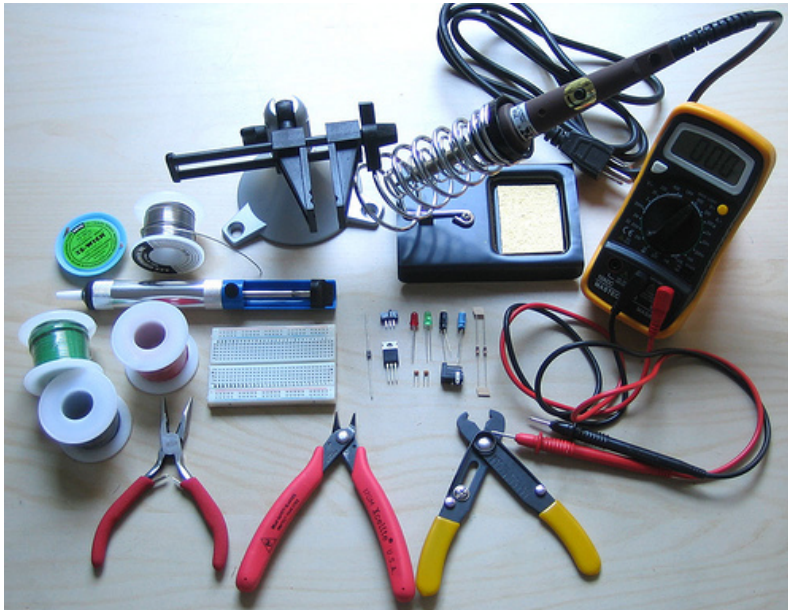
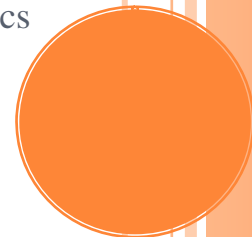


# BABA FARID GROUP OF INSTITUTIONS



*“Electronics is one of the largest and fastest growing field. It covers a wide range of applications which make our life easier and enjoyable such as Television, Radio, Computers, Telecommunication etc. They help us to see, hear and communicate over vast distances and do things faster. Electronics has a major role in improving productivity in industries like oil, energy, agriculture and so many other important sectors of economy. In steel, petroleum and chemical industries it is the electronic devices that direct, control and test production processes. Health care industry depend on electronic instruments to perform chemical tests and to check body functions. The safety in transportation, factories and mines and in homes relies heavily on electronics. The uses are endless. You must find new solutions to the practical problems affecting our daily lives. You may team with other specialists to design, fabricate, produce, test and supervise the manufacture of complex products and systems i.e electronic equipments and components for a number of industries including hospitals, computer industry, electronic data processing systems for communication and in defense etc after completion of course. Electronics is a constantly changing and widening branch among profession courses.”*

--Dr. Subhash Pokhriyal  
In-Charge  
Department of Electronics



**DETAILED CONTENTS  
OF  
VARIOUS SUBJECTS**

# ELECTRONICS ENGINEERING (For UTTARANCHAL)

## VARIOUS SUBJECTS IN FIRST YEAR

Sr No	Subjects	Page No(s)
<b>First Semester</b>		
1.1	English and Communication Skills –I	21
1.2	Applied Mathematics-I	24
1.3	Applied Physics – I	26
1.4	Applied Chemistry-I	29
1.5	Basics of Information Technology	33
1.6	Engineering Drawing-I	37
1.7	General Workshop Practice – I	40
<b>Second Semester</b>		
2.1	English and Communication Skills –II	44
2.2	Applied Mathematics-II	47
2.3	Applied Physics – II	49
2.4	Fundamentals of Electrical Engineering	52
2.5	Electronic Components and Materials(ECM)	54
2.6	Computer Programming and Applications	57
2.7	General Workshop Practice-II	63
	<b>Ecology and Environmental Awareness Camp</b>	<b>66</b>

## 1.1 ENGLISH AND COMMUNICATION SKILLS - I

L T P  
3 - 2

### RATIONALE

Language is the most commonly used medium of self-expression in all spheres of human life – personal, social and professional. A student must have a fair knowledge of English language and skills to communicate effectively to handle the future jobs in industry. The objective of this course is to enable the diploma holders to acquire proficiency, both in spoken (oral) and written language. At the end of the course, the student will be able to develop comprehension skills, improve vocabulary, use proper grammar, acquire writing skills, correspond with others and enhance skills in spoken English. It is expected that each polytechnic will establish a **communication skill laboratory** for conducting practicals mentioned in the curriculum.

### DETAILED CONTENTS

1. Facets of Literature (14 hrs)
  - 1.1 Short Stories
    - 1.1.1 Homecoming – R.N. Tagore
    - 1.1.2 The Selfish Giant - Oscar Wilde
    - 1.1.3 The Diamond Necklace- Guy- De Maupassant
  - 1.2 Prose
    - 1.2.1 I Have A Dream – Martin Luther King
    - 1.2.2 On Habits – A. G. Gardiner
    - 1.2.3 On Seeing People Off – Max Beerbohm
  - 1.3 Poems
    - 1.3.1 Ozymandias – P.B. Shelley
    - 1.3.2 Daffodils – William Wordsworth
    - 1.3.3 Stopping by Woods on a Snowy Evening – Robert Frost
2. Grammar and Usage (10 hrs)
  - 2.1 Parts of speech
    - 2.1.1 Nouns
    - 2.1.2 Pronouns
    - 2.1.3 Adjectives
    - 2.1.4 Articles
    - 2.1.5 Verbs
    - 2.1.6 Adverbs

- 2.1.7 Prepositions
  - 2.1.8 Conjunction
  - 2.1.9 Interjection
  - 2.1.10 Identifying parts of speech
  - 2.1.11 Structures: Verb patterns, Question tags,
  - 2.1.12 Subject – Verb agreement (concord)
- 2.2 Pair of words (Words commonly confused and misused)
- 2.3 Tenses
  - 2.4 Correction of incorrect sentences
  - 2.5 One word Substitution
3. Translation (04 hrs)
- 2.1 Glossary of Administrative Terms (English and Hindi)
  - 2.2 Translation from Hindi into English
4. Paragraph of 100-150 words from outlines (08 hrs)
5. Comprehension (04 hrs)
- Unseen passages of literacy, scientific, data/graph based for comprehension exercises
6. Communication (08 hrs)
- 6.1 Definition, Introduction and Process of Communication
  - 6.2 Objectives of Communication
  - 6.3 Notices

### **LIST OF PRACTICALS**

1. Locating a Book in Library
2. How to look up words in a Dictionary: meaning and pronunciation of words as given in the standard dictionary using symbols of phonetics,
3. How to Seek Information from an Encyclopedia
4. Listening pre-recorded English language learning programme
5. Paper Reading before an audience (reading unseen passages)
6. Study of Spelling Rules
7. Essentials of a Good Speech to respond and comprehend visual, oral themes and situations or stimulus and practice before select gathering
8. Exercises on use of different Abbreviations
9. Greetings for different occasions

10. Introducing oneself, others and leave taking
11. Exercises on writing sentences on a topic

**Note(s):**

1. The Text Book on "English and Communication Skills, Book-I by Kuldip Jaidka et. al. developed by NITTTR, Chandigarh is recommended to be used for teaching and setting-up the question papers.
2. A communication laboratory may be set up consisting of appropriate audio-video system with facility of playing CDs/DVDs and a video camera for recording the performance of each student with play back facility. A set of CDs from any language training organization e.g. British Council etc. may be procured for use of students.
3. Elements of body language will be incorporated in all practicals
4. The practical exercises involving writing may also be included in Theory Examination.

**RECOMMENDED BOOKS**

1. English and Communication Skills, Book-I by Kuldip Jaidka, Alwinder Dhillon and Parmod Kumar Singla, Prescribed by NITTTR, Chandigarh and Published by Abhishek Publication, SCO 57-59, Sector-17, Chandigarh
2. Essentials of Business Communication by Pal and Rorualling; Sultan Chand and Sons, New Delhi
3. The Essence of Effective Communication, Ludlow and Panthon; Prentice Hall of India, New Delhi
4. New Design English Grammar, Reading and Writing Skills by AL Kohli (Course A and course B), Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,
5. New Design English Reading and Advanced Writing Skills for Class XI and XII by MK Kohli and AL Kohli; Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,
6. A Practical English Grammar by Thomson and Marlinet
7. Spoken English by V Sasikumar and PV Dhamija; Tata McGraw Hill, New Delhi
8. English Conversation Practice by Grount Taylor; Tata McGraw Hill, New Delhi
9. Developing Communication Skills by Krishna Mohan and Meera Banerji; MacMillan India Ltd., Delhi
10. Business Correspondence and Report Writing by RC Sharma and Krishna Mohan; Tata McGraw Hill Publishing Company Ltd. New Delhi
11. Communication Skills by Ms R Datta Roy and KK Dhir; Vishal Publication, Jalandhar

## SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

<b>Topic No.</b>	<b>Topic</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allocation</b>
1.	Facets of Literature	14	30
2.	Grammar and Usage	10	20
3.	Translation	4	05
4.	Paragraph of 100-150 words from outlines	8	15
5.	Comprehension	4	10
6.	Communication	8	20
<b>Total</b>		<b>48</b>	<b>100</b>

## 1.2 APPLIED MATHEMATICS – I

L T P  
5 - -

### RATIONALE

Engineering Mathematics forms the backbone of engineering studies. Basic elements of Algebra, Trigonometry, Coordinate geometry have been included in the curriculum as foundation course to be followed by differential and integral calculus. This course will develop analytical abilities to make precise judgements and will provide base for continuing educational base to the students.

### DETAILED CONTENTS

1. Algebra (20 hrs)
  - 1.1 Partial fractions: linear factors, repeated linear factors, non-reducible quadratic factors excluding repeated factors
  - 1.2 Series: Arithmetic and geometric progression, its  $n^{\text{th}}$  term, sum of  $n^{\text{th}}$  term, sum of  $n$  terms, mean, with their applications to engineering problems.
  - 1.3 Permutations and Combinations: Value of  ${}^n P_r$ ,  ${}^n C_r$ , Simple problems
  - 1.4 Binomial theorem: Binomial theorem for positive integral index, any index, first and second binomial approximation with applications to Engineering problems
  - 1.5 Logarithm and Exponential series: Logarithmic and exponential series and use in calculations of engineering problems
  
2. Trigonometry (10 hrs)
  - 2.1 Relation between sides and angle of a triangle. Statements of various formula showing relationship between sides and angles of a triangle
  - 2.2 Complex Numbers: Complex number, representation moduls and amplitude, De-movier's theorem, its application in solving algebraic equations, modulus function and its properties
  - 2.3 Height and distance: Simple problems on height and distance
  - 2.4 Graphs: Graphs of  $\text{Sin}x$ ,  $\text{Cos}x$ ,  $\text{tan}x$ ,  $e^x$ ,  $\log x$
  
3. Co-Ordinate Geometry (16 hrs)
  - 3.1 Straight Line: Equation of straight line in various standard forms
  - 3.2 Conic Section: Circle, Parabola, Ellipse, Hyperbola. Standard forms, their properties, tangents and normals
  
4. Differential Calculus (16 hrs)
  - 4.1 Functions, limits and continuity
  - 4.2 Derivative of function of function, logarithmic differentiation of amplicit function. Exponential and logarithmic function
  - 4.3 Applications: Tangent and normal, maxima and mimima rate measure, error and approximation



5. Integral Calculus (18 hrs)
- 5.1 Infinite Integration: by substitution, partial fraction and by parts, integration of specific function
- 5.2 Definite integral: Meaning and properties of definite integral, evaluation of definite integral
- 5.3 Applications: Finding areas, bounded by simple curves, length of Arc, volume and surface of solids of revolutions, centre of mean of plane curve
- 5.4 Simpson's and Trapezoidal rules and their applications in simple cases

### 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 by Dr. RD Sharma
4. Applied Mathematics, Vol. I & II by SS Sabharwal & Sunita Jain, Eagle Parkashan, Jalandhar
5. Comprehensive Mathematics, Vol. I & II by Laxmi Publications
6. Engineering Mathematics by Dass Gupta
7. Engineering Mathematics by C Dass Chawla, Asian Publishers, New Delhi
8. Comprehensive Mathematics, Vol. I & II by Laxmi Publications
9. Engineering Mathematics, Vol I, II & III by V Sundaram et.al, Vikas Publishing House (P) Ltd., New Delhi
10. Engineering Mathematics by N.Ch.S.N Iyengar et.al, Vikas Publishing House (P) Ltd., New Delhi
11. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
12. Engineering Mathematics, Vol I & II by AK Gupta, MacMillan India Ltd., New Delhi.

### SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Topic No.	Topic	Time Allotted (Hrs)	Marks Allocation
1.	Algebra	20	25
2.	Trigonometry	10	15
3.	Co ordinate Geometry	16	20
4.	Differential Calculus	16	20
5.	Integral Calculus	18	20
<b>Total</b>		<b>80</b>	<b>100</b>

## 1.3 APPLIED PHYSICS – I

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 at giving an understanding of this world both by observation and prediction in which objects will behave. Concrete uses of physical principles and analysis in various fields of engineering and technology are given prominence in the course content.

### DETAILED CONTENTS

1. Units and Dimensions (08 hrs)
  - 1.1 Physical quantities
  - 1.2 Fundamental and derived units
  - 1.3 Systems of units (FPS, CGS, MKS and SI units)
  - 1.4 Dimensions and dimensional formulae of physical quantities (area, volume, velocity, acceleration, momentum, force, impulse, work, power, energy, surface tension, gravitational constant, density). Coefficient of viscosity, stress, strain and elasticity)
  - 1.5 Principle of homogeneity
  - 1.6 Uses of Units and Dimensions
    - a) Conversion of one system of unit into another
    - b) Determination of formula of a physical quantity such as time period of simple pendulum and determination of formula for centripetal force by the method of units and dimensions
    - c) Knowing the correctness of a physical equation
  - 1.7 Limitations of dimensional analysis
2. Force and Motion (10 hrs)
  - 2.1 Scalar and vector quantities – definitions with examples, simple addition and multiplication of scalar and vector quantities
  - 2.2 Force - resolution and composition of forces, Parallelogram Law of forces with the derivation for the resultant force and direction of the resultant force.
  - 2.3 Introduction of forces in nature – Gravitational, electromagnetic, nuclear weak and strong
  - 2.4 Projectile motion - horizontal and oblique and their equation
  - 2.5 Derivation and definitions of
    - a) Time of flight
    - b) Maximum height
    - c) Horizontal range and the condition for the maximum range
  - 2.6 Conservative and non-conservative forces
  - 2.7 Work done by force on bodies
  - 2.8 Concept of power and its unit
  - 2.9 Kinetic energy, potential energy, concept of energy conservation, various forms of energy

3. Dynamics of rigid body (rotational motion) (10 hrs)
- 3.1 Circular motion, regular velocity, angular acceleration
  - 3.2 Centripetal force, centrifugal forces and its applications
  - 3.3 Rigid bodies, definition of torque, moment of inertia
  - 3.4 Theorems of parallel and perpendicular axis (statements)
  - 3.5 Radius of gyration, expression of M.I. of regular bodies
  - 3.6 Conservation of angular momentum, rotational kinetic energy
4. Gravitation and Satellites (4 hrs)
- 4.1 Kepler's law of planetary motion
  - 4.2 Newton's law of gravitation
  - 4.3 Escape velocities, satellites, geo-stationary satellite
5. Properties of Matter (12 hrs)
- 5.1 Elasticity, definition of stress and strain, different types of modulus of elasticity stress – strain diagram, Hook's law, poisson ratio
  - 5.2 Surface tension – its units, measurement of surface tension by capillary tube method, applications of surface tension, effect of temperature and impurity on surface tension
  - 5.3 Fluid motion, stream line and turbulent flow
  - 5.4 Viscosity and coefficient of viscosity, Stock's law, effect of temperature on viscosity
6. Transfer of Heat (08 hrs)
- 6.1 Modes of transfer of heat (conduction, convection and radiation with examples)
  - 6.2 Coefficient of thermal conductivity. Isothermal surface, temperature gradient, steady state
  - 6.3 Properties of heat radiation
  - 6.4 Black body radiation - Stefan's law, Kirchoff's law, Wien's law, in case of black body radiations
  - 6.5 Conduction of heat through compound media
  - 6.6 Principle of measurement of temperature, different scales of temperature
  - 6.7 Platinum resistance thermometer, thermocouple thermometer
  - 6.8 Difference between heat and temperature
7. Simple Harmonic Motion (04 hrs)
- 7.1 Definition of simple harmonic motion relation for the displacement, velocity, acceleration, and time period of a body executing simple harmonic motion
  - 7.2 Free, forced and resonant vibrations with examples, Q factor (qualitative)
  - 7.3 Simple pendulum, derivation of its periodic time
  - 7.4 Energy conservation in simple harmonic motion

8. Application of Sound Waves (8 hrs)
- 8.1 Standing wave
  - 8.2 Close and open organ pipe, resonance, end correction
  - 8.3 Definition of pitch, loudness, quality and intensity of sound waves
  - 8.4 Echo and reverberation time, control of reverberation time
  - 8.5 Acoustic of building-defects and remedy (qualitative)
  - 8.6 Ultrasonic wave, its applications, production of ultrasonic wave by magneto and piezoelectric effects and its properties

### LIST OF PRACTICALS

1. Determination of 'Y' (Young's Modulus) by Searle's Method.
2. Determination of 'g' by plotting a graph  $T^2$  versus  $l$  and using the formula  $g=4\pi^2 / \text{Slope of the graph line}$ .
3. Determination of Spring Constant.
4. Measurement of instantaneous and average wind velocity by indicating cup type anemometer/ hand held anemometer.
5. Verification of Law of Parallelogram of forces.
6. Determination of velocity of sound by resonance tube.
7. Determination of Frequency of a tuning fork by a Sonometer.
8. Measurement solar intensity (determine solar constant) with the help of Insulation meter (Suryaamapi).
9. Determination of Viscosity Coefficient of liquid by Stoke's law.
10. Determination of the thickness of glass strip and radius of curvature of a concave surface using a spherometer.
11. Determination of & verification of time period of cantilever by drawing graph between load (w) and depression (D).
12. Determination of coefficient of Friction between two surfaces

### RECOMMENDED BOOKS

1. Applied Physics Vol. I, TTTI Publication Tata McGraw Hill, Delhi
2. Basic Applied Physics by RK Gaur; Dhanpat Rai Publications
3. Comprehensive Practical Physics - Volume I and II by JN Jaiswal; Laxmi Publishers

4. Numerical Problems in Physics - Volume I and II by RS Bharaj; Tata McGraw Hill
5. Simple Course in Electricity and Magnetism by CL Arora; S Chand and Co, New Delhi
6. Fundamental Physics - Volume I and II by Gomber and Gogia; Pardeep Publications, Jalandhar
7. A Text Book of Optics by Subramanian and Brij Lal
8. Physics Laboratory Manual by PK Palanisamy, Scitech Publications
9. Fundamentals of Physics by Resnick and Halliday, Asian Books Pvt. Ltd., New Delhi
10. Concepts in Physics by HC Verma; Bharti Bhawan Ltd., New Delhi

#### **SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER**

<b>Topic No.</b>	<b>Topic</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allocation</b>
1.	Units and Dimensions	8	10
2.	Force and Motion	10	20
3.	Dynamics of rigid body (rotational motion)	10	15
4.	Gravitation and Satellites	4	7
5.	Properties of Matter	12	20
6.	Transfer of Heat	8	10
7.	Simple Harmonic Motion	4	8
8.	Application of Sound Waves	8	10
<b>Total</b>		<b>64</b>	<b>100</b>

## 1.4 APPLIED CHEMISTRY - I

L T P  
2 - 2

### RATIONALE

The role of Chemistry and chemical products in every branch of engineering is expanding greatly. Now a days various products of chemical industries are playing important role in the field of engineering with increasing number of such products each successive years. The strength of materials, the chemical composition of substances, their behaviour when subjected to different treatment and environment, and the laws of heat and dynamic energy have entered in almost every activity of modern life. Chemistry is considered as one of the core subjects for diploma students in engineering and technology for developing in them scientific temper and appreciation of chemical properties of materials, which they have to handle in their professional career. Effort should be made to teach this subject through demonstration and with the active involvement of students.

### DETAILED CONTENTS

1. Basics Concepts (04 hrs)
  - 1.1 Definition of matter, element, compound and mixtures, atom, molecule, ion, symbol, formula, valency and chemical equation.
  - 1.2 Writing of the chemical formula of a simple chemical compound. Calculation of percentage composition of a chemical compound and from the empirical and molecular formula of the compound
  - 1.3 Essentials of a chemical equation, balancing of a chemical equation by hit and trial method
2. Atomic Structure and Chemical Bonding (04 hrs)
  - 2.1 Fundamental particles i.e. electron, proton and neutron, their characteristics (discovery is not included)
  - 2.2 Modern periodic law, introduction of periodic table, periods and groups
  - 2.3 Electronic concept of valency
  - 2.4 Elementary account of electrovalent, covalent and coordinate bond formation on the basis of the electronic concept of valency giving suitable examples to each
  - 2.5 Hydrogen bonding and its effect on physical properties of the compounds
3. Water (08 hrs)
  - 3.1 Hard and soft water, types of hardness and its causes, disadvantages of hardness of water (i) in industrial use (ii) in boilers for steam generation with special reference to sludge and scale formation; foaming in boilers

- 3.2 Methods to remove hardness of water (i) Clark's Process (ii) Permutit Process (iii) Soda Lime process (iv) Ion-Exchange resin process. Simple numerical problems related to soda lime process.
- 3.3 Definition of degree of hardness of water and the systems to express the degree of hardness of water. Simple numerical problems related to finding the degree of hardness on different scales. Estimation of hardness of water sample by O'Hehner's Method and E.D.T.A. Method
- 3.4 Qualities of water used for drinking purposes, treatment of river water to make it fit for town supply
- 3.5 Disinfection of water by chlorination process
4. Solutions (06 hrs)
- 4.1 Concept of homogenous solution, brief introduction of the terms (i) Ionization (ii) Acidity (iii) Basicity (iv) equivalent weight and gram equivalent weight with suitable examples
- 4.2 Strength of a solution (i) Normality (ii) Molarity (iii) Molality as applied in relation to a solution with simple numerical problems related to these terms
- 4.3 Definition of pH, and different industrial applications of pH, determination of pH of a solution with the help of pH meter
5. Electrolysis (06 hrs)
- 5.1 Definition of the terms: Electrolytes, Non-electrolytes conductors and non-conductors with suitable examples
- 5.2 Faraday's Laws of Electrolysis with simple numerical problems
- 5.3 Different industrial applications of 'Electrolysis' with special reference to electroplating and electrorefining of metals
- 5.4 Basic concept of Buffer solutions, indicators and solubility product.
6. Environmental Chemistry (04 hrs)
- 6.1 Scope and significance of Environmental Science
- 6.2 Decomposition of organic compounds and biodegradability

#### LIST OF PRACTICALS

1. Volumetric analysis and study of apparatus used therein. Simple problems on volumetric analysis equation

2. Preparation of standard solution of oxalic acid or potassium dichromate
3. To analyse the inorganic mixture for two acidic and two basic radicals from the following radicals
  - a) Acidic Radicals  $\text{CO}_3^{2-}$ ,  $\text{S}^{2-}$ ,  $\text{SO}_3^{2-}$ ,  $\text{SO}_4^{2-}$ ,  $\text{NO}_2^-$ ,  $\text{NO}_3^-$ ,  $\text{CH}_3\text{COO}^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$
  - b) Basic Radicals  $\text{NH}_4^{+}$ ,  $\text{Pb}^{+}$ ,  $\text{Cu}^{+}$ ,  $\text{Cd}^{+}$ ,  $\text{As}^{+}$ ,  $\text{Sb}^{+}$ ,  $\text{Sn}^{+}$ ,  $\text{Al}^{+}$ ,  $\text{Fe}^{+}$ ,  $\text{Cr}^{+}$ ,  $\text{Mn}^{+}$ ,  $\text{Ni}^{+}$ ,  $\text{Co}^{+}$ ,  $\text{Zn}^{+}$ ,  $\text{Ba}^{+}$ ,  $\text{Sn}^{+}$ ,  $\text{Ca}^{+}$  and  $\text{Mg}^{+}$ ,
4. Find the amount of chlorides in mg per litre in a sample of  $\text{H}_2\text{O}$  with the help of a solution of  $\text{AgNO}_3$
5. Determine the degree of temporary hardness of water by O'Heher's method
6. Estimation of total alkalinity of water volumetrically
7. Determine pH of a given sample by using pH meter
8. Determination of solubility of a solid at room temperature
9. Demonstration – Application of  $\text{FeCl}_3$  in etching process for designing circuits on PCB (Printed Circuit Board)

### RECOMMENDED BOOKS

1. Chemistry in Engineering by J.C. Kuriacose and J. Rajaram; Tata McGraw-Hill Publishing Company Limited, New Delhi
2. Engineering Chemistry by Dr. S. Rabindra and Prof. B.K. Mishra ; Kumar and Kumar Publishers (P) Ltd. Bangalore-40
3. A Text Book of Applied Chemistry-I by SS Kumar; Tata McGraw Hill, Delhi
4. A Text Book of Applied Chemistry-I by Sharma and Others; Technical Bureau of India, Jalandhar
5. Engineering Chemistry by Jain PC and Jain M,
6. Chemistry of Engineering by Aggarwal CV,
7. Chemistry for Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi
8. Progressive Applied Chemistry –I and II by Dr. G.H. Hugar; Eagle Prakashan, Jalandhar

### SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING PAPER SETTER

Topic No.	Topic	Time Allotted (Hrs)	Marks Allocation
1.	Basic Concepts	4	15
2.	Atomic Structure and Chemical Bonding	4	20
3.	Water	8	20
4.	Solutions	6	15
5.	Electrolytes	6	15
6.	Environmental Chemistry	4	15
<b>Total</b>		<b>32</b>	<b>100</b>



## 1.5 BASICS OF INFORMATION TECHNOLOGY

L T P  
- - 4

### RATIONALE

Information technology has great influence on all aspects of life. Almost all work places and living environment are being computerized. 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 of MS 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:

- i) Teaching of theory should be detailed with practical work.
- ii) The following topics may be kept in mind while doing practical exercises in the laboratory for developing appropriate knowledge and skill in the area of Computer and Information Technology.

### DETAILED CONTENTS FOR GROUP INSTRUCTION

1. Information Technology – its concept and scope
2. Functions and components of a computer system, its usefulness and applications, block diagram of a computer, CPU, memory, data – numeric data, alpha numeric data;
3. Computer organization, computer hardware and software; primary and secondary memory: RAM, ROM, PROM etc.
4. Input devices; keyboard, scanner, mouse etc ; output devices ; VDU and Printer, Plotter
5. Primary and Secondary Storage (Auxiliary Storage), Secondary storage; magnetic disks – tracks and sectors, optical disk (CD, CD-RW and DVD Memory)
6. Introduction to Operating Systems such as MS-DOS and Windows
7. Introduction to internet, browsing using search engine (like google etc. )
8. Basics of Networking – LAN, WAN, Topologies

### LIST OF PRACTICALS

1. Given a PC, name its various components and list their functions
2. Identification of various parts of a computer and peripherals
3. Practice in installing a computer system by giving connection
4. DOS Commands (internal / external) e.g. TYPE, REN, DEL, CD, MD, COPY, TREE, BACKUP
5. Exercises on entering text and data (Typing Practice using any tutor)
6. Features of Windows as an operating system
  - Start
  - Shutdown and restore

- Creating and operating on the icons
- Opening closing and sizing the windows
- Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file
- Creating and operating on a folder
- Changing setting like, date, time color (back ground and fore ground)
- Using short cuts
- Using on line help

## 7. MS-Word

- 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
- Page Set up:  
Setting margins, tab setting, ruler, indenting
- Editing a document:  
Entering text, Cut, copy, paste using tool- bars
- 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
- Inserting date, time, special symbols, importing graphic images, drawing tools
- 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
- Using Tools like:  
Spell checker, help, use of macros, mail merge, thesaurus word content and statistics, printing envelopes and labels
- Using shapes and drawing toolbar,
- Working with more than one window in MS Word,

## 8. MS-Excel

- Starting excel, open worksheet, enter, edit, data, formulae to calculate values, format data, create chart, printing chart, save worksheet, switching between different spread sheets
- Menu commands:  
Create, format charts, organize, manage data, solving problem by analyzing data, exchange with other applications. Programming with MS-Excel, getting information while working
- 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, working with arrays
  - Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet
  - 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
9. MS PowerPoint
- a) Introduction to PowerPoint
    - How to start PowerPoint
    - Working environment: concept of toolbars, slide layout, templates etc.
    - Opening a new/existing presentation
    - Different views for viewing slides in a presentation: normal, slide sorter etc.
  - b) Addition, deletion and saving of slides
  - c) How to view the slide show?
    - Viewing the presentation using slide navigator
    - Slide transition
    - Animation effects etc.
10. Internet and its Applications
- a) Log-in to internet
  - b) Navigation for information seeking on internet
  - c) Browsing and down loading of information from internet
  - d) 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

## RECOMMENDED BOOKS

1. Fundamentals of Computer by V . Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
2. Computers Today by SK Basandara, Galgotia Publication Pvt Ltd. Daryaganj, New Delhi.
3. MS-Office 2000 for Everyone by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., New Delhi
4. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
5. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
6. Mastering Windows 95, BPB Publication, 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. Learning MS Office XP by Ramesh Bangia, Khanna Book Publishing Co. (P) Ltd., New Delhi.
11. Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar
12. Linux, BPB Publications

## **1.6 ENGINEERING DRAWING – I**

**(Common with Civil, Electrical, Mechanical, Eltx, Computer Engineering and IT)**

**L T P**  
**- - 6**

### **RATIONALE**

Drawing is said to be the language of engineers and technicians. Reading and interpreting engineering drawing is their day-to-day responsibility. The course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation

- Note:
1. Third angle projection is to be followed
  2. Minimum of 15 sheets to be prepared by each student
  3. SP 46 – 1988 should be followed
  4. Instructions relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students

### **DETAILED CONTENTS**

1. Drawing Office Practice
  - 1.1 Drawing instruments
  - 1.2 Sizes and layout of standard drawing sheets
  - 1.3 Sizes of drawing boards
  - 1.4 Drafting table/board
  
2. Lines, Lettering and Dimensioning (4 sheets)
  - 2.1 Different types of lines in engineering drawing as per BIS specifications
  - 2.2 Instrumental single stroke (vertical and inclined gothic) lettering of 35 mm height in the ratios of 7:4
  - 2.3 Instrumental double stroke lettering of 35 mm height in the ratio of 7:4, vertical
  - 2.4 Free hand lettering (alphabet and numerals) lower case and upper case, single stroke vertical and inclined at 75 degree in different standard series of 2.5, 3, 5, 7, 10, and 15 mm heights in the ratio of 7:4
  - 2.5 Necessity of dimensioning - methods and principles
  - 2.6 Dimensioning of overall sizes, circles, thread holes, chamfered surfaces, angles, tapered surface holes equally spaced on PCD, counter sunk hole counter bored holes, cylindrical parts, narrow space and gaps, radii, curves and arches – chain and parallel dimensioning
  
3. Simple Geometrical Constructions used in Engineering Practice (2 Sheets)
  - 3.1 Construction of regular polygons (triangle, square, pentagon, hexagon) and circles
  - 3.2 Ellipses (concentric circle method and oblong method)
  - 3.3 Parabola (rectangle and tangent method)
  - 3.4 Curves (cycloid and helix)

4. Scale (2 sheets)
  - 4.1 Scales – their need and importance, Definition of representative fraction (RF); Find RF of a given scale
  - 4.2 Types of scales
  - 4.3 Construction of plain and diagonal scales, chord scale
  
5. Principle of Projections (6 sheets)
  - 5.1 Principle of orthographic projection
  - 5.2 Planes of projection, four quadrants, first angle projection and third angle projection
  - 5.3 Projection of points situated in different quadrants
  - 5.4 Projection of lines, Lines inclined to one plane and parallel to the other and vice versa
  - 5.5 Projection of Planes: Planes perpendicular and parallel to either of the planes; planes perpendicular to one plane and parallel to the other or vice versa
  - 5.6 Projection of solids, such as Prism, Cube, Cylinder and Cones with axis perpendicular to horizontal plane or parallel to horizontal plane/vertical plane or both
  - 5.7 Drawing 3 orthographic views of given objects (at least five objects)
  - 5.8 Identification of surfaces on drawn orthographic views from isometric object drawn
  - 5.9 Exercises on missing lines, surfaces and views
  
6. Sectional Views (1 sheet)
  - 6.1 Need for sectional views – conventional sections of various materials
  - 6.2. Drawing of different conventions for materials in sections, conventional breaks for shafts, pipes, rectangular, square, angle, channel and rolled sections
  
7. Isometric Views (2 sheets)
  - 7.1 Fundamentals of isometric projections (theoretical instructions) and isometric scales
  - 7.2 Isometric views from 2 or 3 given orthographic views
  
8. Symbols and Conventions (2 sheets)
  - 8.1 Civil engineering sanitary fitting symbols
  - 8.2 Electrical fitting symbols for domestic interior installations and electronics symbols
  - 8.3 Building plan drawing with electrical and civil engineering symbols
  
9. Auto-CAD (for practical and viva-voce only)
  - 9.1 Concept of AutoCAD, Tool bars in AutoCAD, coordinate system, snap, grid, and ortho mode

- 9.2 Drawing commands – point, line, arc, circle, ellipse
- 9.3 Editing commands – scale, erase, copy, stretch, lengthen and explode
- 9.4 Dimensioning and placing text in drawing area
- 9.5 Sectioning and hatching
- 9.6 Inquiry for different parameters of drawing entity

**Note: Minimum 15 drawing sheets will be prepared by the students**

### **RECOMMENDED BOOKS**

1. Elementary Engineering Drawing by ND Bhatt, Charotar Publishing House
2. A Text Book of Engineering Drawing by Surjit Singh, Dhanpat Rai and Co., Delhi
3. Engineering Drawing by PS Gill, SK Kataria and sons, Delhi

**Note:**

- a. ***No table is suggested of marks, instead it is emphasized that the examination paper should contain exercises for evaluation of all necessary skills envisaged in the curriculum.***
- b. ***It is also suggested that a comprehensive viva of each students should be conducted by an external examiner during or just after the examinations to ascertain understanding of the subject e.g. reading and interpreting drawing and development of necessary skills etc.***

**1.7 GENERAL WORKSHOP PRACTICE - I**  
**(Common with Civil, Electrical, Mechanical, Computer Engineering and IT)**

**L T P**  
**- - 6**

**RATIONALE**

Manual abilities to handle engineering materials with hand tools need to be developed in the students. This course aims at developing generic manual and machining skills in the students. They will be using different types of tools/equipment in different shops for fabrication purposes. Besides above, the development of dignity of labour, precision, safety at work places, team working and development of right attitude are other objectives.

**DETAILED CONTENTS**

**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.

**PRACTICAL EXERCISES**

The following shops are included in the syllabus :

1. Carpentry and Painting shop-I
2. Fitting and Plumbing shop-I
3. Welding shop-I
4. Electric shop-I
5. Sheet Metal Shop
6. Electronics shop

**1. Carpentry and Painting Shop - I**

- 1.1 Introduction to various types of wood by demonstration and their identification.
- 1.2 Demonstration, function and use of commonly used hand tools. Care, maintenance of tools and safety measures to be observed.  
Job I Marking, Sawing and planning practice  
Job II Extensive Planning Practice  
Job III Chiseling Practice
- 1.3 Introduction to joints, their relative advantages and uses.  
Job IV Preparation of half lap joint  
Job V Preparation of Mortise and Tenon Joint
- 1.4 Demonstration of various methods of painting wooden items.  
Job VI Preparation of surface before painting.  
Job VII Application of primer coat  
Job VIII Painting wooden items by brush/roller/spray



- 1.5 Demonstration of various methods adopted for painting steel items.  
Job IX Painting steel items by brush/roller/ spray

## **2. Fitting and Plumbing Shop-I**

- 2.1 Introduction to fitting shop, Common materials used in fitting shop, Identification of materials.
- 2.2 Description and demonstration of various types of tools and work benches. Holding devices and files, Precautions while filing  
Job I Filing practice (Production of flat surfaces) Checking by straight edge.  
Job II Marking of jobs, use of marking and measuring tools.  
Job III Filing a dimensioned rectangular or Square piece of an accuracy of  $\pm 0.25\text{mm}$ .
- 2.3 Introduction to chipping, Demonstration on chipping and its applications. Demonstration and function of chipping tools.  
Job IV Chipping practice
- 2.4 Description and demonstration of simple operation of hacksawing, demonstration and description of various types of blades, their uses and method of fitting the blade.  
Job V Making a cutout from a square piece of iron block using hacksaw.
- 2.5 Introduction and demonstration of plumbing tools and different connectors and plumbing operations  
Job VI Preparation of job involving threads on GI pipe and fixing of different types of elbow, T-unions, sockets, stopcocks, taps etc.

## **3. Welding Shop-I**

- 3.1 Introduction to welding and its importance in engineering practice; types of welding; common materials that can be welded.
- 3.2 Electric arc welding, (a.c and d.c) precautions while using electric arc welding, Practice in setting current and voltage for striking proper arc.  
Job I Practice of striking arc while using electric arc welding set.  
Job II Welding practice job on arc welding for making uniform and straight weld beads.
- 3.3 Common welding defects and inspection.
- 3.4 Various types of joints and end preparation.  
Job III Preparation of butt joint arc welding.  
Job IV Preparation of lap joint by arc welding.  
Job V Preparation of single V/double V butt joint by using electric arc welding.  
Job VI Preparation of Tee joint by arc welding.
- 3.5 Introduction to gas welding and its demonstration

## **4. Electric Shop-I**

- 4.1 Study, demonstration and identification of common electrical materials such as wires, cables, switches, fuses, ceiling roses, battens, cleats and allied items, tools and accessories.
- 4.2 Study of electrical safety measures and demonstration about use of protective devices.  
Job I Identification of phase, neutral and earth of domestic appliances and their

connection to two pin/three pin plugs.

Job II Laying out of complete wiring of a house (i) batten wiring (ii) plastic casing and capping.

4.3 Study of common electrical appliances such as electric irons, electric kettles, electric water heaters, table fans and electric mixer.

Job III Testing and rectification of simulated faults in above said electrical appliances.

4.4 Introduction to battery and its working.

Job IV Charging a battery and testing it with the help of hydrometers and cell testers.

Job V Battery connections in series and parallel

## 5. Sheet metal shop

Introduction to sheet metal process and tools

Job I Making sheet metal joints

Job II Making sheet metal tray or a funnel or a computer chassis

Job III Preparation of sheet metal jobs involving rolling, shearing, creasing, bending and cornering

Job IV Prepare a lap riveting joint of sheet metal pieces

## 6. Electronics Shop

6.1 Identification, familiarization, demonstration and use of the following electronic instruments:

- a) Multi-meter digital
- b) Single beam simple CRO , function of every knob on the front panel
- c) Power supply , fixed voltage and variable voltage, single output as well as dual output.

6.2 Identification, familiarization and uses of commonly used tools; active and passive components; colour code and types of resistor and potentiometers

6.3 Cut, strip, join and insulate two lengths of wires/cables (repeat with different types of cables/wires)

6.4 Demonstrate and practice the skill to remove components/wires by unsoldering

6.5 Cut, bend, tin component, leads, inserts. Solder components e.g. resistor, capacitor, diodes, transistors on a PCB

6.6 Wiring of a small circuit on a PCB/tag strip involving laying, sleeving and use of identifier tags

6.7 Demonstrate the joining (or connecting) methods/mounting and dismantling method, as well as uses of the items mentioned below:

- a) Various types of plugs, sockets, connectors suitable for general-purpose audio video use. Some of such connectors e.g. 2 and 3 pin mains plug and sockets, Banana plugs, sockets and similar male and female connectors and terminal strips.
- b) Various types of switches such as: normal/miniature toggle, slide, push button piano key, rotary, SPST, SPDT, DPST, DPDT, band selector, multi-way Master Mains Switch.

6.8 Exposure to modern soldering and de-soldering processes (Field visits)

6.9 De-solder pump, remove and clean all the components and wires from a given equipment, a PCB or a tag strip

### **RECOMMENDED BOOKS**

1. Manual on Workshop Practice by K Venkata Reddy, KL Narayana and P Kaunaioh; MacMillan India Ltd., New Delhi
2. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi

## 2.1 ENGLISH AND COMMUNICATION SKILLS - II

L T P  
3 - 2

### RATIONALE

Language is the most commonly used medium of self-expression in all spheres of human life – personal, social and professional. A student must have a fair knowledge of English language and skills to communicate effectively to handle the future jobs in industry. The objective of this course is to enable the diploma holders to acquire proficiency, both in spoken (oral) and written language. At the end of the course, the student will be able to develop comprehension skills, improve vocabulary, use proper grammar, acquire writing skills, correspond with others and enhance skills in spoken English. It is expected that each polytechnic will establish a **communication skill laboratory** for conducting practicals mentioned in the curriculum.

### DETAILED CONTENTS

1. Facets of Literature (14 hrs)
  - 0.0 Short stories
    - 1.1.1 The Portrait of a Lady - Khushwant Singh
    - 0.0.1 The Doll's House – Katherine Mansfield
    - 0.0.1 The Refugees – Pearl S. Buck
  - 1.2 Prose
    - 1.2.1 Walking Tours – R.L. Stevenson
    - 1.2.2 A Dialogue on Civilization – C.E.M. Joad
    - 1.2.3 The Sign of Red Cross – Horace Shipp
  - 3 Poems
    - 1.3.1 All The World's A Stage – W. Shakespeare
    - 1.3.2 Say Not, The Struggle Nought Availeth – A.H. Clough
    - 1.3.3 Pipa's Song – Robert Browning
2. The Art of Précis Writing (04 hrs)
3. Grammar and Usage (08 hrs)
  - 3.1 Narration
  - 3.2 Voice
  - 3.3 Idioms and Phrases
4. Correspondence (04 hrs)
  - 3.0 Business Letters
  - 3.0 Personal letters

- |    |  |          |
|----|--|----------|
| 5. | Drafting                                 | (06 hrs) |
|    | 5.1 Report Writing                       |          |
|    | 5.1 Inspection Notes                     |          |
|    | 5.1 Memos, Circulars and Notes           |          |
|    | 5.1 Telegrams                            |          |
|    | 5.1 Press Release                        |          |
|    | 5.1 Agenda and Minutes of Meetings       |          |
|    | 5.1 Applying for a Job                   |          |
| 6. | Glossary of Technical & Scientific Terms | (04 hrs) |
| 7. | Communication                            | (08 hrs) |
|    | 7.1 Media and Modes of Communication     |          |
|    | 6.1 Channels of Communication            |          |
|    | 6.1 Barriers to Communication            |          |
|    | 6.1 Listening Skills                     |          |
|    | 6.1 Body language                        |          |
|    | 6.1 Humour in Communication              |          |

### **LIST OF PRACTICALS**

1. Practice on browsing Information on Internet
1. Group Discussions
1. Mock Interviews
1. Telephone Etiquette-demonstration and practice
1. Situational Conversation with feedback through video recording
1. Presentation on a given theme (using PowerPoint)
1. Exercises leading to personality development like mannerism, etiquettes, body language etc.
1. Reading unseen passages
1. Writing (developing) a paragraph
1. Exercises on writing notices and telephonic messages

### **Note:**

0. The Text Book on "English and Communication Skills, Book-II by Kuldip Jaidka et. al. developed by NITTTTR, Chandigarh is recommended to be used for teaching and setting-up the question papers.
0. A communication laboratory may be set up consisting of appropriate audio-video system with facility of playing CDs/DVDs and a video camera for recording the performance of each student with play back facility. A set of CDs from any language training organization e.g. British Council etc. may be procured for use of students.
0. Elements of body language will be incorporated in all practical exercises.
4. The practical exercises involving writing may also be included in Theory Examination.

## RECOMMENDED BOOKS

1. English and Communication Skills, Book-II By Kuldip Jaidka, Alwainder Dhillon and Parmod Kumar Singla, Prescribed by NITTTTR, Chandigarh & Published By Abhishek Publication, 57-59, Sector-17, Chandigarh
1. Essentials of Business Communication by Pal and Rorualling; Sultan Chand and Sons
1. The Essence of Effective Communication, Ludlow and Panthon; Prentice Hall of India
1. New Design English Grammar, Reading and Writing Skills by AL Kohli (Course A and course B), Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,
1. New Design English Reading and Advanced Writing Skills for Class XI and XII by MK Kohli and AL Kohli; Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,
1. A Practical English Grammar by Thomson and Marlinet
1. Spoken English by V Sasikumar and PV Dhamija; Tata McGraw Hill
1. English Conversation Practice by Grount Taylor; Tata McGraw Hill
1. Developing Communication Skills by Krishna Mohan and Meera Banerji; MacMillan India Ltd., Delhi
1. Business Correspondence and Report Writing by RC Sharma and Krishna Mohan; Tata McGraw Hill Publishing Company Ltd. New Delhi
1. Communication Skills by Ms R Datta Roy and KK Dhir; Vishal Publication, Jalandhar

## SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Topic No.	Topic	Time Allotted (Hrs)	Marks Allocation
1	Facets of Literature	14	30
2	The Art of Précis Writing	4	10
3	Grammar and its Usage	8	15
4	Correspondence	4	10
5	Drafting	6	15
6	Glossary of Technical & Scientific Terms	4	05
7	Communication	8	15
<b>Total</b>		<b>48</b>	<b>100</b>

## 2.2 APPLIED MATHEMATICS – II

L T P  
5 - -

### RATIONALE

Applied mathematics forms the backbone of engineering studies. In continuation to the basic elements of Differential calculus and integral calculus taught in I paper and their applications, statistics and probability have been included in this course. This course will develop analytical abilities amongst the students and will provide base for continuing education base to the students.

### DETAILED CONTENTS

1. Algebra (16 hrs)
  - 1.1 Matrix: Algebra of matrices, inverse, elementary row/column-transformation, linear dependence, rank of matrix, type of matrix, Eigen pairs, Cayley-Hamilton theorem
  - 1.2 Determinants: Elementary properties of determinants of order of 2&3, multiplication system of algebraic equation, consistency of equation, Cramme's rule
  - 1.3 Vector Algebra: Definition of vector and scalar quantities, addition and substration of rectors. Dot and cross product of two vectors. Angle between two vectors, applications of dot and cross product in Engineering problems.
2. Co-ordinate Geometry (16 hrs)
  - 1.0 Point in space. Distance between two points, ratio
  - 1.0 Straight line, finding the equation of straight line, shortest distance between two points
  - 1.0 Plane
  - 1.0 Sphere in space
3. Differential Calculus (16 hrs)
  - 2.0 Successive differentiation. Libnez's theorem
  - 2.0 Partial differentiation: Partial derivatives, total differential co-efficient, chain rule. Euller's theorem of homogeneous function, Jacobians, curl, gradience and divergent and some identities among them.
  - 2.0 Differential equation: Order, degree and meaning of solution of differential equations. Linear, non-linear differential equation, first order equation (separable forms, linear and Bernoulli's form, exact equation and their solutions), second order linear equations (linear equations with constant co-efficients homogeneous and non-homogeneous equation, equations reducible to linear form with constant co-efficients)

4. Integral Calculus (18 hrs)
- 3.0 Laplace transform, solution of differential equation by Laplace transform
- 3.0 Beta and gamma function
- 3.0 Fourier series
5. Statistics and Probability (14 hrs)
- 1.1 Measure of central tendency: Mean, median, mode, mean derivation, standard deviation, rank and rank correlation
- 1.1 Probability: Law of probability and conditional probability
- 1.1 Binomial distribution and Poisson distribution
- 1.1 Continuous and normal distribution
- 1.1 Curve fitting by least square method

### RECOMMENDED BOOKS

10. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi.
10. Engineering Mathematics by Vol. I & II by S Kohli, IPH, Jalandhar
10. Applied Mathematics by Dr. RD Sharma
10. Applied Mathematics, Vol. I & II by SS Sabharwal & Sunita Jain, Eagle Parkashan, Jalandhar
10. Comprehensive Mathematics, Vol. I & II by Laxmi Publications
10. Engineering Mathematics by Dass Gupta
10. Engineering Mathematics by C Dass Chawla, Asian Publishers, New Delhi
8. Comprehensive Mathematics, Vol. I & II by Laxmi Publications
9. Engineering Mathematics, Vol I, II & III by V Sundaram et.al, Vikas Publishing House (P) Ltd., New Delhi
10. Engineering Mathematics by N.Ch.S.N Iyengar et.al, Vikas Publishing House (P) Ltd., New Delhi
1. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
1. Engineering Mathematics, Vol I & II by AK Gupta, Macmillan India Ltd., New Delhi

### SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Topic No.	Topic	Time Allotted (Hrs)	Marks Allocation
1	Algebra	16	20
2	Co-ordinate Geometry	16	20
3	Differential Calculus	16	20
4	Integral Calculus	18	25
5	Statistics and Probability	14	15
<b>Total</b>		<b>80</b>	<b>100</b>



## 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 at giving an understanding of this world both by observation and prediction in which objects will behave. Concrete uses of physical principles and analysis in various fields of engineering and technology are given prominence in the course content.

### DETAILED CONTENTS

1. Classification of materials (4 hrs)  
Classification of materials into Conducting materials, Insulating materials, semiconducting materials with reference to their atomic structure, magnetic material (para, dia and ferro)
2. Fundamentals of D.C. & A.C. (8 hrs)
  - 1.4 D.C: Electric current, Ohm's Law, Series and parallel combination of resistances, Kirchoff's law and their simple applications. Principle of Wheatstone's bridge and its application in meter bridge and post office box
  - 1.5 A.C: Sinusoidal current and EMF. Peak, r.m.s values, inductive, capacitive, reactances, impedance
3. Moving Charge & Magnetic Field (10 hrs)  
Magnetic behaviour of current carrying conductor; Magnetic behaviour of current carrying solenoid; concept of Magnetic Field: Magnetic line of forces; force on a current-carrying conductor in a magnetic field; Fleming's Left hand rule; force on a charge moving in a magnetic field; motion of charged particles in a magnetic field; Magnetic field due to a current carrying conductor (Biot-Savart law); Force between two parallel current carrying conductors.
4. Modern Physics (12 hrs)  
Laser- Absorption and emission of energy by atom, spontaneous and stimulated emission, Population inversion, Main component of Laser and types of Laser: Ruby Laser, He, Ne and semiconductor Laser and their applications. Super Conductivity- Phenomenon of super conductivity, effect of magnetic field, critical field, type I & type II super conductors and their applications. Radioactivity, nuclear stability, radio active emission, radiation damage, concept of nuclear fission and fusion.
5. Application of Optics: (6 hrs)
  - 1.4 Concept of interference

- 1.5 Optical slide film projector (principle and operation)
  - 4.0 Introduction to fibre, optical fibre materials, types, light propagation and applications
  - 4.0 Critical angle, total internal reflection, optical sensor
6. Semi Conductor Physics and its Application (12 hrs)
- Energy band in solids, classification of solids into conductors, insulators and semiconductors on the basis of energy band structure. Intrinsic and extrinsic semiconductors, Electrons and holes as charge carriers in semiconductors, effect of temperature in conduction in semiconductors, P-type and N-type semiconductors, PN junction formation, barrier voltage, forward and reverse biasing of a junction diode, PN junction device characteristics, formation of transistor, transistor action, base, emitter and collector currents and their relationship, LEDs, photoelectric effect and photo devices and their applications..
7. Non Conventional Energy Sources (12 hrs)
- 7.1 Wind Energy: Introduction, scope and significance, measurement of wind velocity by anemometer, general principle of wind mill, India's wind energy programme.
  - 7.2 Solar Energy: Solar radiation and potentiality of solar radiation in India, unit of solar radiation, solar constant measurement of solar radiation by Pyrometer, and by Insolation meter (Suryamapi) uses of solar energy: solar cooker, solar water heater, solar photovoltaic cells, solar energy collector, solar by planets in India, Modern applications in technology (Qualitative only).

### LIST OF PRACTICALS

- 0. Determination of Resistivity of a given material through P.O.Box.
- 0. Determination of Resistivity of a given material through Meter Bridge.
- 0. To verify the Laws of Series and Parallel combination of resistances by P.O.Box
- 0. To verify the Laws of Series and Parallel combination of resistances by Meter Bridge.
- 0. Demonstration of He, Ne Laser (Interferometer)
- 0. To draw the characteristics of transistor
- 0. Verification of Ohm's law.
- 0. Verification of Kirchoff's laws.
- 0. Conversion of Galvano meter into ammeter & Voltmeter.
- 0. To Draw the characteristics of PN Junction Diode & Determination of Static & Dynamic Resistance.
- 0. Measurement of solar intensity with the help of Insolation meter (suryamapi)/Lux meter

## RECOMMENDED BOOKS

1. Applied Physics Vol. II, TTTI Publication Tata McGraw Hill, New Delhi
1. Basic Applied Physics by RK Gaur; Dhanpat Rai and Co . New Delhi
3. Comprehensive Practical Physics - Volume I and II by JN Jaiswal; Laxmi Publishers
4. Numerical Problems in Physics - Volume I and II by RS Bharaj; Tata McGraw Hill, New Delhi
5. Simple Course in Electricity and Magnetism by CL Arora; S Chand and Co, New Delhi
6. Fundamental Physics - Volume I and II by Gomber and Gogia; Pardeep Publications, Jalandhar
7. A Text Book of Optics by Subramanian and Brij Lal
8. Physics Laboratory Manual by PK Palanisamy, Scitech Publications
9. Fundamentals of Physics by Resnick and Halliday, Asian Books Pvt. Ltd., New Delhi
10. Concepts in Physics by HC Verma; Bharti Bhawan Ltd., New Delhi

## SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Topic No.	Topic	Time Allotted (Hrs)	Marks Allocation
1.	Classification of materials	4	5
2.	Fundamentals of D.C. & A.C.	8	10
3.	Moving Charge and Magnetic Field	10	15
4.	Modern Physics	12	20
5.	Application of Optics	6	10
6.	Semiconductor Physics and its application	12	20
7.	Non Conventional Energy Sources	12	20
<b>Total</b>		<b>64</b>	<b>100</b>

## 2.4 FUNDAMENTALS OF ELECTRICAL ENGINEERING

L T P  
3 - 2

### RATIONALE

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

### DETAILED CONTENTS

1. Overview of DC Circuits (08 hrs)
  - 0.0 Ohm's Law. Concept of voltage, current, power and energy
  - 0.0 Simple problems on series and parallel combination of resistors with their wattage consideration,
  - 0.0 Application of Kirchoff's current law and Kirchoff's voltage law to simple circuits. Conversion of circuits from Star to Delta and Delta to Star.
  - 0.0 Constant Voltage and Constant Current Sources
    - ) Concept of constant voltage source, symbol and graphical representation characteristics of ideal and practical sources.
    - b) Concept of constant current sources, symbol, characteristics and graphical representation of ideal and practical current sources.
2. DC Circuit Theorems (06 hrs)

Thevenin's theorem, Norton's theorem, application of network theorem in solving d.c circuit problems.
3. Electro Magnetic Induction (08 hrs)
  - ) Concept of magnetic field produced by flow of current, Magnetic circuit, concept of magneto-motive force (MMF), flux, reluctance, permeability, analogy between electric and magnetic circuit.
  - ) Faraday's law and rules of electro-magnetic induction, principles of self and mutual induction, self and mutually induced e.m.f, simple numerical problems.
  - ) Concept of current rise, decay and time constant in an inductive (RL) circuit.
  - ) Energy stored in an inductor and a capacitor.

4. Batteries (06 hrs)
- 4.1 Basic idea about primary and secondary cells
  - 4.2 Construction, working and applications of Lead-Acid, Nickel-Cadmium and Silver-Oxide batteries
  - 4.3 Charging methods used for lead-acid battery (accumulator )
  - 4.4 Care and maintenance of lead-acid battery
  - 4.5 Series and parallel connections of batteries
  - 4.6 General idea of solar cells, solar panels and their applications
5. AC Fundamentals (08 hrs)
- 5.1 Concept of alternating voltage and current
  - 5.2 Difference between a.c and d.c
  - 5.3 Concept of cycle, frequency, time period, amplitude, instantaneous value, average value, r.m.s. value, maximum value, form factor and peak factor.
  - 5.4 Representation of sinusoidal quantities by phasor diagrams.
  - 5.5 Equation of sinusoidal wave form (with derivation)
  - 5.6 Effect of alternating voltage applied to a pure resistance, pure inductance and pure capacitance.
6. AC Circuits (08 hrs)
- 5.0 Inductive reactance and Capacitive reactance
  - 5.0 Alternating voltage applied to resistance and inductance in series.
  - 5.0 Alternating voltage applied to resistance and capacitance in series.
  - 5.0 Impedance triangle and phase angle
  - 5.0 Solutions and phasor diagrams for simple RLC circuits (series and parallel).
  - 5.0 Introduction to series and parallel resonance and its conditions
  - 5.0 Power in pure resistance, inductance and capacitance, power in combined RLC circuits. Power factor, active and reactive power and their significance, importance of power factor.
  - 5.0 j-notation and its application in solving series and parallel a.c circuits
  - 5.0 Definition of conductance, susceptance and admittance

7. Various Types of Power Plants (04 hrs)

Brief explanation of principle of power generation in thermal, hydro and nuclear power stations and their comparative study. Elementary block diagram of above mentioned power stations

A Visit to a nearby Power Station(s) may be organized for better understanding and exposure.

### **LIST OF PRACTICALS**

1. Familiarization of measuring instruments viz voltmeter, ammeter, CRO, Wattmeter and multi-meter and other accessories
2. Determination of voltage-current relationship in a dc circuit under specific physical conditions and to draw conclusions.
3. To measure (very low) resistance of an ammeter and (very high) resistance of a voltmeter
4. To verify in d.c circuits:
  - a.. Thevenin's theorem,
  - b. Norton's theorem,
5. To observe change in resistance of a bulb in hot and cold conditions, using voltmeter and ammeter.
6. Verification of Kirchhoff's Current Law and Kirchhoff's Voltage Laws in a dc circuit
6. 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. To find the voltage current relationship in a single phase R-L and R-C Series circuits, draw their impedance triangles and determination of the power factor in each case .
9. To test a lead - acid storage battery and to charge it.
10. Measurement of power and power factor in a single phase R.L.C. circuit and to calculate active and reactive power.
1. Visit to nearby Power Station(s) and prepare a report.

### **RECOMMENDED BOOKS**

1. Electrical Technology, Fifth Edition by Edward Hughes, Longman Publishers
2. Basic Electrical and Electronics Engineering by SK Sahdev; Dhanpat Rai and Co, New Delhi

3. Experiments in Basic Electrical Engineering by SK Bhattacharya, KM Rastogi; New Age International (P) Ltd.; Publishers New Delhi
0. Electrical Science by Choudhury S.; Narosa Publishing House Pvt Ltd, Darya ganj, New Delhi
0. Basic Electrical and Electronics Engineering by Kumar KM, Vikas Publishing House Pvt Ltd, Jang pura, New Delhi
0. Basic Electrical Science and Technology by Kumar KM, Vikas Publishing House Pvt Ltd, Jang pura, New Delhi
0. Basic Electrical Engineering by Mool Singh, Galgotia Publications Pvt Ltd. New Delhi
0. Electrical Technology by BL Theraja, S Chand and Co, New Delhi
0. Basic Electricity by BR Sharma; Satya Prakashan; New Delhi
0. Principles of Electrical Engineering by BR Gupta, S Chand and Co, New Delhi
0. Basic Electrical Engineering by PS Dhogal, Tata Mc Graw Hill, New Delhi
0. Basic Electrical Engineering by JB Gupta; SK Kataria and Sons, New Delhi
0. Experiments in Basic Electrical Engineering by GP Chhalhotra, Khanna Publishers, New Delhi

#### **SUGGESTED DISTRIBUTION OF MARKS FOR PAPER SETTER**

<b>Sr. No.</b>	<b>Topic</b>	<b>Time Allotted (hrs)</b>	<b>Percentage Weightage</b>	<b>Marks Allocation</b>
1.	Overview of DC Circuits	8	16.6	15
2.	DC Circuit Theorems	6	12.5	10
3.	Electro Magnetic Induction	8	16.6	15
4.	Batteries	6	12.5	10
5.	AC Fundamentals	8	16.6	20
6.	AC Circuits	8	16.6	20
7.	Various Types of Power Plants	4	6.25	10
<b>Total</b>		<b>48</b>	<b>100</b>	<b>100</b>

## 2.5 ELECTRONIC COMPONENTS AND MATERIALS (ECM)

L T P  
4 - -

### RATIONALE

Study of Electronic components and Materials is important from point of view of manufacturing, testing and maintenance of electronic devices and systems. Students should understand the procedure of identification, characteristics, specifications, merits, limitations, and applications of electronic components and materials.

### DETAILED CONTENTS

- |     |  |                 |
|-----|--|-----------------|
| 1.  | <b>Materials</b>   | <b>(32 hrs)</b> |
| 1.1 | Classification of materials<br>Conducting, semi-conducting and insulating materials with a brief reference to their atomic structure.  | (4 hrs)         |
| 1.2 | Conducting Materials<br>Resistors, factors affecting resistivity such as temperature, alloying and mechanical stressing. Classification of conducting materials into low resistivity and high resistivity materials.                           | (10 hrs)        |
| 1.3 | Insulating Materials<br>Important relevant characteristics (electrical, mechanical and thermal) and applications of the following material:<br>Mica, Glass, PVC, Silicon, Rubber, Bakelite, Cotton, Ceramic, Polyester, Polythene and Varnish. | (10 hrs)        |
| 1.4 | Magnetic Materials<br>Different Magnetic materials; (Dia, Para, Ferro) and their properties. Ferro magnetism, Domains, permeability, Hysteresis loop. Soft and hard magnetic materials, their examples and typical applications.               | (8 hrs)         |
| 2.  | <b>Components</b>  | <b>(32 hrs)</b> |
| 2.1 | Capacitors   | (8 hrs)         |
|     | a) Concept of capacitance and capacitors, units of capacitance, types of capacitors, constructional details and testing specifications   |                 |
|     | b) Capacity of parallel plate capacitors, spherical capacitors, cylindrical capacitor.   |                 |
|     | c) Energy stored in a capacitor.   |                 |
|     | d) Concept of di-electric and its effects on capacitance, di-electric constant, break down voltage.  |                 |
|     | e) Series and parallel combination of capacitor. Simple numerical problems of capacitor.   |                 |
|     | f) Charging and discharging of capacitor with different resistances in circuit, concept of current rise and decay, time constant in R-C circuits, simple problems.   |                 |



- 2.2 Resistors: Carbon film, metal film, carbon composition, wound and variable types (presets and potentiometers) (3 hrs)
- 2.3 Transformer, inductors and RF coils: (4 hrs)  
Methods of manufacture, testing, Need of shielding, application and trouble shooting
- 2.4 Surface Mounted Devices (SMDs): (4 hrs)  
Constructional detail and specifications.
- 2.5 Connectors, Relays, switches and cables: (5 hrs)  
Different types of connectors, relays, switches and cables, their symbols, construction and characteristics.
- 2.7 Semi Conductors and Integrated Circuits (8 hrs)
- Basic characteristics of Semiconductor materials, testing of diodes, transistors, FETs and SCRs.
  - Various processes in IC manufacturing. Hybrid IC technology.
  - Superconductivity and piezoelectric ceramic transducer elements

### RECOMMENDED BOOKS

0. Electronic components and Materials by Grover and Jamwal; Dhanpat Rai and Sons, New Delhi
0. Basic Electronics and Linear Circuits by NN Bhargava and Kulshreshta; Tata McGraw Hill, New Delhi
0. Electronic components and Materials by SM Dhir, Tata McGraw Hill, New Delhi
0. Electrical and Electronic Engineering Materials by SK Bhattacharya, Khanna Publishers, New Delhi
0. Electronic Engineering Materials by ML Gupta, Dhanpat Rai and Sons; New Delhi.

### SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Topic No.	Topic	Time Allotted (Hrs)	Marks Allocation
1	Materials	32	50
2	Components	32	50
<b>Total</b>		<b>64</b>	<b>100</b>

## 2.6 COMPUTER PROGRAMMING AND APPLICATIONS IN ELECTRONICS ENGINEERING

L T P  
2 - 3

### RATIONALE

Computer plays a very vital role in present day life, more so, in the professional life of Diploma engineers. In order to enable the students use the computers effectively in problem solving, this course offers the modern programming language C along with exposure to various engineering applications of computers. The knowledge of C language will be reinforced by the practical exercises and demonstration of application software in the field of Electronics Engineering during the course of study. Introduction to data base management system is also a very significant field with vast employment potential.

### DETAILED CONTENTS

1. Algorithm and Program Development 4 hrs)
  - ) Steps in development of a program
  - ) Flow-charts, algorithm development
  - ) Introduction to various computer languages
  - ) Concept of interpreter, compiler, high level language(HLL), machine language (ML) and Assembly Language
  
2. Program Structure (C Programming) (24 hrs)
  - ) History of 'C', data types, input output statements, arithmetic and logical operations, data assignments, precedence and associativity
  - ) I/O statements  
Assignment, Variables, arithmetic operation- their precedence, data types standard I/O function, formulated I/O
  - ) Control Statements  
Logical and relational operators; if-else, while, do- while, for loops, breaks, switch statements
  - ) Functions:  
Function declaration, parameter passing- by value, storage classes (Local, Global and Static variables), standard library functions
  - ) Arrays:  
Single and multi dimensional arrays, character arrays
  - ) Pointers:

- ) To various data types, pointers in parameters passing, pointers to function Structures:  
Definition of a structure, pointer to structure, union and array of structure
- ) Strings:  
String processing, functions and standard library function
- ) Data files  
File handling and manipulation, file reading and writing, Binary and ASCII files, file records using standard function type mouse

2. Software Applications in Electrical Engineering (4hrs)

Computer application overview through various applications software related to Electronics Engineering branch such as: MATLAB, Circuit Maker, Electronic workbench etc.

### LIST OF PRACTICALS

- 0. Programming exercise on executing a C Programs.
- 0. Programming exercise on editing a C program.
- 0. Programming exercise on defining variables and assigning values to variables
- 0. Programming exercise on arithmetic and relation operators
- 0. Programming exercise on arithmetic expressions and their evaluation
- 0. Programming exercise on reading a character
- 0. Programming exercise on writing a character
- 0. Programming exercise on formatting input using print
- 0. Programming exercise on formatting output using scan
- 0. Programming exercise on simple IF statement
- 0. Programming exercise on IF... ELSE statement
- 0. Programming exercise on SWITCH statement
- 0. Programming exercise on GOTO statement
- 0. Programming exercise on DO-WHILE statement
- 0. Programming exercise on FOR statement
- 0. Programming exercise on one dimensional arrays
- 0. Programming exercise on two dimensional arrays
- 0. Demonstration of Application software to Electronics Engineering branch such as: MATLAB, Circuit Maker, Electronic workbench etc.

## INSTRUCTIONAL STRATEGY

This course is a highly practical and self- study oriented courses. The teachers are expected to explain the theoretical part and make the students to execute and debug different programs. The PC needed to have either Turbo C.

## RECOMMENDED BOOKS

0. Programming in C by Schaum series McGraw Hill
0. Programming in C by Kerning Lan and Richie; Prentice Hall of India, New Delhi
0. Programming in C by Balaguru Swamy, Tata McGraw Hill, New Delhi.
0. Let us C- Yashwant Kanetkar, BPB Publications, New Delhi
0. Vijay Mukhi Series for C and C++
0. Programming in C by R Subburaj, Vikas Publishhing House Pvt. Ltd., Jangpura, New Delhi
0. Programming in C by Kris A Jansa, Galgotia Publications Pvt. Ltd., Daryaganj, New Delhi
0. Programming in C by BP Mahapatra, Khanna Publishers, New Delhi
0. Elements of C by MH Lewin, Khanna Publishers, New Delhi
0. The Complete Reference to Visual Basic 6, by Noel Jerke, Tata McGraw Hill, New Delhi
0. Web site [www.Beyondlogic.org](http://www.Beyondlogic.org)
0. Pointers in C by Yashwant Kanetkar, BPB Publishers New Delhi
0. Programming in Applications by Chandershekhar, Unique International Publications, Jalandhar
0. The essentials of Computer Organizing and Architecture by Linda Null and Julia Labur, Narosa Publishing House Pvt. Ltd., New Delhi

## SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Topic No.	Topic	Time Allotted (Hrs)	Marks Allocation
1.	Algorithm and Program Development	4	15
2.	Program Structure (C Programming)	24	70
3.	Software Applications	4	15
<b>Total</b>		<b>32</b>	<b>100</b>

## **2.7 GENERAL WORKSHOP PRACTICE - II**

**(Common with Civil, Electrical, Eltx., and Mechanical Engineering)**

L T P  
- - 6

### **RATIONALE**

Manual abilities to handle engineering materials with hand tools need to be developed in the students. This course aims at developing generic manual and machining skills in the students. They will be using different types of tools/equipment in different shops for fabrication purposes. Besides above, the development of dignity of labour, precision, safety at work places, team working and development of right attitude are other objectives.

### **DETAILED CONTENTS**

**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.

### **PRACTICAL EXERCISES**

The following shops are included in the syllabus :

1. Carpentry and Painting shop-II
2. Fitting and Plumbing shop-II
3. Welding shop-II
4. Electric shop-II
1. Forging shop
2. Machine shop

#### **1. Carpentry and Painting Shop-II**

- 1.1 Introduction to joints, their relative advantages and uses.  
Job I Preparation of Dovetail joint and glued joint.  
Job II Preparation of Mitre Joint  
Job III Preparation of a lengthening Joint  
Job IV Preparation of at least one utility job with and without lamination.
- 1.2 Demonstration of job showing use of Rip Saw, Bow saw and Trammel, method of sharpening various saws.
- 1.3 Demonstration of job on Band Saw and circular saw, universal wood working machine, saw resharpening machine, Saw Brazing unit.
- 1.4 Importance and need of polishing wooden items, Introduction to polishing materials.  
Job V Preparation of surface before polishing.  
Job VI Application of primer coat.  
Job VII Polishing on wooden items.

## **2. Fitting and Plumbing Shop-II**

- 2.1 Description and demonstration of various types of drills, taps and dies
- 2.2 Selection of dies for tapping. Types of taps, tapping, dieing and drilling operations.
  - Job I Making internal and external threads on a job by tapping and dieing operations (manually)
- 2.3 Precautions while drilling soft metals, specially aluminum and lead.
  - Job II Drilling practice on soft metals (Aluminum, Brass and lead)
- 2.4 Care and maintenance of measuring tools like calipers, steel rule, try square, vernier, micrometer, height gauge, combination set, reading gauge. Handling of measuring instruments, checking of zero error, finding of least count.
  - Job III Preparation of a job by filing on non-ferrous metal.
  - Job IV Production of a utility job involving all the above operations.
  - Job V Preparation of job involving thread on GI pipe/ PVC pipe and fixing of different types of elbow T - Union, socket, stopcock, taps, etc
- 2.5 Description and demonstration of various types of drills, taps and dies; Selection of dies for tapping; Types of taps, Tapping and dieing operations.

## **3. Welding Shop-II**

- 3.1 Introduction of the gas welding, gas welding equipment, adjustments of different types of flames, demonstration and precautions about handling welding equipment.
  - Job I Practice in handling gas welding equipment and welding practice.
- 3.2 Common welding joints generally made by gas welding.
  - Job II Preparation Butt joint by gas welding.
  - Job III Preparation of small cot conduit pipe frame by electric arc welding/gas welding.
  - Job IV Preparation of square pyramid from M.S rods by welding (type of welding to be decided by students themselves).
  - Job V Exercise job on spot/seam welding machine.

## **4. Electric Shop-II**

- 4.1 Importance of three phase wiring and its effectiveness.
  - Job I Laying out 3 phase wiring for an electric motor or any other 3 phase machine.
- 4.2 Estimating and costing power consumption.
  - Job II Connecting single phase energy meter and testing it. Reading and working out the power consumption and the cost of energy.
  - Job III Checking continuity of connection (with tester and bulbs), location of faults with a multimeter and their rectification in simple machines and/or other electric circuits fitted with earthing.
- 4.3 Demonstration of dismantling, servicing and reassembling of a table fan/ceiling fan/air cooler/mixer/electric iron, Electric heater, geaser, electric oven etc.
  - Job IV Dismantling, serving and reassembling of any of the above electrical appliances.

Job V Demonstration of testing single phase/three phase electrical motor by using voltmeters ammeter clip on meter technometer etc.

Job VI Reversing the rotation of motor.

## 5. Forging Shop

Introduction to forging, forging tools, tongs, blowers/pressure blowers, hammers, chisels, punch, anvil, swage-block etc. Forging operations.

Job I Forge a L hook or ring from MS rod 6 mm  $\phi$

Job II Forge a chisel and give an idea of hardening and tempering

Job III Lap joint with forge welding

Job IV High Strength Steel tools – forging of lathe and shaper tools

## 6. Machine Shop

Introduction to various machines used in machine shop.

Job I Exercise on simple turning

Job II Exercise on taper turning

Job III Marking and drilling practice on mild steel piece

Job IV Marking and drilling practice on aluminium piece

Job V Demonstration of various functions of CNC Machine

## RECOMMENDED BOOKS

1. Manual on Workshop Practice by K Venkata Reddy, KL Narayana and P Kaunaioh; MacMillan India Ltd., New Delhi
2. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi

## **ECOLOGY AND ENVIRONMENTAL AWARENESS CAMP**

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 pollution control measures. He should also be aware of environmental laws related to the control of pollution.

The camp may be organized at a stretch for 3 to 4 days. During the camp, experts from various organizations/institutes etc. may be invited to deliver lectures on ecology and environmental issues. The students may be encouraged to read papers or give seminar during the camp on following broad topics. There will be no examination for this subject.

1. Basics of ecology, eco system and sustainable development
2. Conservation of land reforms, preservation of species, prevention of advancement of deserts and lowering of water table
3. Sources of pollution - natural and man made, their effects on living and non-living organisms
4. Pollution of water - causes, effects of domestic wastes and industrial effluent on living and non-living organisms
5. Pollution of air-causes and effects of man, animal, vegetation and non-living organisms
6. Sources of noise pollution and its effects
7. Solid waste management; classification of refuse material, types, sources and properties of solid wastes, abatement methods
8. Mining, blasting, deforestation and their effects
9. Legislation to control environment
10. Environmental Impact Assessment (EIA), Elements for preparing EIA statements
11. Current issues in environmental pollution and its control
12. Role of non-conventional sources of energy in environmental protection



**ELECTRONICS ENGINEERING**  
**(For UTTARANCHAL)**

**VARIOUS SUBJECTS**  
**IN**  
**SECOND YEAR**

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Sr No	Subjects	Page No(s)
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**THIRD SEMESTER**

3.1	Analog electronics –I	67
3.2	Principles of Communication Engineering	71
3.3	Network, Filters and Transmission Lines	74
3.4	Digital Electronics-I	78
3.5	Electrical Machines	82
3.6	General Engineering	85

**FOURTH SEMESTER**

4.1	Analog Electronics –II	92
4.2	Communication Engineering –I	96
4.3	Digital Electronics-II	99
4.4	Power Electronics	102
4.5	Instrumentation	106
4.6	Minor Project Work	109

***Entrepreneurial Awareness Camp***

**111**

### 3.1 ANALOG ELECTRONICS - I

L T P  
4 - 2

#### RATIONALE

This subject will enable the student to have conceptual understanding of conductors, semiconductors and insulators, extrinsic and intrinsic semi-conductors, p-n junction, need of rectifiers in electronics, understanding of filters in rectifiers, tunnel diodes, LEDs, varactor diodes, LCD; understanding the working of transistors in various configurations; understanding of FETs and MOSFET etc. for effective functioning in the field of electronic service industry. The teacher should give emphasis on understanding of concepts and explanation of various terms used in the subject. Practical exercises will reinforce various concepts. Industrial/field exposure must be given by organizing visit to local electronic industries.

#### DETAILED CONTENTS

1. Semi Conductor Physics: (12 hrs)

Review of basic atomic structure and energy levels, concept of insulators, conductors and semi conductors, atomic structure of Ge and Si, covalent bonds

Concept of intrinsic and extrinsic semi conductor, P and N impurities, doping of impurity.

P and N type semiconductors and their conductivity. Effect of temperature on conductivity of intrinsic semi conductor.

Energy level diagram of conductors, insulators and semi conductors; minority and majority carriers.

2. Semi Conductor Diode: (12 hrs)

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

V-I characteristics, static and dynamic resistance and their calculation from diode characteristics.

Diode as half wave, full wave and bridge rectifier. PIV, rectification efficiencies and ripple factor calculations, shunt capacitor filter, series inductor filter, LC filter and  $\pi$  filter.

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

3. Introduction to Bipolar Transistor: (12 hrs)
- Concept of bipolar transistor, structure, PNP and NPN transistor, their symbols and mechanism of current flow; Current relations in transistor; concept of leakage current;
- CB, CE, CC configuration of the 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;
- Transistors as an amplifier in CE Configurations; d.c load line and calculation of current gain, voltage gain using d.c load line.
4. Transistor Biasing Circuits: (6 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, a.c load line and its use in calculation of currents and voltage gain of a single stage amplifier circuit. Explanation of phase reversal of output voltage with respect to input voltage. H- parameters and their significance. Calculation of current gain, voltage gain, input impedance and output impedance using h-parameter.
6. Field Effect Transistors (12 hrs)
- Construction, operation and characteristics of FET and its application.
- Construction, operation and characteristics of MOSFET in depletion and enhancement modes and its applications.
  - C MOS- advantages and applications
  - Comparison of JFET, MOSFET and BJT.
  - FET amplifier circuit and its working principle. (No analysis).

### **LIST OF PRACTICALS**

1. Familiarization, identification and testing of Active and Passive components.
2. Familiarization with operation of following instruments:  
Multi-meter, CRO, Signal generator, Regulated Power Supply by taking readings of relevant electrical quantities with their help.
3. To plot V-I characteristics of a pn junction diode

4. To plot V-I characteristics of a Zener diode
5. To observe the wave shape of following rectifier circuit
  - a. Half wave rectifier
  - b. Full wave rectifier
  - c. Bridge rectifier
6. To plot the wave shape of full wave rectifier with
  - a. Shunt capacitor filter
  - b. Series inductor filter
  - c.  $\Pi$  Filter
7. To plot input and output characteristics and calculate parameters of transistors in CE configuration.
8. To plot input and output characteristics and calculate of parameters of transistors in CB configuration.
9. To plot V-I characteristics of FET amplifier.
10. To measure the Q-Point and note the variation of Q-Point.
  - a. by increasing the base resistance in fixed bias circuit.
  - b. by changing out of bias resistance in potential divider circuit.
11. To measure voltage gain, input, output impedance in single state CE amplifier circuit.

### **BOOKS RECOMMENDED**

1. Basic Electronics and Linear Circuit by NN Bhargava and Kulshreshta, Tata McGraw Hill, 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, New Delhi
4. Electronics Devices and Circuits by Millman and Halkias; McGraw Hill.
5. Principles of Electronics by Albert Paul Malvino; Tata McGraw Hill, New Delhi
6. Electronics Devices and Circuits-I by Naresh Gupta, Jyotesh Malhotra and Harish C Saini, Eagle Prakashan, Jalandhar

7. Electronics Devices and Circuits by Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi

**SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER**

<b>Topic No.</b>	<b>Topic</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allocation</b>
1.	Semi Conductor Physics	12	15
2.	Semi Conductor diode	12	20
3.	Introduction to Bipolar Transistor	12	20
4.	Transistor Biasing Circuits	06	10
5.	Single Stage Transistor amplifier	10	15
6.	Field Effect Transistors	12	20
<b>Total</b>		<b>64</b>	<b>100</b>

## 3.2 PRINCIPLES OF COMMUNICATION

L T P  
3 - 3

### RATIONALE

In the present age of information technology, the communication gains utmost importance whether it be voice or data or control signal. The students will be able to understand the working principle of various communication devices used in electronic industry after going through the basic principles and concepts contained in this subject.

### DETAILED CONTENTS

1. **Introduction** (03 hrs)
  - a) Need for modulation and demodulation in communication system
  - b) Basic schemes of modern communication system
  
2. **Amplitude Modulation** (08 hrs)
  - a) Definition, derivation of expression for an A.M., wave carrier and side band component modulation index, relative power distribution in carrier and side bands
  - b) Basic idea of DSB, DSB-SC, SSB-SC, ISB and VSB modulation and their comparison and area of application
  
3. **Frequency Modulation** (07 hrs)
  - a) Expression for frequency modulated wave and frequency spectrum (without proof and analysis of Bessel function), modulation index, maximum frequency deviation and deviation rating
  - b) Effect of noise on FM carrier, Noise triangle. Need for pre-emphasis and de-emphasis
  - c) Narrow band and wide band FM
  - d) Comparison of FM and AM in communication system
  
4. **Principles of AM Modulator** (04 hrs)

Working principles and typical applications of:

  - a) Collector modulator
  - b) Base modulator
  - c) Balanced modulator

5. **Principles of FM Modulator** (06 hrs)  
Working principle, applications of reactance modulator, varactor diode modulator, VCO and armstrong phase modulator, stabilization of carrier for using AFC (block diagram approach)
6. **Demodulation of FM Wave** (07 hrs)  
a) Basic principle of FM detection using single slope and dual slope detector  
b) Principle of working of following FM demodulator  
- Foster-Seeley discriminator  
- Ratio detector  
- Quadrature detector  
- Phase locked loop, PLL FM demodulator
7. **Phase Modulation** (03 hrs)  
Definition, Derivation of expression for PM wave modulation index. Comparison with FM
8. **Pulse Analog Modulation (PAM, PAW, PPM)** (05 hrs)  
Sampling theorem (basic idea only), basic idea of pulse amplitude modulation (PAM), pulse width modulation (PWM) and pulse position modulation (only block diagram approach). Basic concept of TDM and FDM
9. Concept of Spread Spectrum, frequency hopping and direct sequence spread spectrum, CDMA and generation of spreading sequences Advantages of CDMA (05 hrs)

## LIST OF PRACTICALS

1. To obtain AM waveform from a modulator circuits
2. To measure modulation index of AM signal for different level of modulating signal
3. To obtain a FM wave from reactance tube modulator/voltage controlled oscillator circuit and obtain time constant and obtain its optimal value for least distortion
4. To obtain modulating signal from FM detector (foster seeley/ratio detector) circuits and plot the discriminator characteristics
5. a) To generate PAM signal by modulating with audio signal generator  
b) To demodulate PAM using low pass filter

6. a) To generate PWM signal by modulating with audio signal generator  
b) To demodulate PWM using comparator and low pass filter
7. To generate PPM signal by modulating with audio signal and generator

### RECOMMENDED BOOKS

1. Electronics Communication by Kennedy, Tata McGraw Hill, New Delhi
2. Electronics Communication by KS Jamwal, Dhanpat Rai & Sons, New Delhi
3. Radio Engineering by GK Mittal, Khanna Publishers, New Delhi
4. Principles of Communication Engineering by DR Arora, Ishan Publications, Ambala
5. Communication Engineering by A Kumar
6. Principles of Communication Engineering by Manoj Kumar, Satya Prakashan, New Delhi
7. Principles of Communication Engineering by Anokh Singh, S.Chand & Co., New Delhi

### SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Topic No.	Topic	Time Allotted (Hrs)	Marks Allocation
1.	Introduction	3	7
2.	Amplitude Modulation	8	20
3.	Frequency Modulation	7	15
4.	Principles of AM Modulator	4	5
5.	Principles of FM Modulator	6	10
6.	Demodulation of FM Wave	7	15
7.	Phase Modulation	3	8
8.	Pulse Analog Modulation (PAM, PAW, PPM)	5	10
9.	Concept of Spread Spectrum, frequency hopping and direct sequence spread spectrum, CDMA and generation of spreading sequences Advantages of CDMA	5	10
<b>Total</b>		<b>48</b>	<b>100</b>



### 3.3 NETWORK, FILTERS AND TRANSMISSION LINES

L T P  
4 - 3

#### RATIONALE

The study of network, filters and transmission lines leads to understanding of line communication, audio and video communication and micro wave communication. Particularly the study of network from principles of AC theory, introduces the students 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.

#### DETAILED CONTENT

1. **Networks** (12 hrs)
  - a) Two Port (Four Terminal) Network
    - Two port parameters (impedance, admittance, transmission, hybrid parameters)
    - Interconnection of two ports (series connection, parallel connection, cascade connection)
    - Equivalent networks
    - T-network, Pi-networks, ladder networks
    - Symmetrical and asymmetrical networks
  - b) Symmetrical Network
    - Concept and significance of characteristic impedance, propagation constant, attenuation constant (with expression in terms of  $Z_o$ ,  $Z_{oc}$  for T-network, Pi-network)
  - c) Asymmetrical Network
    - Concept and significance of iterative impedance, image impedance, image transfer constant and insertion loss
    - Half section (L-section), symmetrical T and Pi section into half section
2. **Network Theorem** (08 hrs)

A brief study of following:

  - Tellegen's Theorem
  - Superposition theorem
  - Substitution theorem
  - Thevenin and norton theorem
  - Reciprocity – maximum power transfer theorem
  - Attenuators: brief idea about attenuators and its types

3. **Filters** (16 hrs)

- a) - Applications of filters in communication system
  - Concept of low pass, high pass, band pass, band stop, butter worth filter, constant filters, m-derived filters, K-filters
- b) Proto-type Filter Section
  - Reactance vs attenuation constant and characteristic of a low pass filter and its impedance
  - Attenuation vs frequency, phase shift vs frequency characteristics Impedance vs frequency of T and Pi curve and their significance
- c) M-derived Filter Section
  - Need of M-derived filters
  - Expression for m in terms of  $f_c$  (cut off frequency)  $f_w$  (Frequency at which attenuation is infinity) for low pass and high pass filter
- d) Active Filters
  - Basic concept and comparison with passive filters
  - Simple problems on low pass and high pass filters (first and second order)

4. **Transmission Lines** (26 hrs)

- a) Transmission lines and their implications, shapes of different types of transmission lines, (including 300 ohms antenna feeder cable, 75 ohm co-axial cable)
- b) Distributed (or primary) constant of a transmission line, equivalent circuit of an infinite line, T and Pi type representation of a section of transmission line
- c) Definition of characteristics impedance line: concept of short line termination in  $Z_0$ ; currents and voltage along at infinite line, propagation constant attenuation and phase shift constant of the line
- d) Relationship of characteristics impedance, propagation constant attenuation constant and phase constant in terms of distributed constants of the lines.
- e) Conditions for minimum distortion and minimum attenuation signal on the line; necessity and different methods of loading the communication lines (no derivation)
- f) Concept of reflection and standing waves on a transmission lines; definition of reflection coefficient in terms of characteristic impedance and load impedance, definition of standing wave ratio (SWR). Relation between VSWR and voltage reflection coefficient maximum impedance and VSWR
- g) Transmission line equation; expressions for voltage current and impedance at a point on the line for lines with and without losses
- h) Input impedance of an open and short circuited line and its graphical representation

- i) Transmission Line. at high frequency, effect of high frequencies on the losses of a transmission line; application of Transmission Line as a reactive component and impedance transformer (e.g. quarter wave transformer)
- j) Principle of impedance matching using single stub; comparison of open and short circuited stubs

**Note:** No mathematical derivation

### **LIST OF PRACTICALS**

1. Measurement of characteristics impedance of a symmetrical Pi and T networks
2. Image impedance of a given asymmetrical Pi and T networks
3. Determine experimentally the characteristics impedance of a prototype
  - Low pass filters
  - High pass filter and plot attenuation characteristics
4. To design and measure the attenuation of a symmetrical T/Pi type attenuation
5. To plot the impedance characteristics of a prototype band-pass filter and also plot the attenuation characteristics of band pass filter
6.
  - To plot the impedance characteristics of m-derived low pass filter
  - To plot the attenuation characteristics of a m-derived high pass filter
7. To assemble test the following butter worths active filter:
  - First order low pass and high pass
  - Second order low pass and high pass
8. Measurement of characteristics impedance propagation constant, VSWR for a given T.L. (transmission line)

### **RECOMMENDED BOOKS**

1. Network Lines and Fields by John D Ryder; PHI, New Delhi
2. Network Filters and Transmission Lines by AK Chakarvorty; Dhanpat Rai & Co. Publication
3. Network Analysis by Van Valkenbury: PHI, New Delhi
4. Network Analysis by Soni and Gupta; Dhanpat Rai & Co. Publication , New Delhi
5. Network Theory and Filter Design by Vasudev K. Aatre

**SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER  
SETTER**

<b>Topic No.</b>	<b>Topic</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allocation</b>
1.	Networks	12	20
2.	Network theorem	8	15
3.	Filters	16	25
4.	Transmission Lines	26	40
<b>Total</b>		<b>64</b>	<b>100</b>

### 3.4 DIGITAL ELECTRONICS - I

L T P  
4 - 3

#### RATIONALE

The objective of this subject is to enable the students to know the basic concepts of digital electronics and gain familiarity with the available IC chips. The students will learn about number systems, logic gates, various codes, parities, Boolean algebra, mux and demux, flip-flop, counters, shift registers. This will form a broad base for studying digital system design, advanced microprocessors and further studies.

#### DETAILED CONTENT

1. **Introduction** (02 hrs)
  - a) Define digital and analog signals and systems, difference between analog and digital signals
  - b) Need of digitization and applications of digital systems
  
2. **Number Systems** (10 hrs)
  - a) Decimal, binary, octal, hexadecimal number systems
  - b) Conversion of number from one number system to another including decimal points
  - c) Binary addition, subtraction, multiplication, division, 1's and 2's complement method of subtraction
  - d) BCD code numbers and their limitations, addition of BCD coded numbers, conversion of BCD to decimal and vice-versa
  - e) Excess-3 code, gray code, binary to gray and gray to binary conversion
  - f) Concept of parity, single and double parity, error detection and correction using parity
  
3. **Logic Gates** (04 hrs)
  - a) Logic gates, positive and negative logic, pulse waveform, definition, symbols, truth tables, pulsed operation of NOT, OR, AND, NAND, NOR, EX-OR, EX-NOR gates
  - b) NAND and NOR as universal logic gates

4. **Logic Simplification** (08 hrs)
- a) Rules and laws of Boolean algebra, logic expression, Demorgan's theorems, their proof
  - b) Sum of products form (minterm), Product of sum form (maxterms), simplification of Boolean expressions with the help of Rules and laws of Boolean algebra
  - c) Karnaugh mapping techniques upto 4 variables and their applications for simplification of Boolean expression
5. **Arithmetic Circuits** (04 hrs)
- a) Half adder, full adder circuits and their operation
  - b) Parallel binary adder, 2-bit and 4-bit binary full adder, block diagram, working
6. **Multiplexer/Demultiplexer** (04 hrs)
- a) Basic functions, symbols and logic diagrams of 4-inputs and 8-inputs multiplexers,
  - b) Function/utility of 16 and 32 inputs multiplexers,
  - c) Realization of Boolean expression using multiplexer / demultiplexers
7. **Decoders, Display Devices and Associated Circuits** (04 hrs)
- a) Basic Binary decoder, 4-line to 16 line decoder circuit
  - b) BCD to decimal decoder, BCD to 7-segment decoder/driver, LED/LCD display
8. **Encoders and Comparators** (04 hrs)
- a) Encoder, decimal to BCD encoder, decimal to BCD priority encoder, keyboard encoder
  - b) Magnitude comparators, symbols and logic diagrams of 2-bit and 4-bit comparators
9. **Latches and Flip-Flops** (08 hrs)
- a) Latch, SR-latch, D-latch, Flip-flop, difference between latch and flip-flop
  - b) S-R, D flip-flop their operation using waveform and truth tables, race around condition
  - c) JK flip-flop, master slave and their operation using waveform and truth tables

10. **Counters** (10 hrs)

- a) Asynchronous counter, 4-bit Asynchronous counter, Asynchronous decade counter
- b) Asynchronous counter, 4-bit synchronous binary counter, Asynchronous decade counter
- c) Up/down Asynchronous counters, divide by N counter MOD-3, MOD-5, MOD-7, MOD-12 counters
- d) Ring counter, cascaded counter, counter applications

11. **Shift Registers** (06 hrs)

- a) Shift registers functions, serial-in-serial out, serial-in-parallel-out, parallel-in-serial-out, parallel-in-parallel out
- b) Universal shift register, shift register counter and applications of shift registers

**LIST OF PRACTICALS**

- 1. Study of logic breadboard with verification of truth table for AND, OR, NOT, NAND, EX-OR, NOR gate
- 2. Verification of NAND and NOR gate as universal gates
- 3. Construction of half-adder and full adder circuits using EX-OR and NAND gate and verification of their operation
- 4. Verify the operation of
  - a) multiplexer using an IC
  - b) de-multiplexer using an IC
- 5. a) Verify the operation of BCD to decimal decoder using an IC  
b) Verify the operation of BCD to 7 segment decoder using an IC
- 6. Verify operation of SR, JK, D-flip-flop master slave JK flip-flop using IC
- 7. Verify operation of SISO, PISO, SIPO, PIPO shift register. (universal shift register)
- 8. Study of ring counter, Up/down counter
- 9. Construct and verify the operation of an asynchronous binary decade counter using JK flip-flop
- 10. Verification of truth tables and study the operation of tristate buffer IC 74126 or similar IC and construction of 4/8 bit bi-directional bus by using an IC
- 11. Testing of digital ICs using IC tester

## RECOMMENDED BOOKS

1. Digital Electronics and Applications by Malvino Leach, Tata McGraw Hill, New Delhi
2. Digital Logic Designs by Morris Mano, Prentice Hall of India, New Delhi
3. Digital Fundamentals by Thomas Floyds, Universal Book Stall
4. Digital Electronics by RP Jain, Tata McGraw Hill, New Delhi
5. Digital Electronics by KS Jamwal, Dhanpat Rai & Co., New Delhi
6. Digital Electronics by Rajiv Sapra, Ishan Publication, Ambala
7. Digital Electronics by BR Gupta, Dhanpat Rai & Co., New Delhi
8. Digital Systems: Principles and Applications by RJ Tocci, Prentice Hall of India, New Delhi
9. Digital Electronics by Rajaraman V., Prentice Hall of India, New Delhi
10. Fundamentals of Digital Electronics by naresh Gupta, Jain Brothers , New Delhi

## SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Topic No.	Topic	Time Allotted (Hrs)	Marks Allocation
1.	Introduction	02	05
2.	Number Systems	10	15
3.	Logic Gates	04	07
4.	Logic Simplification	08	10
5.	Arithmetic Circuits	04	07
6.	Multiplexer/Demultiplexer	04	08
7.	Decoders, Display Devices and Associated Circuits	04	08
8.	Encoders and Comparators	04	05
9.	Latches and Flip-Flops	08	10
10.	Counters	10	15
11.	Shift Registers	06	10
<b>Total</b>		<b>64</b>	<b>100</b>



## 3.5 ELECTRICAL MACHINES

L T P  
3 - 3

### RATIONALE

This is a subject dealing with various types of electrical machines being employed in industries, power stations, domestic and commercial appliances etc. It is envisaged that after studying the subject, students will gain competence in operation, repair and maintenance of such machines and give suggestions for improvement in their performance. The practicals will enable students to perform various tests necessary for installation and commissioning of such machines.

### DETAILED CONTENTS

1. Three Phase Supply (04 hrs)
  - a) Advantages of 3 phase system over single phase system
  - b) Star delta connections
  - c) Relation between phase voltage and line voltage, also between phase current and line current in a 3 phase system
  - d) Power and power factor in 3 phase system and their measurements by one, two and three wattmeter methods
  
2. Transformer (08 hrs)

Working principles of a transformer, constructional features, voltage and current transformation. Methods of connection 3 phase transformers, current and voltage relationship, auto transformer and its uses, instruments transformer, voltage regulation and its significance, need for isolation, harmonic and transient suppression, principles of isolation transformer, specifications of all types of transformers. Losses in a transformer, cooling of transformer, conservator
  
3. DC Motor (08 hrs)

Principles, significance of back emf, types of motors and their constructions, motor characteristics for shunt and series, speed control of DC motors and factors controlling the speed. Starting methods, Construction and working of 3 point starter, applications (simple problems)
  
4. Three Phase Induction Motors (08 hrs)

Principle, construction, concept of slip, torque and characteristics, effect of rotor resistance on torque (running and starting), rotor slip-torque current, output power, different methods of speed control. Starting methods, constructional details and working of Star-Delta and DOL starter, applications of submersible motors.

5. Synchronous Machines (08 hrs)  
Working principle, constructional features of synchronous machines, synchronization of an alternator with busbar effect of change in load and excitation on performance of a synchronous motor. Starting of synchronous motors and their specific applications
6. Single Phase Motors and Fractional Kilowatt Motors (08 hrs)  
a) Introduction  
- Principle of operation of single phase motors  
- Types of single phase induction motors and their constructional details (i.e. split phase, capacitor start, capacitor start and run, shaded pole and reluctance start)  
b) Commutator type single-phase motors – a.c series motor and universal motors
7. Stepper Motor and Servo Motor (04 hrs)  
Working principle, construction, working and their applications

**(Note: No Mathematical derivation of any formula)**

### **LIST OF PRACTICALS**

1. To measure power and power factors in 3 Phase load by two wattmeter method
2. To determine effect of a single phase transformer from the data obtained through open circuit and short circuit test
3. To connect the primary and secondary windings of a three phase transformer and to verify line and phase current and voltage relationship respectively
4. To connect a dc shunt motor with supply through a 3 point starter and to run the motor at different speeds with the help of a field regulator
5. To run a 3 phase squirrel cage induction motor with the help of a star-delta starter. To change the direction of rotation of the motor.
6. To run a 3 phase alternator in synchronism with busbar and to measure its voltage and frequency
7. To run a synchronous motor with a.c supply and to measure speed to verify the relation  $N=120 f/ P$
8. 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
9. Study construction of a stepper and servo motor and to write their complete specifications.

### **RECOMMENDED BOOKS**

1. Electrical Machine by SK Bhattacharya, Tata Mc Graw Hill, New Delhi

2. Electrical Machines by SK Sahdev, Unique International Publications, Jalandhar
3. Electrical Machines by Nagrath and Kothari, Tata Mc Graw Hill, New Delhi
4. Electrical Engineering by JB Gupta, SK Kataria & Sons, New Delhi
5. Electrical Technology Vol. - I and II B.L. Thareja, S Chand and Co. New Delhi

**SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER**

<b>Topic No.</b>	<b>Topic</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allocation</b>
1.	Three phase Supply	4	10
2.	Transformer	8	20
3.	DC Motor	8	20
4.	Three Phase Induction Motors	8	15
5.	Synchronous Machines	8	15
6.	Single Phase Motors and Fractional Kilowatt Motors	8	15
7.	Stepper Motor and servo Motors	4	5
<b>Total</b>		<b>48</b>	<b>100</b>

## 3.6 GENERAL ENGINEERING

L T P  
4 - 2

### RATIONALE

A diploma holder has to assist in activities of installation, operation and maintenance etc of different machines and equipment. These activities are not branch specific and instead require him to know basics of civil, electrical and mechanical engineering. The subject of General Engineering has been included to impart basic knowledge of civil, electrical and mechanical engineering to the students.

#### Note:

1. The students of Civil Engineering, will be studying Part A (Mechanical Engineering) and Part B (Electrical Engineering) only.
2. **The students of Electrical engineering, Electronics and Communication Engineering, Instrumentation and Control Engineering, Computer Engineering and Information Technology will be studying Part A (Mechanical Engineering ) and Part C (Civil Engineering) only.**
3. The students of Mechanical Engineering will be studying Part B (Electrical Engineering) and Part C (Civil Engineering) only.
4. The students of remaining branches of engineering and technology will be studying all the three Parts A (Mechanical Engineering), Part B (Electrical Engineering) and Part C (Civil Engineering), unless specified otherwise
5. A time of 2 hours per week has been allotted to Mechanical Engineering, 2 hours per week to Electrical Engineering and 2 hour per week to Civil Engineering in the lecture hours, for teaching theory and a lump-sum time of 2 hours per week has been allotted for the Practical Work.

### DETAILED CONTENTS

#### PART-A

#### MECHANICAL ENGINEERING

##### Theory

1. Transmission of Power (8 hrs)
  - 1.1 Belt Drives:  
Types of belts, belt materials, cross and flat belt drives, advantages of V-belt drive over flat belt drive.
  - 1.2 Gears Drives:  
Types of gears ( briefly), types of gear trains

- |    |  |          |
|----|--|----------|
| 2. | Internal combustion Engines  | (10 hrs) |
|    | 2.1 Classification of IC engines   |          |
|    | 2.2 Working principles of two stroke and four stroke engines                                   |          |
|    | 2.3 Working principles of petrol engine and diesel engines                                     |          |
|    | 2.4 Gas turbines (working principle only)  |          |
| 3. | Refrigeration and Air Conditioning System  | (8 hrs)  |
|    | 3.1 Different types of refrigeration principles and refrigerants                               |          |
|    | 3.2 Working of domestic refrigerator   |          |
|    | 3.3 Working of Window type AC system   |          |
| 4. | Hydraulics:  | (6 hrs)  |
|    | 4.1 Classification of pumps (reciprocating and centrifugal)                                    |          |
|    | 4.2 Working principles of both reciprocating and centrifugal pumps                             |          |
|    | 4.3 Turbine: Working principles of impulse turbine and reaction turbine and their applications |          |

### **PRACTICAL EXERCISES IN MECHANICAL ENGINEERING**

1. Demonstration and study of main parts of 4 stroke petrol and diesel engines by actually dismantling them (The idea is to acquaint the students with the most common troubles occurring in the engines)
2. Demonstration and study of main parts of 2 stroke petrol engine by actually dismantling it. (The idea is to acquaint the students with the most common trouble occurring in the engines)
3. Demonstration and study of gas turbines through models
4. Demonstration and study of different hydraulic pumps
5. Demonstration and study of various drives for transmission of powers i.e. models of belts and gears.
6. Demonstration and study of air conditioning system in a building
7. Demonstration and study of domestic refrigeration system

### **PART B**

#### **ELECTRICAL ENGINEERING**

##### **Theory**

- |    |   |         |
|----|---|---------|
| 1. | Basic Quantities of Electricity:                                      | (4 hrs) |
|    | 1.1 Definition of voltage, current, power and energy with their units |         |

- 1.2 Name of the instruments used for measurement of electrical quantities such as voltmeter, ammeter, wattmeter, energy meter.
- 1.3 Connection of these instruments in electric circuit
2. Applications And Advantages of Electricity: (3 hrs)
  - 2.1 Difference between AC and DC
  - 2.2 Various applications of electricity
  - 2.3 Advantages of electrical energy over other types of energy
3. Various Types of Power Plants: (3 hrs)
  - 3.1 Elementary block diagram of thermal, hydro and nuclear power stations
  - 3.2 Brief explanation of the principle of power generation in above power stations
4. Transmission and Distribution System (6 hrs)
  - 4.1 Key diagram of 3 phase Electrical distribution system
  - 4.2 Brief functions of accessories of distribution line
  - 4.3 Distinction between 11 kV and 415 volt distribution system
  - 4.4 Identification of three phase wires, neutral wires and the earth wire on a low voltage distribution system
  - 4.5 Identification of the voltage between phases and between one phase and neutral
  - 4.6 Distinction between three phase and single phase supply
5. Supply from the Poles to the Distribution Board: (4 hrs)
  - 5.1 Arrangement of supply system from pole to the distribution board
  - 5.2 Function of service line, energy meter, main switch, distribution board
6. Domestic Installation: (6 hrs)
  - 6.1 Distinction between light and fan circuits and single phase power circuit, sub circuits
  - 6.2 Various accessories and parts of installation, identification of wiring systems
  - 6.3 Common safety measures and earthing
  - 6.4 Introduction to BIS code of safety and wiring installation
7. Electric Motors and Pumps: (6 hrs)
  - 7.1 Definition and various application of single and three phase motors
  - 7.2 Conversion of horse power in watts or kilowatts
  - 7.3 Type of pumps and their applications
  - 7.4 Use of direct online starter and star delta starter

## PRACTICAL EXERCISES IN ELECTRICAL ENGINEERING:

1. Use of Megger:  
**Objective:** To make the students familiar with different uses of megger
2. Connection of a three phase motor and starter with supply including fuses and reversing of direction of rotation.  
**Objective:** Students may be made familiar with the equipment needed to control a three-phase motor  
The students must experience that by changing any two phases, the direction of rotation is reversed.
3. Connection of a lamp, ceiling fan, socket outlet, geyser, desert cooler, voltage stabilizer etc.  
**Objective:** Students may be made familiar with the different types of equipment and circuits used in the domestic installations
4. Trouble shooting in a three-phase motor  
**Note:** The teacher may create anyone of the following faults
  - (a) Loose connections
  - (b) Blown fuse
  - (c) Tripped overload protection
  - (d) Incorrect direction of rotation
  - (e) Single phasing
  - (f) Burnt winding to be simulated by a loose connection or short circuiting behind a terminal box.  
**Objective:** The students must be able to detect the most common faults, which may occur in a three-phase motor, using megger and a test lamp wherever necessary
4. Treatment of electric shock  
**Note:** The teacher may give a demonstration how a victim of electric shock must be treated.  
**Objective:** Students must be trained to treat the persons suffering from an electric shock
6. Demonstration and study of Domestic installation components used in single phase and three phase wiring
7. Demonstration and study of distribution line components
8. Demonstration and study of a distribution Board  
**Note:** Students may be asked to study the distribution board in the institution and note down all accessories.  
**Objective:** Students must be made familiar with the distribution board

9. Connections and taking reading of an analog/digital energy meter( single phase and three phase).

**Objective:** Students may be asked to connect an energy meter to a load and calibrate the reading with a stop watch and counting the number of revolutions of the energy meter disk in case of an analog meter and reading in case of a digital meter.

Demonstration and the study of submersible motor pump set and its working

**Objective:** To tell use of the set in water supply and irrigation works

## PART C

### CIVIL ENGINEERING

#### Theory

1. Construction Materials (10 hrs)

Basics of various construction materials such as stones, bricks, lime, cement and timber along with their properties, physical/ field testing and uses, elements of brick masonry.

2. Foundations (8 hrs)

- i) Bearing capacity of soil and its importance
- ii) Types of various foundations and their salient features, suitability of various foundations for heavy, light and vibrating machines

3. Basic concept of concrete (8 hrs)

Various ingredients of concrete, different grades of concrete, water cement ratio, workability, physical/ field testing of concrete, mixing of concrete

4. RCC (6 hrs)

Basics of reinforced cement concrete and its use (elementary knowledge), introduction to various structural elements of a building

### PRACTICAL EXERCISES IN CIVIL ENGINEERING

1. Testing of bricks
- a) Shape and size
  - b) Soundness test
  - c) Water absorption
  - d) Crushing strength



2. Testing of concrete
  - a) Slump test
  - b) Compressive Strength of concrete cube
3. The students should be taken to different construction sites to show them various construction materials, concreting process and construction of RCC structural elements, foundations and other civil works

## **INSTRUCTIONAL STRATEGY**

While imparting instructions, teachers are expected to lay more emphasis on concepts and principles. It will be better if the classes for general engineering are conducted in the laboratories and organized demonstrations for explaining various concepts and principles.

## **RECOMMENDED BOOKS**

### **Mechanical Engineering**

1. General Mechanical Engineering by M. Adithan; TTTI, Chandigarh
2. Basic Civil and Mechanical Engineering by Jayagopal; Vikas Publications, New Delhi
3. IC Engines and Automobile Engineering by Dr.MP Poonia, Standard Publishers, New Delhi
4. Refrigeration and Air Conditioning by RK Rajput; SK Kataria and sons; Ludhiana
5. Theory of Machines by RS Khurmi and JK Gupta; S. Chand and Company Ltd., New Delhi

### **Electrical Engineering**

1. Electrical Technology Part 1: Basic Electrical Engineering by Theraja, BL; S Chand and Company, New Delhi
2. Principles of Electrical Engineering by Gupta , S Chand and Company, New Delhi
3. Basic Electrical Engineering by Mehta VK; S Chand and Company, New Delhi
4. Basic Electricity and Measurements by Suryanarayan NV and N Delhi; Tata McGraw Hill, 1987, New Delhi
5. Basic Electrical and Electronics Engineering by SK Sahdev; Dhanpat Rai and sons, New Delhi
6. Basic Electrical Engineering by PS Dhogal, Tata McGraw Hill, New Delhi
7. Basic Electricity by BR Sharma; Satya Parkashan, New Delhi

### **Civil Engineering**

1. Textbook of Concrete Technology 2<sup>nd</sup> Edition by Kulkarni, PD Ghosh RK and Phull, YR; New Age International (P) Ltd., Publishers, New Delhi
2. Materials of Construction by Ghose; Tata McGraw Hill Publishing Co., Ltd., New Delhi
3. Civil Engineering Materials by TTTI, Chandigarh; Tata McGraw Hill Publishing Co. Ltd., New Delhi
4. Concrete Technology by Gambhir; Tata McGraw Hill Publishing Co., Ltd., New Delhi

5. Building Construction by J Jha and Sinha; Khanna Publishers, Delhi
6. Building Construction by Vazirani and Chandola; Khanna Publishers, Delhi
7. Civil Engineering Materials by SV Deodhar and Singhai; Khanna Publishers, Delhi
8. Soil Mechanics and foundation Engineering by SK Garg; Khanna Publishers, Delhi

**SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER**

Topic No.	Topic	Time Allotted (Hrs)	Marks Allocation
<b>PART-A (MECHANICAL ENGINEERING)</b>			
1.	Transmission of Power	8	12
2.	Internal combustion Engines	10	15
3.	Refrigeration and Air conditioning System	8	13
4.	Hydraulics	6	10
<b>PAERT-B (ELECTRICAL ENGINEERING)</b>			
1.	Basic Quantities of Electricity	4	5
2.	Application and Advantages of Electricity	3	5
3.	Various Types of Power Plant	3	5
4.	Transmission and Distribution System	6	10
5.	Supply from the Poles to the Distribution Board	4	5
6.	Domestic Installation	6	10
7.	Electric Motors and Pumps	6	10
<b>PART-C (CIVIL ENGINEERING)</b>			
1.	Constructional Materials	10	15
2.	Foundations	8	12
3.	Basic concept of concrete	8	13
4.	RCC	6	10
<b>Note:</b>			
Total time and marks will be sum of any two sections. Total time will be 64 hours and total marks will be 100 in this case.			

## 4.1 ANALOG ELECTRONICS – II

L T P

4 - 3

### 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 of equipment used in the field of electronic service industry.

### DETAILED CONTENTS

1. Multistage Amplifiers (08 hrs)
  - a) Need for multistage amplifier
  - b) Gain of multistage amplifier
  - c) Different types of multistage amplifier like RC coupled, transformer coupled, direct coupled, and their frequency response and bandwidth
  
2. Large Signal Amplifier (10 hrs)
  - a) Difference between voltage and power amplifiers
  - b) Importance of impedance matching in amplifiers
  - c) Class A, Class B, Class AB, and Class C amplifiers
  - d) Single ended power amplifiers, push-pull amplifier, and complementary symmetry push-pull amplifier
  
3. Feedback in Amplifiers (10 hrs)
  - a) Basic principles and types of feedback
  - b) Derivation of expression for gain of an amplifier employing feedback
  - c) Effect of feedback (negative) on gain, stability, distortion and bandwidth of an amplifier
  - d) RC coupled amplifier with emitter bypass capacitor
  - e) Emitter follower amplifier and its applications

4. Sinusoidal Oscillators (10 hrs)
- a) Use of positive feedback
  - b) Barkhausen criterion for oscillations
  - c) Different oscillator circuits-tuned collector, Hartley Colpitts, phase shift, Wien's bridge, and crystal oscillator. Their working principles and simple numerical problems
  - d) Series and parallel resonant circuits and bandwidth of resonant circuits
  - e) Single and double tuned voltage amplifiers and their frequency response characteristics
5. Wave Shaping Circuits (04 hrs)
- a) General idea about different wave shapers
  - b) RC and RL integrating and differentiating circuits with their applications
  - c) Diode clipping and clamping circuits and simple numerical problem on the circuits
6. Multivibrator Circuits (08 hrs)
- a) working principle of transistor as switch
  - b) Concept of multi-vibrator: astable, monostable, and bistable and their applications
  - c) Block diagram of IC555 and its working
  - d) IC555 as monostable and astable multi-vibrator
7. Operational Amplifiers (08 hrs)
- a) Characteristics of an ideal operational amplifier and its block diagram
  - b) Definition of differential voltage gain, CMMR, PSRR, slew rate and input offset current
  - c) Operational amplifier as an inverter, scale changer, adder, subtractor, differentiator, and integrator
  - d) Concept of Schmitt trigger circuit and sample/hold circuit using operational amplifier and their applications

8. **Regulated DC Power Supplies** (06 hrs)
- a) Concept of DC power supply. Line and load regulation
  - b) Concept of fixed voltage, IC regulators (like 7805, 7905), and variable voltage regulator like (IC 723)
  - c) Idea of SMPS

### **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 Colpitts 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. To observe the output waveform of a Bistable multivibrator
9. Use of IC 555 as monostable multivibrator and observe the output for different values of RC
10. Use of IC 555 as astable multivibrator and observe the output at different duty cycles
11. To use IC 741 (op-amplifier) as
  - i) Inverter
  - ii) Adder
  - iii) Subtractor
  - iv) Integrator
12. To realize positive and negative fixed voltage AC power supply using three terminal voltage regulator IC (7805, 7812, 7905)

## RECOMMENDED BOOKS

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

## SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Topic No.	Topic	Time Allotted (Hrs)	Marks Allocation
1.	Multistage Amplifiers	08	10
2.	Large Signal Amplifier	10	20
3.	Feedback in Amplifiers	10	15
4.	Sinusoidal Oscillators	10	20
5.	Wave Shaping Circuits	04	5
6.	Multivibrator Circuits	08	10
7.	Operational Amplifiers	08	15
8.	Regulated DC Power Supplies	06	5
<b>Total</b>		<b>64</b>	<b>100</b>

## 4.2 COMMUNICATION ENGINEERING - I

L T P  
4 - 2

### RATIONALE

Study of principles of communication systems leads to further study of audio and video systems, line communication and microwave communication systems. Thus the diploma holders getting employment in areas of R&D, production, servicing and maintenance of various communication systems will utilize these basic principles immensely.

### DETAILED CONTENTS

1. **AM/FM Transmitters** (08 hrs)
  - a) Classification of transmitters on the basis of power and frequency
  - b) Concept of low level and high level modulation, Block diagram of low and high level modulation, AM Transmitters and working of each stage.
  - c) Block diagram and working principles of reactance transmitter and Armstrong FM transmitters.
  
2. **AM / FM Radio Receivers** (20 hrs)
  - a) Brief description of crystal and TRF receiver
  - b) Block diagram and working principle of super heterodyne AM receiver, function of each block and typical wave at I/P and O/P of each block. Advantages of super heterodyne reception.
  - c) Performance characteristics of a radio receiver - sensitivity, selectivity, fidelity, S/N ratio, image rejection ration and their measurement procedure.
  - d) Selection criteria for intermediate frequency (IF), Concepts of simple and delayed AGC.
  - e) Block diagram of an FM receiver, function of each block and wave forms at input and output of different blocks. Need for limiting and de-emphasis in FM reception.
  - f) Block diagram of communication receivers, differences with respect to broadcast receivers.
  
3. **Antennas** (20 hrs)

Physical concept of radiation of electromagnetic energy from a dipole, Concept of polarization of EM waves, electromagnetic spectrum and its various ranges: VLF, LF, HF, VHF, UHF, Micro-wave

- a) Definition and physical concepts of the terms used with antennas like point source, gain, directivity, aperture, effective area, radiation pattern, beam angle, beam width and radiation resistance.
- b) Types of antennas : brief description, characteristics and typical applications of
  - half wave dipole
  - medium wave (mast) antenna
  - yagi and ferrite rod antenna
- c) Brief description of broadside and end fire arrays, their radiation pattern and applications (without analysis); brief idea about rhombic antenna and disc antenna.

#### 4. Propagation

(16 hrs)

- a) Basic idea about different modes of radio wave propagation, ground wave propagation, space wave communication and sky wave propagation and troposcatter (duct propagation their characteristics and typical areas of applications (e.g. medium wave, short wave, radio and TV communication etc.)
- b) Basic idea of field strength in case of ground wave propagation and space wave propagation
- c) Explanation of terms – critical frequency, maximum usable frequency (MUF) and skip distance
- d) Noise in Radio communication, signal fading

#### LIST OF PRACTICALS

1. To plot the sensitivity characteristics of a radio receiver and determine the frequency of maximum sensitivity
2. To plot the selectivity characteristics of a radio receiver
3. To align AM broadcast radio receiver
4. To study the faults in radio receiver
5. To measure the DC/AC voltage at different points of a radio receiver
6. Installation of directional antenna for best reception
7. Installation of dish antenna for best reception



## RECOMMENDED BOOKS

1. Electronic Communication by Kennedy, Tata McGraw Hill Publishers, New Delhi
2. Electronic Communication System by Reddy & Coolen, Prentice Hall of India
3. Electronic Communication System by KS Jamwal, Dhanpat Rai & Sons, Delhi

## SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Topic No.	Topic	Time Allotted (Hrs)	Marks Allocation
1.	AM/FM Transmitters	08	10
2.	AM/FM Radio receivers	20	20
3.	Antennas	20	20
4.	Propagation	16	15
<b>Total</b>		<b>64</b>	<b>100</b>

## 4.3 DIGITAL ELECTRONICS - II

L T P  
4 - 3

### RATIONALE

Digital design is a vital area in electronics with a lot of scope in industry and research. This subject involves conventional and sequential circuit designs both of which are very important fields. This subject forms the basis for research and development of digital systems. This subject will enable the students to learn concept of logic families, A/D D/A converters, memories, Circuits & ALU etc.

### DETAILED CONTENTS

1. Logic Families (14 hrs)

- a) Logic family classification. TTL, ECL, MOS, CMOS. Types of integration SSI, MSI, LSI, VLSI
- b) Characteristics of TTL and CMOS and the comparison. Propagation delay. Speed, noise margin. Logic levels., power dissipation, fan-in, fan-out, power supply requirements
- c) Open collector and totem pole output circuits, operation of a standard TTL, CMOS, NAND, NOR gates
- d) CMOS to TTL interfacing and TTL to CMOS interfacing LAMP/LED interfacing
- e) Introduction to tri-state devices tri-state buffer and inverter circuits. Examples of unidirectional and bi-directional bus with tri-state interfacing.

2. A/D and D/A Converters (10 hrs)

- a) DA Converters : Performance characteristics of D/A converters, binary resistor network and resistance ladder network methods of D/A converters and applications
- b) A/D Converters : Performance characteristics of A/D converters, single slope, dual slope, successive approximation and parallel A/D converters

3. Memories (14 hrs)

Memory organisation, classification of semi conductor memories, ROM, PROM, DRAM, EPROM, EEPROM, RAM. CCD memories, content addressable memory, programmable logic devices, PROM at PLD, programmable logic array (PLA) programmable array logic (PAL), field programmable gate array (FPGA), familiarization with common ICs(2716, 2732, 2114)

4. Combinational Circuits (08 hrs)

Minimisation of Boolean expressions using K-map method, tabular method of function minimization, Quine Mcclaaskey method

5. Sequential Circuits (10 hrs)

Essential components of sequential circuit, synchronous and asynchronous sequential circuits, classification of sequential circuits (Meely and Moore Machine), design of counters using J-K and R-S flip-flops.

6. Arithmetic and Logic Unit (08 hrs)

Basic idea about arithmetic logic unit w.r.t. IC 74181 and applications, implementation of binary multiplication, division, subtraction and addition

### **LIST OF PRACTICALS**

1. Verify the operation of D/A converter
2. Verify the operation of A/D converter
3. Verify the writing and reading operation of RAM IC
4. Design J-K Flip-flop counter and verify its truth table
5. Familiarity with the use of EPROM programs and UV index
6. Exercise on programming of EPROM
7. Using PLA design and implement a combinational circuit like full adder
8. Design and implement full adder and full subtractor
9. Verify the logical operation, arithmetic operation of binary numbers using IC741981
10. Design of combination circuit using ROM

### **RECOMMENDED BOOKS**

1. Digital Systems and Applications by RJ Tocci, Prentice Hall of India, New Delhi
2. Digital Electronics by RP Jain, Tata McGraw Hill, New Delhi
3. Digital Electronics by KS Jamwal, Dhanpat Rai & Co., New Delhi
4. Digital Logic Designs by Morris Mano, Prentice Hall of India, New Delhi

5. Digital Designs by CJ Roth, Jaico Publication
6. Digital Designs by Z Kohavi
7. Digital Electronics by Terry LM Bartlet
8. Digital Electronics by Rajaraman V, Prentice Hall of India, New Delhi
9. Digital Fundamentals by Malvino and Leachy, Tata McGraw Hill Publishers, New Delhi
10. Digital Systems by Sanjay K Bose, Wiley Eastern (P) Ltd., New Delhi

**SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER**

<b>Topic No.</b>	<b>Topic</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allocation</b>
1.	Logic Families	14	25
2.	A/D and D/A Converters	10	15
3.	Memories	14	20
4.	Combinational circuits	08	15
5.	Sequential circuits	10	15
6.	Arithmetic and Logic Circuits	08	10
<b>Total</b>		<b>64</b>	<b>100</b>

## 4.4 POWER ELECTRONICS

L T P  
4 - 2

### RATIONALE

Power electronics play a very vital role in the field of electronics and control engineering. It is specially applied in the modern industries as they mostly use efficient, effective and precise controls as the old magnetic and electrical control schemes have largely become obsolete. A diploma holder in electronics and instrumentation and control has to maintain the panels used in modern control processes. It is obvious that the knowledge of components such as thyristors, and other semiconductor devices used in such control circuits is very essential for them in order to supervise the work efficiently and effectively. Looking into its usefulness and importance, this subject has been incorporated in the curriculum.

### DETAILED CONTENTS

1. Introduction to thyristors and other power Electronics devices (12 hrs)
  - 1.1 Construction, working principles of SCR, two transistor analogy of SCR, V-I characteristics of SCR
  - 1.2 SCR specifications and ratings
  - 1.3 Different methods of SCR Triggering
  - 1.4 Different commutation circuits for SCRs
  - 1.5 Series and parallel operations of SCRs
  - 1.6 Basic idea about the selection of heat sinks for thyristers
  - 1.7 Construction and working principle of Diacs and Triacs and their V-I characteristics
  - 1.8 Construction, working and ratings of Gate Turn Off (GTO) thyristors
  - 1.9 Characteristics of SCR, Diac, Triac, Programmable Uni-junction Transistor (PUT), ASCR, RCT, LASCR, SCS
  - 1.10 Contribution and working of UJT and its application as relaxation oscillator
  - 1.11 Comparison between BJT and SCR
  - 1.12 Construction, working and characteristics of MOSFET, IGBT, MLT, their specifications and ratings
  
2. Application of SCR and Triacs (8 hrs)
  - 2.1 Illumination control
  - 2.2 Temperature control
  - 2.3 Battery charger
  - 2.4 Fan regulators
  - 2.5 Emergency light using SCR
  - 2.6 Speed control of DC and universal motor
  - 2.7 LDR operated SCR circuit
  - 2.8 Switched mode power supply

- 2.9 Uninterrupted power supply
  - 2.10 Solid state relays
3. Controlled Converters (14 hrs)
- 3.1 Half wave controlled rectifier with resistive load
  - 3.2 Half wave controlled rectifier with inductive load
  - 3.3 Full wave half controlled rectifier with resistive load
  - 3.4 Full wave half controlled rectifier with inductive load
  - 3.5 Full wave fully controlled rectifier with resistors as well as inductive load
  - 3.6 Three-phase half wave fully controlled rectifier with resistive and inductive load
  - 3.7 Three phase full wave fully controlled and half controlled with resistive as well as inductive loads
  - 3.8 Dual converters and their applications
4. Inverters (8 hrs)
- 4.1 Voltage and current source inverters
  - 4.2 Working principle of single phase series and parallel inverter
  - 4.3 Working principle of single phase bridge inverter
  - 4.4 Working principle of three phase bridge inverter
5. Choppers (8 hrs)
- 5.1 Working principle of Choppers
  - 5.2 Classification of Choppers
  - 5.3 Step-up Chopper
  - 5.4 A.C Chopper
6. Cyclo Converter (4 hrs)
- Working principle of single phase and three phase cyclo converter
7. Electric Drive Control (10 hrs)
- 7.1 D.C. drive control
    - a) Speed control of dc series motor using bridge rectifier
    - b) Speed control of dc shunt motor using bridge rectifier
    - c) Speed control of dc motor using choppers
    - d) Study of control scheme for speed control of a separately excited d.c motor above and below the base speed
  - 7.2 A.C drive control
    - a) Speed control of induction motors using phase control
    - b) Speed control of induction motors using variable frequency control
    - c) Speed control of induction motor using slip power recovery schemes

## **LIST OF PRACTICALS**

1. Testing of components like SCR Triac, BJT, UJT, MOSFET
2. To plot and verify V-I characteristics of an SCR
3. To plot and verify V-I characteristics of a Triac
4. To plot V-I characteristics of UJT
5. To plot V-I Characteristics of a DIAC
6. Assembly and testing of illumination control circuit using SCR
7. Assembly of street lights circuit using LDR and Triac
8. Assembly of speed control circuit for a d.c. motor
9. Assembly of three phase bridge rectifier using two SCR and two diodes
10. Assembly of three phase bridge rectifier using diodes
11. Assembly of transistorized emergency light cum battery charger circuit

## **INSTRUCTIONAL STRATEGY**

The teacher may encourage students to perform practical simultaneously with teaching of theory for better understanding of the subject and verification of theoretical concepts. The various components must be shown to the students for identification and also be tested. Practical applications of the various circuits and devices should be discussed in the class. The available video films on the subject must be shown to the students.

## **RECOMMENDED BOOKS**

1. Industrial Electronics and Control by SK Bhattacharya and S Chatterji; New Age Publishers, New Delhi
2. Electrical and Electronic Measurements by A.K.Sawhney, Dhanpat Rai and Sons, New Delhi
3. Power Electronics – Principles and Application by J Michael Jacob; Vikas Publishing House, New Delhi
4. Power Electronics by M.H. Rashid.

5. Power Electronics by P.C. Sen, Tata McGraw Hill Publishers, New Delhi
6. Thyristors by M.S. Berde, Khanna Publishers, New Delhi
7. Thyristors and Thyristors by Sugandhi and Sugandhi.
8. Power Electronics by P.S. Bhimbhrah, Khanna Publishers, New Delhi
9. Fundamentals of Power Electronics by S. Rama Reddy, Narosa Publishing House, New Delhi

**SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER**

<b>Topic No.</b>	<b>Topic</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allocation</b>
1.	Introduction to thyristors and other power Electronics devices	12	20
2.	Application of SCR and Triacs	10	15
3.	Controlled Converters	12	20
4.	Inverters	08	10
5.	Chopprres	08	15
6.	Cycloconverters	04	05
7.	Electric Drive control	10	15
<b>Total</b>		<b>64</b>	<b>100</b>



## 4.5 INSTRUMENTATION

L T P  
4 - 2

### RATIONALE

This subject deals with the various electronic instruments, their construction and working which control the various parameters and operations in different industries. Electrical supervisor employed in maintenance of electrical equipment, machinery is required to diagnose faults, rectify them and test the total system for satisfactory performance. Thus there is a need of introducing diploma holders to the basics of Instrumentation.

### DETAILED CONTENTS

1. Measurements (06 hrs)  
Importance of measurement, Basic measuring systems, advantages and limitations of each measuring systems, generalized measurement system, signal conditioning and display devices
2. Transducers (08 hrs)  
Theory, construction and use of various transducers such as (resistance inductance, capacitance, electromagnetic, piezo electric, optical etc.)  
Introduction to smart transducers
3. Measurements of Displacement and Strain (10 hrs)  
Displacement Measuring Devices: wire wound potentiometer, LVDT, strain gauges, different strain gauges such as inductance type, resistive type, wire and foil etc. Gauge factor, gauge materials, and their selections, sources of errors and its compensations. Use of electrical strain gauges, strain gauge bridges and amplifiers.
4. Force and Torque Measurement (10 hrs)  
Different types of force measuring devices and their principles, load measurement by using elastic Transducers and electrical strain gauges. Load cells, proving rings. Measurements of torque by brake, dynamometer, speed measurements; different methods, devices.
5. Pressure Measurement (08 hrs)  
Bourdon pressure gauges, electrical pressure pick ups and their principle, construction ,application and use of pressure cells.
6. Flow Measurement (06 hrs)

- Basic principles of magnetic and ultrasonic flow meters
7. Measurement of Temperature (08 hrs)  
Bimetallic thermometer, pressure thermometers, thermoelectric thermometers, resistance thermometer, thermocouple, thermistors and pyrometer, errors in temperature measurements in rapidly moving fluids. Temperature recorders
  8. Measurement of other non electrical quantities such as humidity, pH value, sound, (06 hrs)
  9. Elements of telemetry and data acquisition system (02 hrs)

### **INSTRUCTIONAL STRATEGY**

The teacher should explain the scope of various measuring devices and their practical application in the field. The transducers and measuring devices must be shown to the students and they should be trained in the selection, operation, maintenance and calibrations. Frequent visits to nearby process industries will be of immense help to the students

### **LIST OF PRACTICALS**

- 1) Measurement and plot of characteristics of optical devices like photodiodes photocells
- 2) Characteristics of light operated switch using photo transistor and LDR
- 3) Measurement of strain using strain gauge
- 4) Measurement of pressure using pressure cell
- 5) Measurement of sound level using sound level meter
- 6) Measurement of temperature using thermistor and thermocouples
- 7) Measurement of load using load cell
- 8) Measurement of humidity using humidity meter
- 9) Measurement of linear and angular displacement
- 10) Measurement of flow rate using flow sensors
- 11) Measurement of angular distance using linear variable capacitor

### **RECOMMENDED BOOKS**

1. Electronic Measurement and Instrumentation by Dr Rajendra Prasad
2. Electrical and Electronics Measurement and Instrumentation by AK Sawhney, Dhanpat Rai and Co., New Delhi
3. Electronic Instrumentation and Measurement Techniques by WD Cooper, AD Helfrick Prentice Hall of India Pvt. Ltd. New Delhi
4. Electronics Tests and Measurement Techniques by Rajiv Sapra

**SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER**

<b>Topic No.</b>	<b>Topic</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allocation</b>
1.	Measurement	06	5
2.	Transducers	08	10
3.	Measurements of Displacement and Strain	10	20
4.	Force and Torque Measurement	08	15
5.	Pressure Measurement	10	10
6.	Flow Measurement	06	10
7.	Measurement of Temperature	08	15
8.	Measurement of other non electrical quantities such as humidity, pH level etc.	06	10
9.	Elements of telemetry and data acquisition system	02	5
<b>Total</b>		<b>64</b>	<b>100</b>

## 4.6 MINOR PROJECT WORK

L T P  
- - 4

### RATIONALE

Minor project work aims at exposing the students to various developments taking place in the field of electronics and related areas in addition to developing interest in the students about the, working and fabrication of electronics devices. The project may be selected from utility items pertain to their laboratories or homes. It would enable first hand experience of components, their purchase, assembly, testing and trouble shooting. It would also boost up confidence of the students in repairing and maintenance of electronics gadgets. There should not be more than 2-3 students for each project. A report must be prepared with a hard and soft copy.

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

**The teacher may guide/ help students to identify their minor project work and chalk out their plan of action well in advance preferably at the beginning of 4<sup>th</sup> semester**

For this purpose, the concerned teachers must identify curriculum related industrial problems which should be expository in nature and ask students (individual/group) to carry out their investigation/ activity such that enough industrial exposure is gained by them during this process.

Some of the projects are listed below which is just a guideline for selecting the minor 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 hand 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. Audio amplifiers

19. Tape recorders
20. Automatic stabilizer/CVT
21. Emergency light
22. Design and manufacture of transformer
23. Fan regulator
24. Triac using Fan Regulator
25. 555 using lighting delay Circuits
26. Temperature sensor based fabrication
27. Design and fabricate transistor switch to operate an LED.
28. Design and Fabricate a single stage Amplifier for 1 kHz

This minor project work of 64 hours duration will carry 100 marks. 50 marks in external assessment will be given by industrial/field supervisors and 50 marks of internal assessment by the teacher supervising this training.

The Minor Project work if taken at a stretch may require to place a student with a relevant industry for a period of 1-2 weeks for collection of information and exposure to the industrial process will carry a total of 100 marks.

The components and criteria of evaluation will include the following :

	<b>Criteria</b>	<b>Weightage</b>
a)	Punctuality and regularity	15%
b)	Initiative in learning new things	15%
c)	Relationship with people	15%
d)	Report writing and seminar	55%

## **ENTREPRENEURIAL AWARENESS CAMP**

The employment opportunities for diploma holders especially in public sector are dwindling. The diploma holders need to explore the possibilities of becoming entrepreneurs. For this, they must be acquainted with entrepreneurial development, scope of setting up small scale industry, existing business opportunities, financial support available and various aspects of managing business. In this context, an entrepreneurial awareness camp is suggested. During the camp, experts from various organizations such as banks, financial corporations, service institutes etc. may be invited to deliver expert lectures. Successful entrepreneurs may also be invited to interact with the students. In addition, the students may be encouraged to read papers or give seminar during the camp on Entrepreneurship Development and related topics.

The camp is to be organized preferably at a stretch for two to three days during 4<sup>th</sup> semester(second year). Expert Lectures will be delivered on the following broad topics. There will be no examination for this subject/camp.

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

## **ELECTRONICS ENGINEERING (For Uttaranchal State)**

<h3 style="margin: 0;"><b>VARIOUS SUBJECTS IN <u>THIRD YEAR</u></b></h3>
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### **FIFTH SEMESTER**

5.1	Consumer Electronics	113
5.2	Electronic Instruments and Measurement	116
5.2	Trouble Shooting of Electronic Equipment	120
5.4	Communication Engineering-II	123
5.5	Elective –I	
	(a) Maintenance and Repair of Computer System	126
	(b) Digital and Data Communication	129
	(c) Satellite Communication	131
5.6	Microprocessor and Applications	133
	<b><i>Generic Skill Development Camp-I</i></b>	<b>136</b>

### **SIXTH SEMESTER**

6.1	Optical Fibre Communication	137
6.2	Mobile Communication	140
6.3	Micro controllers and PLC s	143
6.4	Elective-II : to choose any one from the following:	
	a) Medical Electronics	146
	b) Computer Networks	150
	c) Advanced Microprocessors	154
6.5	Entrepreneurship Development and Management	157
6.6	Major Project Work	160
	<b><i>Generic Skill Development Camp-II</i></b>	<b>163</b>

## 5.1 CONSUMER ELECTRONICS

L T P  
3 - 3

### RATIONALE

Consumer Electronics includes cooking, cooling and cleaning appliances. The objective of teaching this subject is to give students to introduce the students with working principles, block diagram, main features of consumer electronics gadgets/goods/devices like audio-systems, CD systems. TV, VCR and other items like digital clocks, calculators, microwave ovens, Photostat machines etc. Which in-turn will develop in them capabilities of assembling, fault diagnosis and rectification in a systematic way.

### DETAILED CONTENTS

- |    |              |  |
|----|--------------|--|
| a) | Audio System | (10 hrs)   |
|    | 1.1          | Microphones: construction, working principles and applications of microphones, their types viz: a) Carbon b) moving coil, c) velocity, d) crystal, e) condenser, e) cordless etc.  |
|    | 1.2          | Loud Speaker: Direct radiating, horn loaded woofer, tweeter, mid range, multi-speaker system, baffles and enclosures.  |
|    | 1.3          | Sound recording on magnetic tape, its principles, block diagram, and tape transport mechanism  |
|    | 1.4          | Digital sound recording on tape and disc   |
|    | 1.5          | VCD, DVD and Video Camera<br><br>Principle of video recording on CDs and DVDs. Recordable and Rewritable CDs. Study of VCD and DVD Systems. Hi-Fi system, pre-amplifier, amplifier and equalizer system, stereo amplifiers Introduction of functioning of digital movie and still camera |
| b) | Television   | (16 hrs)   |
|    | 2.1          | Monochrome TV Communication:   |
|    |              | - Elements of TV communication system.   |
|    |              | - Scanning- its need for picture transmission.   |
|    |              | - Need for synchronizing and blanking pulses.  |
|    |              | - Progressive scanning- Gross structure filters, interlaced scanning, resolution and band width requirement, tonal gradation.  |
|    |              | - Composite Video signal (CVS) at the end of even and odd fields.  |



- equalizing pulses and their need
  - Monochrome picture tube – construction and working, comparison of magnetic and electric deflection of beam
  - Construction and working of camera tube: vidicon and plumbicon, Block diagram of TV camera and the transmitter chain.
  - Block diagram of a TV receiver: function of each block and waveform at the input and output of each block.
- c) Colour TV (14 hrs)
- Primary colours, tristimulus values, trichromatic coefficients, concepts of additive and subtracting mixing of colours, concepts of luminance, Hue and Saturation, Representation of a colour in colour triangle, non spectral colour, visibility curve
  - Compatibility of colour TV system with monochrome system. Block diagram of colour TV camera, Basic colour TV system-NTSC, SECAM, and PAL their advantages and disadvantages.
  - Need for luminance signal and band sharing by colour signals, sub-carriers frequency, colour difference signal and its need, synchronous quadratic modulation and representation of a colour by a vector, burst signal and its need, chrominance signal.
- d) Working Principle and operation of microwave oven, washing machines, refrigerator cordless telephone, electronic ignition of automobile. (04 hrs)
- e) Cable Television (04 hrs)
- Block diagram and principles of working principle of cable TV and DTH, cable TV using internet

### LIST OF PRACTICALS

1. To plot the directivity pattern and frequency response of a microphone
2. To plot the directivity pattern and frequency response of a loud speaker
3. Demonstration of a tape-transport mechanism of a tape-recorder
4. Trouble shooting of tape-recorder system
5. Different sections of B/W TV receiver
6. To observe the wave forms and voltage B/W and Colour T.V receiver.

7. Tracing in colour TV receiver
8. Demonstration of C.D./ DVD Player.
9. Demonstration and study to VCD especially its transport mechanism.
10. Study of a TV cable network system through internet
11. Demonstration and study of microwave ovens, washing machines and refrigerator and video camera, Photostat machine.

### RECOMMENDED BOOKS

1. Colour Television-principles & practice R.R Gulati by Wiley Eastern Limited, New Delhi
2. Complete Satellite & cable Television R.R Gulati New age International Publisher
3. Colour Television Servicing by RC Vijay BPB Publication, New Delhi
4. Colour Television & Video Technology by A.K. Maini CSB Publishers
5. VCR-principles, maintenance & repair by S.P. Sharma, Tata Mc Graw Hill, New Delhi
6. Colour TV by A.Dhake
7. Service Manuals, BPB Publication, New Delhi
8. Audio-video Systems by RG Gupta

### SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Topic No.	Topic	Time Allotted (Hrs)	Marks Allocation
1.	Audio System	10	20
2.	Television	16	30
3.	Colour Television	14	25
4.	Working Principle and operation of microwave oven, washing machines, refrigerator etc.	04	10
5.	Cable Television	04	5
<b>Total</b>		<b>48</b>	<b>100</b>

## 5.2 ELECTRONIC INSTRUMENTS AND MEASUREMENT(EIM)

L T P

4 - 3

### 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.

### 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, requirements, importance and applications of standards, calibration

2. Multimeter (06 hrs)

Principles of measurement of DC voltage, DC current, AC voltage, AC current, moving coil and moving iron type instruments (voltmeter and Ammeter)

Block diagram of multimeter and measurement of voltage, current and resistance using multimeter

Specifications of multimeter and their applications

Limitations with regard to frequency and input impedance

3. Electronic Voltmeter (08 hrs)

Advantages over conventional multimeter for volt measurement with respect to input impedance and sensitivity

Principles of voltage, current and resistance measurement (block diagram only)  
 Specifications of electronics voltmeter

4. AC Milli Voltmeter (04 hrs)

Types of AC milli voltmeters and their block diagram description  
 Typical specifications and their significance

5. Cathode Ray Oscilloscope (10 hrs)

Construction and working of different blocks used in CRT  
 Time base operation and need for blanking during flyback, synchronization  
 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  
 CRO probes, special features of dual beam, dual trace, delay sweep  
 Digital storage oscilloscope: block diagram and working principle

6. Signal Generators and Analysis Instruments (08 hrs)

Explanation of block diagram specifications of low frequency and RF generators, pulse generator, function generator  
 Distortion factor meter; wave analyser and spectrum analyser

7. Impedance Bridges and Q Meters (08 hrs)

Wheat stone bridge  
 AC bridges: Maxwell's induction bridge, Hay's bridge, De-Sauty's bridge, Schering bridge and Anderson bridge  
 Block diagram description of laboratory type RLC bridge, specifications of RLC bridge  
 Block diagram, working principle and use of Q meters.

8. Digital Instruments (08 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 multimeter

Measurement of time interval, time period and frequency using universal counter/frequency counter

Working principle of logic probe, logic pulser, logic analyzer, logic comparator, signature analyzer and logic analyzer

9. Calibration of Instruments (6 hrs)

Calibration of instruments for voltage, current, time, frequency, impedance, and other applications

### LIST OF PRACTICALS

1. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance
2. Measurement of voltage, frequency, time period and phase using CRO by Lissaguos Pattern
3. Measurement of rise time and fall time using CRO
4. Measurement of Q of a coil and its dependence on frequency using Q meter
5. Measurement of voltage, frequency, time and phase using Digital Storage Oscilloscope( DSO)
6. Measurement of resistance and inductance of coil using RLC meter
7. Measurement of distortion of RF signal generator using distortion factor meter
8. Use of logic pulser and logic probe
9. Measurement of time period, frequency, average period using universal counter/ frequency counter
10. Study of operation and features of a logic analyser

### RECOMMENDED BOOKS

1. Electronics Measurement and Instrumentation by AK Sawhney, Dhanpat Rai & Sons, Delhi
2. Electronics Instrumentation by Cooper, Prentice Hall of India
3. Electronics Test and Instrumentation by Rajiv Sapra, Ishan Publications, Ambala
4. Electronics Instrumentation by JB Gupta, Satya Prakashan, New Delhi

**SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER**

<b>Topic No.</b>	<b>Topic</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allocation</b>
1.	Basics of Measurements	06	10
2.	Multimeter	06	10
3.	Electronic Voltmeter	08	15
4.	AC Milli Voltmeter	04	5
5.	Cathode Ray Oscilloscope	10	15
6.	Signal Generators and Analysis Instruments	08	15
7.	Impedance Bridges and Q Meters	08	15
8.	Digital Instruments	08	10
9.	Calibration of Instruments	06	5
<b>Total</b>		<b>64</b>	<b>100</b>

## 5.3 TROUBLE SHOOTING OF ELECTRONIC EQUIPMENT

L T P  
2 - 4

### RATIONALE

The course provides the students with necessary knowledge and competency to diagnose the faults for trouble shooting and for systematic repair and maintenance of electronic equipment and testing of components.

### DETAILED CONTENTS

1. Repair, Servicing and Maintenance Concepts (06 hrs)
 

Introduction, Modern electronic equipment, Mean time between failures (MTBF), Mean time to repair (MTR), Maintenance policy, potential problems, preventive maintenance, corrective maintenance.

  - a) Study of basic procedure of service and maintenance
  - b) Circuit tracing techniques
  - c) Concepts of shielding, grounding and power supply considerations in instruments.
  
2. Fundamental Trouble Shooting Procedures (06 hrs)
  - i) Fault location
  
  - ii) Fault finding aids
    - Service manuals
    - Test and measuring instruments
    - Special tools
  
  - iii) Trouble Shooting Techniques
    - Functional Areas Approach
    - Split half method
    - Divergent, convergent and feedback path circuit analysis
    - Measurement techniques
  
3. Passive Components (02hrs)
 

Test procedures for checking passive components, resistors, capacitors, inductors, chokes and transformers.
  
4. Semiconductor Devices (From testing procedure point of view) (04hrs)
 

Diodes, rectifier and zener diodes. Bipolar transistors. Field effect transistors JFET and MOSFET. Thyristors, uni-junction transistors, Photo cells, Transistor equivalents. Data Books on transistors

5. Trouble-Shooting Digital Systems (06 hrs)

Typical faults in digital circuits. Use of Logic clip, logic probe, logic pulsar, IC tester

6. Typical Examples of Trouble Shooting (06 hrs)

**Any two groups can be chosen for trouble shooting**

Group-I	Group-II	Group-III	Group-IV	Group-V	Group-VI
Inverters	Telephone Handset	T.V (Coloured and black and white), Video Games	Computer and peripherals	Various instruments such as CRO etc	Medical equipment like X-Ray M/cs,
Stabilizers	Cordless Phone	VCRs / VCPs	Printers Laser	Power supplies, Function-generators etc	ECG. M/c, EEG M/cs,
UPS	Fax Machine	Audio System/ Stereo Amplifiers/ TapeRecorders	Printers Inkjet		Scanning M/cs
Emerging Lights	Mobile Phone	CD/VCD/DVD Players			Other Equipment

1. Log Book and History Sheet (02 hrs)

Introduction, preparation and significance of log book and History sheet.

### LIST OF PRACTICALS

- Selection, demonstration and correct use of tools and accessories: pliers, wire cutter, wire stripper, tweezers, soldering iron, desoldering tools, neon tester, screw driver  
Accessories : insulating tapes, solders, solder tips, fluxes, desoldering wick, solder cleaning fluids, sleeves, tags, identifiers
- Develop skill in assembly of components, wiring, soldering and desoldering methods
- Selection and use of commonly used passive components and accessories
- Testing of active and passive components
- Testing of linear integrated circuits
- Use of digital tools for troubleshooting digital components

### LIST OF RECOMMENDED BOOKS

- Repair Manuals



2. Specifications of Equipment supplied by the manufacturer
3. Introduction to Biomedical Equipment Technology – Joseph J. Carr and John M Brown.
4. Principles of Biomedical Instrumentation and measurement – Richard Aston.
5. Introduction to Biomedical Equipment Technology by Carr and Brown, Regents and Prentice Hall of India, New Delhi
6. Principles of Bio-medical Instrumentation and Measurements by Leslie Cromwell, Fred J Weibell, Erich A Pfeiffer Prentice Hall of India, New Delhi
7. Handbook of Biomedical Engineering- R.S. Khandpur.
8. Modern Electronic Equipment Trouble shooting, Repair and Maintenance by RS Khandpur, Tata McGraw Hill Publishing House, New Delhi
9. Bio-medical Instrumentation by M Arumugam, Anuradha agencies Publishers, Vidayakaruppur, Kumbakonam RMS

## 5.4 COMMUNICATION ENGINEERING -II

L T P  
3 - 2

### RATIONALE

This subject includes an exposure to microwaves engineering, radar systems, fibre optics and satellite communication. In microwaves industry, job opportunities are available in 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.

### DETAILED CONTENTS

1. Introduction to Microwaves (04 hrs)
 

Introduction to microwaves and its applications, Classification on the basis of its frequency bands (HF, VHF, UHF, L, S, C, X, KU, KA, mm, SUB, mm)
2. Microwave Devices (06 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 (06 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. Field configuration of  $TE_{10}$ ,  $TE_{20}$  and  $TM_{11}$  modes.
4. Microwave Components (06 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 antennas (04 hrs)  
Structure characteristics and typical applications of Horn and Dish antennas
6. Microwave Communication systems (04 hrs)
- Block diagram and working principles of microwave communication link.
  - Troposcatter Communication: Troposphere and its properties, Tropospheric duct formation and propagation, troposcatter propagation.
7. Radar Systems (10 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
8. Satellite Communications (08 hrs)
- Basic idea of 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. Link losses etc.
  - Transponders multiple access techniques, VSAT and its features

### LIST OF PRACTICALS

- To study, familiarize and measurement using Microwave Training Kits.
- Study of Waveguide Components-Klystron Mount, Attenuator, Slotted Section, Frequency Meters, Isolator, circulator, Detector Mount, Directional Couplers, Magic Tee, Probes, Shorts etc.
- To Study Characteristics and measure electronic and mechanical tuning range of a reflex klystron.
- To measure VSWR and reflection coefficient of a given load.
- To measure the frequency and wave length in a waveguide working in TE<sub>10</sub> mode.

6. To measure an unknown impedance using the smith chart.
7. To measure the directivity and coupling of a directional coupler.
8. To plot radiation pattern of a horn antenna in horizontal and vertical planes.
9. To verify the properties of magic tee.
10. To study installation of a dish antenna.
11. To measure the polar pattern and the gain of a wave guide Horn Antenna.
12. To calibrate phase shifter.
13. Study and Measurement of Dielectric Constant.
14. Study and Measurement using Gunn Oscillator and Pin Diode.

**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.

**RECOMMENDED BOOKS**

1. Microwave Devices and Components by Sylio, Prentice Hall of India, New Delhi
2. Electronics Communication by Reddy and Coolen
3. Electronics Communication System by KS Jamwal, Dhanpat Rai & Sons, Delhi

**SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER**

Topic No.	Topic	Time Allotted (Hrs)	Marks Allocation
1.	Introduction to Microwaves	04	10
2.	Microwave Devices	06	15
3.	Wave Guides	06	15
4.	Microwave Components	06	15
5.	Microwave antennas	04	5
6.	Microwave communication systems	04	10
7.	Radar Systems	10	15
8.	Satellite Communication	08	15
<b>Total</b>		<b>64</b>	<b>100</b>

(Elective-I)

**5.5(a) MAINTENANCE AND REPAIR OF COMPUTER SYSTEM**L T P  
3 - 2**RATIONALE**

The personal computer (PC) is the tool that defines today's current age and culture. A right understanding about any tool is required to use it effectively. There has been a complete revolution in this area, because of rapid advancements in the field of electronics. The PC is the most logical of modern machines and is no more difficult to understand its function, to know what is inside it and thus master its working. It is very important to learn the various components of a PC, and how these parts work together. All technically trained individuals must understand the general nature of PC, operation of memory, I/O techniques, interfacing applications etc. Looking at the importance and usefulness, this subject has been included in the curriculum.

**DETAILED CONTENTS**

1. Introduction: (8 hrs)
  - a) Origin of PC
  - b) Hardware and software
  - c) Operating system
  - d) Programming Languages
  
2. Hardware Peripherals and Components (20 hrs)
  - a) Motherboard: Introduction to different type of mother boards – Single Based System, Block diagram – of mother board. Installation of computer system .
  - b) CRT Display Device: Block diagram, Principle of operation of computer monitor, Difference between TV and Computer Monitor, Video display Adapters.
  - c) Microprocessors and coprocessors
  - d) Memory – ROM, RAM and Cache
  - e) Chipsets and support circuits
    - Function
    - System control, peripheral control and memory control
  - f) Bus architecture
    - Bus functions
    - Different types of Buses PCI, ISA,EISA, VESA, PCI, SCSI and Ports COM1, COM2, LPT1, USB.

- g) Mass storage Devices  
Hard disks, Floppy disks, Compact disks. Pen drives, common faults with hard disk drive and floppy disk drive
  - h) Input – Output Devices
    - Keyboards, Mouse, keyboards faults, Common faults with mouse
    - Display system, Principle of operation of computer monitor, Difference between TV and Computer Monitor, Video adapters, Audio, Printers, Modems
    - Serial and parallel ports- IEEE 1284, RS 232- C
  - i) Introduction to Scanner, digitizer
  - j) General information about computer viruses and anti viruses.
3. Interfacing Components and Techniques (8 hrs)
- a) Interface systems and standards
  - b) Programmable Peripheral Interface (PPI) chips – 8255 and 8155
  - c) Their pin diagrams and programming
4. Local Area Networking (10 hrs)  
Networking technologies, standards, cabling, configuration, IEEE standards for LANs Brief Introduction and working of following – HUBs, Routers, Bridges, Switches LANs, WANs
5. Concept of Internet (6 hrs)
- a) Internet protocols, HTTP
  - b) Simple Network Management Protocol (SNMP)
  - c) Domain Name Systems (DNS)
  - d) Security
  - e) Electronic Mail
  - f) World Wide Web
  - g) Concept of ATM networks

### LIST OF PRACTICALS

1. Familiarization of complete PC hardware
2. Operation, Maintenance, Installation and Testing of the following devices:
  - a) Key Board
  - b) Mouse
  - c) Monitors
  - d) FDD
  - e) HDD

- f) DOT Matrix Printers
  - g) Laser Printers
  - h) CD – ROM
  - i) Mother Board
  - j) CD- Writer
  - k) DVD Drive
3. Connectors and Cables
  4. Familiarization of the serial and parallel ports and other peripherals of a PC
  5. Interconnections of the various peripherals and energizing the PC
  6. Installation of various software on a PC.
  7. Familiarization of standard anti-virus such as Norton, Dr. Solomon, McAfee etc, their installation and application for removal of viruses
  8. Faultfinding and trouble shooting of PC and its peripherals.
  9. Experimental setup for a LAN in a laboratory.

### INSTRUCTIONAL STRATEGY

This being a highly practice oriented course, students must be provided with ample opportunity to work on personal computers and practice on all the concepts and procedures learnt in the class

### RECOMMENDED BOOKS

1. Hardware Bible ; Winn. L. Rosch, Techmedia
2. The complete PC upgrade and maintenance guide, Mark Minasi, BPB Publications
3. Computer Networks, A. Tanenbaum, PHI Ltd., New Delhi
4. PC organization by S. Chaudhary, Dhanpat Rai & Sons Ltd., Delhi
5. PC organization by S. Chaudhary, Dhanpat Rai & Sons Ltd., Delhi

### SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr. No.	Topic	Time Allotted (hrs)	Marks Allocation
1.	Introduction	8	15
2.	Hardware Components	20	40
3.	Interfacing Components and Techniques	8	20
4.	Local Area Network	6	15
5.	Concept of Internet	6	10
<b>Total</b>		<b>48</b>	<b>100</b>

## 5.5(b) DIGITAL AND DATA COMMUNICATION

L T P  
3 - 2

### RATIONALE

This course deals with the advanced digital and data communication techniques. 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. The students should understand the advantages and limitations of various analog and digital modulation systems on a comparative scale and relate to them while studying practical communication systems.

### DETAILED CONTENTS

- |    |  |          |
|----|--|----------|
| 1. | Introduction   | (04 hrs) |
|    | Basic block diagram of digital and data communication systems, Their comparison with analog communication system. Synchronous and Asynchronous communication system.   |          |
| 2. | Digital Communication  | (12 hrs) |
|    | Basic scheme of PCM system sampling theorem, quantization error companding, block diagram of TDM-PCM communication system and function of each block Advantages of PCM system, concept of differential PCM (DPCM) system   |          |
| 3. | Data Communication Hardware  | (12 hrs) |
|    | UART, USART, their need in communication. 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 methods, Modem interfacing (RS 232 interface other interfaces) |          |
| 4. | Network and Control Considerations   | (20 hrs) |
|    | Protocols and their functions<br>Data communication network organization. Basic idea of various modes of digital switching Circuit switching, message switching, packet switching.   |          |
|    | a) Basic concept of integrated services.   |          |
|    | b) Digital Network (ISDN) its need in modern communication, brief idea of ISDN interfaces  |          |
|    | c) Basic idea of local area Network (LAN), and its various topologies, LAN interconnection, Ethernet   |          |
|    | d) Introduction to EPABX   |          |



**LIST OF PRACTICALS**

1. Observe wave forms at pulse code modulation and demodulation
2. Practicals on USART.
3. Practicals on RS232.
4. To study the different cables- cross cable, straight cable etc.
5. To study the working of a LAN system.

NOTE:

**Visits to the sites of all types of telephone exchanges including mobile and rural exchanges 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.**

**RECOMMENDED BOOKS**

1. Mobile and Wireless Communication by W.Stalling, Pearson Publishers
2. Electronics Communication System by KS Jamwal, Dhanpat Rai & Co., New Delhi
3. Computer Network by Tenenbaun Andrews, Prentice Hall of India, New Delhi
4. Data Communication and Networking by Foronzan TMH, New Delhi

**SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER**

<b>Topic No.</b>	<b>Topic</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allocation</b>
1.	Introduction	04	10
2.	Digital Communication	12	25
3.	Data Communication Hardware	12	25
4.	Network and Control Considerations	20	40
<b>Total</b>		<b>48</b>	<b>100</b>

## 5.5 Elective-II

### 5.5(c) SATELLITE COMMUNICATION

L T P  
3 - 2

#### RATIONALE

The objective of teaching this subject to the students to give an in-depth knowledge of various aspects of satellite communication such as its evolution, applications in communication and other fields.

#### DETAILED CONTENTS

1. Introduction (4hrs)
  - Evolution of satellite communication
  - Basic satellite system – space segment, ground segment, design considerations.
  - Geo-stationary satellites – Geometric considerations solar eclipses and solar interference launching of geo stationary satellite
  
2. Frequency and Propagation Considerations (8hrs)
  - Equitable use of radio spectrum
  - Propagation considerations – Tropospheric effects, Ionospheric effects, Mobile communication channel.
  - Antennas- basic characteristics
  - Noise considerations – Antenna noise Frequency dependant Attenuation system noise, interference.
  
3. Communication Satellites. (6hrs)
  - Design considerations – communication, environmental
  - Lifetime and reliability
  - Satellite communication subsystem – payload, Antenna, Bus, Attitude and Control System techniques, propulsion system, Telemetry, Tracking and command, Power subsystem.
  - Satellite link analysis – uplink, downlink, Direct Home TV Broadcasting Up-Down link analysis, satellite cross-links.
  
4. Satellite Transponder (6hrs)
  - Transponder Model
  - Satellite Front end – Noise, filters and wave forming
  - Satellite signal processing – RF-IF-RF Translation, IF Demodulation,

- Demodulation-modulation conversion
  - Transponder limitations
5. Earth Stations (8 hrs)
- International Regulations and Technical constraints
  - General configuration- Antenna System, Feed System, Tracking System, Low-noise amplifier, High-power amplifier.
  - Fixed satellite service earth station
    - a. Large earth stations- FM/FDM telephony and television, single channel per carries (SCPC), TDMA/DSI
    - b. Very small aperture terminal (VSAT)
  - Mobile satellite service earth stations – large mobile earth station, small mobile earth station.
  - Satellite television Receivers.

**NOTE :**

**There will be no practical as such we can use the time given for practicals for visits.**

**Visit to the sites of Earth Station should be made with a view to understand their working. A comprehensive report must be prepared by all the student on these visits, especially indicating the dates and locations of their visits.**

**RECOMMENDED BOOKS**

1. Satellite Communications Systems- Design Principles, By M. Richharia, Publisher Macmillan New Electronics.
2. Satellite Communication, By Reobert M. Gagliardi, Publishers, CBS Publishers and Distributors, New Delhi.
3. Digital Communication by Satellite By IT Spilker, Prentice Hall Inc Publishers, New Jersey.

**SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER**

Topic No.	Topic	Time Allotted (Hrs)	Marks Allocation
1.	Introduction	8	15
2.	Frequency and Propagation Considerations	10	20
3.	Communication satellites	8	15
4.	Satellite Transponder	10	20
5.	Earth Station	12	30
<b>Total</b>		<b>48</b>	<b>100</b>

## 5.6 MICROPROCESSORS AND APPLICATIONS

L T P  
4 - 3

### RATIONALE

The study of microprocessor in terms of architecture, software, and interfacing techniques lead to the understanding of working of CPU in a computer. Also study of peripherals like PPT, PIT, PIC etc. enables understanding and designing of small process control systems.

### DETAILED CONTENTS

1. Introduction (04 hrs)  
Microprocessors – Evolution, Importance and Applications
2. Architecture of a Microprocessor – 8085 (16 hrs)
  - a) Concept of bus and bus organisation
  - b) Functional block diagram and function of each block
  - c) Pin details of 8085 and related signals
  - d) Demultiplexing of address/data bus and memory/IO read/write control signals
  - e) Memory mapping and extention
3. Introduction Set for Intel 8085 (16 hrs)
  - a) Instruction and data format – opcode and operand and is word size
  - b) Instruction cycle, machine cycle, T-states, fetch cycle, and execute cycle
  - c) Different addressing modes
  - d) Status flags and their importance
  - e) Data transfer, arithmetic and logical operation, branding, and machine control instructions
  - f) Use of stacks and subroutines
  - g) Assembly language programming
4. Interfacing and Data Transfer Schemes (08 hrs)
  - a) Memory mapped I/O and I/O mapped I/O schemes

- b) Interrupts of 8085
- c) Programmable data transfer, DMA data transfer and interrupt driven data transfer schemes with their applications

5. Peripheral Devices (12 hrs)

Detailed study of the following

- a) 8255 PPI
- b) 8253 PIT/8284
- c) 8257 DMA Controllers/8237
- d) 8259 PIC
- e) 8279 Programmable KB/Display Interface
- f) 8251 Communication Interface Adapter
- g) 8155/8156

6. Introduction to 16-bit microprocessor 8086 (08 hrs)

- a) Internal Architecture of 8086
- b) Concept of memory segmentation and physical address generation
- c) Memory and data addressing
- d) Minimum and maximum mode of 8086

### 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 program on 8085 kit
3. Writing and execution of ALP for addition and subtraction of two 8 bit numbers
4. Writing and execution of ALP for multiplication and division of two 8 bit numbers
5. Writing and execution of ALP for arranging 10 numbers in ascending/descending order
6. Writing and execution of ALP 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. Interfacing exercise on 8253 programmable interval timer
9. Interfacing exercise on 8279 programmable KB/display interface like to display the hex code of key pressed on display
10. Study and use of interfacing 8 bit A/D card
11. Study and use of interfacing 8 bit D/A card
12. Use of 8085 emulator for hardware testing

**RECOMMENDED BOOKS**

1. Microprocessor Architecture, Programming and Applications with 8085 by RS Gaonkar
2. Microprocessor and Applications by B Ram
3. Comprehensive Study of Microprocessor by Naresh Grover
4. Introduction to Microprocessor by Adithya P Mathur, Tata McGraw Hill Publishers, New Delhi
5. Microprocessor by SK Goel
6. 8051 by Mcakenzie, Prentice Hall of India, New Delhi

**SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER**

<b>Topic No.</b>	<b>Topic</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allocation</b>
1.	Introduction	04	5
2.	Architecture of a Microprocessor-8085	16	25
3.	Introduction Set for Intel 8085	16	30
4.	Interfacing and Data Transfer Schemes	08	10
5.	Peripheral Devices	12	20
6.	Introduction to 16-bit microprocessor	08	10
<b>Total</b>		<b>64</b>	<b>100</b>

## **GENERIC SKILL DEVELOPMENT CAMP - I**

As per general feedback received from the employers regarding Technician Engineers during formal interactions, the pass outs of polytechnics are labeled of falling short of employable skills which comprises of Communication, inter-personal relationship, leadership qualities, team work, problem solving, managing task, managing self etc. in addition to technical knowledge and skills. We have, therefore, added papers such as English and Communication Skills and Entrepreneurship Development and Management in the curriculum in addition to proposed camps of 3-4 days to be conducted in polytechnics on common and vital issues e.g. Environmental Awareness, Entrepreneurship Development and Generic Skill Development.

It is proposed that a camp of 3-4 days duration on Generic Skills Development (GSD) during 5<sup>th</sup> semester be organized by arranging expert lectures/discussion sessions either by polytechnic teachers or by eminent educationists from the neighborhood to deal with the following topics. Few students may also be encouraged to prepare on some of these topics and make presentation during the camp. Expert lectures must be followed by distribution of relevant handouts for further study. The attendance of students should be compulsory and marks be awarded under provision of Student Centred Activities. **It is envisaged that such camps will bring in a significant improvement in confidence level and personality of the pass outs from polytechnics.**

Suggested list of topics for arranging lectures/discussion sessions:

1.     **Independent Study Technique**
  - 1.1     Information search, information extraction, storage and retrieval
  - 1.2     Reading skills
  - 1.3     Life long learning
  - 1.4     Continuing education
  
2.
  - 2.1     Introduction
  - 2.2     Time Management
  - 2.3     Stress and emotions
  - 2.4     Health and hygiene
  
3.     **Task Management**
  - 3.1     Task planning and organizing
  - 3.2     Task execution
  - 3.3     Task evaluation
  - 3.4     Event management
  
4.     **Action Research**
  - 4.1     Importance and Scope
  - 4.2     Steps in action research
  - 4.3     Analysis of data
  - 4.4     Conclusions and report writing

## 6.1 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.

### DETAILED CONTENTS

1. Introduction (14 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 (10 hrs)  
Fiber types construction, multimedia and monomode fibers, step index and graded index fibers, acceptance angle and acceptance types of optical fiber cables.
3. Losses in optical fiber cable: (10 hrs)
  - a) Absorption Losses, Scattering Losses, Radiation losses, Compelling losses, Bending loses.
  - b) Dispersion, Material dispersion, wave guide dispersion, modal dispersion total dispersion and bit rate.
4. Light Sources and Detectors (12 hrs)
  - a) Characteristics of light source used in optical communication, principle of operation of LED, different type of LED structures used and their brief description, LED driving circuitry, Injection Laser diode, principle of operation, different injection laser diodes, comparison of LED and ILD, non semiconductor laser.



b) Characteristics of photo detectors used in optical communication; PIN diode and avalanche photo diode (APD), their brief description.

5. Connectors, Splicing and coupling (06 hrs)

Fiber alignment and joint losses, splicing, types of splices, types of connectors used, couplers, three and four port coupler, star coupler, fiber optic switch.

6. Optical Fiber System (12 hrs)

Optical transmitter circuit, optical receiver circuit, optical power budgeting, multiplexing methods used. Modulation methods used.

### **LIST OF PRACTICALS**

1. Setting up of fiber analog link
2. Setting up to optic digital link
3. Measurement of various 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 observe the radiation pattern of LED
9. To Connectorise a fiber with connector at both ends
10. Introduction to various components and tools used in optical fiber communication

### **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 Systems by GP Agrawal, John Wiley & Sons, New Delhi
6. Optical fiber Communication and its Applications by S C Gupta, Prentice Hall of India, New Delhi

### SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

<b>Topic No.</b>	<b>Topic</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allocation</b>
1.	Introduction	14	25
2.	Optical Fibers and Cables	10	10
3.	Losses in optical fiber cable	10	15
4.	Light sources and Detectors	12	20
5.	Connectors, Splicing and coupling	06	10
6.	Optical Fiber System	12	20
<b>Total</b>		<b>64</b>	<b>100</b>

## 6.2 MOBILE COMMUNICATION

L T P  
4 - 3

### RATIONALE

The Wireless /mobile communication is spreading at a very fast rate . It is expected that with in short perod nearly every body is using mobile communication .Hence students should know the functioning of wireless /mobile system/ equipemnt to keep themselves abreast of this latest application of communication.

### DETAILED CONTENTS

1. Wireless communication (20 hrs)
  - 1.1 Basics
  - 1.2 Advantages Of wireless communication
  - 1.3 Electromagnetic Waves
  - 1.4 Frequency Spectrum used
  - 1.5 Propagation considerations
    - 1.5.1 Range
    - 1.5.2 Atmospheric Effect
    - 1.5.3 Geographic Effect
    - 1.5.4 Fading
    - 1.5.5 Doppler Effect
2. Mobile communication (12 hrs)
  - 2..1 Evolution of Mobile Radio Communication
  - 2..2 Mobile Radio System around the world
  - 2.3 Examples of wireless communication system
    - 2.3.1 Paging system
    - 2.3.2 Cordless Telephone System
    - 2.3.3 Cellular telephone system

- 2.4 Comparison of Communication wireless communication system.
- 3. Cellular Concept: (12 hrs)
  - 3.1 Cell area
  - 3.2 Capacity of cell
  - 3.3 Frequency Response
  - 3.4 Co-channel Interference
  - 3.5 Adjacent channel Interference
  - 3.6 Power Control for reducing Interference
  - 3.7 Improving coverage and capacity in cellular system
    - 3.7.1 Cell Splitting
    - 3.7.2 Sectoring
    - 3.7.3 Repeater for Range extension
- 4. Multiple Access Techniques for wireless Communication (12 hrs)
  - 4.1 Introduction to Multiple Access
  - 4.2 Frequency Division Multiple Access(FDMA)
  - 4.3 Time Division multiple Access(TDMA)
  - 4.4 Code Division Multiple Access(CDMA)
  - 4.5 Spread Spectrum Multiple Access(SSMA)
  - 4.6 Channel loading
  - 4.7 Channel allocation Schemes
- 5. Mobile Communication Systems – Introduction of: (8 hrs)
  - 5.1 Advance Mobile Phone Systems(AMPS)

- 5.2 Operation of AMPS
- 5.3 Working of AMPS Phone System
- 5.4 Global Systems for Mobile Communication(GSM)
- 5.5 GPRS, GPS, Elable positioning systems

**RECOMMENDED BOOKS**

1. Wireless Communications (Priciples and Practice), by Theodore S.Rappaport.
2. Introdoction to Wireless and Mobile Systems, by Dharma Prakash Agarwal, Qing-An zeng.
3. Wireless Communications and Networking, by William Stallings.
4. Mobile and Personal Communication Systems and Services, by Raj Pandya,Prentice Hall of India, New Delhi

**SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER**

<b>Topic No.</b>	<b>Topic</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allocation</b>
1.	Wireless Communication	20	25
2.	Mobile communication	12	20
3.	Cellular concept	12	20
4.	Multiple Access Techniques For Wireless Communication	12	20
5.	Mobile Communication Systems	8	15
<b>Total</b>		<b>64</b>	<b>100</b>

## 6.3 MICRO CONTROLLERS AND PLCs

L T P  
4 - 3

### RATIONALE

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.

Micro-controllers have assumed a great significance in the electronic and consumer goods industry and are a very vital field..

### DETAILED CONTENTS

1. Microcontroller series (MCS) – 51 Overview (10 hrs)
  - Pin details
  - I/O Port structure
  - Memory Organization
  - Special Function Registers (SFRS)
  - External Memory
2. Instruction Set; Addressing Modes, Instruction types (8 hrs)
  - Timer operation
  - Serial Port operation
  - Interrupts
3. Assembly language programming (08 hrs)
  - Assembler directives
  - Assembler operation
4. Design and Interface (08 hrs)

Eamples like keypad interface, 7- segment interface etc
5. Introduction to PLCs (10 hrs)
  - Architectural details – Processor
  - Memory structure, I/O Structure
  - Programming terminal, Power Supply

- |    |   |          |
|----|---|----------|
| 6. | Working of PLC<br>Basic principle, response time, effects of response time, relay replacing, Basic instructions, PLC registers and program scan | (08 hrs) |
| 7. | Instruction Set<br>Latching, counter, timers one shot, shift register, math, Boolean instructions   | (04 hrs) |
| 8. | Ladder diagram programming  | (04 hrs) |
| 9. | Applications of PLCs in industry with case studies from electronics industry  | (04 hrs) |

## **LIST OF PRACTICALS**

### **Micro Controllers**

1. Familiarization with a study of Architecture of 8085 kit, basic sub systems and input output connectors, functions keys on micro controllers kit
2. Familiarization of Micro Controllers (8051) kit
3. Assembly Language Programming
4. Familiarization of Micro controller (8051) based kit
5. Testing of general input/output on Micro controller board
6. Development of Electrical , Instrumentation applications using 8051 micro-controller
7. Study of interfacing ADC, Infra red Sensor, RS 232, DAC with 8051.

### **PLCs**

1. Components/sub-components of a PLC, Learning functions of different modules of a PLC system
2. Practical steps in programming a PLC (a) using a Hand held programmer (b) using computer interface
3. Introduction to step 5 programming language, ladder diagram concepts, instruction list syntax
4. Basic logic operations, AND, OR, NOT functions
5. Logic control operations using latching properties e.g. in activating a cylinder
6. Logic control systems with time response as applied to clamping operation
7. Sequence control system e.g. in lifting a device for packaging and counting
8. Use of PLC for various mechanical outputs viz motion of a piston in a single cylinder multiple cylinders, driving machine operation etc.

- Use of PLC for an application( teacher may decide)

### RECOMMENDED BOOKS

- The 8051 Micro controller by Scot Mackenzie, Prentice Hall International, London
- Process Control Instrumentation Technology by Johnson, Curtis; EEE Edition, Prentice Hall of India, New Delhi
- Programmable Logic Controller by Job Dan Otter; P. H. International, Inc, USA
- Programmable Logic Controllers by Thomas E.Kissel
- Design with Micro Controller by C Nagara, Murthy, S Ramgopal, Joshi B Peatman; McGraw Hill, 1988
- The 8051 Micro controller Architecture Programming and Applications, Second Edition by Kenneth J; Ayala Penram International Publishing (India) 1996
- Micro controller by Mazidi
- Festo Didactic – Programmable Logic Controllers Basic Level – TP 301 – A Training Manual on PLCs
- Instrument Engineers Handbook Vol.II, by Liptak, P, Chittor Book Company
- Process control Instrumentation Technology by Johnson, Curtis; EEE Edition, Prentice Hall of India
- Programmable Logic Controller by Job Dan Otter; P.H. International Inc, USA
- Humphries and Lesly P Sheets, FourthEdition by James T: Demar Publisher Inc by Mazidi

### SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Topic No.	Topic	Time Allotted (Hrs)	Marks Allocation
1.	Microcontroller series (MCS) – 51 Overview	10	20
2.	Instruction Set; Addressing Modes, Instruction types	8	10
3.	Assembly language programming	8	10
4.	Design and Interface	8	10
5.	Introduction to PLCs	10	15
6.	Working of PLC	8	10
7.	Instruction Set	4	8
8.	Ladder diagram programming	4	7
9.	Applications of PLCs	4	5
<b>Total</b>		<b>64</b>	<b>100</b>



## 6.4 Elective –II

### 6.4 (a) MEDICAL ELECTRONICS

L T P  
3 - 2

#### RATIONALE

Electronics is being used in medical science. A large number of electronic equipments 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. There is requirement of exposure of the medical equipment. Accordingly field visits may be arranged.

#### DETAILED CONTENTS

1. Anatomy and physiology (8 hrs)
  - Elementary ideas of cell structure
  - Heart and circulatory system.
  - Central nervous system
  - Muscle action
  - Respiratory system
  - Body temperature and reproduction system
  
2. Overview of Medical Electronics Equipments, classification, application and specifications of diagnostic, therapeutic and clinical laboratory equipment, method of operation of these instruments (06 hrs)
  
3. Electrodes (04 hrs)

Bioelectric signals, Bio electrodes, Electrode, Electrode tissue interface, contact impedance, Types of Electrodes, Electrodes used for ECG , EEG
  
4. Transducers (06 hrs)

Typical signals from physiological parameters, pressure transducer, flow transducer, temperature transducer, pulse sensor, respiration sensor,
  
5. Bio Medical Recorders (6 hrs)

Block diagram description and application of following instruments

  - ECG Machine
  - EEG Machine
  - EMG Machine

6. Patient Monitoring Systems (6 hrs)
- Heart rate measurement
  - Pulse rate measurement
  - Respiration rate measurement
  - Blood pressure measurement
  - Principle of defibrillator and pace mark
  - Use of Microprocessor in patient monitoring.
7. Safety Aspects of Medical Instruments (04 hrs)
- Gross current shock
  - Micro current shock
  - -Special design from safety consideration
  - Safety standards.
8. X-rays Machines (08 hrs)
- 8.1 Types of X-rays Machines
- 1) General purpose X-Rays machines
  - 2) Dental X-Ray machine
  - 3) Mobile X-Ray units
  - 4) Patient tables
- 8.2 Safety Aspects of X-rays Machines
- 1) Correct operation of controls
  - 2) Relations between KV and mA
  - 3) Exposure tables
  - 4) Precautions in the use of X-rays machines
  - 5) Test exposures
- 8.3 Operator Safety Aspects
- 1) Biological effects of X-rays
  - 2) Personnel radiation monitoring
  - 3) Film badges

**Note :**

Since the equipment for medical electronics is quite costly, it will be appropriate to take the students to nearby health centers, hospital(s)/ clinical laboratory(ies) for exposure and observation of the following:

**LIST OF PRACTICALS**

**Anatomy and Physiology**

1. Measurement of skins contact impedance and techniques to reduce it.
2. Determine the contact impedance of following electrodes ECG, EEG and EMG Machines.
3. Observe the wave shapes on CRO the output of these transducers. Study of physiological transducers including pressure transducers, temperature transducers and pulse sensors.
4. ECG machines frequency response, input impedance and CMMR Measurement.
5.
  - (a) Concept of ECG lead system and placement of electrodes
  - (b) Taking EEG of a subject
  - (c) Observation of ratification ECG recording
6. Use of oscilloscope as cardioscope with and without memory.
7. Measurement of heart rate with ECG machine cardioscope and heart rate meter.
8. Direct blood pressure measurement and transducers calibration and testing (under stimulated conditions).
9. Measurement of leakage currents with the help of safety tester.
10. Testing of defibrillator with the help of defibrillator analysis

### **X-ray Equipment**

1. Operation and function of all the controls of Hospital based X-rays machines
2. Operation and functions of all the controls of dental X-rays machines.
3. Operation and functions of all the controls of mobile X-ray units.
4. Identification of different blocks/sub-systems of circuits in X-ray machines.
5. Measurement of EHT in X-ray machines.
6. Film processing (expose and develop the X-ray film)

### **RECOMMENDED BOOKS**

1. Handbook of biomedical Instrumentation by RS Khandpur
2. Biomedical Instrumentation by Cromwell,
3. Modern Electronics Equipment by RS Khandpur, TMMH, New Delhi
4. Introduction to BioMedical Electronics by Edward J. Perkstein; Howard Bj, USA

### SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE SETTER

<b>Topic No.</b>	<b>Topic</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allocation</b>
1.	Anatomy and physiology	8	20
2.	Overview of Medical Electronics Equipments	6	10
3.	Electrodes	4	5
4.	Transducers	6	15
5.	Bio Medical Recorders	6	10
6.	Patient Monitoring Systems	6	15
7.	Safety Aspects of Medical Instruments	4	5
8.	X-Ray Machines	8	20
<b>Total</b>		<b>48</b>	<b>100</b>

## 6.4 Elective –II

### 6.4(b) COMPUTER NETWORKS

L T P  
3 - 2

#### RATIONALE

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

#### DETAILED CONTENTS

1. Networks Basics ( 6 hrs)
  - What is network
  - Models of network computing
  - Networking models
  - LAN, MAN and WAN
  - Network Services
  - Topologies
  
2. OSI Model ( 9 hrs)
  - Standards
  - OSI Reference Model
  - OSI Physical layer concepts
  - OSI Datalink 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 ( 4 hrs)
  - Concept of physical and logical addressing
  - Different classes of IP addressing special IP address
  - Sub netting and super netting
  - Loop back concept
  - IP packet Format
  
4. Protocol Suites ( 4 hrs)
  - Models and Protocols
  - Network IPX/SPX
  - Intranet Protocols
  - Apple Talk
  - Digital Network Architecture

5. Network Architecture (4 hrs)
  - ARC net specifications
  - Ethernet Specification
  - Token Ring Specifications
  
6. Network Connectivity (4 hrs)
  - Network connectivity Devices
  - NICs
  - Hubs
  - Repeaters
  - Multiplexers
  - Modes
  - Routers
  
7. Network Printing (2 hrs)
  - Print Services
  
8. Network Administration / Security (7 hrs)
  - Server Chief Technology
  - Server Management
  - Raid management and mirroring
  - Hauffman codes
  - Cryptography
  
9. Network Trouble Shooting Techniques (4 hrs)
  - Trouble Shooting process
  - Trouble Shooting Tools
  
10. Wireless Networking (4 hrs)
  - Basics of wireless LAN and blue tooth technology
  - Installation of server MS 2003 ser/Linux

## **LIST OF PRACTICALS**

1. Recognize the physical topology of a network.
2. Identify the IP address of a workstation and the class of the address.
3. Install Net Ware Client 32 software.
4. Use NetWare Administrator to Add a user object.
5. Use User Manager for Domains to create, delete and rename a user in Windows NT.
6. Create, Edit and Delete a Linux user account.
7. Use the Console. One utility to create a group in NetWare.
8. Subnet a Class C IP address.
9. Use of Netstat and its switches.
10. Configure an IP address on a workstation.
11. Install and configure a network interface card in a workstation.

12. Create a user login script in a NetWare network.
13. Edit a windows login script in a windows NT workstation.
14. Map a Network drive in a NetWare network.
15. Add and change security rights in a Window NT network.
16. Add and change security rights in a NetWare network.
17. Implement a full backup with the Sbackup utility.
18. Use the Monitor Utility in a NetWare 5 network to analyze network performance.
19. Analyze NetWare volume statistics.
20. Troubleshooting connectivity issues on a Multiplatform network.
21. Editing file system rights in a **Linux** environment.
22. CAT 5, CAT6, Basic idea of thin
  - a) Interfacing with the network (Ethernet)
  - b) Preparing of network cables including hubs, connectors etc.
  - c) Establishment of LAN network for homogeneous systems
  - d) Establishment of LAN network for heterogeneous systems
  - e) Use of protocols and gateways in establishing LAN
  - f) Writing small programs such as file security, file transfer, remote testing
  - g) Trouble shooting of networks
  - h) Writing login scripts

#### **Support Equipment:**

- Serial mouse
- 3.5" floppy drive
- A network Interface card
- Network connection with Internet connectivity
- A tape backup device attached to and configured on the NetWare5 server
- Access to a DNS server
- Three 3.5" floppy disks
- An external modem with cables

#### **Required Software**

- Windows95
- Windows NT server
- NetWare5 server
- Linux OS
- S/W drivers for NIC and modem.

#### **Required Tools and Supplies**

- Anti-static wrist wrap
- Anti-static mat
- Screwdriver kit

## RECOMMENDED BOOKS

1. Computer Networks Tanenbaum Prentice Hall of India , New Delhi
2. Local Area Networks by Peter Hudson
3. Understanding Local Area Network by Neil Jenkins
4. Area Networks by Stan Schatt, Prentice Hall
5. Network+ Lab manual,- BPB Publications -by Tami Evanson
6. Networking Essentials – BPB Publications
7. Computer Network and communications By V.K. Jain and Narija Bajaj, Cyber Tech Publications, New Delhi.
8. Data Communications and Networking by Foronzan, TMH, New Delhi
9. Linux – The complete Reference by Richard Peterson, Tata McGraw Hill, New Delhi.
10. Linux – Install and Configuration Black Book by Dee Annleblanc and Issac Yates, IDG Books India Private Limited, Delhi.
11. Unleashed Linux by TechMedia Publishers

## SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE SETTER

Topic No.	Topic	Time Allotted (Hrs)	Marks Allocation
1.	Networks Basics	06	15
2.	OSI Model	09	20
3.	Introduction to TCP/IP	04	8
4.	Prototcol suites	04	7
5.	Network Application	04	8
6.	Network connectivity	04	7
7.	Network Printing	02	5
8.	Network Administration /Security	07	15
9.	Network Troubleshooting Techniques	04	8
10.	Wireless Networking	04	7
<b>Total</b>		<b>48</b>	<b>100</b>



## 6.4 Elective –II

### 6.4(c) ADVANCED MICROPROCESSORS

L T P  
3 - 2

#### RATIONALE

The complex systems require high through put that at times is not met with 8-bit microprocessor system. So, 16 bit up based system become suitable. They provide better facilities to personal computers and other automatic process control systems. Micro controller based system design provides facilities for economical & less complicated small process control system.

#### DETAILED CONTENTS

1. The 8086 Microprocessor (08 hrs)
  - Internal Architecture of 8086.
  - Concept of memory segmentation & physical address generation.
  - Memory and data addressing mode
  - Minimum and Maximum mode of 8086.
  
2. System Design using 8086 (10 hrs)
  - Pins and Signals.
  - CLK circuitry
  - 8086 Address and Data bus Concept
  - Memory and I/o Interface block diagram
  - Math coprocessor 8087
  
3. Programming of 8086 (10 hrs)
  - Instruction Format
  - Data transfer, Arithmetic, Bit & Logical manipulation, String, Program transfer and processor control instructions.
  - Programming using manual assembly on exercises like
    - (i) Addition & Subtraction of two 16 bit numbers.
    - (ii) Multiplication's & Division of two numbers
    - (iii) Moving a block of data (intra and inter segment)
    - (iv) To arrange a block of data in ascending/descending order.
  - Use of assembler and assembler directives.

4. 8086 Interrupt System (6 hrs)

Concept

- Interrupt Vector table and Interrupt type code.
- Types of interrupts and interrupt priority.
- Predefined Interrupts (0 to 4).
- User defined software/hardware interrupts.

5. Application of Microprocessors- (10 hrs)

Use of microprocessor (with block diagram, main devices used and operation) for applications like-

- (i) A microprocessor based weighing scale
- (ii) Temperature measurement and control system
- (iii) Data Acquisition system.
- (iv) Speed control of DC motor.

6. Introduction to 32 bit Microprocessors (04 hrs)

Main features of 80386, 80486, Pentium microprocessor.

### LIST OF PRACTICALS

1. Familiarization of different keys of 8086-microprocessor kit and its memory map.
2. Steps to enter, check /modify data or program and to execute a program on 8086 microprocessor kit.
3. Writing and execution of ALP on 8086 for addition/subtraction of two 16 bit numbers (signed & unsigned).
4. Writing and execution of ALP on 8086 kit for Multiplication/Division of two signed/unsigned numbers.
5. Writing and execution of ALP on 8086 kit for arranging a block of data in ascending/descending order.
6. Writing and execution of ALP on 8086 kit to generate nos of series like 1,1,2,3,5,8,13,21-----.
7. Writing and execution of ALP for stepper motor control using stepper motor interfacing card.
8. Study and use of Logic controller Interface card.
9. Study and use of opto coupler interface card.

10. Exercise on micro controller kit 8051.
11. Use of 8086 emulator for hardware testing.

### RECOMMENDED BOOKS

1. Microprocessor and Application by D.V. Hall.
2. 8051 Micro Controller.
3. Microprocessor 8086/88 by B.B. Brey
4. Microprocessors & Micro controllers by Dr. B.P. Singh
5. Microprocessor by Rajiv Sapra, Ishan Publications, Ambala
6. Microprocessor by Naresh Grover
7. Microprocessors and Microcomputers and their Applications by AK Mukhopadhyay
8. Microprocessors and Applications by Uffenback
9. Introduction to Microprocessor by Adithya Mathur, Tata McGraw Hill Publishing Co, New Delhi
10. Microprocessor Architecture, Programming and Applications with 8085 by RS Gaonkar, Wiley Eastern Ltd, New Delhi
11. Microprocessor and Applications by B Ram
12. Microprocessor by SK Goel
13. 8051 by McaKenzie, Prentice Hall of India, New Delhi

### SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE SETTER

Topic No.	Topic	Time Allotted (Hrs)	Marks Allocation
1.	Then 8086 Microprocessor	08	15
2.	System Design using 8086	10	20
3.	Programming of 8086	10	20
4.	8086 Interrupt System	06	15
5.	Application of microprocessors	10	20
6.	Introduction to 32 bit Microprocessor	04	10
<b>Total</b>		<b>48</b>	<b>100</b>

## 6.5 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

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### RATIONALE

Entrepreneurship Development and Management is one of the core competencies of technical human resource. Creating awareness regarding entrepreneurial traits, entrepreneurial support system, opportunity identification, project report preparation and understanding of legal and managerial aspects can be helpful in motivating technical/ vocational stream students to start their own small scale business/enterprise. Since diploma technicians are expected to take-up middle level managerial positions, their exposure to basic management principles is very essential. Based on the broad competencies listed above, following detailed contents have been finalized to develop the appropriate competencies.

### DETAILED CONTENTS

- |     |  |          |
|-----|--|----------|
| (1) | Entrepreneurship   | (10 hrs) |
| 1.1 | Concept/Meaning and its need   |          |
| 1.2 | Competencies/qualities of an entrepreneur  |          |
| 1.3 | Entrepreneurial Support System e.g., District Industry Centres (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institutes (SISIs), Small Industries Development Bank of India (SIDBI), National Bank for Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State and national level |          |
| (2) | Market Survey and Opportunity Identification (Business Planning)   | (10 hrs) |
| 2.1 | How to start a small scale industry  |          |
| 2.2 | Procedures for registration of small scale industry  |          |
| 2.3 | List of items reserved for exclusive manufacture in small scale industry   |          |
| 2.4 | Assessment of demand and supply in potential areas of growth   |          |
| 2.5 | Understanding business opportunity   |          |
| 2.6 | Considerations in product selection  |          |
| 2.7 | Data collection for setting up small ventures  |          |
| (3) | Project Report Preparation   | (08 hrs) |
| 3.1 | Preliminary Project Report   |          |
| 3.2 | Techno-Economic feasibility report   |          |
| 3.3 | Project Viability Report   |          |

- (4) Managerial Aspects of Small Business (10 hrs)
- 4.1 Principles of Management, Definitions, functions of management viz planning, organization, coordination and control
  - 4.2 Structure of an industrial organization.
  - 4.3 Basic principles of financial management
  - 4.4 Marketing Techniques
  - 4.5 Personnel Management, staff development and training strategies
  - 4.6 Importance and techniques of communication in business
- (5) Legal Aspects of Small Business (10 hrs)
- 5.1 Elementary knowledge of Income Tax, Sales Tax, Patent Rules, Excise Rules, provident fund
  - 5.2 Elementary knowledge of Factory Act, 1948 and Payment of Wages Act 1936, Workmen Compensation Act, Industrial Dispute act 1947, Employees State Insurance Act 1978
- (6) Environmental Considerations (04 hrs)
- 6.1 Concept of ecology and environment
  - 6.2 Factors contributing to Air, Water, Noise pollution
  - 6.3 Air, water and noise pollution standards and control
  - 6.4 Norms and standards of State pollution Board
  - 6.5 Disaster Management – basic idea
- (7) Miscellaneous (12 hrs)
- 7.1 Human resource development in an organization
  - 7.2 Motivation – Incentives, Rewards, Job Satisfaction
  - 7.3 Leadership- types, qualities, functions and factors of effective leadership
  - 7.4 Labor Welfare schemes including wage payment- types, system of wage payment and incentives
  - 7.5 Workers participation in management, case studies in effective Management.
  - 7.6 Accident and Safety: Classification, precaution and treatment after accident, safety practices promotion, personal protection equipment (PPFs) for safety at work places.
  - 7.7 Introduction to Total Quality Management (TQM) and steps to achieve this.
  - 7.8 Intellectual Property Rights (IPR): Concept, definition, infringements and remedies related to patents, copy rights, trademarks, designs. Introduction to registering procedure

## INSTRUCTIONAL STRATEGY

The aim of this subject is to develop conceptual understanding by giving inputs and exposure about 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.

## RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
3. Environmental Engineering and Management by Suresh K Dhamija, SK Kataria and Sons, New Delhi
4. Environmental and Pollution Awareness by Sharma BR, Satya Prakashan , New Delhi
5. Thakur Kailash, Environmental Protection Law and policy in India: Deep and Deep Publications, New Delhi
6. Handbook of Small Scale Industry by PM Bhandari
7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
8. Industrial management by N. Mohan, and AP Verma, SK Kataria and Sons, Nai Sarak, Delhi-110006
9. Total Quality Management by Dr DD Sharma, Sultan Chand and Sons, New Delhi.
10. Principles of Management by Philip Kotler TEE Publication
11. Intellectual Property Rights and the Law by Dr. GB Reddy.

## SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr. No.	Topic	Time Allotted (hrs)	Marks Allocation
1.	Entrepreneurship	10	10
2.	Market Survey and Opportunity Identification (Business Planning)	10	20
3.	Project Report Preparation	08	10
4.	Managerial Aspects of Small Business	10	15
5.	Legal Aspects of Small Business	10	15
6.	Environmental Considerations	04	10
7.	Miscellaneous	2	20
Total		<b>64</b>	<b>100</b>

## 6.6. MAJOR 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 with a view to:

- i) 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.
- ii) Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.
- iii) 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.
- iv) Develop abilities like interpersonal skills, communication skills, positive attitudes and values etc.

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 based circuits/ instruments.

**Some of the projects based on above areas are listed below for the benefit of students:**

1. Microprocessor based rolling display/bell and calendar
2. Microprocessor based stepper motor control.
3. Speed control of DC Machines by Microprocessors.
4. Temperature monitoring using microprocessor based systems.
5. Microprocessor based liquid level indicator and control/solar tracking system
6. Fabrication and assembling of digital clock.
7. Design and fabrication of timing circuits using 555 and counters.
8. Design and fabrication of amplifiers and oscillators circuits.
9. Fabrication of demonstration type Radio receiver
10. Fabrication of PCB circuits using ORCAD/ Fagu /Proteus Software.
11. Fabrication of ON line/OFF line UPS of different ratings and inverters
12. Design, fabrication and testing of different types of experimental boards as per the curriculum of Electronics and Communication Engineering.
13. Repair of X-Ray Machines, ECG, EEG, EMG, Calorimeter and Centrifuge etc.
14. Repair and fault location of telephone exchanges and intercom system.
15. Repair of oscilloscope, function generator, Power supply
16. Design and developing web sites of organizations
17. Installation of computer network (LANS).
18. Microprocessor based solar tracking system
19. Car or home security system
20. Bank token display
21. Printer sharing unit
22. Caller Identification unit for phone
23. LCR-Q meter and frequency meter
24.  $\mu$ P-Based A/D converter
25.  $\mu$ P-Based D/A converter
26. Simulation of half wave and full wave rectifiers using ORCAD
27. Simulation of following circuits:  
Integrator, differentiator, adder, subtractor, V-I converter comparator etc. using OP-Amps.
28. Simulation of class A, Class B, Class AB and Class C amplifiers
29. Simulation of different wave forms like sine, square, triangular waves etc.
30. Fan control using Triac.
31. AD/DA interfacing with 8051/(Micro controller).
32. Study of various wave forms after ckt display on CRO



33. Auto/ Microprocessor based Traffic control.
34. Project based on new technologies.
35. Assembly of a colour TV

**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 criteria 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				
			Exce-llent	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
<b>Total marks</b>		<b>100</b>	<b>100</b>	<b>80</b>	<b>60</b>	<b>40</b>	<b>20</b>

**Important Notes:**

1. **This criteria must be followed by the internal and external examiners and they should see 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 100 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 teachers are free to evolve another 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. **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 industries are approached for instituting such awards.**

## **GENERIC SKILL DEVELOPMENT CAMP-II**

As per general feedback received from the employers regarding Technician Engineers during formal interactions, the pass outs of polytechnics are labeled of falling short of employable skills which comprises of Communication, inter-personal relationship, leadership qualities, team work, problem solving, managing task, managing self etc. in addition to technical knowledge and skills. We have, therefore, added papers such as English and Communication Skills and Entrepreneurship Development and Management in the curriculum in addition to proposed camps of 3-4 days to be conducted in polytechnics on common and vital issues e.g. Environmental Awareness, Entrepreneurship Development and Generic Skill Development.

It is proposed that a camp of 3-4 days duration on Generic Skills Development (GSD) during 6<sup>th</sup> semester be organized by arranging expert lectures/discussion sessions either by polytechnic teachers or by eminent educationists from the neighborhood to deal with the following topics. Few students may also be encouraged to prepare on some of these topics and make presentation during the camp. Expert lectures must be followed by distribution of relevant handouts for further study. The attendance of students should be compulsory and marks be awarded under provision of Student Centred Activities. **It is envisaged that such camps will bring in a significant improvement in confidence level and personality of the pass outs from polytechnics.**

Suggested list of topics for arranging lectures/discussion sessions:

1. **Ethics and Values**
  - 1.1 Introduction and importance
  - 1.2 Ethics and values in profession and society
  - 1.3 Dignity of labour
  - 1.4 Net etiquettes
  
2. **Group Dynamics**
  - 2.1 Introduction
  - 2.2 Leadership
  - 2.3 Communication in group
  - 2.4 Team work
  
3. **Personality Development**
  - 3.1 PR technique
  - 3.2 Positive attitude
  - 3.3 Self-esteem
  - 3.4 Creativity
  
4. **SWOT Analysis**
  - 4.1 Importance
  - 4.2 Introduction to SWOT analysis steps
  - 4.3 SWOT analysis parameters