

## SECOND SEMESTER (ELECTRONICS ENGINEERING)

Sr. No.	SUBJECTS	STUDY SCHEME			Credits	MARKS IN EVALUATION SCHEME									Total Marks of Internal & External
		Periods/Week				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT						
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot		
2.1	*Applied Mathematics - II	5	-	-	4	20	-	20	50	2 ½	-	-	50	70	
2.2	*Applied Physics -II	5	-	2	5	20	10	30	50	2 ½	20	3	70	100	
2.3	*Basics of Information Technology	-	-	6	2	-	40	40	-	-	60	3	60	100	
2.4	Electrical Engineering -I	4	-	4	5	20	30	50	50	2 ½	50	3	100	150	
2.5	Electronic Components and Devices	6	-	6	7	20	30	50	50	2 ½	50	3	100	150	
2.6	General Workshop Practice-II	-	-	8	2	-	40	40	-	-	60	4	60	100	
#Student Centred Activities (SCA)		-	-	2	1	-	30	30	-	-	-	-	-	30	
<b>Total</b>		20	-	<b>28</b>	26	80	<b>180</b>	<b>260</b>	<b>200</b>	-	<b>240</b>	-	<b>440</b>	<b>700</b>	

\* Common with other diploma programmes

# Student Centred Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

## 2.1 APPLIED MATHEMATICS - II

L T P  
5 - -

### RATIONALE

Basic elements of integral calculus, differential calculus, numerical methods, differential equations included in this course will play a vital role in understanding engineering problem mathematically. This will also develop analytical as well as conceptual abilities among students.

### LEARNING OUTCOMES

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

- Calculate simple integration by methods of integration
- Evaluate the area under curves, surface by using definite integrals.
- Calculate the area and volume under a curve along areas
- Solve the engineering problems with numerical methods.
- Understand the geometric shapes used in engineering problems by co-ordinate geometry.

### DETAILED CONTENTS

#### 1. Integral Calculus - I (20 Periods)

Methods of Indefinite Integration:-

- 1.1 Integration by substitution.
- 1.2 Integration by rational function.
- 1.3 Integration by partial fraction.
- 1.4 Integration by parts.
- 1.5 Integration of special function

#### 2. Integral Calculus – II (20 Periods)

- 2.1 Meaning and properties of definite integrals, Evaluation of definite integrals..
- 2.2 Application : Length of simple curves, Finding areas bounded by simple curves Volume of solids of revolution, centre of mean of plane areas.
- 2.3 Simposns 1/3rd and Simposns3/8th rule and Trapezoidal Rule : their application in simple cases. Numerical solutions of algebraic equations; Bisections method, Regula-Falsi method, Newton-Raphson's method(without proof), Numerical solutions of simultaneous equations; Gauss elimination method(without proof)

#### 3. Co-ordinate Geometry (2 Dimension) (18 Periods)

- 3.1 Circle  
Equation of circle in standard form. Centre - Radius form, Diameter form, Two intercept form.

4. Co-ordinate Geometry (3 Dimension) (12 Periods)

4.1 Straight lines and planes in space

Distance between two points in space, direction cosine and direction ratios,  
Finding equation of a straight line (without proof)

**INSTRUCTIONAL STRATEGY**

Basic elements of Differential Calculus, Integral Calculus and differential equations can be taught conceptually along with real engineering applications in which particular algorithm and theory can be applied. Numerical examples will be helpful in understanding the content of the subject.

**MEANS OF ASSESSMENT**

- Assignments and Quiz/Class Tests
- Mid-term and End-term Written Tests
- Model/Prototype Making

**RECOMMENDED BOOKS**

1. Elementary Engineering Mathematics by BS Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics, Vol I & II by SS Sastry, Prentice Hall of India Pvt. Ltd.,
3. Applied Mathematics-II by Chauhan and Chauhan, Krishna Publications, Meerut.
4. Applied Mathematics-I (B) by Kailash Sinha and Varun Kumar; Aarti Publication, Meerut
5. e-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

**SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic</b>	<b>Time Allotted (Periods)</b>	<b>Marks Allotted (%)</b>
1.	20	28
2.	20	28
3.	18	24
4	12	20
<b>Total</b>	<b>70</b>	<b>100</b>

## 2.2 APPLIED PHYSICS – II

L T P  
5 - 2

### RATIONALE

Applied physics includes the study of a diversified topics related to the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which objects behave. Concrete knowledge of physical laws, analysis and applications in various fields of engineering and technology are given prominence in this course content.

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

### LEARNING OUTCOMES

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

- Define wave motion its types (Transverse and Longitudinal), Periodic and Simple Harmonic Motion, solve simple problems.
- Define the terms: frequency, amplitude, wavelength, velocity of a wave.
- Explain various Engineering, Medical and Industrial applications of Ultrasonics.
- Apply acoustics principles to various types of buildings to get best sound effect
- Explain diffraction, interference, polarization.
- Define capacitance and its unit. They will be able to explain the function of capacitors in simple circuits, solve simple problems using  $C=Q/V$
- Explain the role of free electrons in insulators, conductors and semiconductors, qualitatively the terms: potential, potential difference, electromotive force.
- Explain the concept of electric current, resistance and its measurement.
- List the effects of an electric current and their common applications, State and apply Ohm's law, calculate the equivalent resistance of a variety of resistor combinations, determine the energy consumed by an appliance, distinguish between AC and DC electricity
- Explain Biot-Savart Law, Ampere's law, Lorenz Force.
- State the laws of electromagnetic induction, describe the effect on a current-carrying conductor when placed in a magnetic field
- Explain operation of moving coil galvanometer, simple DC motor
- Apply the knowledge of diodes in rectifiers, adapters IC's and various electronic circuits. Apply the concept of light amplification in designing of various LASER based instruments and optical sources.
- Explain total internal reflection and apply this concept for optical fibre and its uses in Medical field and Communication.

## DETAILED CONTENTS

1. Wave motion and its applications (12 periods)
  - 1.1 Wave motion, transverse and longitudinal wave motion with examples, sound and light waves, relationship among wave velocity, frequency and wave length and its application
  - 1.2 Wave equation  $y = r \sin wt$ , phase, phase difference, principle of superposition of waves
  - 1.3 Simple Harmonic Motion (SHM): definition and characteristic, expression for displacement, velocity, acceleration, time period, frequency in S.H.M., Energy of a body executing S. H. M., simple pendulum, concept of simple harmonic progressive wave,
  - 1.4 Free, Damped and forced oscillations, Resonance with examples, Q-factor
  - 1.5 Definition of pitch, loudness, quality and intensity of sound waves, intensity level, Echo and reverberation, Sabine formula for reverberation time(without derivation), coefficient of absorption of sound, methods to control reverberation time and their applications, Acoustics of building defects and remedy.
  - 1.6 Ultrasonics –production, detection, properties and applications in engineering and medical applications.
  
2. Wave Optics (6 periods)
  - 2.1 Dual nature of light, wave theory of light, laws of reflection and refraction, Snell's law, Power of lens, magnification.
  - 2.2 ,Two-Source Interference, Double-Slit interference, Interference due to thin films, Fresnel's biprism.
  - 2.3 use of interference making highly efficient solar panel.
  - 2.4 diffraction, Single Slit diffraction, Intensity calculation etc
  - 2.5 Polarization of electromagnetic waves, polarizing sheets, polarizing by Reflection (Brewster's law), Malus law, use of polarizers.
  
3. Electrostatics (12 periods)
  - 3.1 Concept of charge, Coulombs law, Electric field of point charges, Electric lines of force and their properties, Electric flux, Electric potential and potential difference.
  - 3.2 Gauss law of electrostatics: Application of Gauss law to find electric field intensity of straight charged conductor, plane charged sheet and charged sphere.
  - 3.3 Capacitor and its working principle, Capacitance and its units. Capacitance of parallel plate capacitor. Series and parallel combination of capacitors (numericals), charging and discharging of a capacitor.
  - 3.4 Dielectric and its effect on capacitance, dielectric break down.
  - 3.5 Application of electrostatics in electrostatic precipitation of microbes and moisture separation from air and gases in industry for pollution control (Brief explanation only)

4. Current Electricity (12 periods)
- 4.1 Electric Current, Resistance, Specific Resistance, Conductance, Specific Conductance, Series and Parallel combination of Resistances. Factors affecting Resistance, Colour coding of carbon Resistances, Ohm's law. Superconductivity.
  - 4.2 Kirchhoff's laws, Wheatstone bridge and its applications (meter bridge and slide wire bridge)
  - 4.3 Concept of terminal potential difference and Electro motive force (EMF), potentiometer.
  - 4.4 Heating effect of current, Electric power, Electric energy and its units (related numerical problems), Advantages of Electric Energy over other forms of energy
  - 4.5 Examples of application of DC circuits in various electrical and electronics equipment such as C.R.O, T.V., Audio-Video System, Computers etc.
5. Magneto Statics and Electromagnetism (12 periods)
- 5.1 Magnetic poles, force on a moving charge, circulating charges, force on a current carrying wire, Hall effect, torque on a current loop.
  - 5.2 Magnetic field due to moving charge(Biot-Savart Law), due to current (Biot-Savart Law), parallel currents, field of a solenoid, Ampere's law.
  - 5.3 Faraday's law, Lenz' law, motional emf, induced electric fields.
  - 5.4 Magnetic dipole and force on a magnetic dipole in a non-uniform field, Magnetization, Gauss' law for magnetism.
  - 5.5 Types of magnetic materials. Dia, para and ferromagnetic materials with their properties,
  - 5.6 Application of electromagnetism in ac/dc motors and generators.
6. Semiconductor physics (8 periods)
- 6.1 Types of materials (insulator, semi conductor, conductor), intrinsic and extrinsic semiconductors, p-n junction diode and its V-I characteristics
  - 6.2 Diode as rectifier – half wave and full wave rectifier (centre taped),
  - 6.3 Semiconductor transistor, pnp and npn (concepts only)
  - 6.4 Application of semiconductor diodes (Zener, LED) and that of transistor as amplifier and oscillator.
7. Modern Physics (8 Periods)
- 7.1 Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; laser and its characteristics, population inversion, Types of lasers; Ruby and He-Ne lasers, engineering and medical applications of lasers.
  - 7.2 Fibre optics: Total internal reflection and its applications, Critical angle and conditions for total internal reflection, introduction to optical fibers, light propagation, types, acceptance angle and numerical aperture, types and applications of optical fibre in communication.
  - 7.3 Introduction to nanotechnology, nanoparticles and nano materials,

### **LIST OF PRACTICALS (To perform minimum six experiments)**

1. To determine the velocity of sound with the help of resonance tube.
2. To find the focal length of convex lens by displacement method.
3. To find the refractive index of the material of given prism using spectrometer.
4. To find the wavelength of sodium light using Fresnel's biprism.
5. To verify laws of resistances in series and parallel combination
6. To verify ohm's laws by drawing a graph between voltage and current.
7. To measure very low resistance and very high resistances using Slide Wire bridge
8. Conversion of Galvanometer into an Ammeter and Voltmeter of given range.
9. To draw hysteresis curve of a ferromagnetic material.
10. To draw characteristics of a pn junction diode and determine knee and break down voltages.
11. To find wave length of the laser beam.
12. To find numerical aperture of an optical fiber.

### **INSTRUCTIONAL STRATEGY**

Teacher may use various teaching aids like live models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. The teacher should explain about field applications before teaching the basics to develop proper understanding of the physical phenomenon. Use of demonstration and animations can make the subject interesting and may develop scientific temper in the students. Teacher must plan a tour of Science Park/planetarium available in nearby areas in order to enhance the interest in this course.

### **MEANS OF ASSESSMENT**

- Assignment & Quiz,
- Mid-Term and End-Term written test,
- Model Making,
- Actual Lab & Practical Work,
- Viva-Voice

### **RECOMMENDED BOOKS**

1. Text Book of Physics (Part-I, Part-II); N.C.E.R.T., Delhi
2. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
3. A Text Book of Optics, Subramanian and BrijLal, S Chand & Co., New Delhi
4. Practical Physics, by C. L. Arora, S Chand publications
5. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
6. Modern Engineering Physics by SL Gupta, Sanjeev Gupta, DhanpatRai Publications.
7. Physics Volume 2, 5<sup>th</sup> edition, HalidayResnick and Krane, Wiley publication
8. Fundamentals of Physics by Haliday, Resnick& Walker 7<sup>th</sup> edition, Wiley publication
9. e-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

### SUGGESTED DISTRIBUTION OF MARKS

<b>Topic No.</b>	<b>Time Allotted (Periods)</b>	<b>Marks Allotted (%)</b>
1	12	18
2	6	8
3	12	18
4	12	16
5	12	16
6	8	12
7	8	12
<b>Total</b>	<b>70</b>	<b>100</b>



## 2.3 BASICS OF INFORMATION TECHNOLOGY

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### RATIONALE

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

### Note:

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

### LEARNING OUTCOMES

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

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

## **TOPICS TO BE EXPLAINED THROUGH DEMONSTRATION**

1. Introduction to Computers and Peripherals.

Components of Computer, Types of Computer, CPU, RAM, ROM, Hard disk, USB, Flash drive, CD, DVD, Blue ray, Keyboard, Mouse, Monitor, LCD, Printer, Plotter, Scanner, Modem, Sound Cards, Speakers, CMOS battery, Sharing of Printers.

2. Operation System and Application Software

System Software, Application Software, Virtualization Software, Utility Software, MS Office/Open Office/Libreoffice, Working with window, Desktop components, Menu bars, creating shortcut of program. Installation of Application softwares, Antivirus and Drivers.

3. Word Processing, Spreadsheet and Presentation

Usage and creation of word document, spreadsheets and presentation, Google Suits (Google drive, google sheet, google doc. Google presentation)

4. Internet

Basics of Networking – LAN, WAN, Wi-Fi technologies, Concept of IP Addrsses, DNS, Search Engines, e-mail, Browsing and cyber laws.

### **LIST OF PRACTICAL EXERCISES**

1. Identify various components, peripherals of computer and list their functions.
2. Installation of various application software and peripheral drivers
3. Installation of operating system (windows/linux/others)
4. Creation and Management (Rename, delete, search of file and folders)
5. Installation of Antivirus and remove viruses
6. Scanning and printing documents
7. Browsing, Downloading, Information using Internet
8. E-Mail ID creation, comparing, sending and receiving e-mail. Attaching a file with e-mail message.
9. Word Processing (MS Office/Open Office)
  - a) File Management:
    - Opening, creating and saving a document, locating files, copying contents in some different file(s), protecting files, giving password protection for a file
  - b) Page set up:
    - Setting margins, tab setting, ruler, indenting

c) Editing a document:

- Entering text, cut, copy, paste using tool- bars

d) Formatting a document:

- Using different fonts, changing font size and colour, changing the appearance through bold/italic/underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods
- Aligning of text in a document, justification of document, inserting bullets and numbering
- Formatting paragraph, inserting page breaks and column breaks, line spacing
- Use of headers, footers: Inserting footnote, end note, use of comments, autotext
- Inserting date, time, special symbols, importing graphic images, drawing tools

e) Tables and Borders:

- Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table
- Print preview, zoom, page set up, printing options
- Using find, replace options

f) Using Tools like:

- Spell checker, help, use of macros, mail merge, thesaurus word content and statistics, printing envelopes and labels
- Using shapes and drawing toolbar,
- Working with more than one window.

10. Spread Sheet Processing (MS Office/Open Office/Libre Office)

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

b) Menu commands:

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

c) Work books:

Managing workbooks (create, open, close, save), working in work books, selecting the cells, choosing commands, data entry techniques, formula creation and links, controlling calculations

Editing a worksheet, copying, moving cells, pasting, inserting, deletion cells, rows, columns, find and replace text, numbers of cells, formatting worksheet, conditional formatting

d) Creating a chart:

Working with chart types, changing data in chart, formatting a chart, use chart to analyze data

Using a list to organize data, sorting and filtering data in list

- e) Retrieve data with query:  
Create a pivot table, customizing a pivot table. Statistical analysis of data
- f) Exchange data with other application:  
Embedding objects, linking to other applications, import, export document.

#### 11. PowerPoint Presentation (MS Office/Open Office/Libre office)

- a) Introduction to PowerPoint
  - How to start PowerPoint
  - Working environment: concept of toolbars, slide layout & templates.
  - Opening a new/existing presentation
  - Different views for viewing slides in a presentation: normal, slide sorter.
- b) Addition, deletion and saving of slides
- c) Insertion of multimedia elements
  - Adding text boxes
  - Adding/importing pictures
  - Adding movies and sound
  - Adding tables and charts etc.
  - Adding organizational chart
  - Editing objects
  - Working with Clip Art
- d) Formatting slides
  - Using slide master
  - Text formatting
  - Changing slide layout
  - Changing slide colour scheme
  - Changing background
  - Applying design template

#### 12. Google Suits

Using Google drive, Google shut, Google docs, Google slides.

### **INSTRUCTIONAL STRATEGY**

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

## MEANS OF ASSESSMENT

- Class Tests/Quiz
- Software Installation and Use
- Viva-Voce
- Presentation

## RECOMMENDED BOOKS

1. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
2. Information Technology for Management by Henery Lucas, Tata McGraw Hills, New Delhi
3. Computers Fundamentals Architecture and Organisation by B Ram, revised Edition, New Age International Publishers, New Delhi
4. Computers Today by SK Basandara, Galgotia publication Pvt Ltd. Daryaganj, New Delhi.
5. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
6. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
7. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
8. Fundamentals of Information Technology by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
9. On Your Marks - Net...Set...Go... Surviving in an e-world by AnushkaWirasinha, Prentice Hall of India Pvt. Ltd., New Delhi
10. Fundamentals of Information Technology by Vipin Arora, Eagle Parkashan, Jalandhar
11. e-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

## Online Resources

1. [www.tutorialspoint.com](http://www.tutorialspoint.com)
2. [www.sf.net](http://www.sf.net)
3. [Gsuite.google.com](http://Gsuite.google.com)
4. [Spoken-tutorial.org](http://Spoken-tutorial.org)
5. [Swayam.gov.in](http://Swayam.gov.in)

## 2.4 ELECTRICAL ENGINEERING-I

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### RATIONALE

The objective of this subject is to impart fundamental knowledge and skills regarding basic electrical engineering, which diploma holders will come across in their professional life. This course will provide the student to understand the basic concept and principles of dc and ac fundamentals, electromagnetism, batteries, electrical materials, electrical safety etc.

### LEARNING OUTCOMES

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

- Classify various materials into conductor, semiconductor and insulator.
- Describe the properties of conducting, insulating and magnetic materials.
- Understand Kirchhoff's laws to solve simple DC circuit.
- Understand various network theorems such as Thevenin's theorem, Norton theorem, and superposition theorem to solve simple circuit problems.
- Understand AC Circuit Theory.
- Understand construction, rating & safety measures for batteries.

### DETAILED CONTENTS

1. Classification (2 Periods)  
Classification of materials into conducting materials, insulating materials and Semi-conducting materials with reference to their atomic structures.
2. Conducting Materials (6 Periods)
  - 2.1 Resistivity and factors affecting resistivity such as temperature, alloying and mechanical stressing.
  - 2.2 Classification of conducting materials into low resistivity and high resistivity materials. Some examples of each and their typical applications.
3. Insulating Materials (10 Periods)
  - 3.1 Electrical Properties:  
Volume resistivity, surface resistance, Dielectric loss, Dielectric strength (Break down voltage) and Dielectric constant.

- 3.2. Chemical Properties:  
Solubility, Chemical resistance and Weatherability.
- 3.3. Physical Properties:  
Hygroscopicity, Tensile and Compressive strength, Abrasive resistance, Brittleness.
- 3.4. Thermal Properties:  
Heat resistance, classification according to permissible temperature rise, Effect of electrical overloading on the life of an electrical appliance.
- 3.5. Plastic Insulating Materials:  
Classification into thermoplastic and thermosetting categories, example of each and their typical applications.
4. Magnetic Materials (4 Periods)
  - 4.1 Ferromagnetism, Domains, permeability, hysteresis loop-(including coercive force and residual magnetism) and magnetic saturation.
  - 4.2 Soft and Hard magnetic materials, their examples and typically applications.
5. Electro Magnetism (8 Periods )
  - 5.1 Concept of mmf, flux, reluctance and permeability.
  - 5.2 Energy stored in a magnetic field and an inductor.
  - 5.3 Solution of problems on magnetic circuits.
  - 5.4 Faraday's laws of electromagnetic induction, Lenz's law, Physical explanation of self and mutual inductance.
  - 5.5 B-H curve, Hysteresis, Eddy currents-elementary ideas and significance.
  - 5.6 Growth and decay of current in an inductive circuit.
  - 5.7 Force between two parallel current carrying conductors and its significance.
  - 5.8 Current carrying conductors in magnetic field and its significance
6. D.C Circuits (11 Periods)
  - 6.1 Ohm's law, resistivity, effect of temperature on resistances, heating effect of electric current, conversion of mechanical units into electrical units.
  - 6.2 Kirchhoff's laws, application of Kirchhoff laws to solve simple dc circuits.
  - 6.3 Thevenin's theorem, maximum power transfer theorem, Norton's theorem and super position theorem, simple numerical problems.
7. A.C Theory (11 Periods)
  - 7.1 Concept of alternating voltage and current, difference between AC and DC .
  - 7.2 Generation of alternating voltage, equation of sinusoidal waveform.
  - 7.3 Definition and concept of cycle, frequency, Time period, amplitude, instantaneous value, average value, RMS value, peak value, form factor, Peak factor.
  - 7.4 Phase and phase difference, representation of alternating quantities by phasor, addition and subtraction of alternating quantities.

## 8. Batteries

(4 Periods)

- 8.1 Construction of lead acid and nickel cadmium batteries.
- 8.2 Charging and maintenance of batteries.
- 8.3 Rating of batteries.
- 8.4 Back up batteries (Lithium & Silver Oxide batteries).
- 8.5 Shelf life of batteries.

### LIST OF PRACTICALS

1. Ohm's law verification.
2. To verify the laws of series and parallel connection of resistance i.e. to verify:-
  - i. Total resistance in series connections.  
$$R_T = R_1 + R_2 + R_3 + \dots$$
Where  $R_T$  is total resistance and  $R_1, R_2, R_3$  etc. are the resistances connected in series.
  - ii. Total resistance in parallel connections.  
$$1/R_T = 1/R_1 + 1/R_2 + 1/R_3 + \dots$$
Where  $R_T$  is total resistance and  $R_1, R_2, R_3$  etc. are the resistances connected in parallel circuit.
3. To verify the laws of series and parallel connection of capacitance i.e. to verify:-
  - i. Total capacitance in series connections.  
$$1/C_T = 1/C_1 + 1/C_2 + 1/C_3 + \dots$$
Where  $C_T$  is total capacitance and  $C_1, C_2, C_3$  etc. are the capacitances connected in series.
  - ii. Total capacitance in parallel connections.  
$$C_T = C_1 + C_2 + C_3 + \dots$$
Where  $C_T$  is total capacitance and  $C_1, C_2, C_3$  etc. are the capacitances connected in parallel.
4. To verify Kirchhoff's following laws:-
  - i. The algebraic sum of the currents at a junction is zero.
  - ii. The algebraic sum of the emf in any closed circuit is equal to the algebraic sum of IR products (drops) in that circuit.
5. To measure the resistance of an ammeter and a voltmeter and to conclude that ammeter has very low resistance whereas voltmeter has very high resistance.
6. To verify Thevenin's and maximum power transfer theorems.
7. To find the ratio of inductance values of a coil having air core and iron core respectively and thus see that by the introduction of magnetic material inside the coil, the induction value of coil is substantially increased.



8. To test a battery for charged and discharged condition and to make connections for its charging.
9. To show that the range of an ammeter (dc and ac) and a voltmeter (dc and ac ) can be extended with the use of shunts and multipliers.
10. To convert the given galvanometer into voltmeter and an ammeter.

## **INSTRUCTIONAL STRATEGY**

The teachers should give emphasis on understanding of concept and various terms used in the Electrical Engineering. Practical exercises will reinforce various concepts.

## **ASSESSMENT TOOLS**

- Class Tests
- Home Assignments
- Attendance
- Sessional Test

## **RECOMMENDED BOOKS**

1. Electrical Technology by B L Thareja; S Chand & Co.
2. Basic Electrical Engineering by J B Gupta; S K Kataria and Sons, New Delhi
3. Basic Electrical Engineering by J S Katre; Technical Max. Publication Pune
4. e-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

## **SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>No. of Periods</b>	<b>Marks (%)</b>
1.	02	04
2.	06	11
3.	10	18
4.	04	07
5.	08	13
6.	11	20
7.	11	20
8.	04	07
<b>Total</b>	<b>56</b>	<b>100</b>

## 2.5 ELECTRONIC COMPONENTS & DEVICES

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### RATIONALE

Knowledge of Electronic components & devices is quite essential for a student of electronic engineering diploma programme. With the knowledge of these active and passive components he will work successful in every field of the branch. Therefore a diploma student in electronics engineering must be equipped with the fundamental knowledge about electronic components, voltage and current source, semi conductor diode, transistors and FET for successful handling of industrial problems.

### LEARNING OUTCOMES

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

- Identify and distinguish between active components (BJT, FET etc) and passive components (Resistor, Capacitor, inductor etc).
- Understand voltage and current sources as well as their interconversions.
- Understand the working and application of semiconductor diode including half wave rectifier & Full wave rectifier.
- Understand the working of BJT and hence able to design amplifier using it.
- Compare various transistors biasing circuit and stabilize their operating points.
- Understand the working of FET and hence able to design amplifier using it.
- Compare BJT, JFET, MOSFET & CMOS.

### DETAILED CONTENTS

1. Introduction to Electronics (06 Periods)
  - 1.1 Application of electronic in different fields.
  - 1.2 Brief introduction to active components and devices.
2. Passive Components (12 Periods)
  - 2.1. Resistor- Working characteristics/properties, Resistors-Carbon film, metal-film, carbon composition, wire wound and variable type (presets and potentiometers) constructional details, characteristics (size, voltage, tolerance temperature and frequency dependence) , noise consideration, specification, Testing, mutual comparison and typical applications, Voltage Dependent Resistor (VDR).
  - 2.2. Capacitors- Working characteristics/properties, Capacitors-polyester, Metalized polyester, ceramic paper mica and electrolytic tantalum and solid aluminium types; construction details and testing, specifications, mutual comparison & typical applications.
  - 2.3. Inductors, Transformers and RF coils- Working characteristics/properties Methods of manufacture of inductors, RF coils and small power and AF transformer and their testing, Properties of cores, Needs and type of shielding.
3. Voltage And Current Sources (06 Periods)

- 3.1. Concept of constant voltage sources, symbol and graphical representation, characteristics of ideal and practical voltage sources.
  - 3.2. Concept of constant current source, symbol and graphical representation, characteristics of ideal and practical current sources.
  - 3.3. Conversion of voltage sources into a current sources and vice-versa.
  - 3.4. Concept of floating and grounded D.C. supplies.
4. Semiconductor Diode (12 Periods)
- 4.1. P-N junction diode, Mechanism of current flow in P-N junction, drift and diffusion currents, depletion layer, potential barriers, P-N junction diode characteristics, Zener & avalanche breakdown, Concept of junction capacitance in forward & reverse bias conditions.
  - 4.2. Semiconductor diode characteristics, dynamic resistance & their calculation from diode characteristics, dynamic resistance of diode in terms of diode current, Variation of leakage current and forward voltage with temperature (No derivations).
  - 4.3. Diode (P-N Junction) as rectifier, Half wave rectifier, full wave rectifier including bridge rectifier, relationship between D.C output voltage and A.C input voltage, rectification efficiency and ripple factor for rectifier circuits, filter circuits- shunt capacitor, series inductor, bleeder resistance, working of the filter and typical application of each type
  - 4.4. Different types of diodes, characteristics and typical application of power diodes, zener diodes, varactor diodes, point contact diodes, tunnel diodes, LEDs and photo diodes
  - 4.5. Important specification of rectifier diode and zener diode.
5. Introduction to Bipolar Transistor: (12 Periods)
- 5.1. Concept of bipolar transistor as a two junction three terminal device having two kinds of charge carriers, PNP an NPN transistor, their symbol and mechanism of current flow, explanation of fundamental current relations, Concept of leakage current, effect of temperature on leakage current, Standard notation for current and voltage polarity.
  - 5.2. CB, CE and CC configurations.
    - a. Common base configuration (CB): input and output characteristics, determination of transistor parameters (input and output) dynamic resistance, current amplification factor.
    - b. Common emitter configuration (CE): current relations in CE configuration, collector current in term of base current and leakage current ( $I_{CEO}$ ) relationship between the leakage current in CB and CE configuration, input and output characteristics, determination of dynamic input and output resistance and current amplification factor  $\beta$  from the characteristics.
    - c. Common collector configuration (CC): Expression for emitter current in terms of base current and leakage current in CC configuration.

- 5.3. Comparison of CB and CE configuration with regards to dynamic input and output resistance, current gain and leakage current performance of CE configuration for low frequency voltage amplification, Typical application of CB configuration in amplification.
- 5.4. Transistor as an amplifier in CE configuration.
  - a. DC load line, its equation and drawing it on collector characteristics.
  - b. Determination of small signal voltage and current gain of basic transistor amplifier using CE output characteristics and DC load line, Concept of power gain as a product of voltage gain and current gain.
6. Transistor Biasing And Stabilization Of Operating Point (09 Periods)
  - 6.1. Different transistor biasing circuits for fixing the operating points, effect of temperature on operating point.  
Need and method for stabilization of operating point.  
Effect of fixing operating point in cut-off or saturation region on performance of amplifier
  - 6.2. Calculation of operating point for different biasing circuits, use of Thevenin's theorem in analyzing potential divider biasing circuit.
  - 6.3. Simple design problems on potential divider biasing circuits.
7. Single Stage Transistor Amplifier (09Periods)
  - 7.1. Analysis of Single Stage CE, CB and CC amplifier.
  - 7.2. Single stage CE amplifier circuits with proper biasing components.
8. Field Effect Transistor (Fet) (06 Periods)
  - 8.1. Construction, operation, characteristics and Biasing of Junction FET.
  - 8.2. Analysis of Single Stage CS,CG and CD amplifiers. (Only Brief Idea)
9. MOSFET (06 Periods)
  - 9.1 Construction, operation, Characteristics and Biasing of MOSFET in both depletion and enhancement modes.
  - 9.2 Analysis of Single Stage CS, CG and CD amplifiers. (Only Brief Idea)
10. CMOS (06 Periods)
  - 10.1 Construction, operation and Characteristics of CMOS in both depletion and enhancement modes.
  - 10.2 Use of CMOS as Invertor, Different application of CMOS, CMOS IC.
  - 10.3 Comparison of JEET, MOSFET and Bipolar Transistor.

#### **LIST OF PRACTICALS**

1. Identification of types of packages, terminals and noting different ratings using data books for various types of semiconductor diodes (Germanium, point contact, silicon low power, high power and switching diode).
2. Familiarization with lab instruments (Multi-meter/CRO), etc.
3. Testing of various passive and active components.
4. Plotting of forward V-I characteristics for a point contact and P-N junction diode (Silicon & Germanium diode).

5. To Plot forward and reverse V-I characteristics for a zener diode.
6. Rectifier circuits using semiconductor diode, measurement of input and output voltage and plotting of input and output wave shapes.
  - i) Half wave rectifier
  - ii) Full wave rectifier (centre tapped and bridge rectifier circuits)
7. To Plot wave shapes of a full wave rectifier with shunt capacitor, series inductor and filter circuit.
8. To Plot the input and output characteristics and calculation of parameters of a transistor in common base configuration
9. To Plot input and output characteristics and calculation of parameters of a transistor in common emitter configuration.
10. Transistor Biasing circuits
  - i) Measurement of operating point ( $I_c$  &  $V_{ce}$ ) for a fixed bias circuit.
  - ii) Potential divider biasing circuits.  
(Measurement can be made by changing the transistor in the circuits by another of a same type number).
11. Plot the FET characteristics and determination of its parameters from these characteristics.
12. Measurement of voltage gain at 1 KHZ for different load resistance for a BJT amplifier circuit.
13. Measurement of voltage gain for a JFET amplifier circuit.
14. Measurement of voltage gain for a MOSFET amplifier circuit.

### **INSTRUCTIONAL STRATEGY**

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

### **MEANS OF ASSESSMENT**

- Class Tests
- Home Assignments
- Attendance
- Sessional Test

### **RECOMMENDED BOOKS**

1. Bhargava, Kulshreshtha & Gupta – “Basic Electronics & Linear Circuits” – Tata McGraw-Hill.
2. Malvino, A. P.-“Electronics Principles” –Tata McGraw-Hill
3. Robert.L.Boylestad – “Electronic Devices & Circuits Theory” – Pearson Publication.
4. V.K.Mehta- “Principles of electronics” – S.Chand Publication.
5. e-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

### SUGGESTED DISTRIBUTION OF MARKS

<b>Topic No.</b>	<b>Period Allotted</b>	<b>Marks Allotted (%)</b>
1.	6	7
2.	12	14
3.	6	7
4.	12	14
5.	12	15
6.	9	11
7.	9	11
8.	6	7
9.	6	7
10.	6	7
<b>Total</b>	<b>84</b>	<b>100</b>

## 2.6 GENERAL WORKSHOP PRACTICE –II (For Electronics Engineering)

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### RATIONALE

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

### LEARNING OUTCOMES

After completing the course, the students will be able to:

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

### DETAILED CONTENTS (PRACTICAL EXERCISES)

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

The following shops are included in the syllabus:

1. Carpentry Shop
2. Painting and Polishing Shop
3. Electroplating Shop
4. Computer Shop

## **1. CARPENTRY SHOP**

### **1.1 General Shop Talk**

- 1.1.1 Name and use of raw materials used in carpentry shop : wood & alternative materials
- 1.1.2 Names, uses, care and maintenance of hand tools such as different types of Saws, C-Clamp, Chisels, Mallets, Carpenter's vices, Marking gauges, Try-squares, Rulers and other commonly used tools and materials used in carpentry shop by segregating as cutting tools, supporting tools, holding tools , measuring tools etc.
- 1.1.3 Specification of tools used in carpentry shop.
- 1.1.4 Different types of Timbers, their properties, uses & defects.
- 1.1.5 Seasoning of wood.

### **1.2. Practice**

- 1.2.1 Practices for Basic Carpentry Work
- 1.2.2 Sawing practice using different types of saws
- 1.2.3 Assembling jack plane — Planning practice including sharpening of jack plane cutter
- 1.2.4 Chiselling practice using different types of chisels including sharpening of chisel
- 1.2.5 Making of different types of wooden pin and fixing methods. Marking measuring and inspection of jobs.

### **1.3 Job Practice**

- Job I Marking, sawing, planning and chiselling and their practice
- Job II Half Lap Joint (cross, L or T – any one)
- Job III Mortise and Tenon joint (T-Joint)
- Job IV Dove tail Joint (Lap or Bridle Joint)

- 1.4. Demonstration of job showing use of Rip Saw, Bow saw and Tenon saw, method of sharpening various saws.

## **2. PAINTING AND POLISHING SHOP**

- 2.1. Introduction of paints, varnishes, Reason for surface preparation, Advantages of Painting, other method of surface coating ie. Electroplating etc.

### **2.2. Job Practice**

- Job 1: To prepare a wooden surface for painting apply primer on one side and to paint the same side. To prepare french polish for wooden surface and polish the other side.



Job II: To prepare metal surface for painting, apply primer and paint the same.

Job III: To prepare a metal surface for spray painting, first spray primer and paint the same by spray painting gun and compressor system.

The sequence of polishing will be as follows:

- i) Abrasive cutting by leather wheel
- ii) Polishing with hard cotton wheel and with polishing material
- iii) Buffing with cotton wheel or buff wheel.

### **3. ELECTROPLATING SHOP**

- 3.1. Use of personal protective equipments and safety precautions while working.
- 3.2. Introduction and demonstration of machines and equipment used in electroplating shop
- 3.3 Practice Job  
Job I : Electroplating practice i.e. Nickel plating

### **4. COMPUTER SHOP**

- 4.1 Keyboard
  - 4.1.1 Types of Keyboards
  - 4.1.2 Interfacing (PS2, USB port, DIN connector)
  - 4.1.3 Working
- 4.2 Mouse
  - 4.2.1 Types of Mouse
  - 4.2.2 Interfacing (serial, PS2, USB)
  - 4.2.3 Working
- 4.3 Printers
  - 4.3.1 Types (Dot matrix, Inkjet, Laserjet)
  - 4.3.2. Interfacing (parallel port, USB port, Networking)
  - 4.3.3. Working
  - 4.3.4. Maintenance (cartridge change etc)
  - 4.3.5 Installation of printers
  - 4.3.6 Troubleshooting (Driver compatibility, Paper jam, printing problems due to uncleaned drum in laserjet printers, belt related problems in inkjet printer, jets choking problem in inkjet printer, color alignment problem).
  - 4.3.7 Tracing network printer and sharing it.
- 4.4 Scanner
  - 4.4.1 Types
  - 4.4.2 Interfacing
  - 4.4.3 Scanning a document
- 4.5 Monitor

- 4.5.1 Types and Interfacing
- 4.5.2 Fault finding and repairing

#### 4.6 CPU

- 4.6.1. Motherboard connection (dimensions, processor, chipset, BIOS, EFI (Extended Firmware Interfacing), UFI (Unified Firmware Interfacing).
- 4.6.2 SMPS-AT
  - Working
  - Voltage levels

### **MEANS OF ASSESSMENT**

- Workshop jobs
- Report writing, presentation and viva voce

### **RECOMMENDED BOOKS**

1. Workshop Technology I,II,III, by SK Hajra, Choudhary and AK Choudhary; Media Promoters and Publishers Pvt. Ltd. Mumbai.
2. Workshop Technology Vol. I, II, III by Manchanda; India Publishing House, Jalandhar.
3. Workshop Training Manual Vol. I, II by S.S. Ubhi; Katson Publishers, Ludhiana.
4. Manual on Workshop Practice by K Venkata Reddy; MacMillan India Ltd., New Delhi
5. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
6. Workshop Technology by B.S. Raghuwanshi; DhanpatRai and Co., New Delhi
7. Workshop Technology by HS Bawa; Tata McGraw Hill Publishers, New Delhi.
8. e-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.