1.1 ENGLISH AND COMMUNICATION SKILLS – I

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RATIONALE

Communication skills play an important role in career development. This subject aims at introducing basic concepts of communication besides laying emphasis on developing listening, speaking, reading and writing skills.

LEARNING OUTCOME

After undergoing the subject, the student will be able to:

- Pronounce properly.
- Overcome communication barriers.
- Write legibly and effectively.
- Listen in proper prospective.
- Read various genres adopting different reading techniques.
- Converse logically.

DETAILED CONTENTS

1. Basics of Communication   (12 hrs)

    1.1 Definition and process of communication
    1.2 Types of communication - formal and informal, oral and written, verbal and non-verbal
    1.3 Objectives of communication
    1.4 Essentials of communication
    1.5 Channels of communication
    1.6 Barriers to communication

2. Functional Grammar and Vocabulary   (12 hrs)

    2.1 Parts of speech
    2.2 Article
    2.3 Tenses
    2.4 Active and passive voice
    2.5 Synonyms and antonyms
    2.6 Pair of words
    2.7 Correction of incorrect sentences

3. Listening   (04 hrs)

    3.1 Meaning and process of listening
    3.2 Importance of listening
    3.3 Methods to improve listening skills

4.   Speaking   (04 hrs)

    4.1   Importance
    4.2   Methods to improve speaking

5.   Reading   (12 hrs)

    5.1   Meaning
    5.2   Techniques of reading: skimming, scanning, intensive and extensive reading
    5.3   Comprehension, vocabulary enrichment and grammar exercises based on following readings:

    Section - I
- God Lives in the Panch – Munshi Prem Chand
- The Gift of the Magi – O. Henry
- Uncle Podger Hangs a Picture – Jerome K. Jerome

    Section - II
- Skylark – P.B. Shelley
- Stopping by Woods on a Snowy Evening – Robert Frost
- Where the Mind is Without Fear – Rabindranath Tagore

6.   Writing   (04 hrs)

    6.1   Significance and effectiveness of writing
    6.2   Paragraph of 100 – 120 words
    6.3   Picture composition/Guided composition

LIST OF PRACTICALS

1.   Self and peer introduction
2.   Looking up words in a dictionary (meaning and pronunciation)
3.   Newspaper reading
4.   Just a Minute session – extempore
5.   Situational conversation and role play
6.   Using pre – recorded CDs/DVDs to students to listen and comprehend.
7.   Greetings for different occasions
8.   Improving pronunciation through tongue twisters.

INSTRUCTIONAL STRATEGY

Use of pre-recorded CDs/DVDs should be made to help the students in developing listening skills. Student centred activities such as group discussions, role play should be used to ensure active participation of students in the classroom.

RECOMMENDED BOOKS

1. Communicating Effectively in English, Book-I by Revathi Srinivas; Abhishek Publications, Chandigarh.
2. Professional Communication by Kavita Tyagi & Padma Misra; Published by PHI Learning Pvt. Ltd; New Delhi.
3. Developing Communication Skills (2nd Edition) by Krishna Mohan & Meera Banerji; Published by Macmillan Publishers India Ltd; New Delhi.
4. Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.
5. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
6. Communication Skills by Sanjay Kumar & Pushp Lata; Oxford University Press, New Delhi

Websites for Reference:

1. http://www.mindtools.com/ page 8.html – 99k
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	12	25
2	12	25
3	04	08
4	04	08
5	12	26
6	04	08
Total	**48**	**100**

1.2   APPLIED MATHEMATICS - I

L T P
5 - -

RATIONALE

Contents of this course provide fundamental base for understanding engineering problems and their solution algorithms. Contents of this course will enable students to use basic tools like logarithm, binomial theorem, partial fractions, matrices etc. for solving complex engineering problems with exact solutions in a way which involve less computational task. By understanding the logarithm, they will be able to make long calculations in short time and it is also a pre-requisite for understanding Calculus.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Apply Complex Number and its representation for two dimensional designing and related calculations. They will be able to apply this knowledge in many engineering problems like alternating current/voltage. The concept of rotation of a vector using iota will enable them solve many engineering problems.
- Apply the basics concepts of Permutation and Combination to find out how many possible ways or arrangements are possible for a particular problem and its solutions. They will be able to count without actual counting. They will be able to apply this concept in understanding of Binomial Theorem and demonstrate better reasoning in different analytical situations.
- Calculate the approximate value of certain expressions and extract roots of certain expression in many engineering problems by Application of Binomial Theorem.
- Resolve a fraction to further fractions by applying basics concepts of Partial Fractions. They will be able to use and apply this knowledge in Integral Calculus.
- Solve engineering problems that are in matrix format by applying the basic understanding of Matrices and their properties, which are usually less computational. Further, this understanding will work as a backbone for the use and development of software in many engineering applications. Study of matrices and its properties will also provide educational base for continuing study and provide solution to many engineering problems by different methodologies.
- Design and solve related problems like constructions of roads, dams, bridges and calculation of height, distance, elevation etc. By the understanding of basic concepts of Trigonometry and 2 D geometry, they will be able to apply the same in different situations in surveying, navigation, astronomy and many other engineering problems. They will also be able to draw graphs of trigonometrical functions for many applications in the solution of engineering problems.

- Write the equations of a geometric shape used in many engineering problems such as straight line and circle. With the use of coordinate geometry, they will be able to explore and evaluate the idea of location, graph, linear relationships between two forms, and distance between two lines, which will be useful in solving engineering problems. They will be able to calculate the distance between a point and a line.

DETAILED CONTENTS

1. Algebra (30 hrs)

   1.1 Complex Numbers: Complex number, representation, modulus and amplitude.

   1.2 Basics and properties of logarithms.

   1.3 Partial fractions (linear factors, repeated linear factors, non-reducible quadratic factors excluding repeated factors).

   1.4 Meaning of $^{n}p_{r}$ & $^{n}c_{r}$ (mathematical expression). Binomial theorem (without proof) for positive integral index (expansion and general form); binomial theorem for any index (expansion without proof), first and second binomial approximation with applications to engineering problems.

   1.5 Determinants and Matrices – Expansion of determinants (upto 3rd order, using properties and otherwise), solution of equations (upto 3 unknowns) by Crammer's rule, definition of Matrices with types, addition, subtraction and multiplication of matrices (upto 3rd order), Minors and Co-factors, inverse of a Matrix by Adjoint method (upto 3rd order), solution of simultaneous equations (upto 3rd order) by Matrix method. Area of a triangle using determinants.

2. Trigonometry (25 hrs)

   2.1 Concept of angle, measurement of angle in degrees, grades and radians and their conversions.

   2.2 T-Ratios of Allied angles (without proof), Sum, Difference formulae and their applications (without proof). Product formulae (Transformation of product to sum, difference and vice versa). T-Ratios of multiple angles, sub-multiple angles (2A, 3A, A/2).

   2.3 Applications of Trigonometric terms in engineering problems such as to find an angle of elevation, height, distance etc.

3.   Co-ordinate Geometry   (25 hrs)

    3.1   Cartesian and Polar coordinates (two dimensional), conversion from Cartesian to Polar coordinates and vice-versa

    3.2   Slope of a line, equation of straight line in various standards forms (without proof); (slope intercept form, intercept form, one-point form, two-point form, symmetric form, normal form, general form), inter section of two straight lines, concurrency of lines, angle between straight lines, parallel and perpendicular lines, perpendicular distance formula, conversion of general form of equation to the various forms.

    3.3   General equation of a circle and its characteristics. To find the equation of a circle, given:

        *   Centre and radius
        *   Three points lying on it
        *   Coordinates of end points of a diameter

INSTRUCTIONAL STATREGY

Basic elements of algebra, trigonometry and coordinate geometry can be taught in the light of their applications in the field of engineering and technology. By laying more emphasis on applied part, teacher can also help in providing a good continuing education base to the students.

RECOMMENDED BOOKS

1.   Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi

2.   Applied Mathematics, Vol. I & II by SS Sabharwal & Dr Sunita Jain, Eagle Parkashan, Jalandhar

3.   Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,

4.   .Engineering Mathematics by Srimanta Pal and Subodh C. Bhunia; Oxford University Press, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Hrs)	Marks Allotted (%)
1.	30	35
2.	25	35
3.	25	30
Total	**80**	**100**

1.3   APPLIED PHYSICS – I

L T P
4 - 2

RATIONALE

Applied physics includes the study of a large number of diverse topics all related to things that go on in the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which objects will behave. Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the course content.

Note: Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles. In all contents, SI units should be followed.

LEARNING OUTCOME

After undergoing this subject, the student will be able to:

- Identify physical quantities, parameters and select their units for use in engineering solutions and make measurements with accuracy by optimising different types of errors.
- Represent physical quantities as scalar and vectors and calculate area of an engineering design and determine net flow (flux) through a given closed surface, etc.
- Solve difficult problems (walking of man, horse and cart problem, flying of bird/ aircraft, etc.)
- Analyse and design banking of roads/railway tracks and apply conservation of momentum principle to Explain rocket propulsion, recoil of gun etc.
- Define work, energy and power and their units. Drive work, power and energy relationship and solve problems about work and power.
- Classify sources of energy as renewable or non renewable. State the principle of conservation of energy. Give advantages and disadvantages of each energy source and Identify forms of energy, conversions. Compare and contrast the physical properties associated with linear motion and rotational motion and give examples of conservation of angular momentum. Describe the surface tension phenomenon and its units, cause of surface tension and effects of temperature on surface tension and Solve statics problems that involve surface tension related forces.
- Describe the viscosity of liquids, coefficient of viscosity and the various factors affecting its value. calculate the viscosity of an unknown fluid using Stokes' Law and the terminal velocity
- Define stress and strain. State Hooke's law and conditions under which it is valid. Given an engineering stress–strain diagram, determine (a) the modulus of elasticity, (b) the yield strength (0.002 strain offset), and (c) the tensile strength, and (d) estimate the percent elongation.

- Express physical work in term of heat and temperature; Measure temperature in various processes on different scales (Celsius, Kelvin Fahrenheit etc.)
- Distinguish between conduction, convection and radiation, identify the different methods for reducing heat losses
- Define the terms: specific heat capacity, specific latent heat, analyse the result of heat transfer between bodies at different temperatures and states measure the specific heat capacity of a solid or a liquid

DETAILED CONTENTS

1. Units and Dimensions   (10 hrs)

    1.1   Physical quantities Units - fundamental and derived units, systems of units (FPS, CGS and SI units)
    1.2   Dimensions and dimensional formulae of physical quantities (area, volume, velocity, acceleration, momentum, force, impulse, work, power, energy, surface tension, coefficient of viscosity, stress, strain, moment of inertia, gravitational constant.)
    1.3   Principle of homogeneity of dimensions
    1.4   Dimensional equations and their applications, conversion from one system of units to other, checking of dimensional equations and derivation of simple equations)
    1.5   Limitations of dimensional analysis
    1.6   Error in measurement, absolute error, relative error, rules for representing significant figures in calculation.
    1.7   Application of units and dimensions in measuring length, diameter, circumference, volume, surface area etc. of metallic and non metallic blocks, wires, pipes etc (at least two each).

2. Force and Motion   (12 hrs)

    2.1   Scalar and vector quantities – examples, representation of vector, types of vectors
    2.2   Addition and Subtraction of Vectors, Triangle and Parallelogram law (Statement only), Scalar and Vector Product.
    2.3   Resolution of Vectors and its application to lawn roller.
    2.4   Force, Momentum, Statement and Derivation of Conservation of linear momentum, its applications such as recoil of gun.
    2.5   Impulse and its Applications
    2.6   Circular motion, definition of angular displacement, angular velocity, angular acceleration, frequency, time period.
    2.7   Relation between linear and angular velocity, linear acceleration and angular acceleration (related numerical)
    2.8   Expression and Applications of Centripetal and centrifugal forces with examples such as banking of roads and bending of cyclist

2.9   Application of various forces in lifts, cranes, large steam engines and turbines

3.   Work, Power and Energy   (10 hrs)

3.1   Work: and its units, examples of zero work, positive work and negative work
3.2   Friction: modern concept, types, laws of limiting friction, Coefficient of friction and its Engineering Applications.
3.3   Work done in moving an object on horizontal and inclined plane for rough and plane surfaces with its applications
3.4   Energy and its units: Kinetic energy and gravitational potential energy with examples and their derivation
3.5   Principle of conservation of mechanical energy for freely falling bodies, examples of transformation of energy.
3.6   Power and its units, calculation of power in numerical problems
3.7   Application of Friction in brake system of moving vehicles, bicycle, scooter, car trains etc.

4   Rotational Motion   (10 hrs)

4.1   Concept of translatory and rotatory motions with examples
4.2   Definition of torque and angular momentum and their examples
4.3   Conservation of angular momentum (quantitative) and its examples
4.4   Moment of inertia and its physical significance, radius of gyration for rigid body, Theorems of parallel and perpendicular axes (statements only), Moment of inertia of rod, disc, ring and sphere (hollow and solid) (Formulae only).
4.5   Application of rotational motions in transport vehicles, and machines.

5.   Properties of Matter   (12 hrs)

5.1   Elasticity: definition of stress and strain, different types of modulii of elasticity, Hooke's law, significance of stress strain curve
5.2   Pressure: definition, its units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications
5.3   Surface tension: concept, its units, angle of contact, Ascent Formula (No derivation), applications of surface tension, effect of temperature and impurity on surface tension
5.4   Viscosity and coefficient of viscosity: Terminal velocity, Stoke's law and effect of temperature on viscosity, application in hydraulic systems.
5.5   Concept of fluid motion, stream line and turbulent flow, Reynold's number Equation of continuity, Bernoulli's Theorem and their applications (no derivation and numerical).

6.   Thermometry   (10 hrs)

       6.1   Difference between heat and temperature
       6.2   Modes of transfer of heat (Conduction, convection and radiation with examples)
       6.3   Different scales of temperature and   their relationship
       6.4   Types of Thermometer (Mercury Thermometer, Bimetallic Thermometer, Platinum resistance Thermometer, Pyrometer)
       6.5   Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them
       6.6   Concept of Co-efficient of thermal conductivity
       6.7   Application of various systems of thermometry in refrigeration and air-conditioning etc.

LIST OF PRACTICALS (to perform minimum eight experiments)

1.   To find volume of solid sphere using a vernier calipers

2.   To find internal diameter and depth of a beaker using a vernier calipers and hence find its volume.

3.   To find the diameter of wire using a screw gauge

4.   To determine the thickness of glass strip using a spherometer

5.   To verify parallelogram law of forces

6.   To study conservation of energy of a ball or cylinder rolling down an inclined plane.

7.   To find the Moment of Inertia of a flywheel about its axis of rotation

8.   To determine the atmospheric pressure at a place using Fortin's Barometer

9.   To determine the viscosity of glycerin by Stoke's method

10.   To determine the coefficient of linear expansion of a metal rod

11.   To determine force constant of spring using Hooks law

INSTRUCTIONAL STATREGY

Teacher may use various teaching aids like models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. The teacher should explain about field applications before teaching the basics of mechanics, work power and energy, rotational motion, properties of matter etc. to develop proper understanding of the physical phenomenon. Use of demonstration can make the subject interesting and develop scientific temper in the students.

RECOMMENDED BOOKS

1. Text Book of Physics for Class XI (Part-I, Part-II); N.C.E.R.T., Delhi

2. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi

3. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi

4. A Text Book of Optics, Subramanian and Brij Lal, S Chand & Co., New Delhi

5. Comprehensive Practical Physics, Vol, I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi

6. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi

7. Applied Physics I & II by RA Banwait & R Dogra, Eagle Parkashan, Jalandhar

8. Engineering Physics by DK Bhhatacharya & Poonam Tandan; Oxford University Press, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Hrs)	Marks Allotted (%)
1.	10	15
2.	12	20
3.	10	15
4.	10	15
5.	12	20
6.	10	15
Total	**64**	**100**

1.4   APPLIED CHEMISTRY – I

L T P
4 - 2

RATIONALE

The use of various chemicals and chemical products in diverse technical and engineering fields have repeatedly proved the importance of Applied Chemistry, which enhances its role to a new peak. On the other hand, ever increasing use of such materials will compel engineers, technocrats to acquire essential applied chemistry knowledge in order to select engineering materials, which not only suit them but also provide more environmental compatibility. This situation demands principles of Applied Chemistry in diploma-engineering courses. Principles of Applied Chemistry will enable budding engineers and technocrats to develop scientific temper and appreciate physical, chemical and engineering properties of materials. Hence the subject of Applied Chemistry.

LEARNING OUTCOMES

After undergoing this subject, the student will be able to:

- Classify various substances based on state of aggregation
- Ascertain qualitatively few physical properties of substances such as density melting and boiling points etc qualitatively.
- Calculate qualitative and quantitative of simple chemical substances.
- Explain and substantiate the laws of chemical combinations.
- Substantiate the laws and principles on which structure of atom is established.
- Explain and predict properties of substances.
- Explain various engineering properties of substances.
- Prepare solution of required concentrations.
- Prepare pH and buffer solutions and understand their significance in industrial process such as electrolysis, electrochemical machining of materials etc.
- Explain sources of water and various characteristics of water (quantitatively).
- Explain cause and factors which can adversely affecting natural water quality and remedial measures available for water purification to achieve water quality standards required for domestic, agricultural and industrial applications.
- Explain the reasons for scarcity of natural water (locally and globally) on mother Earth.
- Think critically, develop and adapt water conservation techniques.
- Explain corrosion of metal and their preventive measures.
- Classify the substance based on the electric behavior and apply these laws/principles efficiently in industrial electrochemical processes.
- Distinguish and construct electrochemical cells and electrolytic cells.
- Explain the principle and mechanisms of latest electrochemical machining technology.
- Explain various biochemical process, pollutions and their control measures polymers composites etc.

DETAILED CONTENTS

1.   Basic Concept of Chemistry   (08 hrs)

   1.1   Physical Classification of matter –solids, liquids, gases.
   1.2   Chemical Classification of matter – element, compounds and mixtures
   1.3   Symbols of elements and valency, writing of chemical formulae of simple compounds.
   1.4   Calculation of percentage of elements in the following compounds using atomic and molecular masses of $CaCO_3$, NaCl, $CuSO_4$, NaOH, $Ca(OH)_2$, H_2SO_4, $C_2H_2O_4$. (Atomic mass of elements should be provided)
   1.5   Chemical equations, thermo-chemical equations, balancing of chemical equations (hit and trial method)

2.   Atomic Structure, Periodic Table and Chemical Bonding   (14 hrs)

   2.1   Fundamental particles- mass and charges of electrons, protons and neutrons with names of the scientists who discovered these fundamental particles.
   2.2   Bohr's model of atom and successes and drawbacks of Bohr's Model of atom (qualitative treatment only).
   2.3   Atomic number, atomic mass number isotopes and isobars.
   2.4   Definition of orbit and orbitals, shapes of s and p orbitals only, quantum numbers and their significance,
   2.5   Aufbau's principle, Pauli's exclusion principle and Hund's rule electronic configuration of elements with atomic number (Z) = 30 only. (Electronic configurations of elements with atomic number greater than 30 are excluded).
   2.6   Modern periodic law and periodic table, groups and periods, classification of elements into s, p, d and f blocks (periodicity in properties - excluded)
   2.7   Chemical bonding and cause of bonding and types of chemical bonding ; Ionic bond (example NaCl) and Covalent bond (sigma (σ) and pi (π) bonds) with examples of H_2, O_2, N_2 and CH_4. Elementary idea of hybridization and its types (sp^3, sp^2 & sp) with examples of CH_4 BF_3 & $BeCl_2$.
   2.8   Metallic bonding- explanation with the help of electron gas (sea) model.

3.   Solutions   (08 hrs)

   3.1   Definition of solution, solute and solvent with examples
   3.2   Methods to express the concentration of solution- molarity (*M*), molality (m) and normality (N) and numericals based on calculation of M, m and N
   3.3   Introduction to pH of solution, simple numericals on pH and industrial applications of pH.
   3.4   Definition of buffer solution and types of buffer solutions with examples and industrial applications of buffers solutions.

4.   Water   (14 hrs)

    4.1   Demonstration of water resources on Earth using pie chart.
    4.2   Classification of water – soft water and hard water, action of soap on hard water, types of hardness, causes of hardness, units of hardness – mg per liter (mgL^{-1}) and part per million (ppm) and simple numericals.
    4.3   Disadvantages caused by the use of hard water in domestic and boiler feed water.
    4.4   Removal of hardness -Permutit process and Ion-exchange process.
    4.5   Chemical analysis of water for estimation of
        a)   Total dissolved solids (TDS)
        b)   Alkalinity of water .
    4.6   Drinking water and characteristics of drinking water.
    4.7   Natural water sterilization by chlorine and UV radiation and reverse osmosis (elementary idea).

5.   Electro Chemistry   (14 hrs)

    5.1   Electronic concept of oxidation, reduction and redox reactions
    5.2   Definition of terms: electrolytes, non-electrolytes with suitable examples
    5.3   Faradays laws of electrolysis and simple numerical problems.
    5.4   Industrial Application of Electrolysis – Electroplating, electrolytic refining and electrometallurgy.
    5.5   Application of redox reactions in electrochemical cells – commercial dry cell (Primary), commercially used lead storage battery (Secondary cell).

6.   Organic Chemistry   (06 hrs)

    6.1   Tetra valency and catenation property of carbon to produce huge orgnic compounds.
    6.2   Classification of organic compounds on the bases of functional groups
    6.3   Nomenclature of simple organic compounds in accordance with I.U.P.A.C. (compounds having two carbon atoms in a molecule belongs to alkanes, alkenes, alkynes, alkyl chlorides, alcohols, ethers, aldehydes, ketones, carboxylic acids,   amines) (compounds containing more than one functional groups are excluded) and their common names (if any)

LIST OF PRACTICALS

1.   Volumetric analysis and apparatus used in volumetric analysis
2.   Preparation of standard solution of oxalic acid or potassium permanganate
3.   To determine strength of given sodium hydroxide solution by titrating against standard oxalic acid solution using phenolphthalein indicator.
4.   Volumetric estimation of ferrous ammonium sulfate solution by titrating it against standard potassium permanganate solution in acidic medium
5.   To prepare iodoform from ethanol or acetone.

6. To prepare Mohr's salt from ferrous sulfate and ammonium sulfate
7. Determination of pH of given solution using pH meter
8. To distinguish between aldehyde and ketone by Tollen's reagent (benzaldehyde and acetone may be used).
9. Estimation of total alkalinity of given water sample by titrating it against standard sulfuric acid solution

INSTRUCTIONAL STRATEGY

Teachers may take help of various models and charts while imparting instructions to make the concept clear. More emphasis should be laid on discussing and explaining practical applications of various chemical process and reactions. In addition, students should be encouraged or motivated to study those processes in more details, which may find practical application in their future professional career.

RECOMMENDED BOOKS

1. Chemistry in Engineering by J.C. Kuricose & J. Rajaram, Tata McGraw Hill, Publishing Company Limited, New Delhi.
2. Engineering Chemistry by P.C. Jain & Monika Jain, Dhanapat Rai Publishing Company, New Delhi.
3. Eagle's Applied Chemistry - I by S. C. Ahuja & G. H. Hugar, Eagle Prakashan, Jalandhar.
4. Engineering Chemistry – A Text Book by H. K. Chopra & A. Parmar, Narosa Publishing House, New Delhi.
5. Applied Chemistry - I by Dr. P. K Vij & Shiksha Vij, Lords Publications, Jalandhar.
6. Engineering Chemistry by Dr. Himanshu Pandey, Goel Publishing House, Meerut, India.

SUGGESTED DISTRIBUTION OF MARKS

Topics	Time Allotted (hrs)	Marks Allotted (%)
1.	08	12
2.	14	22
3.	08	12
4.	14	22
5.	14	22
6.	06	10
Total	**64**	**100**

1.5   BASICS OF INFORMATION TECHNOLOGY

L   T   P
-   -   3

RATIONALE

Information technology has great influence on all aspects of life. Primary purpose of using computer is to make the life easier. Almost all work places and living environment are being computerized. The subject introduces the fundamentals of computer system for using various hardware and software components. In order to prepare diploma holders to work in these environments, it is essential that they are exposed to various aspects of information technology such as understanding the concept of information technology and its scope; operating a computer; use of various tools using MS Office/Open Office/Libre Office using internet etc., form the broad competency profile of diploma holders. This exposure will enable the students to enter their professions with confidence, live in a harmonious way and contribute to the productivity.

Note:

Explanation of Introductory part should be demonstrated with practical work. Following topics may be explained in the laboratory along with the practical exercises. There will not be any theory examination.

LEARNING OUTCOME

After undergoing the subject, the students will be able to:

- Identify Computer Hardware Components, Network Components and Peripherals.
- Explain the role of an Operating System.
- Install System and Application Software.
- Explain the function of the system components including Processor, Motherboard and Input-output devices.
- Use Word Processing Software to prepare document.
- Use Spreadsheet Software to create workbooks and automate calculation.
- Use Presentation Software to create interactive presentation.
- Perform fundamental tasks common to most application software including print, save, edit, cut, copy, paste, format, spell and grammar check.
- Find and evaluate information on the Web.
- Install Antivirus.
- Safeguard against Online Frauds, threats and crimes.

TOPICS TO BE EXPLAINED THROUGH DEMONSTRATION

1. Basic Concepts of IT and Its Application

   Information Technology concept and scope, applications of IT. in office, Air and Railway Ticket reservation, Banks financial transactions, E-Commerce and E-Governance applications etc.,Ethics of IT,concept of online frauds,threats of IT crimes.

2. Computer Hardware:

   Block diagram of a computer, components of computer system, CPU, Memory, Input devices; keyboard, Scanner, mouse etc; Output devices; VDU, LCD, Printers etc. Primary and Secondary Memory: RAM, ROM, magnetic disks – tracks and sectors, optical disk (CD , DVD & Blue Ray Disk.), USB/Flash Drive.

3. Software Concepts:

   System software, Application software, Virtualization software and Utility software, Introduction of Operating System, Installation of Window / linux, Features of OPEN OFFICE/MS_OFFICE(MS word, Excel, PowerPoint) .

4. Internet Concepts:

   Basics of Networking – LAN, WAN, Wi-Fi technologies and sharing of printers and other resources, Concept of IP addresses,DNS, introduction of internet, applications of internet like: e-mail and browsing, concept of search engine and safe searching. Various browsers like Internet explorer/Microsoft Edge, Mozilla Firefox, use of cookies and history, WWW (World Wide Web), hyperlinks, introduction to Anti-virus.

LIST OF PRACTICAL EXERCISES

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

2. Installing various components of computer system and installing system software and application software

3. Installation of I/O devices, printers and installation of operating system viz. Windows/BOSS/ LINUX

4. Features of Windows as an operating system
   - Start
   - Shut down and restore
   - Creating and operating on the icons
   - Opening, closing and sizing the windows and working with windows interfacing elements (option buttons, checkbox, scroll etc.)

- Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file and folders
- Changing settings like, date, time, colour (back ground and fore ground etc.)
- Using short cuts
- Using on line help

5. Word Processing (MS Office/Open Office)

a) File Management:
   - Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, giving password protection for a file
b) Page set up:
   - Setting margins, tab setting, ruler, indenting
c) Editing a document:
   - Entering text, cut, copy, paste using tool- bars
d) Formatting a document:
   - Using different fonts, changing font size and colour, changing the appearance through bold/italic/underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods
   - Aligning of text in a document, justification of document, inserting bullets and numbering
   - Formatting paragraph, inserting page breaks and column breaks, line spacing
   - Use of headers, footers: Inserting footnote, end note, use of comments, autotext
   - Inserting date, time, special symbols, importing graphic images, drawing tools
e) Tables and Borders:
   - Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table
   - Print preview, zoom, page set up, printing options
   - Using find, replace options
f) Using Tools like:
   - Spell checker, help, use of macros, mail merge, thesaurus word content and statistics, printing envelops and lables
   - Using shapes and drawing toolbar,
   - Working with more than one window .

6. Spread Sheet Processing (MS Office/Open Office)

a) Starting excel, open worksheet, enter, edit, data, formulae to calculate values, format data, save worksheet, switching between different spread sheets

b) Menu commands:
   Create, format charts, organise, manage data, solving problem by analyzing data. Programming with Excel Work Sheet, getting information while working

c) Work books:
   Managing workbooks (create, open, close, save), working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations
   Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet, conditional formatting

d) Creating a chart:
   Working with chart types, changing data in chart, formatting a chart, use chart to analyze data
   Using a list to organize data, sorting and filtering data in list

e) Retrieve data with query:
   Create a pivot table, customizing a pivot table. Statistical analysis of data

f) Exchange data with other application:
   Embedding objects, linking to other applications, import, export document.

7. PowerPoint Presentation (MS Office/Open Office)

    a) Introduction to PowerPoint
        -   How to start PowerPoint
        -   Working environment: concept of toolbars, slide layout & templates.
        -   Opening a new/existing presentation
        -   Different views for viewing slides in a presentation: normal, slide sorter.

    b) Addition, deletion and saving of slides

    c) Insertion of multimedia elements
        -   Adding text boxes
        -   Adding/importing pictures
        -   Adding movies and sound
        -   Adding tables and charts etc.
        -   Adding organizational chart
        -   Editing objects
        -   Working with Clip Art

    d) Formatting slides
        -   Using slide master
        -   Text formatting
        -   Changing slide layout
        -   Changing slide colour scheme
        -   Changing background
        -   Applying design template

e)   How to view the slide show?
- Viewing the presentation using slide navigator
- Slide transition
- Animation effects, timing, order etc.

f)   Use of Pack and Go Options.

8.   Internet and its Applications

a)   Establishing an internet connection.
b)   Browsing and down loading of information from internet.
c)   Sending and receiving e-mail
- Creating a message
- Creating an address book
- Attaching a file with e-mail message
- Receiving a message
- Deleting a message

d)   Assigning IP Addresses to computers and use of domain names.

9.   Functioning of Antivirus

a)   Installation and updation of an antivirus.
b)   How to scan and remove the virus.

INSTRUCTIONAL STRATEGY

Since this subject is practice oriented, the teacher should demonstrate the capabilities of computers to students while doing practical exercises. The students should be made familiar with computer parts, peripherals, connections and proficient in making use of MS Office/Open Office in addition to working on internet. The student should be made capable of working on computers independently.

RECOMMENDED BOOKS

1.   Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi

2.   Information Technology for Management by Henery Lucas, Tata McGraw Hills, New Delhi

3.   Computers Fundamentals Architecture and Organisation by B Ram, revised Edition, New Age International Publishers, New Delhi

4.   Computers Today by SK Basandara, Galgotia publication Pvt Ltd. Daryaganj, New Delhi.

5. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi

6. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi

7. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi

8. Fundamentals of Information Technology by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi

9. On Your Marks - Net…Set…Go… Surviving in an e-world by Anushka Wirasinha, Prentice Hall of India Pvt. Ltd., New Delhi

10. Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar

1.6 ENGINEERING DRAWING - I

L T P
- - 6

RATIONALE

Drawing is the language of engineers and technicians. Reading and interpreting engineering drawing is their day to day responsibility. The subject is aimed at developing basic graphic skills in the students so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation. The emphasis, while imparting instructions, should be to develop conceptual skills in the students following BIS SP 46 – 1988.

Note:
i)   First angle projection is to be followed
ii)   Minimum of 16 sheets to be prepared and atleast 2 sheets on AutoCAD
iii)   Instructions relevant to various drawings may be given along with appropriate demonstrations, before assigning drawing practice to students

LEARNING OUTCOME

After undergoing the subject, the students will be able to:

- Identify and use of different grades of pencils and other drafting instruments which are used in engineering field
- Draw free hand sketches of various kinds of objects.
- Utilize various types of lines used in engineering drawing.
- Read and apply different dimensioning methods on drawing of objects.
- Use different types of scales and their utilization in reading and reproducing drawings of objects and maps.
- Draw 2 - dimensional view of different objects viewed from different angles (orthographic views)
- Draw and interpret complete inner hidden details of an object which are otherwise not visible in normal view
- Generate isometric (3D) drawing from different 2D (orthographic) views/sketches
- Identify conventions for different engineering materials, symbols, sections of regular objects and general fittings used in Civil and Electrical household appliances
- Use basic commands of AutoCAD.

DETAILED CONTENTS

1.   Introduction to Engineering Drawing   (03 sheets)

      1.1   Introduction to drawing instruments, materials, layout and sizes of drawing sheets and drawing boards.

1.2   Different types of lines in Engineering drawing as per BIS specifications

1.3   Practice of vertical, horizontal and inclined lines, geometrical figures such as triangles, rectangles, circles, ellipses and curves, hexagonal, pentagon with the help of drawing instruments.

1.4   Free hand and instrumental lettering (Alphabet and numerals) – upper case (Capital Letter), single stroke, vertical and inclined at 75 degree, series of 5,8,12 mm of free hand and instrumental lettering of height 25 to 35 mm in the ratio of 7:4

2.   Dimensioning Technique   (01 sheet)

2.1   Necessity of dimensioning, method and principles of dimensioning (mainly theoretical instructions)

2.2   Dimensioning of overall sizes, circles, threaded holes, chamfered surfaces, angles, tapered surfaces, holes, equally spaced on P.C.D., counter sunk holes, counter bored holes, cylindrical parts, narrow spaces and gaps, radii, curves and arches

3.   Scales   (02 sheets)

3.1   Scales –their needs and importance (theoretical instructions), type of scales, definition of R.F. and length of scale

3.2   Drawing of plain and diagonal scales

4.   Orthographic Projections   (06 sheets)

4.1   Theory of orthographic projections (Elaborate theoretical instructions)

4.2   Projection of Points in different quadrant

4.3   Projection of Straight Line (1st and 3rd angle)
        4.3.1. Line parallel to both the planes
        4.3.2. Line perpendicular to any one of the reference plane
        4.3.3. Line inclined to any one of the reference plane.

4.4   Projection of Plane – Different lamina like square, rectangular, triangular and circle inclined to one plane, parallel and perpendicular to another plane in 1st angle only

4.5   Three views of orthographic projection of different objects. (At least one sheet in 3rd angle)

4.6   Identification of surfaces

5.   Sections   (02 sheets)

    5.1   Importance and salient features

    5.2   Drawing of full section, half section, partial or broken out sections, Offset sections, revolved sections and removed sections.

    5.3   Convention sectional representation of various materials, conventional breaks for shafts, pipes, rectangular, square, angle, channel, rolled sections

    5.4   Orthographic sectional views of different objects.

6.   Isometric Views   (02 sheets)

    6.1   Fundamentals of isometric projections and isometric scale.

    6.2   Isometric views of combination of regular solids like cylinder, cone, cube and prism.

7.   Common Symbols and Conventions used in Engineering   (02 sheets)

    7.1   Civil Engineering sanitary fitting symbols

    7.2   Electrical fitting symbols for domestic interior installations

*8.   Introduction to AutoCAD   (02 sheets)

    Basic introduction and operational instructions of various commands in AutoCAD. At least two sheets on AutoCAD of cube, cuboid, cone, pyramid, truncated cone and pyramid, sphere and combination of above solids.

  *   Auto CAD drawing will be evaluated internally by sessional marks and not by final theory paper.

INSTRUCTIONAL STRATEGY

Teacher should show model of realia of the component/part whose drawing is to be made. Emphasis should be given on cleanliness, dimensioning and layout of sheet. Focus should be on proper selection of drawing instruments and their proper use. The institute should procure AutoCAD or other engineering graphics software for practice in engineering drawings. Teachers should undergo training in AutoCAD/Engineering Graphic. Separate labs for practice on AutoCAD should be established.

RECOMMENDED BOOKS

1. A Text Book of Engineering Drawing by Surjit Singh; Dhanpat Rai & Co., Delhi
2. Engineering Drawing by PS Gill; SK Kataria & Sons, New Delhi
3. Elementary Engineering Drawing in First Angle Projection by ND Bhatt; Charotar Publishing House Pvt. Ltd., Anand
4. Engineering Drawing I & II by JS Layall; Eagle Parkashan, Jalandhar
5. Engineering Drawing I by DK Goel, GBD Publication.

1.7   GENERAL WORKSHOP PRACTICE – I

(Common for   Electronics and Communication Engineering, Electronics &
Telecommunication Engineering, Computer Science and Engineering, Computer
Engineering, Information Technology, Electrical Engineering)

L   T   P
-   -   6

RATIONALE

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. General workshop practices are included in the curriculum in order to provide hands-on experience about use of different tools and basic manufacturing practices. This subject aims at developing general manual and machining skills in the students. In addition, the development of dignity of labour, safety at work place, team working and development of right attitude are the other objectives.

LEARNING OUTCOME

After undergoing the subject, the students will be able to:

- Identify tools and equipment used and their respective functions.
- Identify different types of materials and their basic properties.
- Use and take measurements with the help of basic measuring tools/equipment.
- Select proper tools for a particular operation.
- Select materials, tools, and sequence of operations to make a job as per given specification/drawing.
- Prepare independently simple jobs and inspect the same.
- Follow safety procedures and measures.
- Use safety equipment.

DETAILED CONTENTS (PRACTICAL EXERCISES)

Note: The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

The following shops are included in the syllabus:

1.   Welding Shop – I
2.   Fitting Shop – I
3.   Sheet Metal Shop – I
4.   Electric Shop – I
5.   Electronic Shop – I
6.   Computer Shop – I

1. **WELDING SHOP - I**

1.1   Introduction and importance of welding as compared to other material joining processes. Specifications and type of welding machines, classification and coding of electrodes, welding parameters, welding joints and welding positions. Materials to be welded, safety precautions.

1.2   Jobs to be prepared

   Job I   Practice of striking arc (Minimum 4 beads on 100 mm long M.S. flat).
   Job II   Practice of depositing beads on plate at different current levels. (Minimum 4 beads on M.S. plate at four setting of current level).
   Job III   Preparation of lap joint using arc welding process.
   Job IV   Preparation of butt joint using arc welding process. (100 mm long).
   Job V   Preparation of T Joint using gas or arc welding (100mm x 6 mm M.S. Flat).

2. **FITTING SHOP – I**

2.1   Use of personal protective equipment and safety precautions while working.

2.2   Basic deburring processes.

2.3   Introduction to fitting shop tools, marking and measuring devices/equipment.

2.4   Identification of materials. (Iron, Copper, Stainless Steel, Aluminium etc.)

2.5   Identification of various steel sections (flat, angle, channel, bar etc.).

2.6   Introduction to various fitting shop operations/processes (Hacksawing, Drilling, Chipping and Filing).

   Job I   Marking of job, use of marking tools, filing and use of measuring instruments. (Vernier caliper, Micrometer and Vernier height gauge).
   Job II   Filing a rectangular/square piece to maintain dimensions within an accuracy of $\pm$.25 mm.
   Job III   Making a cut-out from a square piece of MS flat using hand hacksaw and chipping.

3.   **SHEET METAL SHOP – I**

3.1.   Introduction to sheet metal shop, use of hand tools and accessories e.g. different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material.

3.2   Introduction and demonstration of hand tools used in sheet metal shop.

3.3   Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. Shearing Machine, Bar Folder, Burring Machine, Turning Machine, Wiring Machine, Setting Down Machine, Forming Machine, Brake etc.

3.4   Introduction and demonstration of various raw materials used in sheet metal shop e.g. black-plain sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheet etc.

3.5   Study of various types of nuts, bolts, rivets, screws etc.

    Job I   Shearing practice on a sheet using hand shears.
    Job II   Practice on making Single riveted lap joint/Double riveted lap Joint.
    Job III   Practice on making Single cover plate chain type, zig-zag type and single rivetted Butt Joint.

4.   **ELECTRIC SHOP – I**

4.1   Study, demonstration and identification of common electrical materials with standard ratings and specifications such as wires, cables, switches, fuses, cleats, clamps and allied items, tools and accessories.

4.2   Study of electrical safety measures and protective devices.
    Job I   Identification of phase, Neutral and Earth wires for connection to domestic electrical appliances and their connections to three pin plugs.
    Job II   Carrying out house wiring circuits using fuse, switches, sockets, ceiling rose etc. in batten or P.V.C. casing-caping.

4.3   Study of common electrical appliances such as auto electric iron, electric kettle, ceiling/table fan, desert cooler etc.

4.4   Introduction to the construction of lead acid battery and its working.
    Job III   Installation of battery and connecting two or three batteries in series and parallel.

4.5   Introduction to battery charger and its functioning.

        Job IV   Charging a battery and testing with hydrometer and cell tester

5.   ELECTRONIC SHOP – I

5.1   Identification and familiarization with the following tools used in electronic shop: Tweezers, Screw drivers (different sizes), Insulated Pliers, Cutter, Sniper, Philips Screw Driver (Star Screw Driver), L- Keys, Soldering Iron and their demonstration and uses.

5.2   Demonstrate the jointing methods. mounting and dismantling as well as uses of the items mentioned below:

     5.2.1   Various types of single, multi-cored insulated screened power, audio video, co-axial, general purpose wires/cables

     5.2.2   Various types of plugs, sockets connectors suitable for general purpose audio and video use, 2 and 3 pin mains plug and sockets. Banana-plugs, and sockets, BNG, RCA, DIN, UHF, Ear phone speaker connector, telephone jacks and similar male and female connectors and terminal strips.

5.2.3   Various types of switches such as normal/miniature toggle, slide, push button, piano key, rotary, micro switches, SPST, SPDT, DPST, DPDT, band selector, multi way Master Mains Switch.

     5.2.4   Various types of protective devices such as: Wire fuse, cartridge fuse, slow acting/fast acting fuse, HRC fuse, thermal fuse, single/multiple circuit breakers, over and under current relays.

5.3   Job Practice

     Job I   To make perfect solder joints and exposure to modern soldering and re-soldering process.

     Job II   To make soldering on PCBs and to remove components/wires by desoldering.

     Job III   Cut, strip, connect/solder/crimp different kinds of wires/cables (including coaxial and shielded cable) to different types of power/general purpose/ audio video/ telephone plugs, sockets jacks, terminal, binding, posts, terminal strips, connectors.

     Job IV   Identification and familiarisation with various types of switches, protective devices such as- wire fuse, cartridge fuse etc. and relays.

     Job V   Safety precautions to be observed in the electronic shops.

6.   COMPUTER SHOP – I

EXERCISE – I

6.1   Keyboard
- Types of Keyboards
- Interfacing (PS2, USB port, DIN connector)
- Working
- Repairing

6.2   Mouse
- Types of Mouse
- Interfacing (serial, PS2, USB)
- Working

EXERCISE – II

6.3   Printers
- Types (Dot matrix, Inkjet, Laserjet)
- Interfacing (parallel port, USB port, Networking)
- Working
- Maintenance (cartridge change etc)
- Installation of printers
- Troubleshooting (Driver compatibility, Paper jam, printing problems due to uncleaned drum in laserjet printers, belt related problems in inkjet printer, jets choking problem in inkjet printer, color alignment problem).
- Tracing network printer and sharing it.

EXERCISE – III

6.4   Scanner
- Types
- Interfacing
- Scanning a document

6.5   Monitor
- Types and Interfacing
- Fault finding and repairing

EXERCISE – IV

6.6   CPU

- Motherboard connection (dimensions, processor, chipset, BIOS, EFI (Extended Firmware Interfacing), UFI (Unified Firmware Interfacing).
- SMPS-AT
    – Working
    – Voltage levels
    – Fault finding and repair

RECOMMENDED BOOKS

1.   Workshop Technology I,II,III, by SK Hajra, Choudhary and AK Choudhary; Media Promoters and Publishers Pvt. Ltd. Mumbai.
2.   Workshop Technology Vol. I, II, III by Manchanda; India Publishing House, Jalandhar.
3.   Workshop Training Manual Vol. I, II by S.S. Ubhi; Katson Publishers, Ludhiana.
4.   Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd., New Delhi
5.   Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
6.   Workshop Technology by B.S. Raghuwanshi; Dhanpat Rai and Co., New Delhi
7.   Workshop Technology by HS Bawa; Tata McGraw Hill Publishers, New Delhi.

TRAFFIC AWARENESS & ROAD SAFETY CAMP(I)

A diploma holder must have knowledge of various types of traffic rules and regulations. Road safety education is vital for people of all ages. As a responsible citizen, you should be aware of each and every road safety rules. Observation is the key skill you need in ensuring road safety By obeying safety rules and regulations, you can save yourself and others on the road. This camp covers the basic concepts of traffic rules and safety. Lectures will be delivered on following broad topics with the coordination of Distt. Traffic police. There will be no exam for this camp.

1. Road safety Scenario

2. School bus and traffic management

3. Awareness of Traffic Signs

4. Speeding Limit

5. Always Wear your Shields

6. Overtaking

7. Awareness through Hoardings

8. Walking & Safe cycling

2.1   ENGLISH AND COMMUNICATION SKILLS - II

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	3	-	2

RATIONALE

Communication skills play an important role in career development. This subject aims at introducing basic concepts of communication besides laying emphasis on developing listening, speaking, reading and writing skills.

LEARNING OUTCOME

 After undergoing the subject, the students will be able to:

- Make proper oral presentations.
- Speak confidently.
- Debate properly.
- Write accurate official/business letters.
- Respond to telephone calls effectively.
- Overcome communication barriers.

DETAILED CONTENTS

1.   Functional Grammar and Vocabulary   (12 hrs)

Theory and Practical exercises on following:
1.1   One word substitution
1.2   List of words misspelt
1.3   Prefixes and Suffixes
1.4   Punctuation
1.5   Narration
1.6   Idioms and Phrases

2.   Reading   (12 hrs)

Comprehension, Vocabulary enrichment and grammar exercises based on the following readings:

Section-I

- The Refund - Friotz Karinthy
- Riders to the Sea - J.M. Synge

Section-II

- Night of the Scorpion - Nissim Ezekiel
- Palanquin Bearers - Sarojini Naidu
- Ode on a Grecian Urn – John Keats

3.   Writing   (24 hrs)

3.1   Precis Writing
3.2   Correspondence: Business and Official
3.3   Report Writing: Project report
3.4   Press Release
3.5   Memos and Circulars
3.6   Notices, Agenda and Minutes of Meetings
3.7   Filling-up different forms such as bank form and on-line form for placement etc.

LIST OF PRACTICALS

1. Group discussion on some current topic of interest.
2. Small speech using voice modulation.
3. Seminar
4. Debate
5. Use of recorded CDs of speeches for comprehension.
6. Manners and etiquettes
7. Paper presentation
8. Telephonic conversation: General etiquette for making and receiving calls.

INSTRUCTIONAL STRATEGY

Use of pre-recorded CDs/DVDs should be made to help the students in developing listening skills. Student centred activities such as group discussions, role play should be used to ensure active participation of students in the classroom.

RECOMMENDED BOOKS

1.   Communicating Effectively in English, Book-I by Revathi Srinivas; Abhishek Publications, Chandigarh.
2.   Professional Communication by Kavita Tyagi & Padma Misra; Published by PHI Learning Pvt. Ltd; New Delhi.
3.   Developing Communication Skills (2nd Edition) by Krishna Mohan & Meera Banerji; Published by Macmillan Publishers India Ltd; New Delhi.
4.   Communication Techniques and Skills by R. K. Chadha; Dhanpat Rai Publications, New Delhi.

5. Business correspondence and report writing by RC Sharma and Krishna Mohan; Tata McGraw Hill, New Delhi.
6. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
7. Communication Skills by Sanjay Kumar & Pushp Lata; Oxford University Press, New Delhi

Websites for Reference:

1. http://www.mindtools.com/ page 8.html – 99k
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	12	25
2	12	25
3	24	50
Total	**48**	**100**

2.2 APPLIED MATHEMATICS – II

L T P
5 - -

RATIONALE

Applied mathematics forms the backbone of engineering students. Basic elements of Differential calculus and Integral calculus and Operations Research have been included in this course. This will develop analytical abilities to apply in engineering field and will provide continuing educational base to the students.

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- Calculate the effect of one variable with respect to another variable and write the equation of tangent and normal to a curve at a point by understanding and application of basics concepts of derivatives. After understanding the concept of derivatives they will be able to calculate the maximum and minimum values of a function.
- Calculate the area of a curve bounded by axes, by understanding the applications of basic concepts of integration. They will also be able to find the velocity from acceleration and displacement from velocity.
- Evaluate complex integrals in a simpler way by applying definite integral.
- Calculate the approximate area under a curve by applying Numerical Integration by using Trapezoidal and Simpson's Rules.
- Optimize the utilization of limited resources by applying basics concepts of Linear Programming.
- Solve Engineering and Industrial Problems by understanding and applying the solution of differential equations.
- Apply differential Equations and Numerical methods for higher learning of Mathematics and Engineering Applications.

DETAILED CONTENTS

1. Differential Calculus (26 hrs)

    1.1 Definition of function; Concept of limits (Introduction only).

    1.2 Standard Differentiation of x^n, sin x, cos x, tan x, e^x, $\log_a x$ and related formule.

1.3 Differentiation of sum, product and quotient of functions, differentiation of implicit functions, differentiation of parametric functions. Differentiation of function of a function.

1.4 Differentiation of trigonometric, inverse trigonometric functions. Logarithmic differentiation. Exponential differentiation, Successive differentiation (excluding nth order).

1.5 Application of differential calculus in:
  (a) Rate Measures
  (b) Maxima and minima
  (c) Equation of tangent and normal to a curve (for explicit functions only)

2. Integral Calculus   (30 hrs)

2.1 Integration as inverse operation of differentiation with simple examples.

2.2 Standard integrals and related simple problems

2.3 Simple integration by substitution, by parts and by partial fractions (for linear factors only)

2.4 Evaluation of definite integrals (simple problems)

Evaluation of $\int_{0}^{\pi/2} Sin^n x \, dx, \quad \int_{0}^{\pi/2} Cos^n x \, dx, \quad \int_{0}^{\pi/2} Sin^m x \; Cos^n x \, dx$

using formulae without proof (m and n being positive integers only).

2.5 Applications of integration for evaluation of area bounded by a curve and axes (Simple problem).

2.6 Numerical integration by Trapezoidal Rule and Simpson's $1/3^{rd}$ Rule and $3/8^{th}$ Rule.

3. Operations Research   (12 hrs)

3.1 Linear Programming Problems formulations.

3.2 Graphical Method

4. Differential Equations   (12 hrs)

4.1 Definition, order, degree of ordinary differential equations.

4.2   Formation of differential equation (upto 2nd order). Solution of Differential equations with Variable separation and Linear Differential equations.

INSTRUCTIONAL STATREGY

Basic elements of Differential Calculus, Integral Calculus, Operations research and Differential Equations can be taught in the light of their applications in the field of engineering and technology. By laying more stress on applied part, teachers can also help in providing continuing education base to the students.

RECOMMENDED BOOKS

1.   Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi

2.   Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar

3.   Applied Mathematics, Vol. I & II by SS Sabharwal &Dr Sunita Jain, Eagle Parkashan, Jalandhar

4.   Engineering Mathematics, Vol I, II & III by V Sundaram et al, Vikas Publishing House (P) Ltd., New Delhi

5.   Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd., Delhi

6.   Applied Mathematics I, Archana Sharma, Lords Publications, Jalandhar.

7.   Engineering Mathematics by Srimanta Pal and Subodh C. Bhunia; Oxford University Press, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Hrs)	Marks Allotted (%)
1	26	34
2	30	38
3	12	16
4	12	12
Total	**80**	**100**

2.3   APPLIED PHYSICS – II

L   T   P
4   -   2

RATIONALE

Applied physics includes the study of a large number of diverse topics related to things that go in the world around us. It aims to give an understanding of this world both by observation and prediction of the way in which objects behave. Concrete use of physical principles and analysis in various fields of engineering and technology

LEARNING OUTCOME

After undergoing this subject, the student will be able to;

a)   Define wave motion its types (Transverse and Longitudinal), Periodic and Simple Harmonic Motion, solve simple problems.

b)   Define the terms: frequency, amplitude, wavelength, velocity of a wave. They will be able to explain diffraction, interference, polarization.

c)   Explain various Engineering, Medical and Industrial applications of Ultrasonics.

d)   Apply acoustics principles to various types of buildings to get best sound effect.

e)   State the laws of reflection and refraction of light, calculate the location of the final image for a concave mirror single thin converging lens**,** design and assemble a microscope using 2 lenses

f)   Measure the refractive index of a liquid or a solid. They will be able to explain total internal reflection as applied to optical fibers.

g)   Define capacitance and its unit. They will be able to explain the function of capacitors in simple circuits, solve simple problems using C=Q/V

h)   Explain the role of free electrons in insulators, conductors and semiconductors, qualitatively the terms: potential, potential difference, electromotive force.

i)   Explain electric current as flow of charge, the concept of resistance, measure correctly, using a multimeter, the following: electric current, potential difference, resistance.

j)   List the effects of an electric current and their common applications, State and apply Ohm's law, calculate the equivalent resistance of a variety of resistor combinations, determine the energy consumed by an appliance, distinguish between AC and DC electricity

k)   State the laws of electromagnetic induction, describe the effect on a current-carrying conductor when placed in a magnetic field

l)   Explain how the following operate: moving coil galvanometer, simple DC motor

m)   Apply the knowledge of diodes in rectifiers, adapters IC's and various electronic circuits. Use the knowledge of semiconductors in various

technical gadgets like mobile phones, computers, LED, LCD, solar lights etc.

n) Apply the concept of light amplification in designing of various LASER based instruments and optical sources.

o) Apply the use of optical fibre in Medical field and optical fibre Communication.

DETAILED CONTENTS

1. Wave motion and its applications   (08 hrs)

    1.1 Wave motion, transverse and longitudinal wave motion with examples, sound and light waves, relationship among wave velocity, frequency and wave length and its application

    1.2 Wave equation y = r sin wt, phase, phase difference, principle of superposition of waves

    1.3 Simple Harmonic Motion (SHM): definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M. concept of simple harmonic progressive wave

    1.4 Study of vibration of Cantilever and determination of its time period

    1.5 Free, forced and resonant vibrations with examples

    1.6 Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time and their applications

    1.7 Ultrasonics – Introduction and their engineering and medical applications.

2. Optics   (10 hrs)

    2.1 Laws of reflection and refraction, refractive index, lens for thin lenses, power of lens, magnification

    2.2 Total internal reflection and its applications, Critical angle and conditions for total internal reflection

    2.3 Simple and compound microscope, astronomical telescope in normal adjustment, magnifying power.

    2.4 Applications of Total Internal Reflection in optical fiber, uses of microscope and telescope.

3. Electrostatics   (12 hrs)

    3.1 Coulombs law, unit of charge,

    3.2 Electric field, Electric lines of force and their properties, Electric flux, Electric potential and potential difference.

    3.3 Gauss law: Application of Gauss law to find electric field intensity of straight charged conductor, plane charged sheet and charged sphere.

3.4 Capacitor and its working principle, Capacitance and its units. Capacitance of parallel plate capacitor. Series and parallel combination of capacitors (numericals)

3.5 Dielectric and its effect on capacitance, dielectric break down

3.6 Application of electrostatics in electrostatic precipitation of microbes and moisture separation from air and gases in industry for pollution control (Brief explanation only)

4. Current Electricity (12 hrs)

4.1 Electric Current and its Unit, Direct and alternating current,

4.2 Resistance and its Units, Specific Resistance, Conductance, Specific Conductance, Series and Parallel combination of Resistances. Factors affecting Resistance, Colour coding of carbon Resistances

4.3 Ohm's law and its verification, superconductivity

4.4 Kirchhoff's laws, Wheatstone bridge and its applications (slide wire bridge only)

4.5 Concept of terminal potential difference and Electro motive force (EMF)

4.6 Heating effect of current, Electric power, Electric energy and its units (related numerical problems), Advantages of Electric Energy over other forms of energy

4.7 Examples of application of DC circuits in various electrical and electronics equipment such as C.R.O, T.V., Audio-Video System, Computers etc.

5. Electromagnetism (10 hrs)

5.1 Introduction to magnetism, Types of magnetic materials. Dia, para and ferromagnetic materials with their properties,

5.2 Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and their units

5.3 Concept of electromagnetic induction, Faraday's Laws

5.4 Lorentz force (force on moving charge in magnetic field). Force on current carrying conductor, force on rectangular coil placed in magnetic field

5.5 Moving coil galvanometer its principle, construction and working. Conversion of a galvanometer into ammeter and voltmeter

5.6 Application of electromagnetism in ac/dc motors and generators.

6. Semiconductor physics (06 hrs)

6.1 Energy bands, Types of materials (insulator, semi conductor, conductor), intrinsic and extrinsic semiconductors, p-n junction diode and its V-I characteristics

6.2 Diode as rectifier – half wave and full wave rectifier (centre taped), semiconductor transistor; pnp and npn (concept only)

6.3 Application of semiconductor diodes (Zenor, LED) and that of transistor as amplifier and oscillator.

7.   Modern Physics   (06 hrs)

     7.1   Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; laser and its characteristics, population inversion, Types of lasers; Ruby and He-Ne lasers, engineering and medical applications of lasers.

     7.2   Fibre optics: introduction to optical fibers, light propagation, types, acceptance angle and numerical aperture and applications in communication.

     7.3   Introduction to nanotechnology, nanoparticles and nano materials.

LIST OF PRACTICALS (To perform minimum Eight experiments)

1.   To find the time period of a simple pendulum
2.   To determine and verify the time period of Cantilever
3.   To find the focal length of convex lens by displacement method.
4.   To determine the magnifying power of an astronomical telescope
5.   To verify ohm's laws by drawing a graph between voltage and current.
6.   To verify laws of resistances in series and parallel combination.
7.   To find resistance of galvanometer by half deflection method
8.   Conversion of Galvanometer into an Ammeter and Voltmeter of given range.
9.   To measure very low resistance and very high resistances using Slide Wire bridge
10.   To draw characteristics of a pn junction diode and determine knee and break down voltages
11.   Use of CRO in plotting AC and DC waveforms.
12.   To find wave length of the laser beam.
13.   To find numerical aperture of a plastic optical fiber.

INSTRUCTIONAL STATREGY

Teacher may use various instructional media like models, charts and graphs while imparting instructions. The field application should be made clear before teaching the basics of waves, sound, light, electrostatics, dc circuits, electromagnetism, and semiconductor physics etc to develop proper understanding of the physical phenomenon. Use of demonstration can make the subject interesting and develop scientific temper in the students.

RECOMMENDED BOOKS

1.   Text Book of Physics (Part-I, Part-II); N.C.E.R.T., Delhi
2.   Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
3.   A Text Book of Optics, Subramanian and Brij Lal, S Chand & Co., New Delhi
4.   Practical Physics, by C. L. Arora, S Chand publications
5.   Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (hrs)	Marks Allotted (%)
1	08	12
2	10	16
3	12	18
4	12	18
5	10	16
6	06	10
7	06	10
Total	**64**	**100**

2.4 BASIC ELECTRONICS

L T P
4 - 2

RATIONALE

This subject gives the knowledge of fundamental concepts and principles of basic electronics and aims at providing the students with basic understanding of various types of materials such as conductors, semiconductors and insulators, extrinsic and intrinsic semi-conductors, p-n junction, need of rectifiers, significance and use of filters in rectifiers, basic structure and working principle of tunnel diodes, LEDs, varactor diodes, LCD; working of transistors in various configurations; fundamental knowledge of FETs and MOSFETs etc. and their applications. The teacher should give emphasis on understanding of concepts by explaining the various terms used in the subject. Practical exercises have been included in order to reinforce various concepts. Industrial/field exposure must be given by organizing industrial visit.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Identify and able to take readings on various electronics equipments(multimeter, CRO, signal generator, LCR meter)
- Plot the VI characteristics of pn junction diode and Zener diode
- Measure voltage gain, input and output impedance in a single state CE amplifier circuit.
- Fabricate half wave, full wave and bridge rectifier and observe waveforms of each
- Plot the waveforms of the rectifier circuit with different filters
- Plot input and output characteristics of transistor in CB and CE mode
- Plot the characteristics of FET based amplifier
- Measure voltage gain, input and output impedance in a single state CE amplifier circuit

DETAILED CONTENTS

1. Semiconductor Physics: (12 hrs)

   1.1 Review of basic atomic structure and energy levels, concept of insulators, conductors and semi conductors, atomic structure of Germanium (Ge) and Silicon (Si), covalent bonds
   1.2 Concept of intrinsic and extrinsic semi conductor, process of doping.
   1.3 Energy level diagram of conductors, insulators and semi conductors; minority and majority charge carriers.
   1.4 P and N type semiconductors and their conductivity, effect of temperature on conductivity of intrinsic semi conductors.

2.   Semiconductor Diode: (12 hrs)

2.1   PN junction diode, mechanism of current flow in PN junction, forward and reverse biased PN junction, potential barrier, drift and diffusion currents, depletion layer, concept of junction capacitance in forward and reverse biased condition.

2.2   V-I characteristics, static and dynamic resistance and their value calculation from the characteristics.

2.3   Application of diode as half-wave, full wave and bridge rectifiers. Peak Inverse Voltage, rectification efficiencies and ripple factor calculations, shunt capacitor filter, series inductor filter, LC and RC filters.

2.4   Types of diodes, characteristics and applications of Zener diodes. Zener and avalanche breakdown.

3.   Introduction to Bipolar-Transistors: (12 hrs)

3.1   Concept of a bipolar transistor, its structure, PNP and NPN transistors, their symbols and mechanism of current flow; Current relations in a transistor; concept of leakage current;

3.2   CB, CE, CC configurations of a transistor; Input and output characteristics in CB and CE configurations; input and output dynamic resistance in CB and CE configurations; Current amplification factors. Comparison of CB, CE and CC Configurations;

3.3   Transistor as an amplifier in CE Configuration; concept of DC load line and calculation of current gain and voltage gain using DC load line.

4.   Transistor Biasing Circuits: (06 hrs)

Concept of transistor biasing and selection of operating point. Need for stabilization of operating point. Different types of biasing circuits.

5.   Single Stage Transistor Amplifier: (10 hrs)

Single stage transistor amplifier circuit, concept of dc and ac load line and its use. Explanation of phase reversal of output voltage with respect to input voltage.

6.   Field Effect Transistors   (12 hrs)

Construction, operation and characteristics of FETs and their applications.

6.1   Construction, operation and characteristics of a MOSFET in depletion and enhancement modes and its applications.

6.2   C MOS - advantages and applications

6.3   Comparison of JFET, MOSFET and BJT.

6.4   FET amplifier circuit and its working principle. (No Derivation).

LIST OF PRACTICALS

1. Operation and use of the following instruments:

    Multi-meter, CRO, Signal generator, LCR meter, Regulated Power Supply by way of taking readings of relevant quantities with their help.

2. Plotting of V-I characteristics of a PN junction diode

3. Plotting of V-I characteristics of a Zener diode

4. Measurement of the voltage gain, input and output impedance in a single state CE amplifier circuit.

5. Design of following circuit on breadboard and observe the output of :
    a. Half-wave rectifier circuit using one diode

    b. Full-wave rectifier circuit using two diodes

    c. Bridge-rectifier circuit using four diodes

6. Plotting of the wave shape of full wave rectifier with

    a. Shunt capacitor filter

    b. Series inductor filter

    c. RC filter

7. Plotting of input and output characteristics and calculation of parameters of transistors in CE   configuration.

8. Plotting of input and output characteristics and calculation of parameters of transistors in CB   configuration.

9. Plotting of V-I characteristics of a FET based amplifier.

10. Measurement of voltage gain, input and output impedance in a single state CE amplifier circuit.

INSTRUCTIONAL STRATEGY

The aim of this subject is to provide the knowledge of the fundamental concepts related to basic electronics. The teacher should give more emphasis on understanding of concepts and the measuring of various terms used in the subject. The students be made familiar with diodes, transistors, resistors, capacitors, inductors etc. and various measuring instruments such as Multi-meter, CRO, Signal generator, LCR meter, Regulated Power Supply etc. Practical exercises should be included to reinforce the various concepts. Practical applications of semiconductor diodes, transistors, field effect transistors etc must be elucidated to the students.

RECOMMENDED BOOKS

1.   Basic Electronics and Linear Circuit by NN Bhargava, Kulshreshta and SC Gupta, Tata McGraw Hill Education Pvt Ltd., New Delhi.
2.   Principles of Electrical and Electronics Engineering by VK Mehta; S Chand and Co., New Delhi
3.   Electronic Components and Materials by SM Dhir, Tata McGraw Hill Education Pvt Ltd., New Delhi.
4.   Principles of Electronics by SK Bhattacharya and Renu Vig, SK Kataria and Sons, Delhi
5.   Electronics Devices and Circuits by Millman and Halkias; McGraw Hill.
6.   Principles of Electronics by Albert Paul Malvino; Tata McGraw Hill Education Pvt Ltd., New Delhi.
7.   Basic Electronics – Problems and Solutions by Albert Malvino and David J. Bates; Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi.
8.   Basic Electronics by J.S. Katre, Sandeep Bajaj, Tech. Max. Publications, Pune.
9.   Analog Electronics by DR Arora, Ishan Publications, Ambala City.
10.   Electronic Principles by SK Sahdev, Dhanpat Rai & Co., New Delhi
11.   Analog Electronics by JC Karhara, King India Publication, New Delhi
12.   Electrical Devices and Circuits by Rama Reddy, Narosa Pulishing House Pvt. Ltd., New Delhi
13.   Electronic Devices and Circuits by Dharma Raj Cheruku and Battula Tirumala Krishna: Pearson Education (Singapore) Pvt Ltd., Indian Branch, 482 F.I.E Patparganj, Delhi- 92
14.   Basic Electronics by JB Gupta, SK Kataria and Sons, New Delhi
15.   Grob's Basic Electronics- A text Lab Manual (Special Indian Edition) by Schultz, Tata McGraw Hill Education Pvt Ltd, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	12	20
2	12	20
3	12	20
4	6	5
5	10	15
6	12	20
Total	**64**	**100**

2.5 BASIC ELECTRICAL ENGINEERING

L T P
4 - 2

RATIONALE

A diploma holder may be involved in various jobs ranging from preventive maintenance of electrical installation to fault location. In addition, he/she may be working in testing laboratories where he/she uses measuring instruments. To carry out these and similar jobs effectively, knowledge of basic concepts, principles and their applications is very essential. This course will enable the students to understand the basic concepts and principles of DC and AC fundamental, ac circuits, batteries, electromagnetic induction, voltage and current sources etc

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Identify and able to take readings on various electrical equipments(voltmeter, ammeter, CRO, wattmeter, multi-meter)
- Determination of voltage-current relationship in a DC circuit under specific physical conditions
- Measure resistance of an ammeter and a voltmeter
- Verify DC circuits (Thevenin and Nortons Theorem)
- Verify Kirchhoff's Current and Voltage Laws in a dc circuit
- Find the ratio of inductance of a coil having air-core and iron-core respectively and to observe the effect of introduction of a magnetic core on coil inductance
- Test a lead - acid storage battery
- Measure power and power factor in a single phase R-.L-.C. Circuit and calculation of active and reactive powers in the circuit.

DETAILED CONTENTS

1. Overview of DC Circuits (06 hrs)

    1.1 Simple problems on series and parallel combination of resistors with their wattage consideration,
    1.2 Application of Kirchhoff's current law and Kirchhoff's voltage law to simple circuits. Star – Delta connections and their conversion.

2. DC Circuit Theorems (06 hrs)

    Thevenin's theorem, Norton's theorem, application of network theorems in solving D.C. circuit problems.

3.   Voltage and Current Sources   (04 hrs)

    3.1   Concept of voltage source, symbol and graphical representation characteristics of ideal and practical sources.

    3.2   Concept of current sources, symbol, characteristics and graphical representation of ideal and practical current sources.

4.   Electro Magnetic Induction   (10 hrs)

    4.1   Concept of electro-magnetic field produced by flow of electric current, magnetic circuit, concept of magneto-motive force (MMF), flux, reluctance, permeability, analogy between electric and magnetic circuit.\

    4.2   Faraday's laws of electro-magnetic induction, principles of self and mutual induction, self and mutually induced e.m.f, simple numerical problems.

    4.3   Concept of current growth, decay and time constant in an inductive (RL) circuit.

    4.4   Energy stored in an inductor, series and parallel combination of inductors.

5.   Batteries   (06 hrs)

    5.1   Basic idea of primary and secondary cells

    5.2   Construction, working principle and applications of Lead-Acid, Nickel-Cadmium and Silver-Oxide batteries

    5.3   Charging methods used for lead-acid battery (accumulator)

    5.4   Care and maintenance of lead-acid battery

    5.5   Series and parallel connections of batteries

    5.6   General idea of solar cells, solar panels and their applications

    5.7   Introduction to maintenance free batteries

6.   AC Fundamentals   (10 hrs)

    6.1   Concept of alternating quantities

    6.2   Difference between ac and dc

    6.3   Concepts of: cycle, frequency, time period, amplitude, instantaneous value, average value, r.m.s. value, maximum value, form factor and peak factor.

    6.4   Representation of sinusoidal quantities by phasor diagrams.

    6.5   Equation of sinusoidal wave form for an alternating quantity and its derivation

    6.6   Effect of alternating voltage applied to a pure resistance, pure inductance and pure capacitance.

7.   AC Circuits   (16 hrs)

   7.1   Concept of inductive and capacitive reactance
   7.2   Alternating voltage applied to resistance and inductance in series.
   7.3   Alternating voltage applied to resistance and capacitance in series.
   7.4   Introduction to series and parallel resonance and its conditions
   7.5   Power in pure resistance, inductance and capacitance, power in combined RLC circuits. Power factor, active and reactive power and their significance, definition and significance of power factor.
   7.6   Definition of conductance, susceptance, admittance, impedance and their units

8.   Various Types of Power Plants   (06 hrs)

   8.1   Brief explanation of principle of power generation practices in thermal, hydro and nuclear power stations and their comparative study. A Visit to a nearby Power Station(s) may be organized for better understanding and exposure.
   8.2   Elementary block diagram of above mentioned power stations

LIST OF PRACTICALS

1.   Operation and use of measuring instruments viz voltmeter, ammeter, CRO, Wattmeter, multi-meter and other accessories
2.   Determination of voltage-current relationship in a dc circuit under specific physical conditions and to draw conclusions.
3.   Measurement of resistance of an ammeter and a voltmeter
4.   Verification of dc circuits:
   a.   Thevenin's theorem,
   b.   Norton's theorem,
5.   Observation of change in resistance of a bulb in hot and cold conditions, using voltmeter and ammeter.
6.   Verification of Kirchhoff's Current and Voltage Laws in a dc circuit
7.   To find the ratio of inductance of a coil having air-core and iron-core respectively and to observe the effect of introduction of a magnetic core on coil inductance
8.   Charging and testing of a lead - acid storage battery.
9.   Measurement of power and power factor in a single phase R-.L-.C. circuit and calculation of active and reactive powers in the circuit.

Note: Visit to a nearby Power Station(s) may be arranged to demonstrate various aspects of subject.

INSTRUCTIONAL STRATEGY

Basic electrical engineering being a fundamental subject, it needs to be handled very carefully and in a manner such that students develop clear understanding of the related concepts and principles. The teacher may lay more emphasis on laboratory work and give home assignments to students to inculcate self-study and problem solving abilities amongst them.

RECOMMENDED BOOKS

1.   Basic Electrical Engineering by PS Dhogal, Tata Mc Graw-Hill Education Pvt Ltd., New Delhi.
2.   Basic Electrical and Electronics Engineering by SK Sahdev; Dhanpat Rai and Co, New Delhi.
3.   Electrical Technology, Fifth Edition by Edward Hughes, Longman Publishers.
4.   Experiments in Basic Electrical Engineering by SK Bhattacharya, KM Rastogi; New Age International (P) Ltd.; Publishers New Delhi.
5.   Electrical Science by Choudhury S.; Narosa Publishing House Pvt Ltd, Daryaganj, New Delhi.
6.   Basic Electrical and Electronics Engineering by Kumar KM, Vikas Publishing House Pvt Ltd, Jang pura, New Delhi.
7.   Electrical Technology by BL Theraja, S Chand and Co, New Delhi.
8.   Basic Electricity by BR Sharma; Satya Prakashan; New Delhi.
9.   Principles of Electrical Engineering by BR Gupta, S Chand and Co, New Delhi.
10. Basic Electrical Engineering by JB Gupta; SK Kataria and Sons, New Delhi.
11. Experiments in Basic Electrical Engineering by GP Chhalhotra, Khanna Publishers, New Delhi
12. Basic Electrical Engineering by J.S. Katre, Technical Max. Publication, Pune.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	06	8
2.	06	10
3.	04	08
4.	10	15
5.	06	12
6.	10	15
7.	16	20
8	06	12
Total	**64**	**100**

2.6   ENVIRONMENTAL STUDIES

L T P
3 - -

RATIONALE

A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the eco system and controlling pollution by various control measures. He should also be aware of environmental laws related to the control of pollution. He should know how to manage the waste. Energy conservation is the need of hour. He should know the concept of energy management and its conservation.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Comprehend the importance of ecosystem and sustainable
- Demonstrate interdisciplinary nature of environmental issues
- Identify different types of environmental pollution and control measures.
- Take corrective measures for the abetment of pollution.
- Explain environmental legislation acts.
- Define energy management, energy conservation and energy efficiency
- Demonstrate positive attitude towards judicious use of energy and environmental protection
- Practice energy efficient techniques in day-to-day life and industrial processes.
- Adopt cleaner productive technologies
- Identify the role of non-conventional energy resources in environmental protection.
- Analyze the impact of human activities on the environment

DETAILED CONTENTS

1.   Basics of ecology, eco system and sustainable development   (03 hrs)

2.   Conservation of land reforms, preservation of species, prevention of advancement of deserts and lowering of water table, rain water harvesting, maintenance of ground water, deforestation – its effects and control measures
                                                                                          (04 hrs)

3.   Pollution: Sources of pollution - natural and man made, causes, effects and control measures of pollution (air, water, noise, soil, radioactive and nuclear) and their units of measurement. Prevention of Pollution :Introduction to Cleaner Production Technologies, , Waste Minimization Techniques, Concept of Zero Discharge
                                                                                          (12 hrs)

4.   Solid waste management, classification of refuse material, sources, effects and control measures.Introduction to E-waste Management   (06 hrs)

5. Environmental Legislation - Water (prevention and control of pollution) Act 1974, Air (Prevention and Control of Pollution) Act 1981 and Environmental Protection Act 1986, Role and Function of State Pollution Control Board, Environmental Impact Assessment (EIA) (08 hrs)

6. Energy Conservation: Introduction to Energy Management, Energy Conservation, Energy efficiency & its need. Introduction to Energy Conservation Act 2001 and Energy Conservation (Amendment) Act 2010 & its importance. Role of Non-conventional Energy Resources (Solar Energy, Wind Energy, Bio Energy, Hydro Energy) in environmental protection. (10 hrs)

7. Impact of Energy Usage on Environment: – Global Warming, Green House Effect, Depletion of Ozone Layer, Acid Rain. Eco-friendly Material, Recycling of Material, Concept of Green Buildings, (05 hrs)

INSTRUCTIONAL STRATEGY

In addition to theoretical instructions, different activities pertaining to Environmental Studies like expert lectures, seminars, visits etc. may also be organized.

RECOMMENDED BOOKS

1. Environmental and Pollution Awareness by Sharma BR; Satya Prakashan, New Delhi.
2. Environmental Protection Law and Policy in India by Thakur Kailash; Deep and Deep Publications, New Delhi.
3. Environmental Pollution by Dr. RK Khitoliya; S Chand Publishing, New Delhi
4. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.
5. Engineering Chemistry by Jain and Jain; Dhanpat Rai and Co. (P) Ltd. Delhi.
6. Environmental Studies by Erach Bharucha; University Press (India) Private Ltd., Hyderabad.
7. Environmental Engineering and Management by Suresh K Dhamija; SK Kataria and Sons, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	03	05
2	04	08
3	12	25
4	06	12
5	08	18
6	10	22
7	05	10
Total	**48**	**100**

2.7   GENERAL WORKSHOP PRACTICE - II
(Common for Electronics and Communication Engineering,
Electronics & Telecommunication Engineering, Electrical Engineering)

L T P
-   -   6

RATIONALE

Psychomotor skills are mastered through practice, an opportunity therefore, has been extended to students through this course to refine their skills in different trades. The basic skills developed during first semester will be refined during this course by doing higher order skills jobs. In addition to developing general manual and machining skills in the students, the objective of development of sense of dignity of labour, precision, safety at work places, team working and right attitude among the students will also be met.

LEARNING OUTCOME

After undergoing the subject, the students will be able to:

- Follow safety procedures and measures.
- Maintain good housekeeping practices.
- Select materials, sequence of operations, select tools to make a given job based on interpretation of drawing as per given specification with close tolerances using at least the resources of three shops.
- Prepare a job using at least the resources of three shops and compare the job with the specifications given.
- Specify and read/understand specifications of different types of tools, equipment and machines used in various shops.
- Inspect visually to identify various types of defects in different type of materials.
- Analyze a given job and identify various operations required to make it.

DETAILED CONTENTS (PRACTICAL EXERCISES)

Note: The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

The following shops are included in the syllabus.

1.   Welding Shop – II
2.   Fitting Shop – II
3.   Sheet Metal Shop – II
4.   Electric Shop – II
5.   Electronic Shop – II
6.   Computer Shop – II

1. **WELDING SHOP - II**

1.1   Introduction to gas welding, gas welding equipment, introduction to soldering and brazing, introduction to resistance welding, safety precautions.

1.2   Jobs to be prepared

Job I	Identification and adjustment of various types of gas flames.
Job II	Preparation of lap joint on 75 mm × 35 mm × 3mm M.S. plate using gas welding.
Job III	Preparation of butt joint on 75mm×35mm×3mm M.S.flat using gas welding process.
Job IV	Preparation of a small cot frame (M.S. steel bed frame) from M.S. conduit pipe using arc/gas welding process.
Job V	Preparation of a square pyramid from M.S. rod by welding (Arc or Gas welding).
Job VI	Practice of Spot/Seam welding.

2. **FITTING SHOP - II**

2.1   Care and maintenance of various measuring tools.

2.2   Handling of measuring instruments, finding least count and checking of zero error.

2.3   Description and demonstration of various types of drills, taps and dies.

2.4   Selection of dies for threading, selection of drills and taps.

2.5   Precautions while drilling soft metals (Aluminium, Copper, Brass etc.).

2.6   Introduction to various types of threads (internal, external, single start, multi-start, left hand and right hand threads).

Job I	Drilling practice on soft metals-Aluminium or Copper or Bronze.
Job II	Preparation of a job by filing on non ferrous metals upto an accuracy of ± .1 mm.
Job III	Making internal and external threads on a job (GI Pipe, PVC pipe, Steel bars etc.) by tapping and dieing operations (manually) and fixing of different types of elbow, tee, union, socket.

3. **SHEET METAL SHOP - II**

3.1   Introduction to various metal forming processes e.g. Spinning, Punching, Blanking, cup drawing

3.2   Introduction to soldering and brazing.

3.3   Introduction to metal spinning process.

Job I	Preparation of job involving shearing, circular shearing, rolling, folding, beading and soldering process e.g. Funnel or any other job involving above operations.

Job II	Exercise on job involving brazing process
Job III	Spinning a bowl/cup/saucer
Job IV	Visit to a sheet metal industry e.g. coach builders etc.

4. ELECTRIC SHOP- II

4.1 Introduction to single phase and three phase supply and wiring system. Importance of three phase supply and wiring system.

| Job I | Laying 3 phase wiring for an electric motor or any three phase machine. |

4.2 Estimating and costing of power consumption

| Job II | Connecting single phase energy meter with supply and load. Reading and working out power consumption and cost of energy. |
| Job III | Finding faults in electric circuits, machines, with series testing lamp and multimeter. |

4.3 Demonstration of dismantling, servicing and reassembling of table/ceiling fan, air-cooler, auto electric iron, heater etc.

| Job IV | Dismantling, servicing and reassembling of any of the above electrical appliances. |

4.4 Testing and reversing direction of rotation of single phase and three phase motors.

| Job V | Testing single phase/three phase motors by using voltmeter, ammeter and tachometer. |
| Job VI | Reversing direction of rotation of single phase and three phase motors. |

5. ELECTRONIC SHOP - II

5.1 Identification and familiarization with the following electronic instruments:
   a) Multimeter analog and digital (Three and half digit)
   b) Single beam simple CRO, Signal Generator and Function Generator; function of every knob on the front panel
   c) Audio-oscillator having sine and square wave output
   d) Regulated Power supply -- fixed voltage and variable voltage, single output as well as dual output.

5.2 Identification and familiarisation with active and passive components; colour code and types of resistor, capacitors and potentiometers (including VDR, LDR, and thermistor). Identification of components including LED, LCD, UJT, FET, Coils, transformers (mains, audio and RF, etc), MOSFET, SCR, DIAC, TRIAC, Photodiode and Photo transistor.

5.3 Job Practice

Job I	Use of multimeters to test components and measurement of circuits, voltage, resistance.
Job II	Use of familiarisation with CRO, signal generator, function generator and Audio oscillator.
Job III	To make regulated power supply on general purpose PCB.
Job IV	Identification and familiarisation of datasheets of the following components: UJT, FET, MOSFET, SCR, DIAC, TRIAC, Photodiode and Photo transistor.
Job V	Safety precautions to be observed in the electronic shop.

6. COMPUTER SHOP – II

EXERCISE - I

6.1 Optical Devices

- CD-R, DVD, CD-W
- Working
- Copying
- CD/DVD drives
- Pen drive (copying data, formatting scanning)

6.2 Microphones and Speakers

- Types and Interfacing

EXERCISE – II

6.3 Projectors

- Types
- Settings
- Interfacing

6.4 Hard disks

- Different makes of Hard disks
- Retrieval of Hard disk data

6.5 Graphic Card connection

6.6 Sound Card Connection

EXERCISE – III

6.7   Different types of network interface cards, cables such as data cables, printer cables, network cables, power cables etc.

6.8   Networking tools such as cutter, connector (RJ45)

6.9   Network Cable

- Straight Cable
- Cross Cable
- Roll Cable

EXERCISE – IV

6.10   Types of cables

- UTP Cables: CAT3, CAT5, CAT6, CAT7
- Fibre optic cable
- Structured cabling

RECOMMENDED BOOKS

1.   Workshop Technology I,II,III, by SK Hajra, Choudhary and AK Choudhary; Media Promoters and Publishers Pvt. Ltd. Mumbai.
2.   Workshop Technology Vol. I, II, III by Manchanda; India Publishing House, Jalandhar.
3.   Workshop Training Manual Vol. I, II by S.S. Ubhi; Katson Publishers, Ludhiana.
4.   Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd., New Delhi
5.   Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
6.   Workshop Technology by B.S. Raghuwanshi; Dhanpat Rai and Co., New Delhi
7.   Workshop Technology by HS Bawa; Tata McGraw Hill Publishers, New Delhi

TRAFFIC AWARENESS & ROAD SAFETY CAMP (II)

A diploma holder must have knowledge of various types of traffic rules and regulations. Road safety education is vital for people of all ages. As a responsible citizen, you should be aware of each and every road safety rules. Observation is the key skill you need in ensuring road safety By obeying safety rules and regulations, you can save yourself and others on the road. This camp covers the basic concepts of traffic rules and safety. Lectures will be delivered on following broad topics with the coordination of Distt. Traffic police. There will be no exam for this camp.

1. **Time management**
2. **Traffic light signals**
3. **Speed limits of vehicles**
4. **Schedule of offences**
5. **Dividing lines**
6. **Proper road Maintenance and Warnings**
7. **Test yourself**

3.1   ELECTRONIC INSTRUMENTS AND MEASUREMENT

L T P
4 - 2

RATIONALE

In the real world of work, the technician is required to handle wide variety of instruments while testing, trouble shooting, calibration etc. The study of this subject will help students to gain the knowledge of working principles and operation of different instruments. During practical sessions, he will acquire the requisite skills.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Describe and demonstrate the specifications (accuracy, precision, sensitivity, resolution, range, errors, loading effects) of measuring instruments.
- Demonstrate the working principle of measuring instruments like multi-meter, CRO, DSO
- Measure the loading effect of a multi-meter
- Describe the limitation of multi-meter for high frequency measurement
- Measure frequency, voltage, time period and phase using CRO and DSO
- Measure rise time and fall time using CRO and DSO
- Demonstrate the working of RF signal generator, pulse generator
- Identify and differentiate between active and passive transducers and principle of operation of different types transducers.
- Measure distortion of RF signal generator using Distortion factor Meter

DETAILED CONTENTS

1.   Basics of Measurements   (06 hrs)

   - Measurement, method of measurement, types of instruments
   - Specifications of instruments: Accuracy, precision, sensitivity, resolution, range, errors in measurement, sources of errors, limiting errors, loading effect, importance and applications of standards and calibration

2.   Transducers   (14 hrs)

   - Distinction between active and passive transducers with examples. Basic requirements of a transducer
   - Principle of operation of the following transducers and their applications in measuring the physical quantities listed against each one of them:

i. Variable Resistance Type(strain gauge, thermistor, hygrometer)
ii. Variable capacitance type(pressure gauge, dielectric gauge)
iii. Variable inductance type(LVDT, Burdon pressure gauge)
iv. Others(solid state sensor, thermocouple, piezoelectric device, photoelectric device, proximity probe)

3. Cathode Ray Oscilloscope   (12 hrs)

- Construction and working of Cathode Ray Tube(CRT)
- Block diagram description of a basic CRO and triggered sweep oscilloscope, front panel controls
- Specifications of CRO and their explanation
- Measurement of current, voltage, frequency, time period and phase using CRO
- Digital storage oscilloscope (DSO) : block diagram and working principle

4 Voltage, Current and Resistance Measurement   (10 hrs)

- Principles of measurement of DC voltage, DC current, AC voltage, AC current,
- Principles of operation and construction of permanent magnet moving coil (PMMC) instruments and Moving iron type instruments,

5 Signal Generators and Analytical Instruments   (10 hrs)

- Explanation of block diagram specifications of low frequency and RF generators, pulse generator, function generator
- Distortion factor meter
- Instrumentation amplifier: its characteristics, need and working

6. Digital Instruments   (12 hrs)

- Comparison of analog and digital instruments
- Working principle of ramp, dual slope and integration type digital voltmeter
- Block diagram and working of a digital multi-meter
- Specifications of digital multi-meter and their applications
- Limitations of digital multi-meters.

LIST OF PRACTICALS

1. To observe the loading effect of a multi-meter while measuring voltage across a low resistance and high resistance
2. To observe the limitations of a multi-meter for measuring high frequency voltage

3. Measurement and plot of characteristics of optical devices like photodiodes, photocells.
4. Characteristics of light operated switch using photo-transistor and LDR
5. Measurement of strain using strain gauge.
6. Measurement of temperature using thermistor and thermocouple.
7. Measurement of humidity using humidity meter
8. Measurement of linear and angular displacement
9. Measurement of distortion of RF signal generator using distortion factor meter

Class Project: Fabricate LDR Based light Intensity Control circuit for Street Lights.

INSTRUCTIONAL STRATEGY

The subject requires both theory and practical emphasis simultaneously, so that the student can understand the practical significance of the various areas. Visits to instrumentation and communications industries must be carried out, so as to make the students can understand where and how the various instruments are used in the industry.

RECOMMENDED BOOKS

1. Electronics Measurement and Instrumentation by AK Sawhney, Dhanpat Rai and Sons, New Delhi
2. Electronics Measurement and Instrumentation by Oliver, Tata McGraw Hill Education Pvt Ltd, New Delhi
3. Electronics Instrumentation by Cooper, Prentice Hall of India, New Delhi
4. Electronics Test and Instrumentation by Rajiv Sapra, Ishan Publications, Ambala
5. Electronics Instrumentation by JB Gupta, Satya Prakashan, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No	Time Allotted (Hrs)	Marks Allocation (%)
1.	06	09
2.	14	21
3.	12	19
4.	10	16
5.	10	16
6.	12	19
Total	**64**	**100**

3.2   PRINCIPLES OF COMMUNICATION ENGINEERING

L T P
4 - 2

RATIONALE

The study of principles of communication systems leads to further specialized study of audio and video systems, line communications and microwave communication systems. Thus the diploma-holder in Electronics and Communication Engineering shall find employment in areas of R and D, production, servicing and maintenance of various communication systems. The students should understand the advantage and limitations of various analog and digital modulation systems on a comparative a scale and relate to them while studying practical communication systems.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Explain the concept and need of modulation and demodulation
- Measure the modulation index of the Amplitude Modulated wave
- Measure the frequency deviation of FM wave for different modulating signals
- Use different types of modulators and demodulators
- Obtain modulating signal from an AM Detector Circuit
- Obtain modulating signal from a FM Detector
- Use different types of Pulse Modulation Techniques (PAM, PPM, PWM, PCM) and Delta Modulation.

DETAILED CONTENTS

1.   Introduction   (04 hrs)

- Need for modulation, frequency translation and demodulation in communication systems
- Basic scheme of a modern communication system.

2.   Amplitude modulation   (06 hrs)

- Derivation of expression for an amplitude modulated wave. Carrier and side band components. Modulation index. Spectrum and BW of AM Wave. Relative power distribution in carrier and side bands.

- Elementary idea of DSB-SC, SSB-SC, ISB and VSB modulations, their comparison, and areas of applications

3. Frequency modulation (06 hrs)

- Expression for frequency modulated wave and its frequency spectrum (without Proof and analysis of Bassel function) Modulation index, maximum frequency deviation and deviation ratio, BW of FM signals, Carson's rule.

- Effect of noise on FM carrier. Noise triangle, Role of limiter, Need for pre-emphasis and de-emphasis, capture effect.

- Comparison of FM and AM in communication systems

4. Phase modulation (06 hrs)

- Derivation of expression for phase modulated wave, modulation index, comparison with frequency modulation.

5. Principles of Modulators (10 hrs)
   Working principles and typical application as:
   - Sqaure Law Modulator
   - Balanced Modulator
   - Ring Modulator

6. Principles of FM Modulators (06 hrs)

- Working principles and applications of reactance modulator, varactor diode modulator, VCO and Armstrong phase modulator.
- Stabilization of carrier using AFC (Block diagram approach).

7. Demodulation of AM Waves (06 hrs)

- Principles of demodulation of AM wave using diode detector circuit; concept of Clipping and formula for RC time constant for minimum distortion (no derivation)

- Principle of demodulation of AM Wave using synchronous detection.

8. Demodulation of FM Waves (06 hrs)

- Basic principles of FM detection using slope detector
- Principle of working of the following FM demodulators
  i. Foster-Seeley discriminator
  ii. Ratio detector
  iii. Block diagram of Phase locked Loop (PLL) FM demodulators (No Derivation)

9.   Pulse Modulation   (14 hrs)

-   Statement of sampling theorem and elementary idea of sampling frequency for pulse modulation

-   Basic concepts of time division multiplexing (TDM) and frequency division multiplexing (FDM)

-   Pulse Amplitude Modulation (PAM), Pulse Position Modulation (PPM), Pulse Width Modulation (PWM).

-   Pulse code Modulation (PCM): Basic scheme of PCM system, Quantization, Quantization Error. Advantages of PCM systems. Concepts of differential PCM (DPCM)

-   Delta Modulation (DM): Basic principle of delta modulation system, advantages of delta modulation system over PCM system. Limitations of delta modulation, concept of adaptive delta modulation (ADM)

LIST OF PRACTICALS

1.   a)   To observe an AM wave on CRO produced by a standard signal generator using internal and external modulation
        b)   To measure the modulation index of the wave obtained in above practical

2.   a)   To obtain an AM wave from a square law modulator circuit and observe waveforms
        b)   To measure the modulation index of the obtained wave form.

3.   To obtain an FM wave and measure the frequency deviation for different modulating signals.

4.   To obtain modulating signal from an AM detector circuit and observe the pattern for different RC time constants and obtain its optimum value for least distortion.

5.   To obtain modulating signal from FM detector.

6.   To observe the sampled signal and compare it with the analog input signal. Note the effect of varying the sampling pulse width and frequency on the sampled output.

7.   To observe and note the pulse amplitude modulated signal (PAM) and compare them with the corresponding analog input signal

8.   To observe PPM and PWM signal and compare it with the analog input signal

9.   To feed an analog signal to a PCM modulator and compare the demodulated signal with the analog input. Also note the effect of low pass filter at the demodulated output.

10.   To study the process of delta modulation/demodulation

Class Project: Fabricate any one modulation circuit on PCB or design it   in   any   EDA software and observe its output for different modulating signals.

INSTRUCTIONAL STRATEGY

The subject requires both theory and practical emphasis simultaneously, so that the student can understand the practical significance of the various areas. Visits to instrumentation and communications industries must be carried out, so as to make the students can understand where and how the various instruments are used in the industry.

RECOMMENDED BOOKS

(1)   Electronics Communication System by Kennedy, Tata McGraw Hill Education Pvt Ltd, New Delhi
(2)   Fundamentals of Communication System by Fitz, Tata McGraw Hill Education Pvt Ltd, New Delhi
(3)   Principles of Communication Engineering by Taub, Tata McGraw Hill Education Pvt Ltd,
(4)   Electronics Communication by KS Jamwal, Dhanpat Rai and Co, New Delhi
(5)   Radio Engineering by GK Mittal, Khanna Publishers, New Delhi
(6)   Principles of Communication Engineering by DR Arora, Ishan Publications, Ambala
(7)   Communication Engineering by A Kumar
(8)   Principles of Communication Engineering by Manoj Kumar, Satya Prakashan, New Delhi
(9)   Principles of Communication Engineering by Anokh Singh, S.Chand and Co., New Delhi
(10)   Principles of Communication Engineering by Roody , Coolin

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allocation (%)
1.	04	05
2.	06	10
3.	06	10
4.	06	10
5.	10	15
6.	06	10
7.	06	10
8.	06	10
9	14	20
Total	**64**	**100**

3.3   DIGITAL ELECTRONICS

L T   P
4 -   2

RATIONALE

This course has been designed to make the students know about the fundamental principles of digital electronics and gain familiarity with the available IC chips. This subject aims to give a background in the broad field of digital systems design and microprocessors.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Verify and interpret truth tables for all logic gates.
- Realize all logic functions with NAND and NOR gates
- Design half adder and full adder circuit
- Demonstrate and design 4-bit adder, 2's complement subtractor
- Verify and interpret truth tables for all flip flops.
- Verify and interpret truth tables of multiplexer, de-multiplexer, encoder and decoder ICs
- Design a four bit ring counter and verify its operation
- Design 4-bit SISO, PISO, SIPO, PIPO shift registers

DETAILED CONTENTS

1.   Introduction   (02 hrs)

   a) Distinction between analog and digital signal.
   b) Applications and advantages of digital signals.

2.   Number System   (04 hrs)

   a)   Binary, octal and hexadecimal number system: conversion from decimal and hexadecimal to binary and vice-versa.
   b)   Binary addition, subtraction, multiplication and division including binary points. Sign magnitude method of representation, 1's and 2's complement method of addition/subtraction, floating point representation

3.   Codes and Parity   (04 hrs)

   a) Concept of code, weighted and non-weighted codes, examples of BCD, excess-3 and Gray code.

b) Concept of parity, single and double parity and error detection and correction (Hamming code)

c) Alpha numeric codes: ASCII, EBCDIC and Unicode.

4. Logic Gates and Families (07 hrs)

a) Concept of negative and positive logic

b) Definition, symbols and truth tables of gates. Construction of NOT, AND and OR gates from NAND and NOR gates (universal gates).

(c) Introduction to TTL and CMOS logic families and their sub classification

5. Logic Simplification (06 hrs)

a) Postulates of Boolean algebra, De Morgan's Theorems. Various identities. Formulation of truth table and Boolean equation for simple problem. Implementation of Boolean (logic) equation with gates

b) Karnaugh map (upto 4 variables) and simple application in developing combinational logic circuits

6. Arithmetic circuits (06 hrs)

a) Half adder and Full adder circuit, design and implementation.

b) Half and Full subtracter circuit, design and implementation.

c) 4 bit adder/subtracter.

d) Adder and Subtractor IC (7484)

e) 2-bit comparator

7. Decoders, Multiplexers and De-Multiplexers (06 hrs)

a) Basic functions and block diagram of Encoders and decoders.

b) Basic functions and block diagram of Multiplexers and De-Multiplexers. Different types and ICs.

c) Four bit decoder circuits for 7 segment display and decoder/driver ICs.

8. Latches and flip flops (06 hrs)

a) Concept and types of latch with their working and applications

b) Operation using waveforms and truth tables of RS, T, D, JK and Master/Slave JK flip flops.

c) Difference between a latch and a flip flop

d) Flip flop ICs

9. Shift Register (07 hrs)

Introduction and basic concepts including shift left and shift right.

a) Serial in parallel out, serial in serial out, parallel in serial out, parallel in parallel out.
b) Universal shift register
c) Buffer register, Tristate Buffer register
d) IC 7495

10. Counters   (08 hrs)

a) Introduction to Asynchronous and Synchronous counters
b) Binary up/down counters (upto MOD-8)
c) Decade counter.
d) Pre settable and programmable counters
e) Ring counter with timing diagram
f) Counter ICs

11. Analog to Digital and Digital to Analog Converters   (08 hrs)

a) Working principle of A/D and D/A converters
b) Detail study of :
   - Binary Weighted D/A converter
   - R/2R ladder D/A converter
- Brief idea about different techniques of A/D conversion and study of :
   - Stair step Ramp A/D converter
   - Dual Slope A/D converter
   - Successive Approximation A/D Converter
- Performance characteristics of A/D and D/A converter.
- Applications of A/D and D/A converter.

LIST OF PRACTICALS

1. Verification and interpretation of truth tables for AND, OR, NOT NAND, NOR and Exclusive OR (EXOR) and Exclusive NOR(EXNOR) gates

2. - Realisation of logic functions with the help of NAND or NOR gates
   - Design of a NOR gate latch and verification of its operation

3. - To design a half adder using XOR and NAND gates and verification of its operation
   - Construction of a full adder circuit using XOR and NAND gates and verify its operation

4. To design 4 bit adder, 2's complement subtractor circuit using an 4 bit adder IC and an XOR IC and verify the operation of the circuit.

5.   To design a NOR Gate Latch and verification of its operation

6   Verification of truth table for positive edge triggered, negative edge triggered, level triggered IC flip-flops (At least one IC each of D latch , D flip-flop, JK flip-flops).

7.   Verification of truth table for encoder and decoder ICs, Mux and DeMux

8.   To design a 4 bit SISO, SIPO, PISO, PIPO shift registers using JK/D flip flops and verification of their operation.

9.   To design a 4 bit ring counter and verify its operation.

10.   Asynchronous Counter ICs

      Verification of truth table for any one universal shift register IC

      Use of IC 7490 or equivalent TTL (a) divide by 2   (b) divide by 10 Counter
                                  OR
      Use of IC 7493 or equivalent TTL (a) divide by 2 (b) divide by 8 (c) divide by 16 counter

Note: Above experiments may preferably be done on Bread Boards.

INSTRUCTIONAL STRATEGY

The digital systems in microprocessors have significant importance in the area of electronics. Adequate competency needs to be developed by giving sufficient practical knowledge in microprocessors (programming as well as interfacing), A/D, D/A Converters and other topics. Help may be taken in the form of charts, simulation packages to develop clear concepts of the subject. Programming exercises other than the tested in circulation may be given to the students.

RECOMMENDED BOOKS

1.   Digital Electronics and Applications by Malvino Leach, Tata McGraw Hill Education Pvt Ltd, New Delhi

2.   Digital Logic Designs by Morris Mano, Prentice Hall of India, New Delhi

3.   Digital Circuits and Design by DP Kothari and JS Dhillon, Pearson Publication, New Delhi

4.   Digital Electronics by Soumitra Kumar Mandal, Tata McGraw Hill Education Pvt Ltd.

5.   Digital Electronics by Tokheim, Tata McGraw Hill Education Pvt Ltd.

6.   Digital Fundamentals by Thomas Floyds, Universal Book Stall

7. Digital Electronics by RP Jain, Tata McGraw Hill Education Pvt Ltd, New Delhi

8. Digital Electronics by KS Jamwal, Dhanpat Rai and Co., New Delhi

9. Digital Electronics by BR Gupta, Dhanpat Rai & Co., New Delhi

10. Digital Systems: Principles and Applications by RJ Tocci, Prentice Hall of India, New Delhi

11. Digital Electronics by Rajaraman V., Prentice Hall of India, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allocation (%)
1.	2	5
2.	4	5
3.	4	5
4.	7	15
5.	6	10
6.	6	10
7.	6	10
8.	6	10
9	7	10
10.	8	10
11.	8	10
Total	**64**	**100**

3.4 ELECTRONIC DEVICES AND CIRCUITS

L T P
4 - 2

RATIONALE

Having attained basic knowledge of electronic devices like diodes, transistors, and elementary circuits, in second semester, this course will enable the students to learn about the use of transistors in analog circuits like power amplifier, multistage amplifier, oscillators, wave shaping circuits and in multivibrators etc. It also gives information about timer, operational amplifier, voltage regulator, ICs and their applications for effective functioning in the field of electronic service industry.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Demonstrate the concept of multistage amplifiers and plot the frequency response of the same
- Measure the bandwidth of multistage amplifier
- Describe the operation of large signal amplifiers.
- Demonstrate the concept of negative and positive feedback.
- Measure the gain of emitter follower and push pull amplifiers
- Plot the frequency response of oscillators(Hartley, Colpitt, Wein Bridge)
- Explain the concept of feedback amplifiers
- Plot the frequency response of tuned voltage amplifiers
- Design various wave-shaping circuits(concepts of clipping and clamping)
- Describe the concept of multi-vibrators and operational amplifiers
- Demonstrate the working of operational amplifier as inverter, integrator, differentiator, adder and subtractor.
- Describe the concept of regulated DC supplies and opto-electric devices, VCO and PLL

DETAILED CONTENTS

1. Multistage Amplifiers   (08 hrs)

    - Need for multistage amplifier
    - Gain of multistage amplifier
    - Different types of multistage amplifier like RC coupled, transformer coupled, direct coupled, and their frequency response and bandwidth

2. Large Signal Amplifier   (08 hrs)

    - Difference between voltage and power amplifiers
    - Importance of impedance matching in amplifiers

- Class A, Class B, Class AB, and Class C amplifiers, collector efficiency and Distortion in class A,B,C
- Single ended power amplifiers, Graphical method of calculation (without derivation) of out put power; heat dissipation curve and importance of heat sinks. Push-pull amplifier, and complementary symmetry push-pull amplifier

3. Feedback in Amplifiers (08 hrs)

- Basic principles and types of feedback
- Derivation of expression for gain of an amplifier employing feedback
- Effect of feedback (negative) on gain, stability, distortion and bandwidth of an amplifier
- RC coupled amplifier with emitter bypass capacitor
- Emitter follower amplifier and its application

4. Sinusoidal Oscillators (08 hrs)

- Use of positive feedback
- Barkhausen criterion for oscillations
- Different oscillator circuits-tuned collector, Hartley, Colpitts, phase shift, Wien's bridge, and crystal oscillator. Their working principles (no mathematical derivation but only simple numerical problems)

5. Tuned Voltage Amplifiers (04 hrs)

- Series and parallel resonant circuits and bandwidth of resonant circuits.
- Single and double tuned voltage amplifiers and their frequency response characteristics

6. Wave Shaping Circuits (04 hrs)

- General idea about different wave shapers
- RC and RL integrating and differentiating circuits with their applications
- Diode clipping and clamping circuits .

7. Multivibrator Circuits (08 hrs)

- Working principle of transistor as switch
- Concept of multi-vibrator: astable, monostable, and bistable and their applications
- Block diagram of IC555 and its working and applications
- IC555 as monostable and astable multi-vibrator

8. Operational Amplifiers (06 hrs)

- Characteristics of an ideal operational amplifier and its block diagram

- Definition of differential voltage gain, CMRR, PSRR, slew rate and input offset current
- Operational amplifier as an inverter, scale changer, adder, subtractor, differentiator, and integrator

9.   Regulated DC Power Supplies   (08 hrs)

- Concept of DC power supply. Line and load regulation
- Concept of fixed voltage, IC regulators (like 7805, 7905), and variable voltage regulator like (IC 723)

10.   VCO (IC 565) and PLL (IC 566) and their Applications   (02 hrs)

LIST OF PRACTICALS

(1)   Plot the frequency response of two stage RC coupled amplifier and calculate the bandwidth and compare it with single stage amplifier
(2)   To measure the gain of push-pull amplifier at 1KHz
(3)   To measure the voltage gain of emitter follower circuit and plot its frequency response
(4)   Plot the frequency response curve of Hartley and Colpitt's Oscillator
(5)   Plot the frequency response curve of phase shift and Wein bridge Oscillator
(6)   To observe the output waveforms of series and shunt clipping circuits
(7)   To observe the output for clamping circuits
(8)   Use of IC 555 as monostable multivibrator and observe the output for different values of RC
(9)   Use of IC 555 as astable multivibrator and observe the output at different duty cycles
(10)   To use IC 741 (op-amplifier) as
        i)   Inverter,   ii) Adder,   iii) Subtractor   iv) Integrator
(11)   To realize positive and negative fixed voltage AC power supply using three terminal voltage regulator IC (7805, 7812, 7905)

Class Project: Fabricate any simple operational amplifier circuit (Inverter, Adder, Subtractor etc.) and test it.

INSTRUCTIONAL STRATEGY

This subject being of fundamental importance for diploma holders in electronics engineering and related fields, emphasis on conceptual understanding may be given by taking the help of charts, simulation packages etc. Sufficient exercises may given to the students in single stage and multi-stage amplifier circuits in addition to simple exercises in fabricating and testing of various simple d.c circuits. The students may be encouraged to perform some additional practical exercises apart from the list provided.

RECOMMENDED BOOKS

(1)   Basic Electronics and Linear Circuits by NN Bhargava, Tata McGraw Hills, New Delhi
(2)   Electronic Principles by Sahdev, Dhanpat Rai and Sons, New Delhi.
(3)   Electronics Principles by Malvino, Tata McGraw Hills, New Delhi
(4)   Electronic Devices and Circuits by Millman and Halkias, McGraw Hills, New Delhi
(5)   Electronics Devices and Circuits by Bhupinderjit Kaur,modern Publishers, Jalandhar
(6)   Basic Electronics by Grob, Tata McGraw Hills, New Delhi
(7)   Art of Electronics by Horowitz
(8)   Electronic Circuit Theory by Boylstead
(9)   Electronic Devices and Circuits by BL Theraja, S Chand and Co Ltd. New Delhi
(10)   Operational Amplifiers and Linear Integrated Circuits by Ramakant A. Gaykwad
(11)   Electronics Devices and Circuits by Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi
(12)   Electronics Devices and Circuits-II by Rajesh Kumar, Eagle Prakashan, Jalandhar

SUGGESTED DISTRIBUTION OF MARKS:

Topic No.	Time Allotted (hrs)	Marks Allocation
1.	08	15
2.	08	15
3.	08	15
4.	08	10
5.	04	05
6.	04	05
7.	08	10
8.	06	10
9.	08	10
10.	02	05
Total	**64**	**100**

3.5   ELECTRICAL MACHINES

L T P
4 - 2

RATIONALE

Electrical machines is a subject where a student will deal with various types of electrical machines which are employed in industries, power stations, domestic and commercial appliances etc. After studying this subject, diploma holder must be competent to repair and maintain these machines and give suggestions to improve their performance. Practical aspects of the subject will make the students capable of performing various tests on the machines as per latest BIS specifications

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Describe star delta 3-phase connections
- Explain phase, line voltages and current relationships in 3-phase power supply.
- Demonstrate the concept of single phase transformers
- Measure the power and power factor in 3 phase load
- Determine the efficiency of a single phase transformer
- Apply the working principle of rotating electrical machines.
- Demonstrate the working of DC, AC and single phase fractional kilowatt motors.
- Connect and run a DC shunt motor with supply through a 3 point starter

DETAILED CONTENTS

1. Three Phase Supply   (06 hrs)

    - Advantage of three-phase system over single-phase system.
    - Star Delta connections
    - Relation between phase and line voltage and current in a three phase system
    - Power and power factor in three-phase system and their measurements by one, two and three wattmeter methods.

2. Transformers   (10 hrs)

    Principle of operation and constructional details of single phase transformer
    - Voltage Regulation of a transformer (No Derivation)
    - Losses in a transformer
    - Efficiency, condition for maximum efficiency and all day efficiency
    - CTs and PTs (Current transformer and potential transformer)
    - CVT (Constant Voltage Transformer)

3. Introduction to Rotating Electrical Machines   (10 hrs)

    - E.M.F induced in a coil rotating in a magnetic field.
    - Definition of motor and generator
    - Basic principle of a generator and a motor
    - Torque due to alignment of two magnetic fields and the concept of Torque angle
    - Basic Electromagnetic laws (Faraday's laws of Electromagnetic Induction)

4. DC Machines   (14 hrs)

    - Principle of working of d.c motors and d.c generator, their constructional details
    - Function of the commutator for motoring and generating action
    - Factors determining the speed of a DC motor
    - Different types of excitation
    - Characteristics of different types of DC machines
    - Starting of DC motors and starters
    - Application of DC machines

5. A.C. Motors   (12 hrs)

    - Revolving magnetic field produced by poly phase supply
    - Brief introduction about three phase induction motors, its principle of operation
    - Principle and working of Synchronous Machines
    - Application of Synchronous Machines
    -
6. Single Phase Fractional Kilowatt Motors   (12 hrs)

    - Introduction
    - Principle of operation of single phase motors
    - Types of single phase induction motors and their constructional details
    - Single phase synchronous motors – reluctance motor (hysteresis motor)
    - Introduction to Commutator type single-phase motors
    - Introduction to servo- motors and stepper motors
    - Concept of micro-motors.

LIST OF PRACTICALS

Demonstrate various instruments use viz Ammeter, Voltmeter, Wattmeter, p.f meter etc for their identification and and connecting procedure in a circuit.

1.   To measure power and power factors in 3 Phase load by two wattmeter method
2.   To determine the efficiency of a single phase transformer from the data obtained through open circuit and short circuit test
3.   To measure power and power factor of a single phase induction motor.
4.   To run a synchronous motor with a.c supply and to measure speed to verify the relation N=12O f/ P
5.   To make connections of starting and running winding of a single phase capacitor motor and to run it with the help a DOL starter and to measure its speed
6.   Study construction of a stepper and servomotor and to write their complete specifications.

Class Project: Fabricate a transformer using simple iron core and two copper coils and read the output voltage.

INSTRUCTIONAL STRATEGY

A visit to a small factory (Preferably Transformer Factory) must be organised to give live exposure to students. For this the teacher should visit first to understand the assembly line-up which could be followed by a visit of the students in groups of 10-20 (depending upon the size of the factory), where the instructor can give an idea of the working of the factory without much seeking assistance of the factory staff.

RECOMMENDED BOOKS

1)   Electrical Machine by SK Bhattacharya, Tata McGraw Hill Education Pvt Ltd,

New Delhi

2)   Electrical Machines by Nagrath and Kothari, Tata McGraw Hill Education Pvt

Ltd, New Delhi

3)   Experiments in Basic Electrical Engineering: by S.K. Bhattacharya, KM Rastogi:

New Age International (P) Ltd. Publishers, New Delhi

4)   Electrical Machines by SK Sahdev, Uneek Publications, Jalandhar

5)   Electrical Engineering by JB Gupta, SK Kataria & Sons, New Delhi

6)   Electrical Machines by DR Arora, Ishan Publications, Ambala city

7)   Electrical Technology Vol. - I and II   B.L. Thareja, S Chand and Co. New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Hrs)	Marks Allocation (%)
1.	06	10
2.	10	15
3.	10	15
4.	14	20
5.	12	20
6.	12	20
Total	**64**	**100**

3.6   COMPUTER PROGRAMMING USING C

L T P
3 - 4

RATIONALE

Computers play a vital role in present day life, more so, in the professional life of technician engineers. People working in the field of computer industry, use computers in solving problems more easily and effectively. In order to enable the students use the computers effectively in problem solving, this course offers the modern programming language C along with exposition to various applications of computers. The knowledge of C language will be reinforced by the practical exercises.

LEARNING OUTCOME

After undergoing the subject, the students will be able to:

- Identify the problem and formulate an algorithm for it.
- Identify various control structures and implement them.
- Identify various types of variables.
- Use pointer in an array and structure.
- Use structures and union for handling data.
- Explain the concepts of C programming language
- Explain and implement the language constructs concepts
- Install C software on the system and debug the programme
- Explain and execute member functions of C in the programme
- Describe and implement array concept in C programme
- Describe and execute pointers

DETAILED CONTENTS

1.   Algorithm and Programming Development   (04 hrs)

      1.1   Steps in development of a program
      1.2   Flow charts, Algorithm development
      1.3   Programme Debugging

2.   Program Structure   (08 hrs)

      2.1   I/O statements, assign statements
      2.2   Constants, variables and data types
      2.3   Operators and Expressions
      2.4   Standards and Formatted
      2.5   Data Type Casting

3.   Control Structures   (08 hrs)

     3.1   Introduction
     3.2   Decision making with IF – statement
     3.3   IF – Else and Nested IF
     3.4   While and do-while, for loop
     3.5   Break. Continue, goto and switch statements

4.   Functions   (08 hrs)

     4.1   Introduction to functions
     4.2   Global and Local Variables
     4.3   Function Declaration
     4.4   Standard functions
     4.5   Parameters and Parameter Passing
     4.6   Call - by value/reference

5.   Arrays   (06 hrs)

     5.1   Introduction to Arrays
     5.2   Array Declaration, Length of array
     5.3   Single and Multidimensional Array.
     5.4   Arrays of characters
     5.5   Passing an array to function

6.   Pointers   (06 hrs)

     6.1   Introduction to Pointers
     6.2   Address operator and pointers
     6.3   Declaring and Initializing pointers,
     6.4   Single pointer,
     6.5   Pointers to an Array

7.   Structures and Unions   (08 hrs)

     7.1   Declaration of structures
     7.2   Accessing structure members
     7.3   Structure Initialization
     7.4   Pointer to a structures,
     7.5   Unions

LIST OF PRACTICALS

1. Programming exercises on executing and editing a C program.
2. Programming exercises on defining variables and assigning values to variables.
3. Programming exercises on arithmetic and relational operators.
4. Programming exercises on arithmetic expressions and their evaluation.
5. Programming exercises on formatting input/output using printf and scanf and their return type values.
6. Programming exercises using if statement.
7. Programming exercises using if – Else.
8. Programming exercises on switch statement.
9. Programming exercises on do – while, statement.
10. Programming exercises on for – statement.
11. Programs on one-dimensional array.
12. Programs on two-dimensional array.
13. (i) Programs for putting two strings together.
    (ii) Programs for comparing two strings.
14. Simple programs using structures.
15. Simple programs using pointers.
16. Simple programs using union.

INSTRUCTIONAL STRATEGY

The subject is totally practical based. Students should be given clear idea about the basic concepts of programming. In practical session student should be asked to draw flow chart write algorithm and then write program for the algorithm and run on computer. It is required that students should maintain records (files with printouts).

RECOMMENDED BOOKS

1. Let us C by Yashwant Kanetkar
2. Programming in ANSI C by E Balaguruswami, , Tata McGraw Hill Education Pvt Ltd , New Delhi
3. Problem Solving and Programming in C by RS Salaria, Khanna Book Publishing Co(P) Ltd. New Delhi
4. Programming in C by Reema Thareja; Oxford University Press, New Delhi
5. Programming in C by Gottfried, Schaum Series, , Tata McGraw Hill Education Pvt Ltd , New Delhi
6. Exploring C by Yashwant Kanetkar – BPB Publications, New Delhi
7. Programming in C by Stefin G. Coachin
8. Programming in C by R Subburaj, Vikas Publishing House Pvt. Ltd., Jangpura, New Delhi
9. Elements of C by M.H. Lewin, Khanna Publishers, New Delhi
10. Programming in C by Stephen G Kochan
11. Programming in C by BP Mahapatra, Khanna Publishers, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	04	12
2	08	16
3	08	16
4	08	16
5	06	12
6	06	12
7	08	16
Total	**48**	**100**

ENERGY CONSERVATION AWARENESS CAMP

A diploma holder must have knowledge of various tips of energy conservation. Energy conservation has attained priority as it is regarded as additional energy resource. Energy saved is energy produced. This camp covers the basic concepts of energy management and its conservation. It gives the insight to energy conservation opportunities in household appliances and star rating. Lectures will be delivered on following broad topics. There will be no exam for this camp.

1. Classification of energy- primary and secondary energy, commercial and non-commercial energy, non-renewable and renewable energy with special reference to solar energy

2. Introduction to energy management, energy conservation, energy efficiency and its need

3. Salient features of Energy Conservation Act 2001 & The Energy Conservation (Amendment) Act, 2010 and its importance

4. Standards and Labeling

   - Concept of star rating and its importance
   - Types of product available for star rating

5. Salient Features of Punjab Energy Conservation Building Code (ECBC)

6. General Energy Saving Tips in:

   - Lighting System
   - Room Air Conditioners
   - Refrigerators
   - Water Heater
   - Computers
   - Fans, Heaters, Blowers and Washing Machines
   - Colour Television
   - Water Pumps
   - Kitchens
   - Transport

DRUGS USE AND ABUSE AWARENESS CAMP

Unit 1 Drugs Use and Abuse in Society
  a. Concept and overview
  b. Extent of the problem
  c. Drug use as a social problem
  d. Causes of Drug Use: Biological, Socio-cultural, psychological

Unit 2 Types of Dugs and identification of Abuse
  a. Familiar drugs: Tabacco, Caffeine, over the counter drugs
  b. Restricted Drugs: Opiates, Hallucinogens,Marijuana
  c. Reformance enhancing the drugs
  d. Uppers and Downers: Stimulants and Depressants

Unit 3 Impact of drug Abuse
  a. Individual level biological and psychological
  b. Family social, National

Unit 4 Management and prevention of Drug Abuse
  a. Medical and psychological
  b. Role of family School , Media and Legislation

4.1   NETWORK FILTERS AND TRANSMISSION LINES

L T P
3 - 3

RATIONALE

The study of networks, filters and transmission lines leads to understanding of line communication, audio and video communication, and microwave communication. Particularly the study of networks takes off from principles of A.C. theory and introduces the student to parameters and characteristics of various networks, including filters. Also the study of transmission lines becomes important as its analogy is used in study of transmission of plane electromagnetic waves in bounded media.

LEARNING OUTCOMES

After completion of the course, the learner will be able to

- Describe the concept of symmetrical, asymmetrical, balanced, unbalanced, T, PI, ladder, lattice, L and Bridge T networks
- Demonstrate the operation of filters and attenuators.
- Demonstrate the operation of attenuators.
- Design and measure the attenuation of a symmetrical T/ ЛI type attenuator
- Determine the characteristic impedance experimentally and Plot the attenuation characteristic of prototype low pass filter and prototype high pass filter
- Plot the Impedance characteristic and attenuation characteristics of prototype band-pass filter and m-derived filters
- Measure standing wave ratio and characteristic impedance of the line
- Draw the attenuation characteristics of a crystal filter

DETAILED CONTENTS

1.   Networks   (14 hrs)

- Two port (four terminals) network: Basic concepts of the following terms:

  - Symmetrical and asymmetrical networks: Balanced and unbalanced network;   T-network, ЛI network, Ladder network; Lattice network; L-network and Bridge T-network

- Symmetrical Network:

  - Concept and significance of the terms characteristic impedance, propagation constant, attenuation constant, phase shift constant and insertion loss.
  - T-network and ЛI Network (No Derivation)

- Asymmetrical Network

    - Concept and significance of iterative impedance, image impedance,
    - The half section (L-section); symmetrical T and Л sections into half sections (No Derivation)

2. Attenuators   (05 hrs)

    - Units of attenuation (Decibels and Nepers): General characteristics of attenuators

    - Analysis and design of simple attenuator of following types; Symmetrical T and Л type,   L type.

3. Filters   (13 hrs)

    - Brief idea of the use of filter networks in different communication systems, concept of low pass, high pass, band pass and band stop filters.

    - Prototype Filter Section:

        - Impedance characteristics vs frequency characteristics of a low and high pass filter and their significance

        - Attenuation Vs frequency; Phase shift Vs frequency, characteristics impedance vs frequency of T and Л filters and their significance

        - Simple design problems of prototype low pass section.

    - M-Derived Filter Sections
      Limitation of prototype filters, need of m-derived filters

    - Crystal Filters
      Crystal and its equivalent circuits, special properties of piezoelectric filters and their use

    - Active Filters
      Basic concept of active filters and their comparison with passive filters.

4. Transmission Lines   (16 hrs)

    - Transmission Lines, their types and applications.
    - Distributed constants, T and Л representation of transmission line section.
    - Concept of infinite line

- Condition for minimum distortion and minimum attenuation of signal on-the-line and introduction to loading methods.

- Concept of reflection and standing waves, definition of reflection coefficient, SWR & VSWR and their relation (no derivation).

- Concept of transmission lines at high frequencies.

- Introduction to stubs. (single, open and short stubs).

LIST OF PRACTICALS

1. To measure the characteristic impedance of symmetrical T and Л networks

2. To measure the image impedance of a given asymmetrical T and Л networks

3. For a prototype low pass filter:

   a) Determine the characteristic impedance experimentally
   b) Plot the attenuation characteristic

4. To design and measure the attenuation of a symmetrical T/ Л type attenuator

5. For a prototype high pass filter:

   - Determine the characteristic impedance experimentally
   - To plot the attenuation characteristic

6. a) To plot the Impedance characteristic of a prototype band-pass filter
   b) To plot the attenuation characteristic of a prototype band pass filter

7. a) To plot the impedance characteristic of m- derived low pass filter
   b) To plot the attenuation characteristics of m-derived high pass filter

8. To observe the information of standing waves on a transmission line and measurement of SWR and characteristic impedance of the line

9. Draw the attenuation characteristics of a crystal filter

Class Project: Fabricate any filter circuit and measure its characteristic impedance.

INSTRUCTIONAL STRATEGY

Stress should be laid on problems in networks/ filler and transmission lines. Practical must be carried out after completion of topic to gain a good know how on the subject students should be given home assignments on various topics, stress on making own

circuit models to calculate input/output impedance, characteristic impedance, losses etc. should be carried out by the students.

RECOMMENDED BOOKS

1. Network Lines and Fields by John D Ryder; Prentice Hall of India, New Delhi

2. Network Filters and Transmission Lines by AK Chakarvorty; Dhanpat Rai and Co. Publication, New Delhi

3. Network Analysis by Van Valkenburg: Prentice Hall of India, New Delhi

4. Network Analysis by Soni and Gupta; Dhanpat Rai and Co. Publication, New Delhi

5. Network Theory and Filter Design by Vasudev K. Aatre

6. Network Filters and Transmission line by Umesh Sinha

7. Electrical and Electronics Measuring instrumentation , A.K Sawhney, Dhanpat Rai and Co. Publication, New Delhi

8. Network Analysis by G.K. Mithal

9. Network Filters and Transmission line by Nardeep Goyal, Rajneesh Kumari, Tech. Max Publication, Pune.

SUGGESTED DISTRIBUTION OF MARKS:

Topic No.	Time Allotted (Hrs)	Marks Allocation (%)
1	14	25
2	5	10
3	13	30
4	16	35
Total	**48**	**100**

4.2   COMMUNICATION SYSTEMS

L T P
4 - 3

RATIONALE

This course provides the basics of electronic communication systems including transmitters, receivers, antennas and various modes of propagation of signals. In addition to components and systems of fiber optic communication, the students will learn the basics of satellite communication. This course will provide the students with perspectives of different communication systems.

LEARNING OUTCOME

After completion of the course, the learner will be able to:

- Classify the transmitters on the basis of modulation, service, frequency and power
- Demonstrate the working of each stage of AM and FM transmitters
- Identify the waveforms at different stages of a Radio Receiver
- Tune AM broadcast radio receiver
- Measure the performance characteristics of a radio receiver(sensitivity, selectivity, fidelity, S/N ratio, image rejection ratio).
- Determine the appropriate value of Intermediate Frequency IF.
- Identify the waveforms at different stages of a FM receiver
- Identify the various types of antennas used in different frequency ranges
- Plot the radiation pattern of directional and omni-directional antenna
- Explain various modes of propagation of waves i.e. Ground Wave, Sky Wave, Space Wave and Duct Propagation.
- Explain satellite communication link and terms related to satellite orbit.
- Plot the variation of field strength of a radiated wave, with distance from a transmitting antenna

DETAILED CONTENTS

1.   AM/FM Transmitters   (10 hrs)

- Classification of transmitters on the basis of modulation, service, frequency and power
- Block diagram of AM transmitters and working of each stage
- Block diagram and working principles of reactance FET and armstrong FM transmitters

2.   AM/FM Radio Receivers   (16 hrs)

-   Principle and working with block diagram of super heterodyne AM receiver. Function of each block and typical waveforms at input and output of each block
-   Performance characteristics of a radio receiver: sensitivity, selectivity, fidelity, S/N ratio, image rejection ratio and their measurement procedure.   ISI standards on radio receivers (brief Idea)
-   Selection criteria for intermediate frequency (IF).   Concepts of simple and delayed AGC
-   Block diagram of an FM receiver, function of each block and waveforms at input and output of different blocks.   Need for limiting and de-emphasis in FM reception
-   Block diagram of communication receivers, differences with respect to broadcast receivers.

3.   Antennas: (16 hrs)

-   Electromagnetic spectrum and its various ranges: VLF, LF, MF, HF, VHF, UHF, Microwave.
-   Physical concept of radiation of electromagnetic energy from a dipole. Concept of polarization of EM Waves.
-   Definition and physical concepts of the terms used with antennas like point source, gain directivity, aperture, effective area, radiation pattern, beam width and radiation resistance, loss resistance.
-   Types of antennas-brief description, characteristics and typical applications of half wave dipole, medium wave (mast) antenna, folded dipole.
-   Structure, Characteristics and typical applications of Horn antenna and dish antenna.

4.   Propagation: (12 hrs)

-   Basic idea about different modes of wave propagation and typical areas of application.   Ground wave propagation and its characteristics, summer field equation for field strength.

-   Space wave communication – line of sight propagation, standard atmosphere, concept of effective earth radius range of space wave propagation standard atmosphere

-   Duct propagation : sky wave propagation - ionosphere and its layers. Explanation of terms - virtual height, critical frequency, skip distance, maximum usable frequency, multiple hop propagation.

5.   Satellite Communications: (10 hrs)

- Basic idea, passive and active satellites, Meaning of the terms; orbit, apogee, perigee

- Geo-stationary satellite and its need. Block diagram and explanation of a satellite communication link.
- Introduction to VSAT and its features.

LIST OF PRACTICALS

1.   To observe the waveforms at different stages of a AM transmitter
2.   To observe the waveforms at different stages of a Radio Receiver
3.   To align AM broadcast radio receiver
4.   To identify and study the various types of antennas used in different frequency ranges.
5.   To plot the radiation pattern of a directional and omni directional antenna
6.   To plot the variation of field strength of a radiated wave, with distance from a transmitting antenna..

Class Project:

Fabricate wireless remote transmitter and receiver as is used in common toys and verify its operation.

NOTE:Visits to appropriate sites of digital/data communication networks, satellite communication, telemetry centres (like remote sensing) should be made with a view to understand their working. A comprehensive report must be prepared by all students on these visits, especially indicating the dates and locations of their visits.

INSTRUCTIONAL STRATEGY

The subject requires both theory and practical emphasis simultaneously, so that the student can understand the practical significance of the various areas.   Visits to instrumentation and communications industries must be carried out, so as to make the students can understand where and how the various instruments are used in the industry.

RECOMMENDED BOOKS

1. Communication Systems by George Kennedy, Tata McGraw Hill Education Pvt Ltd, New Delhi.

2. Communication Systems by A.K. Gautam, SK Kataria and Sons, New Delhi.

3. Fundamentals of Communication System by Fitz, Tata McGraw Hill Education Pvt Ltd, New Delhi

4. Electronic Communication Sytesms by K.S. Jamwal, Dhanpat Rai and Sons, New Delhi.

5. Electronic Communication System by Roddy and Coolen, Prentice Hall of India, New Delhi.

6. Handbook of Experiments in Electronics and Communication Engineering by S. Poornachandra Rao, and B Sasikala, Vikas Publishing House Pvt Ltd, Jangpura, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	10	10
2	16	30
3	16	30
4	12	15
5	10	15
Total	**64**	**100**

4.3   POWER ELECTRONICS

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L T P
4 - 3

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RATIONALE

Diploma holders in Electronics and related fields are required to handle a wide variety of power electronic equipment used in process control Industry. This subject will provide the student basic understanding of the principles of their working. The practical training will further reinforce the knowledge and skill of the students.

LEARNING OUTCOME

After completion of the subject, the learner will be able to:

- Describe the construction, working principles of SCR, two transistor analogy of SCR, SCR specifications, methods of SCR triggering.
- Plot and explain V-I characteristics of SCR, TRIAC, UJT, DIAC
- Draw and demonstrate I/P and O/P wave forms of UJT relaxation oscillator
- Draw and demonstrate the wave shape of voltage at relevant point of single-phase controlled rectifiers(half wave, full wave) and effect of change of firing angle.
- Draw and demonstrate wave shapes and measurement of voltage at relevant points in TRIAC based AC phase control circuit
- Install UPS system and routine maintenance of batteries
- Demonstrate the concept and working of choppers, inverters, dual converters, and cyclo-conveters.
- Explain basic ideas about electric drives(AC and DC)

DETAILED CONTENTS

1.   Introduction to thyristors and other Power Electronics Devices   (18 hrs)

- Construction, working principles of SCR, two transistor analogy of SCR, V-I characteristics of SCR.
- SCR specifications & ratings.
- Different methods of SCR triggering.
- Different commutation circuits for SCR.
- Construction & working principle of DIAC, TRIAC & their V-I characteristics.
- Construction, working principle of UJT, V-I characteristics of UJT. UJT as relaxation oscillator.
- Basic idea about the selection of Heat sink for thyristors.
- Application such as light intensity control, speed control of universal motors, fan regulator, battery charger.

2. Controlled Rectifiers   (08 hrs)

-   Single phase half wave controlled rectifier with load (R, R-L)
-   Single phase half controlled full wave rectifier (R, R-L)
-   Fully controlled full wave bridge rectifier.
-   Single phase full wave centre tap rectifier.

3. Inverters, Choppers, Dual Converters and Cyclo converters.   (16 hrs)

-   Principle of operation of basic inverter circuits, concepts of duty cycle, series & parallel. Inverters & their applications.
-   Choppers: Introduction, types of choppers (Class A, Class B, Class C and Class D). Step up and step down choppers.
-   Dual Converters and cyclo converters: Introduction, types & basic working principle of dual converters and cyclo converters & their applications.

4. Thyristorised Control of Electric drives   (14 hrs)

a) DC drive control
-   Half wave drives.
-   Full wave drives
-   Chopper drives (Speed control of DC motor using choppers)

b) AC drive control
-   Phase control
-   Constant V/F operation
-   Cycloconverter/Inverter drives.

5. Uninterrupted Power supplies   (08 hrs)

-   UPS, on-line, off line & its specifications
-   Concept of high voltage DC transmission
-   Concept of SMPS

LIST OF PRACTICALS

1) To plot VI characteristic of an SCR.
2) To plot VI characteristics of TRIAC.
3) To plot VI characteristics of UJT.
4) To plot VI characteristics of DIAC.
5) Study of UJT relaxation oscillator and observe I/P and O/P wave forms
6) Demonstrate of wave shape of voltage at relevant point of single-phase half wave controlled rectifier and effect of change of firing angle.
7) Demonstrate of wave shapes of voltage at relevant point of single phase full wave controlled rectifier and effect of change of firing angle.

8) Demonstrate of wave shapes and measurement of voltage at relevant points in TRIAC based AC phase control circuit for .
9) Study of varying lamp intensity and AC fan speed control.
10) Installation of UPS system and routine maintenance of batteries.
11) Speed control of motor using SCRs

Class Project: Fabricate any SCR based rectifier circuit and verify its operation.

INSTRUCTIONAL STRATEGY

Power Electronics being very important for industrial controls requires a thorough know how about industrial devices. Teacher should take to the class various SCRs and other semiconductor devices to demonstrate these to the students. The teacher may encourage students to perform practical simultaneously for better understanding of the subject and verification of theoretical concepts. So industrial visit in between the course is a must.

RECOMMENDED BOOKS

1) Power Electronics by P.C. Sen, Tata Mc Graw Hill Education Pvt Ltd. New Delhi
2) Power Electronics by P.S. Bhimbhra, Khanna Publishers, New Delhi
3) Power Electronics – Pricilpes and Applications by Vithayathi, Tata Mc Graw Hill Education Pvt Ltd. New Delhi
4) Power Electronics by M.S. Berde, Khanna Publishers, New Delhi.
5) Power Electronics by MH Rashid
6) Industrial Electronics and Control by SK Bhattacharya and S. Chatterji, New Age Publications. New Delhi
7) Power Electronics by S Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi
8) Power Electronics by Sugandhi and Sugandhi
9) Power Electronics – Principles and Applications by J Michael Jacob, Vikas Publishing House, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	18	30
2	08	15
3	16	25
4	14	20
5	08	10
Total	**64**	**100**

4.4   MICROPROCESSORS

L T P
4 - 3

RATIONALE

The study of microprocessors in terms of architecture, software and interfacing techniques leads to the understanding of working of CPU in a microcomputer. The development in microprocessors of 32 bit architecture brings them face-to-face with mainframe, finding employment in R&D, assembly, repair and maintenance of hardware of microprocessors and computers.

Microprocessors find application in process control industry. They also form a part of the electronic switching system between source and destination in long distance telecommunications. Thus the microprocessor is an area of specialization. Students of electronics and related engineering branches often use microprocessors to introduce programmable control in their projects, in industrial training.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Write, edit a machine language program using mnemonics
- Describe all the internal parts and pins of 8085 and 8086
- Write, execute and debug assembly language programs for simple applications.
- Interface various peripheral devices with microprocessor.
- Use various data transfer techniques used in microcomputers.

DETAILED CONTENTS

1.   Evolution of Microprocessor   (3 hrs)

-    Typical organization of a microcomputer and functions of its various blocks
-    Microprocessor, its evolution, function and impact on modern society

2.   Architecture of a Microprocessor (With reference to 8085 microprocessor)
                                                                                        (8 hrs)

-    Concept of Bus, bus organization of 8085
-    Functional block diagram of 8085 and function of each block
-    Pin details of 8085 and related signals
-    De-multiplexing of address/data bus of read/write control signals
-    Steps to execute a stored programme

3.   Memories and I/O interfacing   (8 hrs)

-      Basic RAM Cell, N X M bit RAM, Expansion of word length and capacity, static and dynamic RAM, basic idea of ROM, PROM, EPROM and EEPROM
-      Memory organization, Concept of memory mapping, partitioning of total memory space, Address decoding, concept of I/O, mapped I/O and memory mapped I/O, interfacing of memory mapped I/O devices
-      Concept of stack and its function

4.   Programming (with respect to 8085 microprocessor)   (14 hrs)

-      Brief idea of machine and assembly languages, Machines and Mnemonic codes
-      Instruction format and addressing modes, identification of instructions as to which addressing mode these belong
-      Concept of instruction set, Explanation of the instructions of the following groups of instruction set

       Data transfer groups, arithmetic group, logic group, stack, I/O and machine control group

-      Programming exercises in assembly language. (Examples can be taken from the list of experiments)
-      Serial data transfer using RIM and SIM instructions

5.   Instruction Timing and Cycles   (3 hrs)

-      Instruction cycle, machine cycle and T-states
-      Fetch and execute cycle

6.   Interrupts   (4 hrs)

-      Concept of interrupt
-      Maskable and non-maskable interrupts
-      Edge triggered and level triggered interrupts
-      Software interrupts
-      Restart interrupts and its use
-      Various hardware interrupts of 8085
-      Servicing interrupts, extending interrupt system

7.   Peripheral devices   (8 hrs)

-      8255 PPI and 8253 PIT
-      8257 DMA controller
-      8279 Programmable KB/Display Interface

- 8251 Communication Interface Adapter
- 8155/8156

8.   Architecture of 8086 Microprocessor   (8 hrs)

- Internal Architecture of 8086.
- Concept of memory segmentation and physical address generation.
- Memory and date addressing mode
- Minimum and Maximum mode of 8086

9.   Instruction sets of 8086   (8 hrs)

- Instruction Format.
- Data transfer.
- Arithmetic
- Bit and logical manipulation
- String
- Program transfer and processor control instructions
- Assembler and assembler directives

LIST OF PRACTICALS

1. Familiarization of different keys of 8085 microprocessor kit and its memory map.
2. Steps to enter, modify data/program and to execute a programme on 8085 kit.
3. Execution of ALP on 8085 kit for addition/subtraction of two 8 bit numbers.
4. Execution of ALP on 8085 kit for Multiplication/Division of two 8 bit numbers.
5. Execution of ALP on 8085 kit for arranging 10 numbers in ascending/descending order.
6. Execution of ALP on 8085 kit for 0 to 9 BCD counters (up/down counter according to choice stored in memory).
7. Interfacing exercise on 8255 like LED display control.
8. Demonstration of different keys of 8086-microprocessor kit and its memory map.
9. Execution of steps to enter, check /modify data or program and to execute a program on 8086 microprocessor kit.
10. Execution of ALP on 8086 kit for addition/subtraction of two 16 bit numbers (signed and unsigned).
11. Execution of ALP on 8086 kit for Multiplication/Division of two signed/unsigned numbers.

RECOMMENDED BOOKS

1. Microprocessor Architecture, Programming and Applications with 8080/8085 by Ramesh S Goanker, Willey Eastern Ltd, New Delhi
2. Introduction to Microprocessor by Mathur, Tata McGraw Hill Education Pvt. Ltd. New Delhi
3. Advanced Microprocessor and Interfacing by Badri Ram, Tata McGraw Hill Education Pvt. Ltd. New Delhi
4. Microprocessor and Application by D.V. Hall; McGraw Hill Book Co. New Delhi
5. Microprocessor 8086/88 by B.B. Brey; Pearson Education, New Delhi
6. Microprocessor and Applications by B Ram; McGraw Hill Book Co. New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	03	05
2.	08	13
3.	08	13
4.	14	20
5.	03	05
6.	04	05
7.	08	13
8.	08	13
9.	08	13
Total	**64**	**100**

4.5   ELECTRONICS DESIGN AND SIMULATION TECHNIQUES

                                                                                L   T   P
                                                                                -   -   6

RATIONALE

The purpose of this subject is to give practice to the students in elementary design and fabrication of the PCB. The topics of assembly, soldering, testing, and documentation have been included to give overall picture of the process of manufacturing of electronic devices.

LEARNING OUTCOMES

After completion of the course, the learner will be able to:

- Demonstrate skills in assembly of components, soldering, and desoldering techniques
- Prepare a PCB, mount the components and assemble in a cabinet
- Design of electric circuit using software ORCAD/ PSpice /EAGLE/ SEQUEL
- Demonstrate drilling, photo plating, explain concept of SMDs (Surface Mount Devices)
- Assemble circuits on PCB
- Design a mini project using basic techniques

PRACTICAL EXERCISES

1.   Electronic Design

        -       Selection and use of commonly used active and passive components
        -       Testing of active and passive components
        -       Develop skills in assembly of components, soldering, and soldering techniques
        -       Procedure for Cabinet Making

2.   Fabrication Techniques

        -       Printed Circuit Boards (PCBs):
                - PCB board materials, their characteristics and plating, corrosion and its prevention.
                - Photo processing, screen printing, etching, high speed drilling, buffing, surface treatment and protection from harsh environments, plated through holes, double sided and multilayer PCBs.

- Standards of board sizes. Modular assemblies edge connectors, multi board racks, flexible boards.
- Assembly of circuits on PCB, soldering techniques, role of tinning, flow and wave soldering, solderability, composition of solder. Edge connector. Elements of wire shaping.

3. PSpice/ ORCAD/EDA Based Circuit Simulations

    - Introduction to WinSpice
    - DC analysis of resistor network
    - Characteristics of p-n junction diode
    - Half wave rectifier
    - Clamper circuit
    - I/O characteristics of BJT
    - Transistor CE amplifier
    - Input and output characteristics of JFET

4. Event Driven Circuit Simulation
    (Using software like SEQUEL

    - Introduction to Software
    - Simulation of logic gates.
    - Simulation of combinational circuit.

LIST OF PROJECTS (to be designed individually)

Some of the mini projects are listed below which is just a guideline for selecting the mini project. Students can also select any other project with the advice of his teacher.

1. Regulated power supply
2. Timers using 555 and other oscillators
3. Touch plate switches – transistorized or 555 based
4. Door bell/cordless bell
5. Clapping switch and IR switch
6. Blinkers
7. Sirens and hooters
8. Single band AM or FM
9. Electronic toy gun, walker, blinkers
10. Electronic dice
11. Cell charger, battery charger, mobile charger
12. Fire/smoke/intruder alarm
13. Liquid level controller
14. Counters
15. Combination locks
16. Electronics musical instruments

17. Telephone handset
18. Electronic Ballasts
19. Audio amplifiers
20. Automatic stabilizer/CVT
21. Emergency light
22. Fan regulator

INSTRUCTIONAL STRATEGY

More emphasis may be laid on practical Project. Small industrial problems may be taken as assignments. Practical training regarding fabrication techniques using CAD may be carried out.

RECOMMENDED BOOKS

2. Printed Circuit Board by Bosshart; McGraw Hill Education Pvt Ltd., New Delhi

3. Printed Circuit Board by RS Khandpur, Tata McGraw Hill Education Pvt Ltd., New Delhi

4. Electronics Techniques by Rajesh Kumar, NITTTR, Chandigarh

5. Modular CAD for PCBs using EAGLE Software by Rajesh Kumar, NITTTR, Chandigarh

6. Electronic Manufacturing Technology by KS Jamwal; Dhanpat Rai and Sons, New Delhi

4.6   GENERIC SKILLS AND ENTREPRENEURSHIP DEVELOPMENT

L T P
3 - -

RATIONALE

Generic Skills and Entrepreneurship Development is one of the courses from "Human Science" subject area. Generic skills have emerged as an important component of employability skills, which enable an individual to become and remain employable over lifetime and to lead happy and prosperous life. Entrepreneurship development aims at developing conceptual understanding for setting-up one's own business venture/enterprise. This aspect of Human Resource Development has become equally important in the era, when wage employment prospects have become meager. Both the subject areas are supplementary to each other and soft skills are required to be developed in diploma pass-outs for enhancing their employability and self confidence.

LEARNING OUTCOME

After undergoing the subject, the student will be able to:

- Explain the importance of generic skills
- Demonstrate self development
- Manage himself/herself physically, intellectually and psychologically
- Work effectively as a team member
- Manage tasks effectively
- Apply knowledge to solve problems
- Develop an entrepreneurial mindset.
- Identify entrepreneurial support system for new ventures and small businesses.
- Recognize a business opportunity.
- Prepare project report
- Demonstrate how to launch an individual's entrepreneurial career

DETAILED CONTENTS

1.   Introduction to Generic Skills   (04 hrs)

        1.1   Importance of Generic Skill Development
        1.2   Global and Local Scenario of Generic Skill Development
        1.3   Life Long Learning and associated importance of Generic Skill
               Development

2.   Managing Self   (08 hrs)

    2.1   Knowing Self for Self Development
- Self-concept, personality, traits, multiple intelligence such as language intelligence, numerical intelligence, psychological intelligence etc.

    2.2   Managing Self - Physical
- Personal grooming, Health, Hygiene, Time Management

    2.3   Managing Self – Intellectual development
- Information Search: Sources of information
- Writing Skills – Official & business correspondence, Job application covering letter and resume
- Speaking Skills – Mock interview, Preparing for meeting, Group discussion

    2.4   Managing Self – Psychological
- Stress, Emotions, Anxiety-concepts and significance
- Techniques to manage stress

3.   Managing in Team   (06 hrs)

    3.1   Team - definition, team dynamics
    3.2   Team related skills- sympathy, empathy, co-operation, concern, lead and negotiate, work well with people from culturally diverse background

4   Task Management   (03 hrs)

    4.1   Task Initiation, planning, execution, close out
    4.2   Exercises/case studies on task planning towards development of skills for task management

5.   Problem Solving   (05 hrs)

    5.1   Prerequisites of problem solving- meaningful learning, ability to apply knowledge in problem solving
    5.2   Different approaches for problem solving.
    5.3   Steps followed in problem solving.
    5.4   Exercises/case studies on problem solving.

6.   Entrepreneurship   (22 hrs)

    6.1   Introduction
- Concept/Meaning and its need
- Qualities of an entrepreneur

- Entrepreneurial Support System e.g., District Industry Centres (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institute (SISIs), Small Industries Development Bank of India (SIDBI), National Bank of Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State/National level.

6.2 Market Survey and Opportunity Identification (Business Planning)
- How to start a small scale industry
- Procedures for registration of small-scale industry
- Assessment of demand and supply in potential areas of growth.
- Understanding business opportunity
- Considerations in product selection

6.3 Project Report Preparation
- Preliminary Project Report
- Techno-Economic Feasibility Report
- Preparation of Detailed Project Report

INSTRUCTIONAL STRATEGY

This subject will require a blend of different teaching and learning methods beginning with lecture method. Some of the topics may be taught using question answer, assignment, case studies or seminar. In addition, expert lectures may be arranged from within the institution or from management organizations. Conceptual understanding of Entrepreneurship, inputs by teachers and outside experts will expose the students so as to facilitate in starting ones own business venture/enterprise. The teacher will discuss success stories and case studies with students, which in turn, will develop managerial qualities in the students. There may be guest lectures by successful diploma holding entrepreneurs and field visits also. The students may also be provided relevant text material and handouts.

RECOMMENDED BOOKS

1. Soft Skills for Interpersonal Communication by S. Balasubramanian Published by Orient Black Swan, New Delhi**.**
2. Generic skill Development Manual, MSBTE, Mumbai.
3. Lifelong learning, Policy Brief (www.oecd.orf)
4. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
5. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
6. Handbook of Small Scale Industry by PM Bhandari

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	04	05
2.	08	15
3.	06	10
4.	03	10
5.	05	10
6.	22	50
Total	**48**	**100**

ENTREPRENEURIAL AWARENESS CAMP

This is to be organized at a stretch for two to three days during fourth semester. Lectures will be delivered on the following broad topics by experts. There will be no examination for this subject

1.   Who is an entrepreneur?

2.   Need for entrepreneurship, entrepreneurial career and wage employment

3.   Scenario of development of small scale industries in India

4.   Entrepreneurial history in India, Indian values and entrepreneurship

5.   Assistance from District Industries Centres, Commercial Banks. State Financial Corporations, Small industries Service Institutes, Research and Development Laboratories and other financial and development corporations

6.   Considerations for product selection

7.   Opportunities for business, service and industrial ventures

8.   Learning from Indian experiences in entrepreneurship (Interaction with successful entrepreneurs)

9.   Legal aspects of small business

10. Managerial aspects of small business

5.1   AUDIO VIDEO SYSTEMS

L   T   P
3   -   2

RATIONALE

The objective of teaching this subject is to give students an in depth knowledge of various electronic audio and video devices and systems. Further this subject will introduce the students with working principles, block diagram, main features of consumer electronics gadgets/goods/devices. Which in-turn will develop in them capabilities of assembling, fault diagnosis and rectification in a systematic way.

LEARNING OUTCOMES

After completion of the course, the learner should be able to:

- Explain the working of loudspeakers and microphones.
- Describe the basics of digital audio signals.
- Describe the working of colour television system (PAL).
- Use the basic principles of digital video and its compression techniques.
- Illustrate basic techniques of digital television transmission and reception.
- Compare the working of LCD, LED, HDTV and plasma screen television.
- Test color TV using pattern generator

DETAILED CONTENTS

1.   Audio Systems   (06 hrs)

     1.1.   Microphones and Loudspeakers
         a)   Carbon, moving coil, cordless microphone
         b)   Direct radiating and horn loudspeaker
         c)   Multi-speaker system

2.   Digital Audio Fundamentals   (05 hrs)

     Audio as Data and Signal, Digital Audio Processes Outlined, Time Compression and Expansion.

3.   Television   (10 hrs)

     3.1.   Basics of Television
         -    Elements of TV communication system
         -    Scanning and its need
         -    Need of synchronizing and blanking pulses, VSB
         -    Composite Video Signal

3.2   Colour Television
-    Primary, secondary colours
-    Concept of Mixing, Colour Triangle
-    Camera tube
-    PAL TV Receiver
-    NTSC, PAL, SECAM (brief comparison)

4.   Digital Video, Compression Techniques and Standards   (05 hrs)

Digital Video, The RGB and YUV Representation of Video Signals, The Need for Compression, How compression works, Compression formats for video - MPEG-x format, H.26x format

5.   Digital Television-Transmission and Reception   (10 hrs)

Digital satellite television, Direct-To-Home(DTH) satellite television, Digital TV receiver, Merits of digital TV receivers, Digital Terrestrial Television(DTT), Introduction to :Video on demand, CCTV, CATV with optical fibre.

6.   Liquid Crystal and Plasma Screen Televisions   (10 hrs)

LCD technology, LCD matrix types and operation, LCD screens for television, Plasma and conduction of charge, Plasma television screens, Signal processing in Plasma TV receivers, A Plasma colour receiver, LCD colour receivers, Single LCD receivers, 3-LCD colour receivers, Performance comparison of Plasma and LCD televisions, Introduction to LED TV, RGB dynamic LEDs, Edge-LEDs, Differences between LED-backlit and Backlit LCD displays, Comparison of Plasma TV and LED TV, Introduction to OLED TVs.

7.   Introduction to Projection Display Systems and Television Home Theaters.
                                                                                                (02 hrs)

LIST OF PRACTICALS

1.   To plot the directional response of a Microphone
2.   To plot the directional response of a Loud Speaker
3.   To study public address system and its components.
4.   To test color TV using pattern generator.
5.   To perform fault identification in Colour TV.

RECOMMENDED BOOKS

1.   Modern Television Practice by R. R. Gulai; New Age International Publishers.
2.   Audio Video Systems by R. G. Gupta; McGraw Hill Education System.
3.   Television and Video Engineering by A. M. Dhake McGraw Hill Education System

4.   Essential Guide to Digital Video by John Watkinson; Snell Wilcox Inc Publication
5.   Guide to Compression by John Watkinson; Snell Wilcox Inc Publication
6.   Audio Video Systems Principles Practices and Troubleshooting by Bali & Bali; Khanna Publishing Company
7.   Consumer Electronics by S. P. Bali; Pearson Education, New Delhi

SUGGESTED DISTRIBUTION OF MARKS:

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	06	12
2	05	10
3	10	20
4	5	10
5	10	22
6	10	22
7	02	04
Total	**48**	**100**

5.2   COMPUTER NETWORKS

L T P
3 - 3

RATIONALE

The future of computer technology is in computer networks. Global connectivity can be achieved through computer networks. A diploma holder in electronics and communication engineering should therefore understand the function of networks. Knowledge about hardware and software requirements of networks is essential.

LEARNING OUTCOME

After completion of the course, the learner should be able to

- Recognize the physical topology and cabling (coaxial, OFC, UTP, STP) of a network
- Recognize various types of connectorsRJ-45, RJ-11,BNC and SCST
- Demonstrate various types of networking models and protocol suites
- Install and configure a network interface card in a workstation
- Identify the IP address of a workstation and the class of the address and configure the IP Address on a workstation
- Configure the routers
- Demonstrate sub netting of IP address
- Identify connectivity troubleshooting using PING, IPCONFIG, IFCONFIG
- Explain concepts of wireless networking

DETAILED CONTENTS

1.   Networks Basics   (6 hrs)
-           What is network
-           Peer-to –peer Network
-           Server Client Network
-           LAN, MAN and WAN
-           Network Services
-           Topologies
-           Switching Techniques

2.   OSI Model   (8 hrs)
-           Standards
-           OSI Reference Model
-           OSI Physical layer concepts
-           OSI Data-link layer concepts
-           OSI Networks layer concepts
-           OSI Transport layer concepts

- OSI Session layer concepts
- OSI presentation layer concepts
- OSI Application layer concepts

3. Introduction to TCP/IP (7 hrs)
   - Concept of physical and logical addressing
   - Different classes of IP addressing, special IP address
   - Sub netting and super netting
   - Loop back concept
   - IPV4 and IPV6 packet Format
   - Configuring IPV4 and IPV6

4. Cables and Connectors (6 hrs)
   - Types of Cables(Coaxial, Twisted Pair), Shielded and Unshielded Pair of Cables
     (Straight wire Cable, CrossOver Cables) with colour coding.
   - Ethernet Specification and Standardization:
     10 Mbps (Traditional Ethernet), 100 Mbps (Fast Ethernet) and 1000 Mbps (Gigabit Ethernet),Leased lines.
   - Use of RJ45, RJ11, BNC,SCST.

5. Network Connectivity (6 hrs)
   - Network connectivity Devices
   - NICs
   - Hubs
   - Repeaters
   - Switches
   - Routers and Routing Protocols.
   - Configuring of Routers.
   - VOIP and Net-to-Phone Telephony

6. Network Administration / Security (6 hrs)
   - Client/Server Technology
   - Server Management
   - RAID management and mirroring
   - Cryptography
   - Ethical Hacking

7. Network Trouble Shooting Techniques (5 hrs)
   - Trouble Shooting process
   - Trouble Shooting Tools: PING,IPCONFIG, IFCONFIG, NETSTAT, TRACEROOT, Wiresharp/ Dsniffer/ Pcop

8. Wireless Networking (4 hrs)
   Basics of Wireless: Wireless MAN, Networking, Wireless LAN, Wi-Fi, WiMax (Broad-band Wireless) and Li-Fi.

LIST OF PRACTICALS

1. Recognize the physical topology and cabling (coaxial, OFC, UTP, STP) of a network.

2. Recognition and use of various types of connectors RJ-45, RJ-11,BNC and SCST

3. Making of cross cable and straight cable.

4. Install and configure a network interface card in a workstation.

5. Identify the IP address of a workstation and the class of the address and configure the IP Address on a workstation

6. Configuring of router using simulator (Example - Cisco Packet Tracer).

7. Study and demonstration of sub netting of IP address

8. Use of Netstat and its options.

9. Connectivity troubleshooting using PING, IPCONFIG, IFCONFIG

10. Configuring of IP addresses using simulator (Example - Cisco Packet Tracer).

Note: Students must be taken for a visit to nearby industry for latest networking.

techniques.

Required Software

➢ Cisco Packet Tracer

Required Tools and Supplies

1) Crimping tool, crone Tool, Cable tester,
2) RJ 45 connectors, RJ-11, BNC, SCST
3) Coaxial Cable, UTP, STP, OFC cable
4) Screwdriver Kit
5) Switch/Hub
6) Manageable Switch

INSTRUCTIONAL STRATEGY

This subject deals with both theory and practicals. The students should be made to practically establish LAN with various hardware and software and their integration.

RECOMMENDED BOOKS

1. Computer Networks by Tanenbaum, Prentice Hall of India, New Delhi
2. Data Communications and Networking by Forouzan, (Edition 2nd and 4th),Tata McGraw Hill Education Pvt Ltd , New Delhi
3. Data and Computer Communication by William Stallings, Pearson Education, New Delhi

4.   Local Area Networks by Peter Hudson
5.   Understanding Local Area Network by Neil Jenkins
6.   Area Networks by Stan Schatt, Prentice Hall of India, New Delhi
7.   Network+ Lab manual,- BPB Publications -by Tami Evanson
8.   Networking Essentials – BPB Publications New Delhi
9.   Computer Network and Communications By V.K. Jain and Narija Bajaj, Cyber Tech Publications, New Delhi.
10.   Linux – The complete Reference by Richard Peterson, Tata McGraw Hill Education Pvt Ltd, New Delhi.
11.   Linux – Install and Configuration Black Book by Dee Annleblanc and Issac Yates, IDG Books India Private Limited, Delhi.
12.   Computer Network by J.S. Katre, Tech-Max Publication, Pune

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (%)
1.	06	12
2.	08	18
3.	07	15
4.	06	12
5.	06	12
6.	06	13
7.	05	10
8.	04	08
Total	**48**	**100**

5.3 OPTICAL FIBER COMMUNICATION

L T P
4 - 2

RATIONALE

Progressing from communication over copper wire to today's fibre optic communication, we have increased our ability to transmit more information, more quickly and over longer distances. This has expanded our boundaries and is finding a good slot in communication system. Optical fibers has replaced existing transmission media due to its advantages. As a result the technicians are supposed to have knowledge of optical communication. This subject will provide basic concepts and requisite knowledge and skill required.

LEARNING OUTCOME

After completion of the course, the learner should be able to:

- Set up a fiber analog link and optic digital link
- Measure bending losses in optical fibers
- Measure the splice or connector loss
- Measure and calculate numerical aperture of optical fiber
- Explain and demonstrate characteristics of optical source and optical detector
- Connect a fiber with connector at both ends
- Identify and demonstrate use of various components and tools used in optical fiber communication

DETAILED CONTENTS

1. Introduction (12 hrs)

- Historical perspective, basic communication systems, optical frequency range, advantages of optical fibre communication, application of fibre optic communication
- Electromagnetic spectrum used, Advantages and disadvantages of optical communication.
- Principle of light penetration, reflection, critical angle.

2. Optical Fibers and Cables (08 hrs)

- Constructional details of various optical fibers, multimode and mono-mode fibers, step index and graded index fibers, acceptance angle and types of optical fiber cables.
- Optical Fibers cable connectors and splicing techniques (Mechanical, fusion)

3.   Losses in Optical Fiber Cable: (08 hrs)

       a)   Absorption Losses: Scattering Losses, Radiation losses, Connector losses, Bending loses.
       b)   Dispersion: Types and its effect on data rate.
       c)   Testing of losses using OTDR(Optical Time Domain Reflectometer).

4.   Optical Sources   (10hrs)

Characteristics of light used in optical communication, principle of operation of LED, different types of LED structures used and their brief description, Injection laser diode, principle of operation, different injection laser diodes, comparison of LED and ILD.

5.   l Optical Detectors   (08 hrs)

Characteristics of photo detectors used in optical communication; PIN diode and avalanche photo diode (APD), Noise in detectors

6.   Optical Amplifiers   (10 hrs

Types of optical amplifiers, semiconductor & fiber optical amplifiers Functional types, principal of operation of SOA, types of SOA. FPA, TWA, SOA applications, advantages, Drawbacks, EDFAS, Raman amplifiers

7.   Optical Fiber System Application   (08 hrs)

FTTx(Fiber to the x, NGN(Next Generation Network), NFS(Need for Spectrum), IOT(Internet of Things), Apparel Technology.

LIST OF PRACTICALS

1. Setting up of fiber analog link
2. Setting up of optic digital link
3. Measurement of bending losses in optical fibers
4. To observe and measure the splice or connector loss
5. To measure and calculate numerical aperture of optical fiber
6. To observe characteristics of optical source
7. To observe characteristics of optical detector
8. To splice the available optical fiber
9. To connect a fiber with connector at both ends
10. Demonstration of various components and tools used in optical fiber communication

INSTRUCTIONAL STRATEGY

This subject gives the complete knowledge of optical fibre communication techniques. The teacher should make the students aware about the historical development, optical sources and optical fibre system in addition to applications of optical fibre in communication system. Since this subject deals with theory and practical, the theory should be re-enforced by visit to sites and industries like HFCL having optical fiber installations in addition to practical work in the laboratory.

RECOMMENDED BOOKS

1. Optical fiber Communication by John M Senior, Prentice Hall of India, New Delhi

2. Optical fiber Communication by J. Gower , Prentice Hall of India, New Delhi

3. Optical fiber Communication by Gerd Keiser, McGraw Hill International Editions

4. Optical Communications – Components and Systems by JH Franz and VK Jain, Narosa Publishing House, New Delhi

5. Optical Fiber Communication by Sangar and Sahdev, Uneek Publications, Jalandhar

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	12	20
2	8	15
3	8	15
4	10	15
5	8	10
6	10	15
7	8	10
Total	**64**	**100**

5.4   DIGITAL COMMUNICATION

L T P
4 - 2

RATIONALE

This course deals with the advanced digital and data communication techniques beyond the conventional communication. It involves the use of modems in synchronous and asynchronous data transmission. It encompasses the modern communication network and integrated services like ISDN and Radio paging along with cellular mobile telephones, FAX, electronic exchanges etc. so vital for present day communication.

LEARNING OUTCOMES

After completion of the course, the learner should be able to:

- Describe and identify block diagram of digital and data communication link
- Demonstrate and explain different coding schemes(5-bit Baudot, 7-bit ASCII, ARQ, EBCDIC) and error detecting and correcting techniques(redundancy, parity, Block Check Character, Vertical Redundancy Check, Longitudinal Redundancy Check, Cyclic Redundancy Check, Hamming code
- Transmit Hamming code on a serial link and reconvert at the receiving end
- Plot and interpret wave forms at input and output of ASK and FSK modulators
- Transmit parallel data on a serial link using USART
- Transmit data using MODEM
- Describe Space and time switching systems.

DETAILED CONTENTS

1.   Introduction: (05 hrs)

   Basic block diagram of digital and data communication systems. Their comparison with analog communication systems.

2.   Coding   (12 hrs)

   a) Introduction to various common codes 5 bit Baudot code, 7 bit ASCII, ARQ, EBCDIC
   b) Code error detection and correction techniques - Redundancy, parity, block check character (BCC), Vertical Redundancy check (VRC), Longitudinal Redundancy Check (LRC), Cyclic Redundancy check (CRC), Hamming code

3.   Digital Modulation Techniques: (13 hrs)

   -   Basic block diagram and principle of working of the following:

- Amplitude shift keying (ASK): Interrupted continuous wave (ICW), two tone modulation
- Frequency Shift keying (FSK)
- Phase shift keying (PSK), Quadrature Phase Shift Keying(QPSK)

4. Characteristics/working of data transmission circuits; bandwidth requirements, data transmission speeds, noise, cross talk, echo suppressors, distortion, equalizers
(12 hrs)

5. Modems: (12 hrs)

Need and function of modems, Mode of modems operation (low speed, medium speed and high speed modems). Modem interconnection, Modem data transmission speed, Modem modulation method.

6. Space and time switching: Working principle of STS and TST switches. (10 hrs)

LIST OF PRACTICALS

1. Transmission of Hamming code on a serial link and its reconversion at the receiving end.

2. Observe wave forms at input and output of ASK and FSK modulators with the help of CRO

3. Transmission of data using MODEM.

4. Observe wave forms at input and output of QPSK modulators

5. Observe wave forms at input and output of PSK modulators

6. Observe the working of space and time switching circuit.

NOTE:

Visits to the sites of all types of telephone exchanges (including mobile and rural exchanges), Carrier telephony should be made with a view to understand their working. A comprehensive report must be prepared by all the students on these visits, especially indicating the dates and locations of their visits.

INSTRUCTIONAL STRATEGY

This subject provides information to the students regarding the various techniques used in Digitals and Data Communication. Emphasize should be made in the laboratory on the conduct of experiments. For the better awareness, visit must be arranged to the industries like telephone exchange, various cellular industries etc.

RECOMMENDED BOOKS

1. Electronic Communication Systems by George Kennedy Tata McGraw Hill Education Pvt. Ltd, New Delhi
2. Communication system by A.K. Gautam S.K. Kataria Sons, Delhi
3. Electronics communication by K.S. Jamwal, Dhanpat Rai and Sons, Delhi

SUGGESTED DISTRIBUTION OF MARKS:

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	05	07
2	12	18
3	13	20
4	12	20
5	12	20
6	10	15
Total	**64**	**100**

5.5   MICROCONTROLLERS AND EMBEDDED SYSTEM

L T P
4 - 3

RATIONALE

Embedded systems and Micro-controllers have also assumed a great significance in the electronic and consumer goods industry and are a very vital field. The subject aims to expose students to the embedded systems besides giving them adequate knowledge of Micro controllers.

LEARNING OUTCOMES

After completion of the course, the learner should be able to

- Work on a microcontroller kit
- Describe architecture, instruction set and addressing modes of 8051/8031 microcontroller, introduction of PIC microcontroller
- Write, edit a assembly language program(PC based)
- Write, edit C language program
- Write program for LCD interface, A/D converter, D/A converter, serial data transmission from kit to PC
- Write program to interface different sensors with microcontroller
- Demonstrate applications of microcontroller

DETAILED CONTENTS

1.   Microcontroller series (MCS) – 51 Overview   (14 hrs)

Architecture of 8051 Microcontroller
- Pin details
- I/O Port structure
- Memory Organization
- Special Function Registers (SFRs)
- External Memory

2.   Instruction Set; Addressing Modes, Instruction types   (14 hrs)

- Timer operation
- Serial Port operation
- Interrupts

3.   Assembly/C programming(KEIL) for Micro controller   (14 hrs)

- Assembler directives
- Assembler operation
- Programming Examples

4.   Design and Interface   (12 hrs)

Examples like: keypad interface, 7- segment interface, LCD, stepper motor. A/D, D/A, RTC interface.

5.   Block diagram and pin details: PIC, ARDUINO   (04 hrs)

6.   Application of Micro controllers in Communication System   (06 hrs)

LIST OF PRACTICALS

1. Demonstration of Micro-controller Kit
2. Assembly Language Programming
3. C Language Programming- (PC Based)
4. Write Program for LCD interface.
5. Write Program for A/D converter, result on LCD.
6. Write Program for D/A converter, result on LCD.
7. Write a Program for serial data transmission from Kit to PC.
8. Write a program to Interface Sensors.

INSTRUCTIONAL STRATEGY

More emphasis while teaching this subject should be given on practical aspects along with the theory input. Lots of programming exercises may be given to the students. Mini-projects based on microprocessor and micro-controller operations may be identified and given to students as assignments.

RECOMMENDED BOOKS:

1. Microcontrollers by Deshmukh, Tata McGraw Hill Education Pvt Ltd, New Delhi
2. Microcontrollers by Ayala
3. Microcontrollers by Mazidi, Pearon Education, Delhi
4. Microcontrollers by Neil Makanzi, Pearon Education, Delhi
5. Embedded GSM Applications
6. Microcontrollers and Embedded Systems by Sangar and Sahdev, Uneek Publications, Jalandhar
7. Embedded Systems Architechture, Programming and design by Raj Kamal, Tata McGraw Hill Education Pvt Ltd, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allocation (%)
1.	14	20
2.	14	20
3.	14	25
4.	12	20
5.	4	5
6.	6	10
Total	**64**	**100**

5.6   PLCs AND SCADA

RATIONALE

A diploma holder when employed in automated industrial process controls or in automated power station will be required to know the basics of Programmable Logic Controllers, their working and their programming. In industry, many manufacturing processes demand a sequence of operation, which are to be performed repetitively. Early automation systems were mechanical in design, timing and sequencing being effected by gears and cams. Slowly these design concepts were replaced by electrical drives which were controlled by relays and now by programmable logic controllers (PLCs). A PLC is a solid state device, designed to operate in noisy industrial environments and can perform all logic functions. PLCs are widely used in all industries for efficient control operations. A diploma holder in industry is called upon to design, modify and troubleshoot such control circuits. Looking at the industrial applications of PLCs in the modern industry, this subject finds its usefulness in the present curriculum.

LEARNING OUTCOMES

After completion of the course, the learner will be able to:

- Explain and demonstrate the different modules of a Programmable Logic Controller

- Program a PLC using a hand-held programmer and computer interface

- Implement ladder programming concepts

- Implement basic logic operations using ladder programming

- Demonstrate Logic control systems with time response as applied to clamping operation

- Explain sequence control system

- Program a PLC for a specific application

DETAILED CONTENTS

1.   Introduction to PLC   (12 hrs)

Concept of PLC, Building blocks of PLC, Functions of various blocks, limitations of relays. Advantages of PLCs over electromagnetic relays. Different programming languages, PLC manufacturer etc.

2.   Working of PLC   (16 hrs)

- Basic operation and principles of PLC
- Scan Cycle
- Memory structures, I/O structure
- Programming terminal, power supply

3.   Instruction Set   (20 hrs)

- Basic instructions like latch, master control self holding relays.
- Timer instruction like retentive timers, resetting of timers.
- Counter instructions like up counter, down counter, resetting of counters.
- Arithmetic Instructions (ADD,SUB,DIV,MUL etc.)
- MOV instruction
- RTC(Real Time Clock Function)
- Watch Dog Timer
- Comparison instructions like equal, not equal, greater, greater than equal, less than, less than equal
- Programming based on basic instructions, timer, counter, and comparison instructions using ladder program.

4.   DCS Concepts   (08 hrs)
Concept of DCS, DCS I/O hardware, Remote Terminal Unit

5.   SCADA   (08 hrs)
Block Diagram of SCADA, Difference between Open Architecture and Dedicated System. Difference between DCS and SCADA

LIST OF PRACTICALS

1.   Demonstration of Components/sub-components and modules of a PLC,

2.   Demonstration of ladder diagram programming.

3.   Write a ladder diagram program for AND, OR, NOT functions.

4.   Write a ladder diagram program for traffic light control.

5.   Write a ladder diagram program for industry process control.

6.   Write a ladder diagram program for water level control.

7.   Write a ladder diagram program for automatic car parking.

8.   Write a ladder diagram program for lift control.

9.   Development of all above applications using SCADA.

INSTRUCTIONAL STRATEGY

Introduce the subject and make the students familiar with applications of PLCs and Microcontrollers. The inputs shall start with theoretical inputs to architecture, instruction set, assembly language programming, Small projects may be identified, designed and implemented. PLC ladder diagram and programming should be supplemented with visits to industry. More emphasis may be given to practical work.

RECOMMENDED BOOKS

1)   Programmable Logic Controller by Job Dan Otter; P.H. International, Inc, USA

2)   Introduction to PLCs by Gary Dunning. McGraw Hill

3)   Module on PLCs and their Applications by Rajesh Kumar, NITTTR Chandigarh

4)   Programmable Logic Controller and Microcontrollers by Gurpreet Kaur and SK Sahdev by Uneek Publications, Jalandhar

5)   Module on "Allen Bradlag PlC (SLC 500), Institution set-1, by Rajesh Kumar, NITTTR, Chandigarh

6)   Module on "PLC Applications based on SLC 5/03" By Rajesh Kumar, NITTTR Chandigarh

7)   Instrument engineers Handbook - Process Control, Modern Control Techniques for Process Industries by G Liptak

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allocation (%)
1.	12	20
2.	16	30
3.	20	30
4.	08	10
5.	08	10
Total	**64**	**100**

PERSONALITY DEVELOPMENT CAMP

This is to be organized at a stretch for two to three days during fifth or sixth semester. Extension Lectures by experts or teachers from the polytechnic will be delivered on the following broad topics. There will be no examination for this subject.

1. Communication Skills

2. Correspondence and job finding/applying/thanks and follow-up

3. Resume Writing

4. Interview Techniques: In-Person interviews; telephonic interviews, panel interviews; group interviews and video conferencing etc.

5. Presentation Techniques

6. Group Discussions Techniques

7. Aspects of Personality Development

8. Motivation

9. Leadership

10. Stress Management

11. Time Management

12. Interpersonal Relationship

13. Health and Hygiene

6.1   VLSI SYSTEM DESIGN

L T P
4 - 3

RATIONALE

Now-a-days thousands of Digital ICs are embedded on one single chip with the help of VLSI technology. With the help of this technology the Power Consumption of ICs can be reduced (as some devices even works on IV).The size of the overall circuit reduced due to embedding of thousand of Digital IC on one VLSI chip. The VLSI chips are 100 times faster than microprocessors. Every Industry is using this technology. So student should have some knowledge about this technology.

LEARNING OUTCOMES

After completion of the course, the learner will be able to:

- Design different gates(AND, OR, XOR) using VHDL
- Design 2:1 multiplexer, priority encoder, and decoder circuit using VHDL
- Design different arithmetic circuits(half adder, full adder, half subtractor, full subtractor) using VHDL
- Design 4 Bit Binary to Grey code Converter using VHDL
- Demonstrate working of different programmable logic devices(ROM, PLA, GAL, PEEL, CPLDs, FPGA, FPAA)

DETAILED CONTENTS

1. Overview of VLSI: (10 hrs)

   Introduction to Computer-aided design tools for digital systems. Hardware-description languages, Introduction to VHDL, Data objects, Classes and data types, Operators, Overloading, Logical operators. Types of delays, Entity and Architecture declaration. Introduction to behavioural, dataflow and structural models.

2. VHDL Statements: (10 hrs)

   Assignment statements, sequential Statements and process, Conditional statements, Case statements, concept and use of Concurrent statements.

3. Combinational Circuit Design: (12 hrs)

   VHDL models and simulation of combinational circuits such as Multiplexers, Encoders, Decoders, Code converters, Comparators, Implementation of Boolean functions etc.

4. Sequential Circuit Design: (12 hrs)

VHDL Models and simulation of sequential circuits, Shift registers, Counters etc.

5. Introduction to CPLDs and FPGAs: (10 hrs)

Programmable logic devices: ROM, PLAs, GAL, PEEL, CPLDs and FPGA. FPAA (Field Programmes Analog Array)

6. Design Flow: (10 hrs)

The conventional ASIC design flow, Introduction to design methodology challenges (Wire load models, Design verification, floor-planning, placement and routing, power, parasitic extraction.)

LIST OF PRACTIALS

Combinational Design Exercises

1.   VHDL Design of Logic Gates
2.   Design of XOR gate using other basic gates
3.   Design of 2:1 Mux using other basic gates
4.   Design of 2 to 4 Decoder
5.   Design of Half-Adder, Full Adder, Half Substractor, Full Substractor
6.   Design of Synchronous 8-bit Johnson Counter
7.   Design of ALU (Additional, subtraction, Multiplication, Division)
8.   CMOS schematic design of logic gates.
9   Layout design simulation of logic gates.

RECOMMENDED BOOKS:

1. VLSI Technologies by SZE, Tata McGraw Hill Education Pvt Ltd , New Delhi
2. IEEE Standard VHDL Language Reference Manual(1993)
3. "Digital System Design using VHDL":Charles. H. Roth; PWS(1998)
4. VHDL-IV Edition: Perry; Tata McGraw Hill Education Pvt Ltd , New Delhi
5. VLSI Design for Analog by Geiger, Tata McGraw Hill Education Pvt Ltd , New Delhi
6. Principles of CMOS VLSI Design by *Weste* and Kamran Eshraghian.

Recommended Software:

Xilinx Synthesis Software (web pack) freely available on internet. On Xilinx.com
VLSI System Design is wind software for designing (System Designing).
VLSI Learning Resource like Ex-VLSI

INSTRUCTIONAL STRATEGY

This subject is very important for designing Digital Systems. For this, the students need to have strong base understanding of fundamental concepts of digital electronics. The teacher is required to lay more emphasis on programming practice in VHDL.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allocation (%)
1	10	15
2	10	15
3	12	20
4	12	20
5	10	15
6	10	15
Total	**64**	**100**

6.2   MICROWAVE AND RADAR ENGINEERING

L T P
4 - 3

RATIONALE

This subject includes an exposure to microwaves engineering, radar systems, fibre optics and satellite communication. In microwaves industry, job opportunities are available in the area of assembly, production, installation, repair and maintenance of microwave transmitters and receivers. The knowledge of radar systems allows opportunities with civil and defence organizations dealing with aircraft and shipping. Fibre optics is the latest thrust area in communication with vast opportunities in the private sector.

LEARNING OUTCOMES

After completion of the course, the learner should be able to:

- Identify, explain and demonstrate construction, characteristics, operating principles and typical applications of Multicavity Klystron, Reflex Klystron, Magnetron, Travelling Wave Tube, GUNN diode, IMPATT diode
- Measure electronics and mechanical tuning range of a reflex klystron
- Measure VSWR of a given load
- Measure the Klystron frequency by slotted section method
- Measure the directivity and coupling of a directional coupler
- Plot radiation pattern of a horn antenna in horizontal and vertical planes
- Demonstrate the properties of magic tee
- Identify the block diagram and explain the operating principles of CW(Doppler), FMCW, MTI radar
- Interpret radar display PPI
- Describe the working principles of microwave communication link

DETAILED CONTENTS

1.   Introduction to Microwaves   (05 hrs)

Introduction to microwaves and its applications, Classification on the basis of its frequency bands (HF, VHF, UHF, L, S, C, X, KU, KA, SUB, mm)

2.   Microwave Devices   (14 hrs)

Construction, characteristics, operating principles and typical applications of the following devices (No mathematical treatment)

-       Multi cavity klystron
-       Reflex klystron

- Multi-cavity magnetron
- Traveling wave tube
- Gunn diode and
- Impatt diode

3. Wave guides   (10 hrs)

   Rectangular and circular wave guides and their applications. Mode of
   wave guide; Propagation constant of a rectangular wave guide, cut off
   wavelength, guide wavelength and their relationship with free space
   wavelength (no mathematical derivation). Impossibility of TEM mode in
   a wave guide.

4. Microwave Components   (10 hrs)

   Constructional features, characteristics and application of tees, bends,
   matched termination, twists, detector, mount, slotted section, directional
   coupler, fixed and variable attenuator, isolator, circulator and duplex,
   coaxial to wave guide adapter.

5. Microwave Communication systems   (10 hrs)

   Block diagram and working principles of microwave communication
   link.

6. Radar Systems   (15 hrs)

   - Introduction to radar, its various applications, radar range equation
     (no derivation) and its applications.
   - Block diagram and operating principles of basic pulse radar.
     Concepts of ambiguous range, radar area of cross-section and its
     dependence on frequency.
   - Block diagram and operating principles of CW (Doppler) and
     FMCW radars, and their applications.
   - Block diagram and operating principles of MTI radar.
   - Radar display- PPI

LIST OF PRACTICALS

1. To measure electronics and mechanical tuning range of a reflex klystron

2. To measure VSWR of a given load.

3. To measure the Klystron frequency by slotted section method

4. To measure the directivity and coupling of a directional coupler.

5. To plot radiation pattern of a horn antenna in horizontal and vertical planes.

6. To verify the properties of magic tee.

NOTE:

Visit to the appropriate sites of microwave industries, radar installations and communication stations should be made to understand their working. A comprehensive report must be prepared by all the students on these visits, especially indicating the dates and locations of their visits.

INSTRUCTIONAL STRATEGY

Microwave and radar engineering is very important subject and requires both theoretical as well as practical exposure. The teaching should be supplemented by visits to the microwave stations and using suitable audio visual aids.

RECOMMENDED BOOKS

1. Microwave Devices and Components by Sylio, Prentice Hall of India, New Delhi

2. Electronics Communication by Roddy and Coolen

3. Electronics Communication System by KS Jamwal, Dhanpat Rai and Sons, Delhi

4 Microwave Engineering by Das, Tata McGraw Hill Education Pvt Ltd , New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	05	06
2.	14	20
3.	10	16
4.	10	16
5.	10	17
6.	15	25
Total	**64**	**100**

6.3   WIRELESS AND MOBILE COMMUNICATION

L T P
4 - 3

RATIONALE

The wireless/mobile communication technology though complex but is spreading at a very fast rate. People use more of mobile phones in comparison to land line phones. It is expected that within very short period, almost every body will be using mobile communication. Technology is also changing very fast. Therefore, the students should know the functioning of wireless/mobile system/equipment to keep themselves abreast of this latest application of communication.

LEARNING OUTCOMES

After completion of the course, the learner should be able to:

- Identify and explain the features, specification and working of cellular mobile
- Measure and analyse the signal strength at various points from a transmitting antenna/cordless phone
- Describe and analyse different Multiple Access Techniques for Wireless Communication(FDMA, TDMA, CDMA, SSMA, FHSS)
- Describe different Mobile Communication Systems(GSM and CDMA)
- Demonstrate call processing on a GSM and CDMA trainer Kit
- Troubleshoot GSM and CDMA mobile phones

DETAILED CONTENTS

1.   Wireless Communication   (12 hrs)

    1.1   Basics

    1.2   Advantages of wireless communication

    1.3   Electromagnetic waves.

    1.4   Frequency Spectrum used.

    1.5   Cellular Network Systems.

    1.6   Propagation considerations

        a) Range
        b) Atmospheric Effect
        c) Geographic Effect
        d) Fading
        e) Doppler Effect
        f) Multipath Effect

2.   Cellular Concept   (12 hrs)

    2.1   Cell area

    2.2   Cell Site Structure

    2.3   Capacity of cell

    2.4   Frequency Response (ARFCN Concepts)

    2.5   Interference (Co-channel, Adjacent channel)

    2.6   Power Control for reducing Interference

    2.7   Fundamentals of cellular network planning

        a) Coverage planning

        b) Capacity planning

3.   Multiple Access Techniques for Wireless Communication   (16 hrs)

    3.1   Introduction to Multiple Access.

    3.2   Frequency Division Multiple Access (FDMA)

    3.3   Time Division Multiple Access (TDMA)

    3.4   Code Division Multiple Access (CDMA), WCDMA

    3.5   Spread Spectrum Techniques.

4.   Mobile Communication Systems   (16 hrs)

    4.1   Introduction of Global Systems for Mobile Communication (GSM) and its architecture, Introduction of CDMA System, comparison of CDMA and GSM Systems

    4.2   Introduction of GPRS and EDGE.

5.   Introduction to 3G & 4G   (08 hrs)

    5.1   Introduction to Architecture and Features of UMTS
    5.2   HSPA (High Speed Packet Access).
    5.3   Features and Architecture of LTE (Long Term Evolution).

LIST OF PRACTICALS

1. Study the features, specification and working of cellular mobile

2. Measurement of signal strength at various points from a transmitting antenna/cordless phone

3. Demonstration of Base Trans Receiver(BTS) with nearby cellular tower

4. Observing call processing of GSM trainer Kit.

5. Practice of setting GPRS on Mobile phone

6. Repair of a (GSM) mobile phones

INSTRUCTIONAL STRATEGY

Wireless and Mobile Communication is heaving significant impact in Electronics Market. For the proper awareness of this subject, it is must to provide the students the detailed functioning of wireless/mobile system/equipment. For this, visits must be arranged to BTS/MSC (Mobile Switching Centre) providers. The theory classes need to be application based in addition to industrial visits in the BSNL, Vodafone, Airtel, SPICE , TATA indicom etc

RECOMMENDED BOOKS

1. Wireless Communications, Principles and Practice, by Thedore S.Rappaport.

2. Wireless Communications by Singal, Tata McGraw Hill Education Pvt Ltd , New Delhi

3. Wireless Communications by Misra, Tata McGraw Hill Education Pvt Ltd , New Delhi

4. Introduction to Wireless and Mobile Systems, by Dharma Prakash Agarwal, Qing-An zeng.

5. Wireless Communications and Networking, by William Stallings.

6. Mobile and Personal Communication Systems and Services, by Raj Pandya, Prentice Hall of India, New Delhi

7. Mobile Communication by John Schiller, Prentice Hall of India, New Delhi

8. Wireless Communications by Pahalwan, Pearson Publishers

9. Wireless and Mobile Communication VK Sangar, Ishan Publications.

SUGGESTED DISTRIBUTION OF MARKS:

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	12	20
2.	12	20
3.	16	25
4.	16	25
5.	08	10
Total	**64**	**100**

6.4   BASICS OF MANAGEMENT

L T P
3 - -

RATIONALE

The diploma holders are generally expected to take up middle level managerial positions, their exposure to basic management principles is very essential. Topics like Structure of Organization, Leadership, Motivation, Ethics and Values, Marketing management, Financial management, Customer Relationship Management (CRM) & Total Quality Management (TQM), etc. have been included in the subject to provide elementary knowledge about these management areas.. This course explores cyber-security measures and the different forms of cybercrime and emergent forms of cyber-warfare.

LEARNING OUTCOME

After undergoing the subject, the student will be able to:

- Explain the principles of management including its functions in an organisation.
- Have insight into different types of organizations and their structures.
- Inculcate leadership qualities to motivate self and others.
- Manage human resources at the shop-floor
- Maintain and be a part of healthy work culture in an organisation.
- Use marketing skills for the benefit of organization .
- Maintain books of accounts and take financial decisions.
- Undertake store management.
- Use modern concepts like TQM, TPM and CRM.
- Distinguish and classify the forms of cybercriminal activity and the technological and 'social engineering' methods used to undertake such crimes.
- Analyse and assess the impact of cybercrime on government, businesses, individuals and society.

DETAILED CONTENTS

1.   Principles of Management   (06 hrs)

1.1.   Introduction, importance and general functions of management.
1.2.   Concept and Types   of an organization - Sole trading ,partnership, companies, corporation, PSU's and cooperative societies.
1.3.   Structure of an organisation -
a) Line organization
b) Staff organisation
c) Functional organization
d) Line and staff organization

1.4.   Hierarchical Management Structure
- Top, middle and lower level management
1.5.   Departmentalization
- Introduction and its advantages.

2.   Leadership and Motivation   (06 hrs)

2.1   Leadership
a) Definition and Need of Leadership
b) Qualities of a good leader
c) Manager vs. leader
d) Theories of leadership –trait theory and Behaviour theory.
2.2   Motivation
e) Definition and characteristics of motivation
f) Factors affecting motivation
g) Maslow's Need Hierarchy Theory of Motivation and X&Y need Hierarchy theory of motivation.

3.   Work Culture   (06 hrs)

3.1.   Introduction and importance of Healthy Work Culture in organization
3.2.   Components of Culture
3.3.   Importance of attitude, values and behaviour
Behavioural Science – Individual and group behavior.
3.4.   Professional ethics – Concept and need of Professional Ethics and human values.

4.   HRM and its functions   (04 hrs)

4.1   Human Resource Management
- Manpower Planning, recruitment and selection
- Training and development of work force at the shop-floor.
- Performance appraisal
- Wages, salary and incentive schemes

5.   Marketing and sales   (06 hrs)

5.1   Marketing
- Introduction, importance and its functions
- Marketing mix for industries and service sector
- Basic Marketing strategies
5.2   Sales
- Difference between marketing and selling
- Advertisement- print media and electronic media
- Market-Survey and Sales promotion.

6. **Basic of Accounting and Finance** (06 hrs)

    6.1   Basic of Accounting:
- Meaning and definition of accounting
- Double entry system of book keeping
- Trading account, PLA account and balance sheet of a company

    6.2   Objectives of Financial Management
- Profit Maximization v/s Wealth Maximization

7. **Material and Stores Management** (04hrs)

- Introduction, functions and objectives of material management
- Purchasing: definition and procedure
- Just in time (JIT)

8. **TQM , TPM** (02 hrs)

Total Quality Management (TQM) and Total Preventive Maintenance (TPM) - Concepts and importance

9. **Customer Relationship management (CRM)** (02 hrs)

Customer Relationship management - Concepts and importance

10. **Cyber Security** (06 hrs)

-Introduction to Cyberspace and Cyber Law, Pros and Cons of social media.
-Different Components of cyber Laws; Cyber Law and Netizens
- Categories of Cyber Crime: Personal, Business, Financial, Office Security
-Cyber Crime – Complete transparency, hacking/cracking, denial of service, IP piracy, phrasing, hetaerism etc. Cyber Attack – cyber attackers.
-Introduction to IPR, copyright & patent

INSTRUCTIONAL STRATEGY

It is observed that the diploma holders generally take up middle level managerial positions, therefore, their exposure to basic management principles is very essential. Accordingly students may be given conceptual understanding of different functions related to management. Some of the topics may be taught using question answer, assignment or seminar method. The teacher will discuss success stories and case studies with students, which in turn, will develop appropriate managerial qualities in the students. In addition, expert lectures may also be arranged from within the institutions or from management organizations. Appropriate extracted reading material and handouts may be provided.

RECOMMENDED BOOKS

1.   Principles of Management by Philip Kotler TEE Publication

2.   Principles and Practice of Management by Shyamal Bannerjee: Oxford and IBM Publishing Co, New Delhi.

3.   Modern Management Techniques by SL Goel: Deep and Deep Publications Pvt Limited , Rajouri Garden, New Delhi.

4.   Management by James AF Stoner, R Edward Freeman and Daniel R Gilbert Jr. : Prentice Hall of India Pvt Ltd, New Delhi.

5.   Essentials of Management by H Koontz, C O' Daniel , McGraw Hill Book Company, New Delhi.

6.   Intellectual Property Rights and the Law by Dr. GB Reddy.

7.   Service Quality Standards, Sales & Marketing Department, Maruti Udyog Ltd.

8.   Nandan Kamath, A Guide to Cyber Laws & IT Act 2000 with Rules & Notification

9.   Keith Merill & Deepti Chopra (IK Inter.), Cyber Cops, Cyber Criminals & Internet

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	06	12
2.	06	12
3.	06	12
4.	04	9
5.	06	12
6.	06	12
7.	04	9
8.	02	05
9.	02	05
10.	06	12
Total	**48**	**100**

ELECTIVE
6.5.1   DIGITAL SIGNAL PROCESSING

L   T   P
4   -   -

RATIONALE

Digital signal processing (DSP) is an emerging area, which has a great scope and a lot of job potential in the industry. DSP chips are being widely used in communication industry, consumer electronics etc.

LEARNING OUTCOME

After undergoing the subject, student will be able to:

- Explain basic elements of a digital signal processing system and their classification
- Prepare block diagram representation of discrete time system and implement it
- Apply and transform to LTI system
- Design filter structures
- Describe discrete fourier transformer and use it in linear filtering
- Apply DSP processor in various fields of communication industry

DETAILED CONTENTS

1. Introduction   (08 hrs)

    Signals systems, basic elements of a digital signal processing system. Classification of signals, continuous time versus discrete time signals. Concept of frequency in continuous time and discrete time signals

2. Discrete time signals and systems: Block diagram representation of discrete time systems, Linearity, Stability and Causality. Convolution and correlation of signals.
                                                                                          (8 hrs)

3. Implementation of discrete time systems, Recursive and non-recursive FIR systems. Introduction to IIR and FIR filters,

                                                                                          (10 hrs)

4. Z-transform and its application to LTI systems: Direct and inverse Z transform, properties of Z transform.   (10 hrs)

5. Design of Filter structures-Direct Form I, II, cascade and Parallel form.   (10 hrs)

6. Introduction to Fourier Transform. Discrete Fourier transform, properties of DFT (No proof), Multiplication of time DPTS and circular convolution, use of DFT in linear filtering. Fast Fourier transforms: Efficient computation of DFT; FFT, DIT algorithm   (10 hrs)

7. Application of DSP processor   (08 hrs)

INSTRUCTIONAL STRATEGY

The subject requires both theory and practical emphasis simultaneously, so that the students can understand the practical significance of various areas like filter design, wireless communication, analog circuit design. The teacher should follow the learning resources for the lectures. Visits to the industry may also be arranged.

RECOMMENDED BOOKS

1. Digital Signal Processing (Principles, Algorithms and Appications) by John G Proakis and G Monolakis; Prentice Hall of India
2. Digital Signal Processing by AV Oppenheim and RW Ronald W Schafer; Prentice hall of India
3. DSP a computer based approach Mitra Sanjit TMH Publication
4. Digital Signal Processing Using MATLAB by Vinay K Ingle and John G Proakis; Vikas Publishing House, New Delhi
5. Theory and Applications of Digital Signal Processing by Rabiner and Gold; Prentice Hall of India
6. DSP a Practical approach by Ifeachor, Emmanuel Pearson Education

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allocation (%)
1.	8	13
2.	8	13
3.	10	15
4.	10	15
5.	10	15
6.	10	15
7.	8	14
Total	**64**	**100**

ELECTIVE
6.5.2   MEDICAL ELECTRONICS

L   T   P
4   -   -

RATIONALE

A large number of electronic equipment s are being used in hospitals for patient care and diagnosis or carry out advanced surgeries. This subject will enable the students to learn the basic principles of different instruments used in medical science.

LEARNING OUTCOME

After undergoing the subject, student will be able to:

- Describe various medical electronics equipment and their uses
- Use electrodes for various purposes
- Classify the transducers and use them
- Prepare block diagrams of biomedical recorders i.e. ECG, EEG and EMG machines
- Maintain various electronics patient monitoring systems
- Measure current leakage with the help of safety analyzer

DETAILED CONTENTS

1.   Overview of Medical Electronics Equipment, classification, application and specifications of diagnostic, therapeutic and clinical laboratory equipment, method of operation of these instruments   (08 hrs)

2.   Electrodes   (10 hrs)

Bioelectric signals, Bio electrodes, Electrode, Electrode tissue interface, contact impedance, Types of Electrodes, Electrodes used for ECG , EEG

3.   Transducers   (10 hrs)

Typical signals from physiological parameters, pressure transducer, flow transducer, temperature transducer, pulse sensor, respiration sensor,

4.   Bio Medical Recorders   (12 hrs)

Block diagram description and application of following instruments
- ECG Machine
- EEG Machine
- EMG Machine

5.   Patient Monitoring Systems   (12 hrs)

- Heart rate measurement
- Pulse rate measurement
- Respiration rate measurement
- Blood pressure measurement
- Principle of defibrillator and pace mark

6.   Safety Aspects of Medical Instruments   (12 hrs)

- Gross current shock
- Micro current shock
- Special design from safety consideration8.
- Safety standards.

Note: Students must be taken for a visit to hospital for exposure of various medical electronics related equipments like ventilator, boyles apparatus, pulse ox meters, defibrillators, bedside monitor and x-ray equipment etc.

INSTRUCTIONAL STRATEGY

The teacher has to play a proactive role in arranging visits to hospitals and well equipped laboratories to reinforce theory. The apparatus and equipment available should be shown to students so that they can understand where and how the various biomedical instruments are used. Various charts and models be used for demonstration. Exposure to Spectrometer and UV Spectrometer must be given to students in addition to arranging visits to biomedical industries.

RECOMMENDED BOOKS

1.   Handbook of Biomedical Instrumentation by RS Khandpur,Tata McGraw Hill Education Pvt Ltd, New Delhi

2.   Biomedical Instrumentation by Cromwell,

3.   Modern Electronics Equipment by RS Khandpur, TMH, New Delhi

4.   Introduction to Biomedical Electronics by Edward J. Perkstein; Howard Bj, USA

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allocation (%)
1	08	12
2	10	14
3	10	14
4	12	20
5	12	20
6	12	20
Total	**64**	**100**

ELECTIVE
6.5.3   INTRODUCTION TO ROBOTICS

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RATIONALE

Today's industrial assembly line is equipped with robots and man vs. machine interface has been replaced by automation. Most of the machines including our automobiles are available with variety of models and controls. We see luxury cars around us and simply dream of having one. These luxury cars offer varied and many features including safety (central lock, parking assistance, air bags etc.), economy (at times) and comfort as per buyer's criteria. It is therefore need of the day for students to learn Robotics.

LEARNING OUTCOME

After undergoing the subject, student will be able to:

- Identify a Robot for a specific application.
- Interface various Servo and hardware components with Controller based projects.
- Identify parameters required to be controlled in a Robot.
- Maintain various Robotic control features

DETAILED CONTENTS

1.   Basic Components of Robotics Systems   (12 hrs)

    1.1   Definition, need, brief history, social justification
    1.2   Basic Robot terminology configuration and its working
    1.3   Robot components (Anatomy)– manipulator, end effects, drive system, controller, sensors (Optical, Proximity, LVDT, Thermocouple-RTD-Thermistor, Force sensing – strain gaugepiezoelectric, Acoustic)
    1.4   Basic structure of a Robot and Classification – Cartesian, cylindrical, spherical, horizontal articulated(SCARA), Mechanical arm, Degree of freedom, Links and joints, Wrist rotation, Mechanical transmission-pulleys, belts, gears, harmonic drive
    1.5   Linear and rotary motion and its devices
    1.6   Robot configurations: (1) stand above (2) in line (3) cycle independent
    1.7   Selection criteria for robot
    1.8   Robot machine vision

2.   Servo Mechanism and Motion Systems   (20 hrs)

    2.1   ROBOTIC CONTROLS-Purpose and Levels- Device controller, Work cell controller, Area controller, Plant host

    2.2   Servo and non servo control systems – Types, basic principles and block diagram

    2.3   Types, working (with diagrams), and applications of various controls- Computed torque technique, New minimum time control, Variable structure control Non linear decoupled feedback control, Resolved motion control , Adaptive control

    2.4   Types, electrical hardware, programming languages used, advantages, limitations and specific examples of control systems.

    2.5   Robot as work cell controller-PLC

    2.6   Work cell control with local area networking, Multiple network level

    2.7   Level of Robot controller

    2.8   Robot path control (Point to point, Continuous path, Sensor based path)

    2.9   Controller programming

    2.10   Actuators: DC servo motors, Stepper motor, Hydraulic and pneumatic drives

    2.11   Feedback devices

    2.12   Microprocessor based control system

3.   Sensors and Actuators   (20 hrs)

    3.1   Concept of general measurement system and difference between Mechanical and electrical/electronics instruments

    3.2   Measurement of Pressure : Working of Thermocouple vacuum gauge And Pirani vacuum gauge

    3.3   Measurement of Flow: Hot wire Anemometer, Ultrasonic flow meter

    3.4   Measurement of Speed: Contact less electrical tachometer, Inductive, Capacitive type tachometer, Stroboscope

    3.5   Electrical method for moisture measurement

    3.6   Basic requirement of Sensors, Functions

    3.7   Applications and Circuitry arrangement of various Sensors such as Mass Air flow rate sensor, Exhaust gas Oxygen concentration, Throttle plate angular position, Crankshaft angular position, Coolant temperature, Intake air temperature, Manifold absolute pressure (MAP), Vehicle speed Sensor. Transmission gear selector position, Methanol sensor, Rain Sensor; Sensor Calibration

    3.8   Task oriented controls and sequencing, Robotic conventions

4.   Programming and Application in Manufacturing   (12 hrs)

    4.1   Methods of robot programming : Manual Teaching, Lead through

    4.2   Programming languages, Programming with graphics

    4.3   Types, features and applications of various programming languages

4.4 Simulation for robot movements
4.5 Applications of robots (including special types)
4.6 Robot maintenance: Need and types
4.7 Common troubles and remedies in robot operation
4.8 General safety norms, aspects and precautions in robot handling

INSTRUCTIONAL STRATEGY

The course content should be taught and implemented with the aim to develop required skills in the students so that they are able to acquire competency of maintaining various Robotic controls features.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	12	20
2.	20	30
3.	20	30
4.	12	20
Total	**64**	**100**

6.6   PROJECT WORK

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RATIONALE

Major Project Work aims at developing innovative skills in the students whereby they apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project. In addition, the project work is intended to place students for project oriented practical training in actual work situation for the stipulated period.

LEARNING OUTCOMES

After undergoing the project work, students will be able to:

Apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project. In addition, the project work is intended to place the learner for project oriented practical training in actual work situation for the stipulated period with a view to:

- Develop understanding regarding the size and scale of operations and nature of field-work in which students are going to play their role after completing the courses of study

- Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.

- Develop first hand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems related to the world of work.

- Develop abilities like interpersonal skills, communication skills, positive attitudes and values etc.

General Guidelines

The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (say at the end of second year). Students should be allotted a problem of interest to him/her as a major project work. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given to a group. The project work identified in collaboration with industry should be preferred.

This practical training cum project work **should not be considered** as merely conventional industrial training in which students are sent at work places with either minimal or no supervision. This experience is required to be planned in advance and supervised on regular basis by the polytechnic faculty. For the fulfillment of above objectives, polytechnics may establish close linkage with 8-10 relevant organization for providing such an experience to students. It is necessary that each organization is visited well in advance and activities to be performed by students are well defined. The chosen activities should be such that it matches with the curricular interest to students and of professional value to industrial/ field organizations. Each teacher is expected to supervise and guide 5-6 students.

Some of the project activities are given below:

-       Projects related to designing small electronic equipment / instruments.
-       Projects related to increasing productivity in electronic manufacturing areas.
-       Projects related to quality assurance.
-       Projects connected with repair and maintenance of plant and equipment.
-       Projects related to design of PCBs.
-       Projects related to suggesting substitutes of electronics components being used.
-       Projects related to design of small oscillators and amplifier circuits.
-       Projects related to design, fabrication, testing and application of simple digital circuits and components.
-       Projects related to microprocessor/microcontroller based circuits/ instruments.

Some of the projects based on above areas are listed below for the benefit of students:

1.   Microprocessor/Microcontroller based rolling display/bell and calendar
2.   Microprocessor based stepper motor control.
3.   Speed control of DC Machines by Microprocessor/Microcontrollers
4.   Temperature monitoring using Microprocessor/Microcontroller based systems.
5.   Microprocessor/Microcontroller based liquid level indicator and control
6.   Fabrication and assembling of digital clock.
7.   Fabrication of PCB circuits using ORCAD/ EAGLE Software.
8.   Fabrication of ON line/OFF line UPS of different ratings and inverters
9.   Design, fabrication and testing of different types of experimental boards
10.   Repair of oscilloscope, function generator
11.   Design and developing web sites of organizations
12.   Installation of computer network (LANS).
13.   Microprocessor/Microcontroller based solar tracking system

14. GSM based car or home security system

15. Bank token display using microcontroller

16. Printer sharing unit

17. Microprocessor/Microcontroller Based A/D converter

18. Microprocessor/Microcontroller Based D/A converter

19. Simulation of half wave and full wave rectifiers using Simulation Software

20. Simulation of class A, Class B, Class AB and Class C amplifiers

21. Simulation of different wave forms like sine, square, triangular waves etc.

22. GPS based vehicle tracking system

23. Calculate BER(Bit Error Rate) of various modulation techniques

24. Design ALU using CPLD/FPGA

25. Design Display System using CPLD/FPGA

26. Electronic Weighing Machines

NOTE:

The list is only the guideline for selecting a project; however a student is at liberty to select any other related project of his choice independently under guidance of his teacher.

A suggestive criterion for assessing student performance by the external (person from industry) and internal (teacher) examiner is given in table below:

Sr. No.	Performance Criteria	Max.** Marks	Rating Scale				
			Excellent	Very Good	Good	Fair	Poor
1.	Selection of project assignment	10%	10	8	6	4	2
2.	Planning and execution of considerations	10%	10	8	6	4	2
3.	Quality of performance	20%	20	16	12	8	4
4.	Providing solution of the problems or production of final product	20%	20	16	12	8	4
5.	Sense of responsibility	10%	10	8	6	4	2
6.	Self expression/ communication skills	5%	5	4	3	2	1
7.	Interpersonal skills/human relations	5%	5	4	3	2	1
8.	Report writing skills	10%	10	8	6	4	2
9	Viva voce	10%	10	8	6	4	2

Total marks	100	100	80	60	40	20

The overall grading of the practical training shall be made as per following table.

In order to qualify for the diploma, students must get "Overall Good grade" failing which the students may be given one more chance to improve and re-evaluate before being disqualified and declared "not eligible to receive diploma ". It is also important to note that the students must get more than six "goods" or above "good" grade in different performance criteria items in order to get "Overall Good" grade.

	Range of maximum marks	Overall grade
i)	More than 80	Excellent
ii)	79 <> 65	Very good
iii)	64 <> 50	Good
iv)	49 <> 40	Fair
v)	Less than 40	Poor

Important Notes

1. **This criteria must be followed by the internal and external examiner and they should see the daily, weekly and monthly reports while awarding marks as per the above criteria.**

2. **The criteria for evaluation of the students have been worked out for 200 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination.**

3. **The external examiner, preferably, a person from industry/organization, who has been associated with the project-oriented professional training of the students, should evaluate the students performance as per the above criteria.**

4. **It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific nearby industries are approached for instituting such awards.**

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations in such an exhibition.