmitting information.
- Choose the relevant data transfer technique for various types of data transfer.
- Use the relevant applications of digital communication.

Contents: Theory

Unit 1: Introduction of Digital Communication :

Basic digital communication system, block diagram, Channel capacity-definition, Hartley's law, Shannon-Hartley theorem, Channel capacity equation, channel noise and its effect, entropy, Advantages and disadvantages of digital communication.

Unit 2: Pulse Communication :

Introduction, comparison with Continuous Wave Modulation, advantages, Sampling theorem, Nyquist rate, aliasing, natural & flat top sampling, PAM, PWM, PPM definition, generation, block diagram, waveform analysis, and their comparison, Pulse code modulation- block diagram of PCM transmitter & receiver, sampling quantization, quantization error, companding, inter symbol interference, Delta modulation- block diagram of DM, slope overload, granular noise.

Unit 3: Digital Modulation Techniques:

Introduction, ASK, FSK, PSK definition & waveforms, Their transmitter and receiver block diagram and working, M- ary coding QPSK, QAM, DPSK block diagram of transmitter and receiver and working, Bandwidth for each modulation technique and their comparison.

Unit 4: Coding methods and Error control:

Baud rate, Bitrate, Line coding- unipolar, bipolar –NRZ, RZ, Manchester, Source coding, ASCII, EBCDIC and baudotcode. Channel coding, Error, Causes of error and its effects, error detection & correction using parity, Hamming code & simple numerical.

Unit 5: Multiplexing and Multiple Access:

Need of Multiplexing, TDM, FDM definition block diagram and their comparison, Introduction to WDM, Access technique TDMA, FDMA, CDMA (only concepts), advantages of TDMA over FDMA.

References Book:

1. Electronic communication system by Wayne Tomasi Pearson Education
2. Electronics Communication by Louis E. Frenzl Tata McGraw Hill
3. Digital Communication by Amitabh Bhattacharya Tata McGraw Hill
4. Digital & Analog Communication by K. Sam.& Shanmugar Jhon wiley & sons

Industrial Automation

Course Objectives :

- The main objective of this course is to make the aspiring engineers acquainted with the conceptual as well as practical knowledge of the PLC programming & latest technologies being used to achieve PLC Industrial Automation.
- We provide top class plc & SCADA programming training with experienced trainers from an industrial background.

Course Outcomes (CO)

- Qualified PLC/HMI programming engineers to meet the requirements of designing appropriate industrial automation systems.
- On completion of these modules, Engineers are ready to take on any Machine, Process or Plant Automation assignment.

Contents: Theory

Unit 1: Automation:

Need of automation, Advantages of automation, Requirements of Automation

Unit 2: Control System :

Concept of control system, Basic block diagram of control system, Transfer function, Block diagram reduction Techniques, Types of control system, Applications of control system

Unit 3: Control System Components & Electrical Actuators:

I/P devices-switches-push buttons, foot switch, selector switch, pilot switch, proximity Switch. Sensors, Relays [Electro mechanical,reed], Valves,pilotlamps,contactors,Potentiometer-workingusesas error detector, Servo motors - AC & DC working Principle, Synchros- Transmitter & control transformer, Tacho generator- working Principle, Stepper motor (Permanent magnet & Variable reluctance)- working Principle, Power & control circuits for different applications like host, games, comeyer belt etc.

Unit 4: Controllers & Control Actions:

Electric & Electronic Controllers & Lead log networks, Digital controllers :- Brief overview of microprocessor & microcontroller to be worked as controller, P, I P+I, P+D, P+I+D actions, P+I+D action using hydraulic pneumatic & electronic controller, Tacho – generator

Unit 5: Programmable logic Controller Applications of above components as AC/DC control system:

Introduction, Advantages & disadvantages, PLC vs PC, Block diagram of PLC Introduction to special control system: Distribution control system (DCS)- brief introduction to hardware & Software used.

Reference Books:

1. Control System Engg. By Nagrath Gopal Wiley Eastern
2. Modern Control Engg. By Ogata Prentice Hall
3. Industrial Control Engg by Jacob Prentice Hall
4. Hydraulics &Pneumatics Andrew Parr Jaico Publication



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