

**Course Name : Electronics and Electrical Engineering Group**

**Course Code : EE/EP/EJ/EN/ET/EX/ IC/IE/IS/MU/DE/ED/EI/IU**

**Semester : Second**

**Subject Title : Applied Science (Electrical/Electronics)**

**Subject Code : 9008**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme						
TH	TU	PR	PAPER HRS	TH	TEST	PR	OR	TW	TOTAL
04	--	04	03	80	20	50@	--	--	150

- Note:**
1. Two periods each for theory and Practical will be used for Applied Physics and Applied Chemistry respectively
  2. Theory paper will have two parts one for Applied Physics and one for Applied Chemistry. Each will have same weightage of 40 marks.
  3. Practical Marks will be divided equally between Applied Physics and Applied Chemistry

### **Part A: Applied Physics**

#### **Rationale:**

Physics provides foundation for core technology subjects. Understanding of any subject is entirely depending on logical thinking and hierarchy of knowledge component. As Physics is considered as basic science its principles, laws, hypothesis, concepts, ideas are playing important role in reinforcing the knowledge of technology.

Deep thought is given while selecting topics in physics. They are different for different groups. This will provide sound background for self-development in future to cope up with new innovations. Topics are relevant to particular programme and student will be motivated to learn and can enjoy the course of Physics as if it is one of the subjects of their own stream.

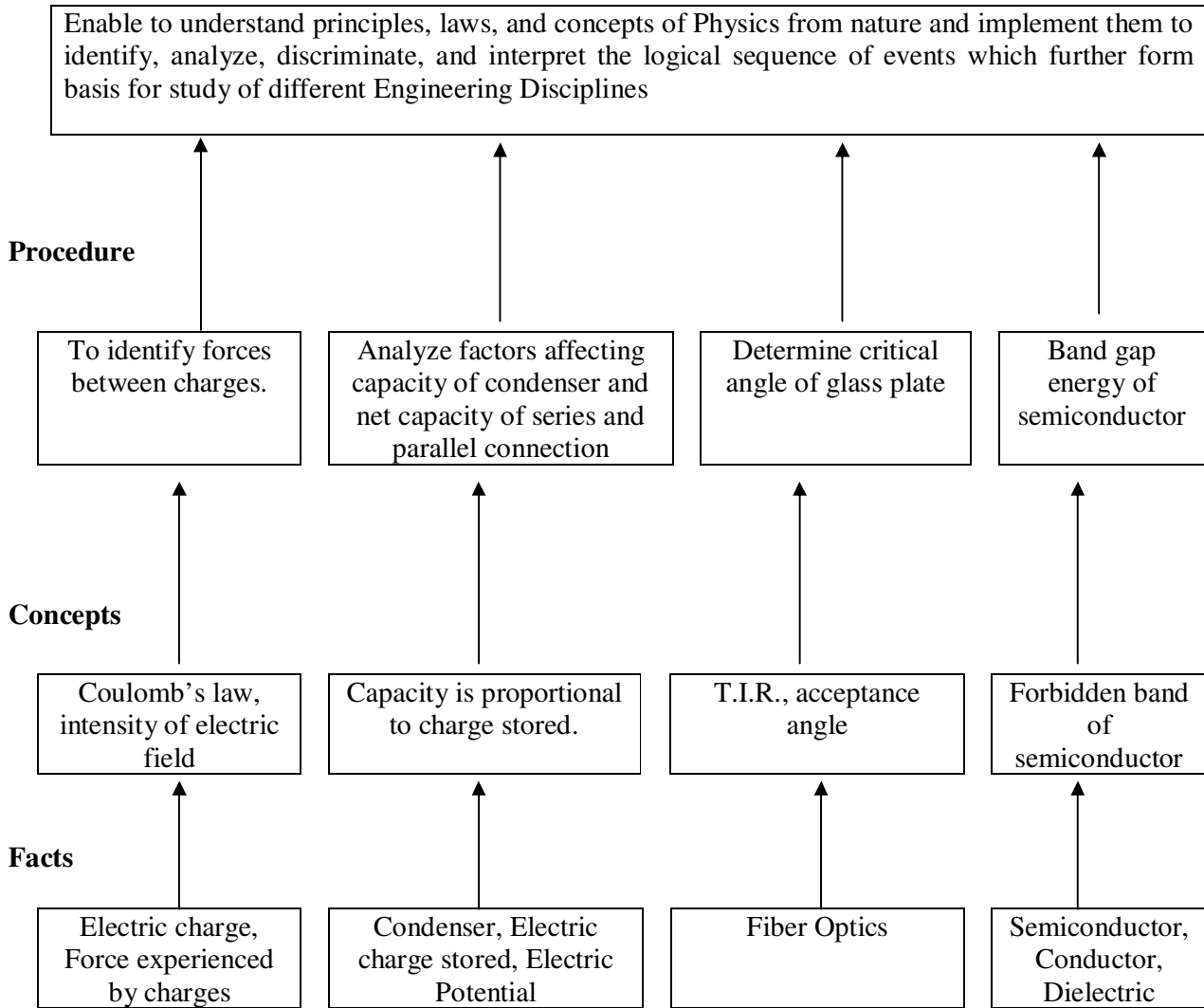
#### **Objectives:**

The Student will be able to:

1. Analyze different factors on which capacitance depends.
2. Differentiate between field intensity and potential.
3. List advantages of optical fiber.
4. Describe principle of working of optical fiber.
5. Differentiate between conductor, insulator and semiconductor on the basis of band Theory.
6. State the effect of variation of resistance of material at very low temperature.

## Learning Structure

### Applications



**Contents: Theory**

Chapter	Name of the Topic	Hrs	Mks
01	<b>Electric Field and Potential</b> <b>1.1</b> Electric charge, Coulomb's inverse square law, Definition of 1 coulomb Charge,(problems), Electric field, Electric lines of force and their properties, Electric field intensity, Electric flux, Electric flux density, Relation between field Intensity and flux density, Electric field intensity due to charge sphere.(problems) <b>1.2</b> Electric Potential, Potential due to point charge-derivation using integration, P.D. between two points, potential due to charged sphere(problems), Definition of dielectric strength and breakdown potential.	12	16
02	<b>Condenser</b> Capacitor—capacitance and its unit, Principle of condenser, Capacity of parallel plate condenser, spherical condenser, cylindrical condenser (equations only), Condensers in series, and parallel connections, Energy of charged condenser, Types of capacitors- variable air condenser, condenser with solid dielectric, electrolytic condenser.	06	08
03	<b>Optical Fiber</b> Introduction, Principle of optical fiber, Propagation in optical fiber, acceptance angle, Structure of optical fiber, Numerical Aperture, Fiber optic materials, Types of optical fibers, Transmission characteristics of optical fibers, Fabrication of optical fiber, Applications.	06	08
04	<b>Band Theory of Solids</b> Formation of energy bands in solids, energy band diagrams for Conductors, Semiconductors, and Insulators, Intrinsic and Extrinsic semiconductors, Atomic bonding in intrinsic and extrinsic semiconductors, Fermi level and its position in p type and n type semiconductor, Conductivity and current density in semiconductor, Superconductivity, graph of resistance of mercury against temperature (below 4.15 K) Properties of superconductors.	08	08
<b>Total</b>		<b>32</b>	<b>40</b>

**Practical:**

Skills to be developed:

Intellectual skills:

- Selection of measuring instruments
- Read and interpret the graph.
- Interpret the results from observations and calculations.
- Use these results for parallel problems

Motor skills:

- Proper handling of instruments.
- Measuring physical quantities accurately.
- To adopt proper procedure while performing the experiment.

### List of Practical:

1. TO DETERMINE EFFECTIVE CAPACITANCE OF SERIES COMBINATION OF CAPACITORS BY CALCULATING ITS REACTANCE
2. TO DETERMINE EFFECTIVE CAPACITANCE OF PARALLEL COMBINATION OF CAPACITORS BY CALCULATING ITS REACTANCE.
3. TO VERIFY TOTAL INTERNAL REFLECTION (T.I.R) PHENOMENON FOR GIVEN GLASS SLAB AND TO CALCULATE CRITICAL ANGLE OF INCIDENCE.
4. TO DETERMINE FORBIDDEN ENERGY GAP IN A SEMICONDUCTOR.
5. TO CALCULATE PERMITTIVITY OF AIR BY USING FLAT CONDENSER PLATES.
6. TO DETERMINE JOULE'S CONSTANT (J) BY ELECTRIC METHOD.
7. To calculate refractive index of material of prism using spectrometer device.
8. To determine temperature co-efficient of resistance of metal (conductor) using Platinum resistance thermometer.
9. TO DETERMINE I.V CHARACTERISTICS OF PN JUNCTION DIODE.
10. To determine the divergence of He-Ne laser beam.
11. To Verify Ampere's rule using Oersted's Experiment and find Variation of intensity of magnetic field with Current and Distance

### Laboratory based Mini Projects:

1. To convert galvanometer into an ammeter of required range using appropriate value of shunt.
2. To calibrate voltmeter of required range by using potentiometer.
3. To measure the numerical aperture of the plastic fiber using 660 nm wavelength LED. (Take at least 5 different plastic fibers)

### Learning Resources:

#### Books:

Sr. No.	Name of the Book	Author	Publisher
01	Physics-I	V. Rajendran	Tata McGraw- Hill
02	Applied physics	Arthur Beiser	Tata McGraw- Hill
03	Engineering Physics	R.K.Gaur and S.L.Gupta	Dhanpatrai
04	Physics	Rensic and Halliday	--

### Part B: Applied Chemistry

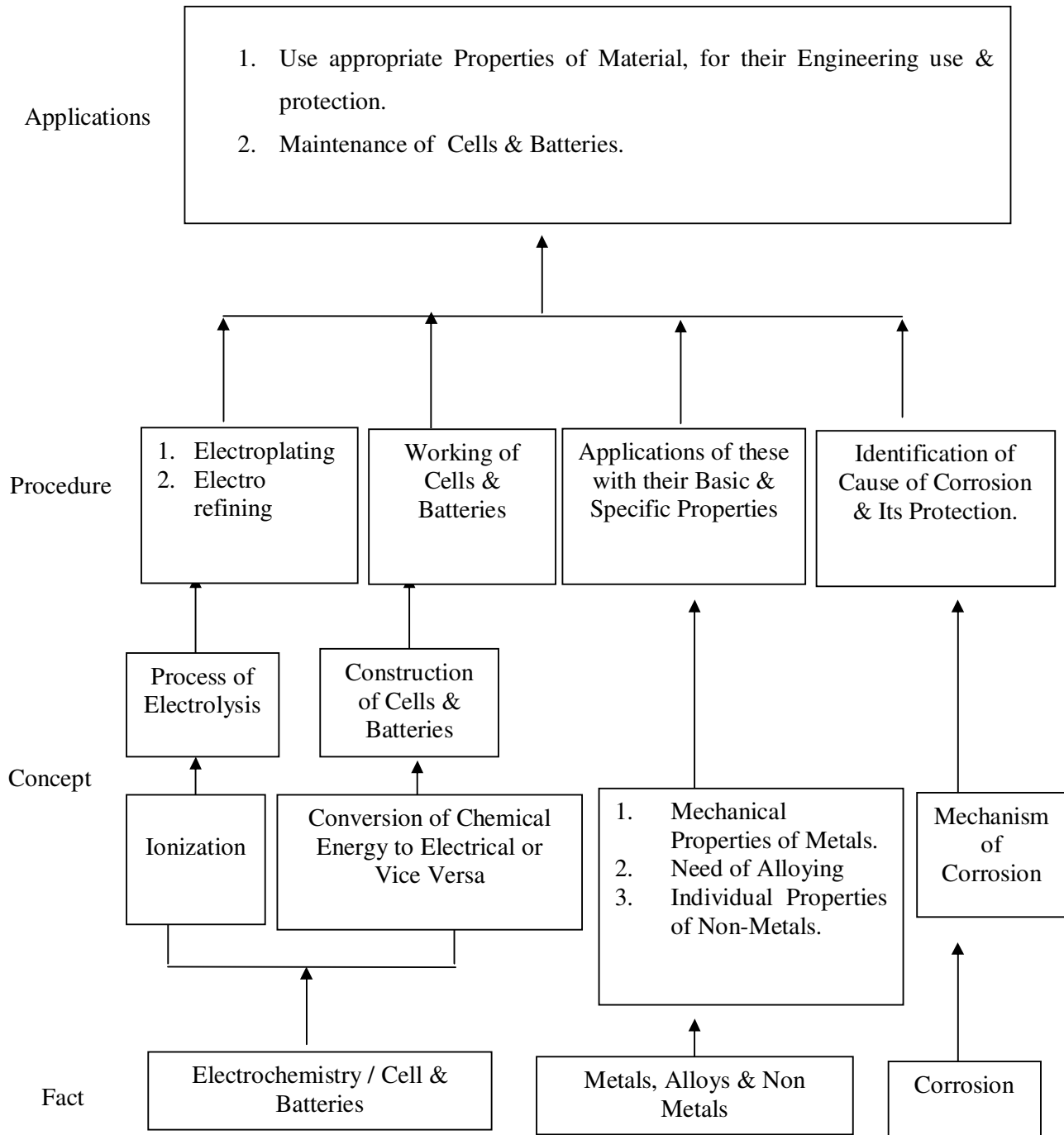
#### RATIONALE

This syllabus of chemistry for electronics & electrical students is classified under the category of applied science. It is intended to teach students the working of cells & batteries, selection of various materials for engg. applications & their protection by metallic coatings.

## **OBJECTIVES**

1. Apply knowledge to correlate the properties of materials, their engg. uses & protection.
2. Able to learn working of cells & batteries.

**LEARNING STRUCTURE:**



**Contents: Details**

<b>Chapter</b>	<b>Name of the Chapter</b>	<b>Hours</b>	<b>Marks</b>
01	<b>Electrochemistry</b> Definition of Electrolyte, Conductor, Difference Between Metallic & Electrolytic Conduction, Ionisation, Degree of Ionisation & Factors affecting Degree of Ionisation, Conductivity of Electrolytes – Ohms Law, Specific Conductivity, Equivalent Conductivity & Molar Conductivity, Cell Constant, Variation of Specific & Equivalent Conductance with dilution, Definition of Electrode Potential, Oxidation Potential & Reduction Potential, Concept of pH & pOH, Buffer Solutions.	04	04
02	<b>Cell And Batteries</b> Definition of Electrochemical Cell, Battery, Charge, Discharge, Closed Circuit Voltage, Electrochemical Couple, Internal Resistance, Open Circuit Voltage, Separator, E.M.F., Classification of Batteries Such as Primary, Secondary & Reserve Batteries, Construction, Working & Applications of a Primary Cell Such as Dry Cell & Daniel Cell, Secondary Cell Such as Ni – Cd Cell & Lead Acid Storage Cell, Charging & Discharging of Lead Acid Storage Cell, Any Two Examples of Reserve Batteries, Hydrogen Oxygen Fuel Cell its Chemical Reactions & Advantages, Introduction of Solar Cell.	08	12
03	<b>Non-Metallic Engineering Materials</b> Definition of Dielectrics or Insulators, Classifications of Insulating Materials, Properties & Applications of Inert Gases, Silicone Fluids, Mineral Oil or Transformer Oil, Teflon, Epoxy Resin, Ceramics, Glass, Mica, Mylar	06	08
04	<b>Metals &amp; Alloys</b> Definition of Metallurgy, Important Ores of Copper, Metallurgy of Copper, Physical & Chemical Properties (Action of Air, Water & Acids), Uses of Copper, Important Ores of Aluminium, Extraction of Aluminium from Alumina by Electrolytic Reduction Process, Electrolytic Refining of Aluminium, Engineering Properties of Aluminium & Uses, Properties & Applications of Semiconductors such as Silicon, Germanium, Selenium, Graphite, Silicon Carbide, Cadmium Sulphide. Alloys – Definition, Compositions, Properties & Applications of Soft Solder, Tinmann’s Solder, Brazing Alloy, Plumber’s Solder, Woods Metal, Rose Metal, Plationoid.	08	10
05	<b>Corrosion</b> Definition, Types, Atmospheric or Chemical Corrosion, Mechanism, Factors Affecting Atmospheric, Corrosion & Immersed Corrosion or Electrochemical Corrosion, Mechanism, Protection of Metals by Purification of Metals, Alloy Formation, Cathode Protection, Controlling the External Conditions & Application of Protective Coatings i.e. Galvanising, Tinning, Metal Spraying, Sherardizing, Electroplating, Metal Clodding, Cementation or Diffusion Method, their Definition, Procedure,	06	06

	Uses, Advantages & Disadvantages, Examples of Non Corrosive Materials		
<b>TOTAL</b>		<b>32</b>	<b>40</b>

**Practical:**

Skills to be developed:

Intellectual Skills:

1. Select proper equipment and instruments
2. Interpret results

Motor Skills:

1. Accuracy in measurement
2. Careful use of equipment

**List of Practical:**

- 01 To find the strength in grams per litre of the given electrolyte solution (NaOH) with the help of standard oxalic acid.
- 02 To verify Faraday's Second Law of electrolysis.
- 03 To determine neutralization point of acetic acid (weak acid) and ammonium hydroxide (weak base). To calculate normality and strength of acetic acid.
- 04 To determine the equivalent point of precipitation titration of  $\text{BaCl}_2$  with  $\text{H}_2\text{SO}_4$  using conductivity meter. To find the normality and strength of  $\text{BaCl}_2$  solution.
- 05 To determine pH value of given solutions by using pH paper, universal indicator and pH meter.
- 06 To determine the strength of given hydrochloric acid solution by titrating it against sodium hydroxide solution using pH meter.
- 07 To measure the voltage developed by making the setup of Daniel Cell.
- 08 To determine acid value of a plastic material by using KOH/NaOH solution.
- 09 To prepare urea formaldehyde resin and understand the structure and properties for its applications in engineering.
- 10 To determine percentage of copper from brass iodometrically.
- 11 To determine thinner content in oil paint.

**Learning Resources:**

**Books:**

Sr. No.	Author	Name of the book	Publisher
01	Jain & Jain	Engineering Chemistry	Dhanpat Rai and Sons
02	S. S. Dara	Engineering Chemistry	S. Chand Publication
03	B. K. Sharma	Industrial Chemistry	Goel Publication
04	S. S. Dara	Environmental Chemistry & Pollution Control	S. Chand Publication