 <b>MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI</b> <b>TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES</b>																			
<b>COURSE NAME : ELECTRICAL ENGINEERING GROUP</b>																			
<b>COURSE CODE : EC</b>																			
<b>DURATION OF COURSE : EIGHT SEMESTERS</b>										<b>WITH EFFECT FROM 2012-13</b>									
<b>SEMESTER : SECOND</b>										<b>DURATION : 15 DAYS SESSION</b>									
<b>PATTERN :CORRESPONDENCE - SEMESTER</b>										<b>SCHEME : G</b>									
SR. NO	SUBJECT TITLE	abbrevi ation	SUB CODE	TEACHING SCHEME			PAP ER HRS	EXAMINATION SCHEME								SW (17200)			
				TH	Test	PR		TH (1)		PR (4)		OR (8)		TW (9)					
								Max	Min	Max	Min	Max	Min	Max	Min				
1	Communication Skills	CMS	17916	05	01	16	03	100	40	--	--	25#	10	25@	10	50			
2	Engineering Mathematics	EMS	17917	09	01	--	03	100	40	--	--	--	--	--	--				
3*	Applied Science	Physics	APH	17924	06	01	20+2*	02	50	100	40	25@	50	20	--		--	--	--
		Chemistry	ACH	17925	06	01	20+2*	02	50			25@			--		--	--	--
4	Fundamentals of Electrical Engineering	FEE	17927	05	01	24	03	100	40	25#	10	--	--	25@	10				
<b>Total</b>				<b>31</b>	<b>05</b>	<b>84</b>	--	<b>400</b>	--	<b>75</b>	--	<b>25</b>	--	<b>50</b>	--	<b>50</b>			

Total Contact Hours During resident session Per Week: **120 Hrs.** (15 days\* 8 hours per day)  
**THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH.**  
Total Marks : **600**  
@ - Internal Assessment, # External Assessment,   No Theory Examination,  
Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Term Work, SW- Sessional Work

- Conduct One class test of 25 marks for each theory subject. Sum of the total test marks of all subjects is to be converted out of 50 marks as sessional work (SW).
- Progressive evaluation is to be done by subject teacher as per the prevailing curriculum implementation and assessment norms
- Code number for TH, PR, OR, TW are to be given as suffix 1, 4, 8, 9 respectively to the subject code.

\* Applied Science is divided into two parts- Applied Science (Physics) and Applied Science (Chemistry). Theory examination of both parts as well as practical examination of both parts will be conducted on separate days. Sum of theory marks of both parts shall be considered for passing theory examination of Applied Science. Similarly it is also applicable to practical examination. It is mandatory to appear theory and practical examination of both parts. Remaining absent in any examination of any part will not be declared successful for that examination head.

\* **Candidate remaining absent in examination of any one part of Applied Science subject i.e. Physics, Chemistry will be declare as Absent in Mark List and has to appear for examination. The marks of the part for which candidate was present will not be processed or carried forward.**

**Course Name : All Branches of Diploma in Engineering & Technology**

**Course Code : CC/EC/MC/XC/GC**

**Semester : Second**

**Subject Title : Communication Skills**

**Subject Code : 17916**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TEST	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
05	01	16	03	100	--	25#	25@	150

**NOTE:**

- **One tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

**Rationale:**

In this age of globalization, competition is tough. Hence effective communication skills are important. Communication skills play a vital and decisive role in career development. The subject of Communication Skills introduces basic concepts of communication. It also describes the verbal, non-verbal modes and techniques of oral & written communication.

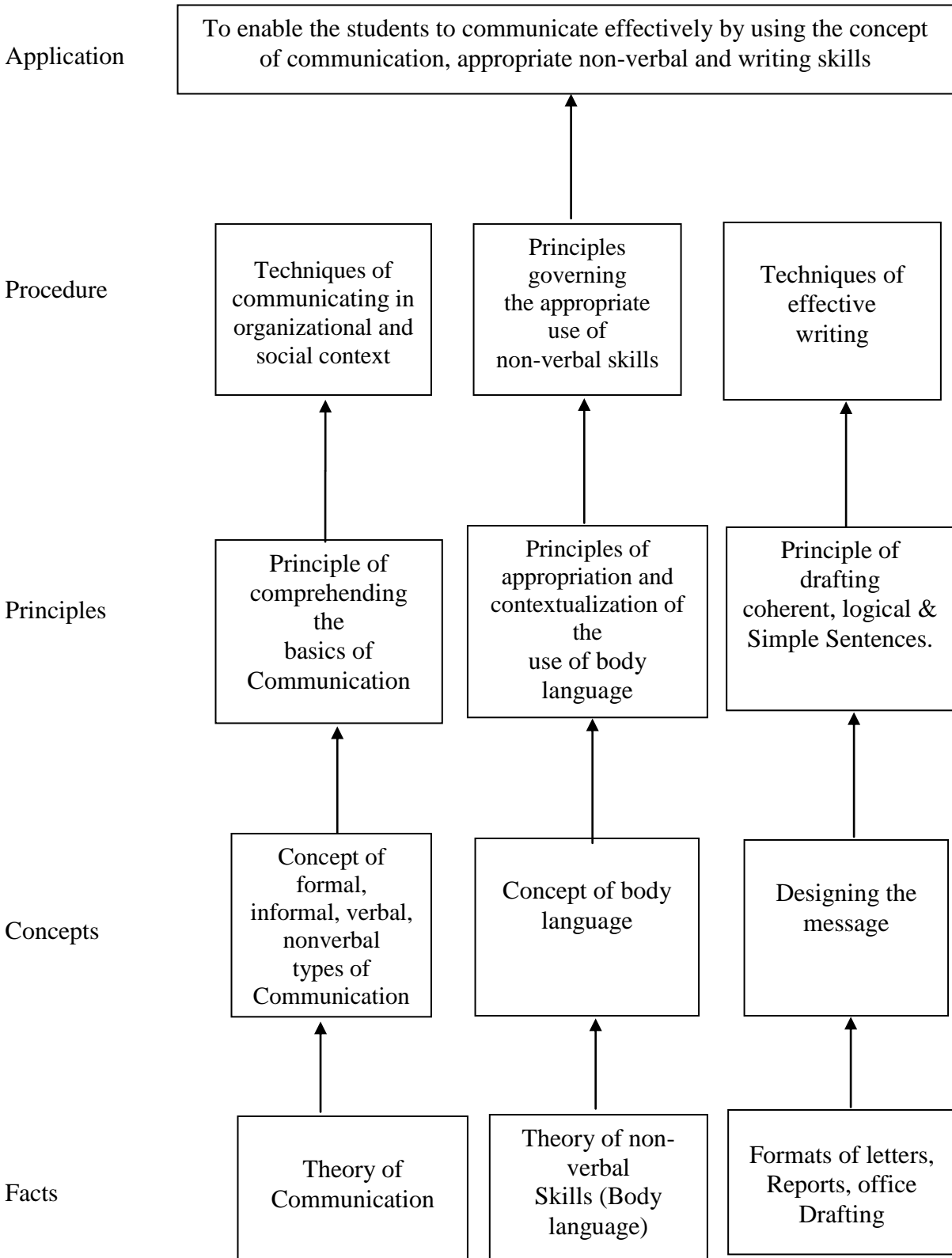
It will guide and direct to develop a good personality and improve communication skills.

**General Objectives:**

Students will be able to:

1. Utilize the skills necessary to be a competent communicator.
2. Select and apply the appropriate methods of communication in various situations.

**Learning Structure:**



## Theory

Name of the Topic	Hours	Marks
<p><b>Topic 01 - Introduction to Communication:</b></p> <p><b>Specific Objective:</b></p> <ul style="list-style-type: none"> <li>➤ Describe the process of communication.</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>• Definition of communication</li> <li>• Process of communication</li> <li>• Types of communication -- Formal, Informal, Verbal, Nonverbal, Vertical, Horizontal, Diagonal</li> </ul>	<b>06</b>	<b>16</b>
<p><b>Topic 02 - Effective communication</b></p> <p><b>Specific Objective:</b></p> <ul style="list-style-type: none"> <li>➤ Identify the principles and barriers in the communication process</li> </ul> <p><b>Contents:</b></p> <ul style="list-style-type: none"> <li>❖ Principles of communication.</li> <li>❖ Barriers to communication</li> <li>a. <b>Physical Barrier:</b> <ul style="list-style-type: none"> <li>❖ Environmental ( time, noise, distance &amp; surroundings),</li> <li>❖ Personal (deafness, stammering, ill-health, spastic, bad handwriting)</li> </ul> </li> <li>b. <b>Mechanical :</b> Machine oriented</li> <li>c. <b>Psychological:</b> Day dreaming, prejudice, emotions, blocked mind, generation gap, phobia, status inattentiveness, perception.</li> <li>d. <b>Language :</b> Difference in language, technical jargons, pronunciation &amp; allusions.</li> </ul>	<b>08</b>	<b>20</b>
<p><b>Topic 03 - Non verbal &amp; Graphical communication:</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Effective use of body language &amp; nonverbal codes</li> <li>➤ View and interpret graphical information precisely.</li> </ul> <p><b>Contents:</b></p> <p>3.1 Non- verbal codes: [08 Marks]</p> <ul style="list-style-type: none"> <li>• Proxemics,</li> <li>• Chronemics</li> <li>• Artefacts</li> </ul> <p>3.2 Aspects of body language ( Kinesics) [10 Marks]</p> <ul style="list-style-type: none"> <li>• Facial expression</li> <li>• Eye contact</li> <li>• Vocalics, paralanguage</li> <li>• Gesture</li> <li>• Posture</li> <li>• Dress &amp; appearance</li> <li>• Haptics</li> </ul>	<b>08</b>	<b>28</b>

3.3 Graphical communication [10 Marks]		
<ul style="list-style-type: none"> <li>• Advantages &amp; disadvantages of graphical communication</li> <li>• Tabulation of data &amp; its depiction in the form of bar graphs &amp; pie charts.</li> </ul>		
<b>Topic 04 - Listening</b> <b>Specific Objective:</b> ➤ Effective use of listening  <b>Contents:</b> <ul style="list-style-type: none"> <li>• Introduction to listening</li> <li>• Listening versus hearing</li> <li>• Merits of good listening</li> <li>• Types of listening.</li> <li>• Techniques of effective listening.</li> </ul>	<b>02</b>	<b>08</b>
<b>Topic 05 - Formal Written Communication</b> <b>Specific Objectives:</b> ➤ Use different formats of formal written skills.  <b>Contents:</b> <ul style="list-style-type: none"> <li>• Office Drafting: Notice , memo &amp; e-mail</li> <li>• Job application with resume.</li> <li>• Business correspondence: Enquiry letter, order letter ,complaint letter, adjustment letter.</li> <li>• Report writing: Accident report, fall in production, investigation report.</li> <li>• Describing objects &amp; giving instructions</li> </ul>	<b>08</b>	<b>28</b>
	<b>32</b>	<b>100</b>

**Skills to be developed in practical:****Intellectual Skills:**

1. Analyzing given situation.
2. Expressing thoughts in proper language.

**Motor Skills:**

1. Presentation Skills focusing on body language.
2. Interpersonal skills of communication

**Journal will consist of following assignments:**

01: Draw the diagram of communication cycle for given situation.

State the type and elements of communication involved in it.

- 02: Graphics:-
- a) Draw suitable bar-graph using the given data.
  - b) Draw suitable pie-chart using the given data.

03: Role play: Teacher should form the group of students based on no. of characters in the situation. Students should develop the conversation and act out their roles.

04: Collect five pictures depicting aspects of body language from different sources such as magazines, newspapers, internet etc. State the type and meaning of the pictures.

**NOTE: The following assignments should be performed by using Language Software.**

05 Practice conversations with the help of software.

06 Describe people/personalities with the help of software and present in front of your batch.

07 Prepare and present elocution (three minutes) on any one topic with the help of software.

08 Describe any two objects with the help of software.

**Learning Resources:**

Sr. No.	Author	Title	Publisher
01	MSBTE, Mumbai.	Text book of Communication Skills	MSBTE, Mumbai.
02	MSBTE, Mumbai.	CD On Communication Skills	MSBTE
03	Joyeeta Bhattacharya	Communication Skills	Reliable Series
04	Communication Skills	Sanjay Kumar, Pushpa Lata	Oxford University Press

**Web Sites for Reference:**

Sr. No	Website Address
01	Website: <a href="http://www.mindtools.com/page8.html">www.mindtools.com/page8.html</a> -99k
02	Website: <a href="http://www.khake.com/page66htm/">www.khake.com/page66htm/</a> -72k
03	Website: <a href="http://www.BMConsultantIndia.Com">www.BM Consultant India.Com</a>
04	Website: <a href="http://www.letstak.co.in">www.letstak.co.in</a>
05	Website: <a href="http://www.inc.com/guides/growth/23032.html">www.inc.com/guides/growth/23032.html</a> -45k

**Course Name : All Branches of Diploma in Engineering and Technology.**

**Course Code : CC/EC/MC/XC/GC**

**Semester : Second**

**Subject Title : Engineering Mathematics**

**Subject Code : -17917**

**Teaching and Examination Scheme**

Teaching Scheme			Examination Scheme					
TH	TEST	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
09	01	--	03	100	--	--	--	100

**NOTE:**

- **One tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

**Rationale:**

This subject is an extension of Basic mathematics of first semester and a bridge to further study of applied mathematics. The knowledge of mathematics is useful in other technical areas.

Differential calculus has applications in different engineering branches. For example concepts such as bending moment, curvature, maxima and minima.

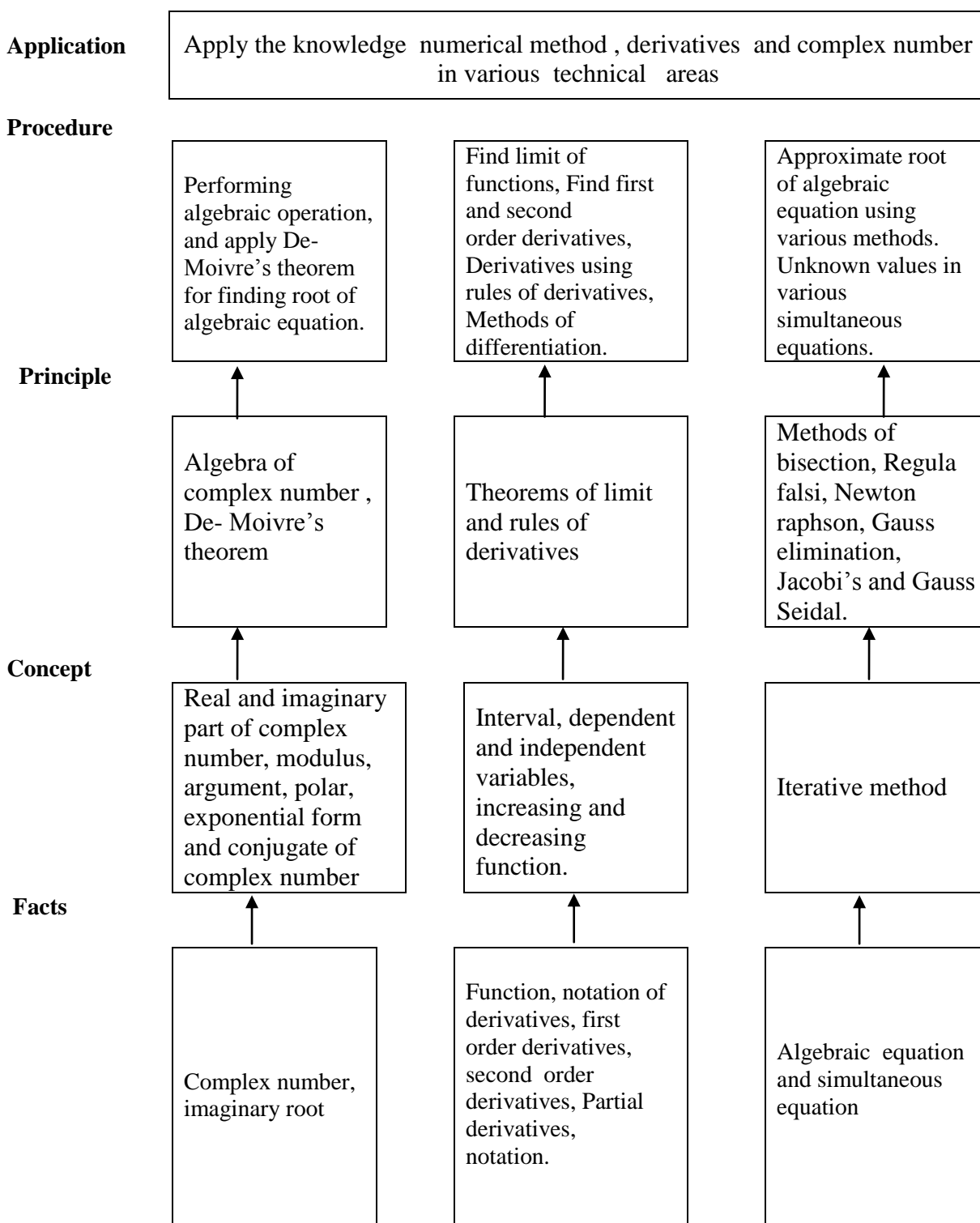
Numerical methods are used in programming as an essential part of computer engineering. For solution of problems in electrical circuits and machine performances complex number is used engineering mathematics lays the foundation to understand technical principles in various fields.

**General objectives:**

Student will be able to

- 1) Use complex numbers for representing different circuit component in complex form to determine performance of electrical circuit and machines.
- 2) Apply rules and methods of differential calculus to solve problems.
- 3) Apply various numerical methods to solve algebraic and simultaneous equations.

**Learning Structure:**





**Content Theory:**

Topic	Hours	Marks
<b>Topic 1 - Complex number</b>		
<b>1.1 Complex number</b> ----- 14 <b>Specific objectives :</b> ➤ Find roots of algebraic equations which are not in real. • Definition of complex number, Cartesian, polar and exponential forms of complex number. • Algebra of complex number such as equality, addition, subtraction, multiplication and division. • De- Moivre's theorem with simple examples. • Euler's form of circular functions, hyperbolic functions and relation between circular and hyperbolic functions.	<b>08</b>	<b>14</b>
<b>Topic 2 - Differential Calculus</b>		
<b>2.1 Function</b> ----- 14 <b>Specific objectives :</b> ➤ Identify the function and find the value of function. • Definition of function, range and domain of function. • Value of function at a point. • Types of functions and examples.	<b>08</b>	<b>58</b>
<b>2.2 Limits</b> ----- 20 <b>Specific objectives :</b> ➤ To evaluate limit of function. • Concept and definition of limit. • Limits of algebraic, trigonometric, logarithmic and exponential functions with examples.	<b>08</b>	
<b>2.3 Derivatives</b> ----- 24 <b>Specific objectives :</b> ➤ Find the derivatives by first principle. ➤ Solve problems using rules and methods of derivatives • Definition of derivatives, notation, derivatives of standard function using first principle. • Rules of differentiation such as, derivatives of sum or difference, product, and quotient with proofs. • Derivative of composite function with proof ( Chain rule ) • Derivatives of inverse trigonometric functions using substitution • Derivatives of inverse function. • Derivatives of implicit function. • Derivatives of parametric function. • Derivatives of one function w.r.t another function. • Logarithmic differentiation. • Second order differentiation.	<b>12</b>	
<b>Topic 3 - Numerical Method</b>		
<b>3.1 Solution of algebraic equation</b> ----- 14 <b>Specific objectives :</b> ➤ Find the approximate root of algebraic equation. • Bisection method • Regula falsi method • Newton Rapshon method	<b>06</b>	<b>28</b>

<b>3.2 Numerical solution of simultaneous equations ----- 14</b>		
<b>Specific objectives :</b>		
<ul style="list-style-type: none"> <li>➤ Solve the system of equations in three unknowns.</li> <li>• Gauss elimination method</li> <li>• Jacobi's method</li> <li>• Gauss Seidal method</li> </ul>	<b>06</b>	
<b>Total</b>	<b>48</b>	<b>100</b>

**Assignments:**

- 1) Assignments are to be used to get enough practice.

**List of Assignments:**

Sr No.	Topic for Assignments
1	Complex number ( Examples based on algebra of complex numbers)
2	Complex number ( Examples based on De Moivre's theorem and Euler's formulae)
3	Function
4	Limit (algebraic and trigonometric functions)
5	Limit (logarithmic and exponential functions)
6	Derivatives by first principle
7	Derivatives ( Examples based on formulae of standard functions and rules )
8	Derivatives ( Examples based on methods of differentiation)
10	Solution of algebraic equations
11	Solution of simultaneous equations

**Learning Resources:****1) Books:**

Sr. No.	Title	Authors	Publication
1	Mathematics for polytechnic	S. P. Deshpande	Pune Vidyarthi Griha Prakashan, Pune
2	Calculus : Single Variable	Robert T. Smith	Tata McGraw HILL
3	Advanced Engineering mathematics	Dass H. K	S. Chand Publication New Delhi
4	Fundamentals of Mathematical Statistics	S. C. Gupta and Kapoor	S. Chand Publication New Delhi
5	Higher Engineering Mathematics	B. S .Grewal	Khanna publication New Delhi
6	Applied Mathematics	P. N. Wartikar	Pune vidyarthi Griha Prakashan, Pune

**2) Websites: [www.khan.academy](http://www.khan.academy)**

**Course Name : Electrical and Electronics Engineering Group****Course Code : CC/EC/MC/XC/GC****Semester : Second****Subject Title : Applied Science (Physics)****Subject Code : 17924****Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TEST	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
06	01	20+2*	02	50	25@	--	--	75

**NOTE:**

- **One tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**
- **Applied Science is divided into two parts - Applied Science (Physics) and Applied Science (Chemistry). Theory examination of both parts as well as practical examination of both parts will be conducted on separate days. Sum of theory marks of both parts shall be considered for passing theory examination of Applied Science. Similarly it is also applicable to practical examination. It is mandatory to appear theory and practical examination of both parts. Remaining absent in any examination of any part will not be declared successful for that examination head.**

**Rationale:**

Applied Physics is the foundation of all core technology subjects. Study of science and technology goes hand in hand. Technical knowledge can be gained more effectively using concepts of Physics. Curriculum of Applied physics includes applications used in the Electronics, Electrical and Computers industry.

Study of various topics like electrical Instruments and condenser enables the students to use various electrical instruments and study their applications. Semiconductor physics makes the students aware of semiconductor devices such as P-N Junction diode, Semiconductor devices are based on transport of charge.

Modern concepts like LASER and nanotechnology make the students to understand various properties and applications. The concept of LASER is beneficial for the students to understand the use of LASER in Fiber optic communication. Commercially lasers are used in sensing devices such as bar code recognition, distance meter (LIDAR), Transmission of optical signal through optical fibres & avoid cross talk .Application of laser namely HOLOGRAPHY is used to store data in ROM Chips. Holograms store large amount of data in 3D form.

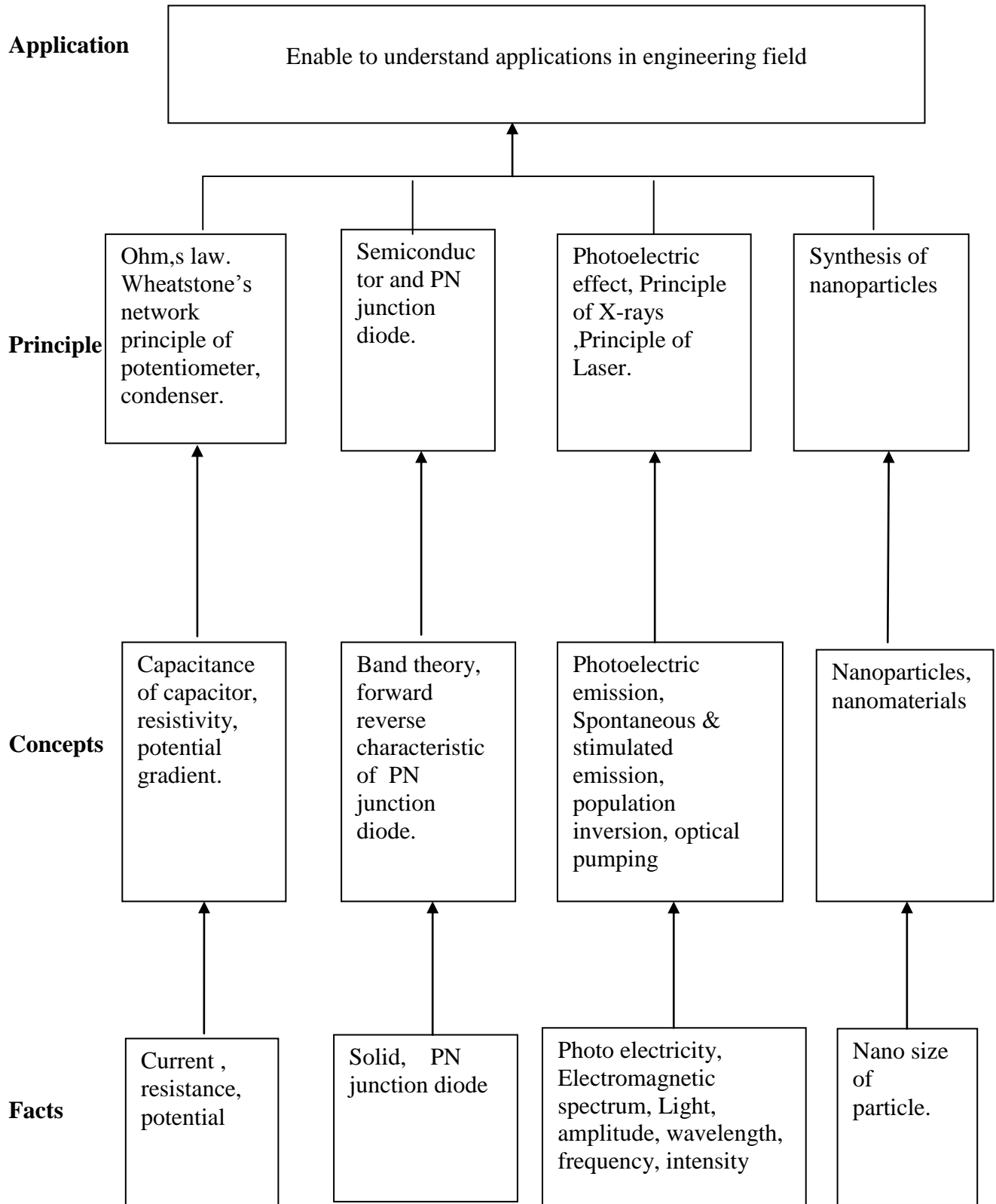
Nanotechnology will invoke the students to understand the nanoparticles and carbon nanotubes. Power can be transmitted at low voltage levels. Nanosized components show unique properties which are different from larger semiconductor components. These devices have increased data storage capacities of hard disks and led to small & faster microprocessors.

**General Objectives:** Students will be able to

1. Understand laws and principles of electrical circuits.
2. Classify solids on the basis of semiconductor band theory.

3. Understand principle of Laser and its applications in engineering field.
4. Identify superconductor and its types.
5. Understands applications of nanoparticles in engineering field.

**Learning Structure:**



**Applied Physics (Computer/ Electrical / Electronic Engineering group) Theory:**

Topics and contents	Hours	Marks
<p><b>Topic1] Basic Electric circuits:</b></p> <p><b>Specific objectives</b></p> <ul style="list-style-type: none"> <li>➤ Calculate basic electric parameters for designing the simple electric circuits.</li> <li>➤ Use basic electronic components like resistor, capacitor in electronic circuits.</li> <li>➤ Use various networks such as Whetastone's network , potentiometer</li> <li>➤ Study principle and applications of condenser</li> </ul> <p><b>1.1 Simple D.C. electric circuits: [04 Marks]</b></p> <ul style="list-style-type: none"> <li>• Electric current: definition, symbol and unit, Ohm's law: statement, mathematical expression, resistivity: definition, unit, conductivity: definition, unit .</li> </ul> <p><b>1.2 Wheatstone's network and potentiometer [06 Marks]</b></p> <ul style="list-style-type: none"> <li>• Wheatstone's network, working principle, balancing condition, principle of potentiometer, potential gradient</li> </ul> <p><b>1.3 Condensers: [06 Marks]</b></p> <ul style="list-style-type: none"> <li>• Capacity of condenser-definition and its unit, definition of 1 farad capacity, principle of condenser, derivation of capacity of parallel plate condenser, statement and derivation of series and parallel combination of condensers.</li> </ul>	<b>12</b>	<b>16</b>
<p><b>Topic 2] Semiconductor Physics:</b></p> <p><b>Specific objectives</b></p> <ul style="list-style-type: none"> <li>➤ Differentiate between conductor, semiconductor, insulator</li> <li>➤ Verify characteristics of P-N junction diode</li> <li>➤ Study applications of P-N junction diode, photodiode.</li> </ul> <ul style="list-style-type: none"> <li>• Classification of solids on the basis of band theory: forbidden energy gap, conductor, insulator, semiconductor.</li> <li>• Classification of semiconductors, P-N junction diode, forward characteristics of P-N junction diode, reverse characteristics of P-N junction diode, photodiode, its symbol, principle and applications.</li> </ul>	<b>04</b>	<b>10</b>
<p><b>Topic 3]: Modern physics.</b></p> <p><b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>➤ State the concept of photocell</li> <li>➤ State applications of X - ray</li> <li>➤ State properties and applications of LASER</li> </ul> <p><b>3.1 Photo electricity: [06 Marks]</b></p> <ul style="list-style-type: none"> <li>• Photon (quantum), Plank's hypothesis, energy of photon, properties of photons.</li> <li>• Photo electric effect: circuit diagram, process of photoelectric emission, definitions:-threshold frequency, threshold wavelength, stopping potential, characteristics of photoelectric effect</li> <li>• Work function, Einstein's photoelectric equation, photo resistor (LDR) – symbol, principle, applications, photoelectric cell:- principle,.</li> </ul> <p><b>3.2 X-rays: [06 Marks]</b></p> <ul style="list-style-type: none"> <li>• Origin of X-rays, production of X-rays using Coolidge's X-ray tube, minimum wavelength of X-ray, properties of X-rays, applications of X- rays: engineering, medical and scientific.</li> </ul>	<b>12</b>	<b>18</b>

<b>3.3 Laser:</b> <span style="float: right;"><b>[06 Marks]</b></span> <ul style="list-style-type: none"> <li>• Laser, properties of laser, spontaneous and stimulated emission, population inversion, optical pumping.</li> <li>• He-Ne Laser: Principle, construction and working, engineering applications of Laser</li> </ul>		
<b>Topic 4] Physics of Nanoparticles:</b> <b>Specific Objectives</b> <ul style="list-style-type: none"> <li>➤ Study properties of nanoparticles.</li> <li>➤ Study applications of nanotechnology.</li> <li>• History, nanoparticles, properties of nanoparticles, methods of synthesis of nanoparticles: physical method of synthesis of nanoparticles, engineering applications of nanotechnology.</li> </ul>	<b>04</b>	<b>06</b>
<b>Total</b>	<b>32</b>	<b>50</b>

**Practical:****Skills to be developed****1) Intellectual skills-**

- Proper selection of measuring instruments
- Verify the principles, laws, using given instruments under different conditions.
- Read and interpret the graph.
- Interpret the results from observations and calculations.

**2) Motor skills-**

- Handle/operate the instruments.
- Measuring physical quantities accurately.
- Observe the phenomenon and to list the observations in a tabular form.
- Plot the graphs.

**List of experiments:**

Sr No	Title of Experiment	To be performed by a group of
1	Determine specific resistance by voltmeter ammeter method	4 to5 students
2	Verify law of resistances in series by using meter bridge.	4 to5 students
3	Verify principle of potentiometer	4 to5 students
4	Determine the characteristics of condenser using RC circuit.	4 to5 students
5	Verify characteristics of photoelectric cell.	4 to5 students
6	Verify characteristics of thermocouple.	4 to5 students
7	Plot forward characteristics of P-N junction diode	4 to5 students
8	Determine Joule's constant (J) by electrical method.	4 to5 students
9	Determine temperature co-efficient of resistance of metal (conductor) using platinum resistance thermometer	4 to5 students

**Learning resources:****1. Reference Books:**

Sr. No.	Title	Author	Publisher
01	Physics	Resnick and Hailday	Wisley Toppan Publishers – England
02	Engineering Physics	B.L. Theraja	S. Chand Publishers – New Delhi
03	Engineering Physics	V. Rajendran	Tata McGraw-Hill Publications
04	Conceptual Physics	P.G.Hewitt	Pearson education (Tenth edition)
05	Physics for Engineers	M.R.Srinivasan	New Age international publishers
06	Physics- Std XI, Std XII	--	HSC board/CBSE Board
07	Engineering Physics	D.K. Bhattachrya A. Bhaskaran	Oxford university press

**2. Websites:**

<http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html>  
<http://physics.info>  
<http://physics.org>  
<http://about.com>  
<http://classroom.com>  
<http://101science.com>

**3) Videos:**

<http://www.youtube.com> Laser cutter  
<http://www.cmslaser.com>

**4) CD:**

Educational Cd of NCERT  
 Educational cd of Pearson education India

**5) PPT:**

[www.slideshare.net/donpraju/laser-ppt](http://www.slideshare.net/donpraju/laser-ppt)  
[www.research.usf.edu/cs/rad/laser-ppt](http://www.research.usf.edu/cs/rad/laser-ppt)  
[www.studyvilla.com/laser-ppt-ruby](http://www.studyvilla.com/laser-ppt-ruby) laser  
[www.coursesuperconductor.ppt](http://www.coursesuperconductor.ppt)  
[www.khanacademy.com](http://www.khanacademy.com)

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

**Course Code : CC/EC/MC/XC/GC**

**Semester : Second**

**Subject Title : Applied Science (Chemistry)**

**Subject Code : 17925**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TEST	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
06	01	20+2*	02	50	25@	--	--	75

**NOTE:**

- **One tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**
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**Rationale:**

The contents of this curriculum has four units which provide knowledge of cells and batteries, selection of appropriate materials for engineering applications and methods of protection by metallic and non-metallic coatings. This satisfies the need of the students to cope with the recent use of these materials and processes in their world of work.

Unit of cells and batteries covers working principle of construction, operations and their engineering applications. Now a days there are new electronic devices, gadgets coming up in the market which function on cells and batteries. Study of cells and batteries give complete knowledge of working of reversible and non-reversible cells, their classification, construction, chemical reactions during working and different chemicals used in manufacturing of cells and batteries will help the students to make proper selection in electronic equipments and computer industry.

Study of different polymers, insulators or dielectrics, adhesives and their chemical behavior will be useful in their applications in electrical appliances and electronic industries. Study of corrosion and methods of prevention will make students realize importance of care and maintenance of machines and equipments.

The contents of this subjects are designed to enhance student's reasoning capacity and capabilities in solving challenging problems at various levels of working in the electronic and computer industry.

**General Objectives:**

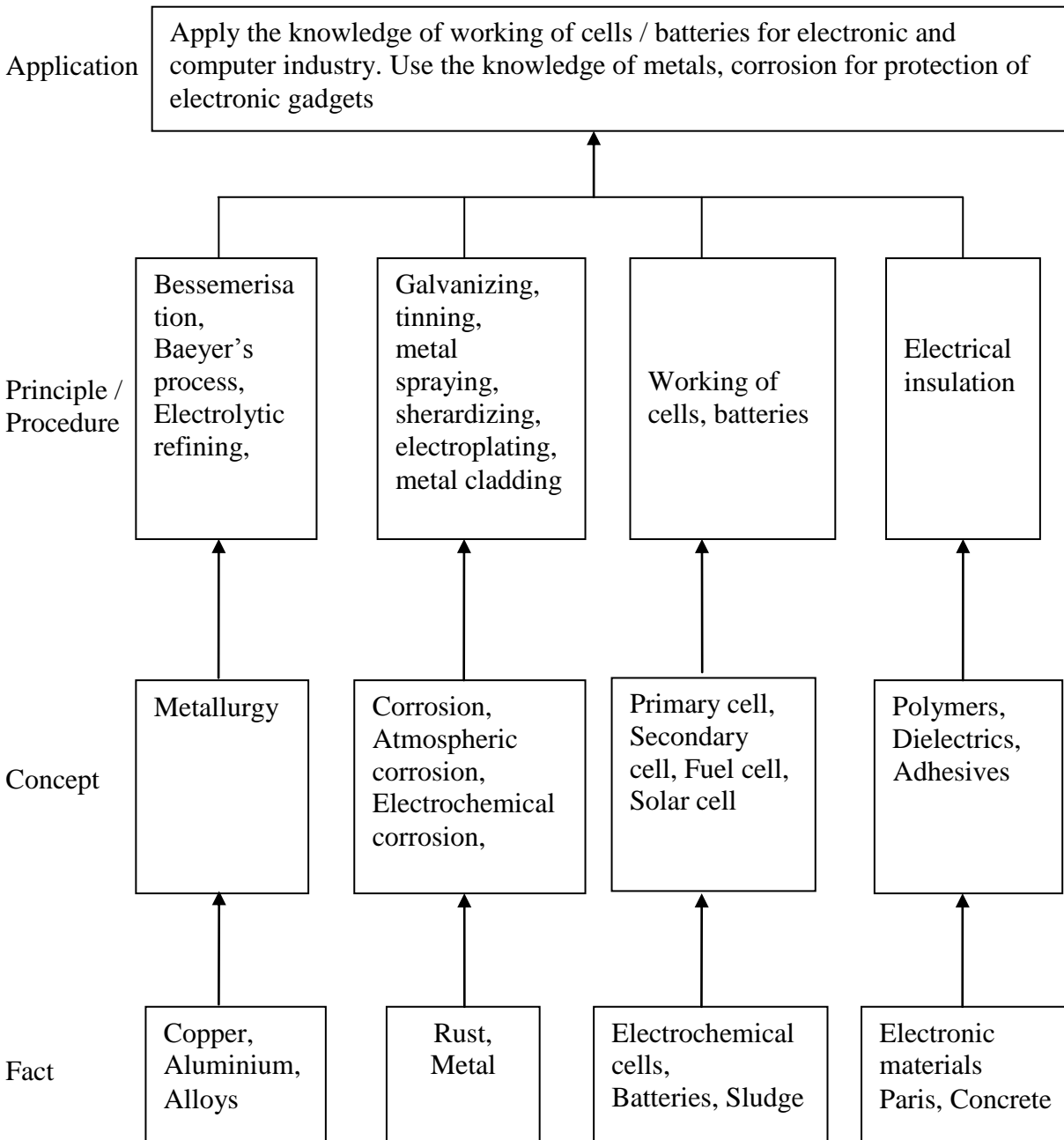
The student will be able to

1. Select proper type of cell based on the requirement in electronic and computer engineering.
2. Apply knowledge of extraction, properties of copper and aluminium in engineering



- applications.
3. Know various insulating or dielectric materials used for electronic equipments and computers.
  4. Generalize different factors which affect atmospheric as well as electrochemical Corrosion.

**Learning Structure:**



**Theory Content:**

Topics and Contents	Hours	Marks
<p><b>Topic 1] Metallurgy:</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Describe the extraction processes of copper and aluminium.</li> <li>➤ State engineering applications of copper and aluminium based on their properties.</li> </ul> <p><b>1.1 Metallurgy of Copper: [4 Marks]</b></p> <ul style="list-style-type: none"> <li>• Definition of metallurgy.</li> <li>• Extraction process: Ores of copper, extraction of copper from copper pyrite by concentration, roasting, smelting, bessemerisation, electrolytic refining.</li> <li>• Physical, chemical properties – action of air, water, acid, alkali. Applications of copper.</li> </ul> <p><b>1.2 Metallurgy of Aluminium: [4 Marks]</b></p> <ul style="list-style-type: none"> <li>• Extraction process: Ores of aluminium, extraction of aluminium from bauxite by Bayer's process, electrolytic reduction of alumina, electrolytic refining of aluminium.</li> <li>• Physical, chemical properties–action of air, water, acid, alkali. Applications of aluminium, anodizing of aluminium.</li> </ul> <p><b>1.3 Solders: [4 Marks]</b></p> <ul style="list-style-type: none"> <li>• Composition, properties and applications of- soft solder, tinmann's solder, brazing alloy, rose metal, plumber's solder.</li> </ul>	<b>08</b>	<b>12</b>
<p><b>Topic 2] Corrosion:</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Explain Mechanism of atmospheric corrosion and immersed corrosion.</li> <li>➤ Describe different methods of protection of metal from corrosion</li> </ul> <p><b>2.1 Corrosion: [6 Marks]</b></p> <ul style="list-style-type: none"> <li>• Definition of corrosion, Types of corrosion.</li> <li>• Atmospheric Corrosion: Definition, mechanism of oxidation corrosion, types of oxide films and their significance, factors affecting rate of atmospheric corrosion.</li> <li>• Immersed Corrosion: Definition, mechanism of immersed corrosion by galvanic cell action- with evolution of hydrogen gas and absorption of oxygen gas, factors affecting immersed corrosion.</li> </ul> <p><b>2.2 Protection of metals by: [8 Marks]</b></p> <ul style="list-style-type: none"> <li>• Modification of environment, modification of properties of metal, electrochemical protection by sacrificial anodic protection and impressed current cathodic protection, use of protective coatings.</li> <li>• Application of metallic coatings: By galvanising, tinning, metal spraying, electroplating, metal cladding, cementation- sherardizing, chromising, colourising.</li> <li>• Application of non-metallic coatings: paint-definition, characteristics, constituents of paint and their functions.</li> </ul>	<b>10</b>	<b>14</b>

<p><b>Topic 3] Cells And Batteries:</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Explain the concept of electrochemical cell.</li> <li>➤ Describe construction and working of different types of cells.</li> </ul> <p><b>Electrochemical cells/ batteries:</b></p> <ul style="list-style-type: none"> <li>• Basic concepts : Definition of electrolyte, conductivity of electrolytes, Ohm's law, specific conductance, equivalent conductance, cell, battery, electrolytic cell, electrochemical cell, charging, discharging.</li> <li>• Classification of electrochemical cells: Primary and secondary cells.</li> <li>• Primary cells: construction, working and applications of - Dry Cell, Daniel cell,</li> <li>• Secondary cells: construction, working and applications of - Lead-acid storage cell, Ni-Cd Cell</li> <li>• Fuel cell : Definition, construction, working, advantages, limitations and applications of Hydrogen- oxygen fuel cell.</li> </ul>	<b>10</b>	<b>16</b>
<p><b>Topic 4] Chemistry of Electronic Materials</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ State role of polymers in electronic engineering.</li> <li>➤ Describe applications of dielectrics and insulators in electronic devices.</li> </ul> <p><b>4.1 Polymers: [4 Marks]</b></p> <ul style="list-style-type: none"> <li>• Definitions, examples and applications of electrically conducting polymers, photoconductive polymers, electrically insulating polymers, liquid crystal polymers(LCP).</li> </ul> <p><b>4.2 Insulators, Dielectrics and Adhesives: [4 Marks]</b></p> <ul style="list-style-type: none"> <li>• Definition of dielectrics and insulator, Properties of gaseous, liquid and solid insulators , their examples. Properties and applications of- inert gases, silicone fluids, teflon , bakelite, ceramics and glass.</li> <li>• Definition, characteristics, advantages of adhesives, properties and applications of phenol formaldehyde resin, urea formaldehyde resin and epoxy resin.</li> </ul>	<b>04</b>	<b>08</b>
<b>Total</b>	<b>32</b>	<b>50</b>

**Practical:****Intellectual Skills:**

1. Select proper equipments and instruments.
2. Interpret the results.
3. Plan the set up of the experiment.
4. Verify the characteristics of materials.

**Motor Skills:**

1. Measure the parameters accurately.
2. Calibrate the equipments as per the standards.

3. Calculate the results.
4. Measure chemicals accurately.
5. Handle apparatus and various laboratory reagents.
6. Observe the completion of reaction.

**List of Experiments:**

Sr. No.	Name of the experiment
1	Determine percentage of copper in the given brass alloy or copper ore.
2	Determine percentage of aluminium in aluminium alloy.
3	Determine electrode potential of various metals to study their tendency towards corrosion.
4	Find the relation between loss in weight of aluminium strip in acidic and alkaline medium and rate of corrosion.
5	Determine the strength of given hydrochloric acid solution by titrating it against sodium hydroxide solution by using pH meter.
6	Determine thinner content in oil paint.
7	Determine neutralization point of acetic acid (weak acid) and ammonium hydroxide (weak base) and to calculate normality and strength of acetic acid.
8	Measure the voltage developed due to chemical reactions by setting up a Daniel cell.
9	To prepare urea formaldehyde resin and understand the structure and properties for its applications in engineering.

**Learning Resources:****1. Reference Books:**

Sr. No.	Author	Name of the Book	Publisher
1	S. S. Dara	Engineering Chemistry	S. Chand Publication
2	Jain and Jain	Engineering Chemistry	Dhanpat Rai and Sons
3	B. Sivasankar	Engineering Chemistry	The McGraw-Hill Companies
4	K. B. Chandrasekhar, U. N. Das, Sujatha Mishra	Engineering Chemistry	SCITECH

**2. List of websites, videos and animations :**

[http://en.wikipedia.org/wiki/conductive\\_polymer](http://en.wikipedia.org/wiki/conductive_polymer)

[http://en.wikipedia.org/wiki/waste-management.](http://en.wikipedia.org/wiki/waste-management)

<http://www.footprints-science.co.uk/Chemistry.htm>

[.http://www.youtube.com/watch?v=8tqfDE6vqcs&feature=related](http://www.youtube.com/watch?v=8tqfDE6vqcs&feature=related)

<http://www.splung.com/content/sid/3/page/batteries>

[www.teachnet-uk.org.uk/...Metals/...metals/Properties%20of%20Meta...](http://www.teachnet-uk.org.uk/...Metals/...metals/Properties%20of%20Meta...)

[http://www.substech.com/dokuwiki/doku.php?id=full\\_index\\_of\\_articles\\_on\\_ceramics](http://www.substech.com/dokuwiki/doku.php?id=full_index_of_articles_on_ceramics)

[http://www.substech.com/dokuwiki/doku.php?id=full\\_index\\_of\\_articles\\_on\\_polymers](http://www.substech.com/dokuwiki/doku.php?id=full_index_of_articles_on_polymers)

<http://www.powerstream.com/BatteryFAQ.html>

<http://physchem.co.za/OB12-sys/batteries.htm#lead-acid> (Dry Cell & Lead acid cell)

<http://www.kentchemistry.com/links/Redox/flash/RedoxAgentsElectrodesBattery.swf> (Battery)

<http://www.kentchemistry.com/links/Redox/flash/battery.swf>

<http://www.kentchemistry.com/links/Redox/flash/halfcells.swf> (Voltaic Cell)

<http://group.chem.iastate.edu/Greenbowe/sections/projectfolder/animations/ZnCbatteryV8web.html> (Dry Cell)

<http://www.ausetute.com.au/battery.html> (Batteries)

[http://www.sherardizing.com/resources/files/9\\_Sherardizing\\_Corrosion.pdf](http://www.sherardizing.com/resources/files/9_Sherardizing_Corrosion.pdf) (Sherardizing)

[http://www.galvanizeit.org/aga/animation/4728?keepThis=true&TB\\_iframe=true&height=480&width=640](http://www.galvanizeit.org/aga/animation/4728?keepThis=true&TB_iframe=true&height=480&width=640) (Galvanizing)

[http://www.galvanizeit.org/aga/animation/4728?keepThis=true&TB\\_iframe=true&height=480&width=640](http://www.galvanizeit.org/aga/animation/4728?keepThis=true&TB_iframe=true&height=480&width=640) (Galvanizing)

[http://www.ehow.com/list\\_6725219\\_different-types-metal-cladding.html](http://www.ehow.com/list_6725219_different-types-metal-cladding.html) (Metal Cladding)

<http://www.authorstream.com/Presentation/sheelachawla-590475-insulators/> (Insulators)

[http://www.sut.ac.th/engineering/metal/pdf/Nonferrous/02\\_Aluminium%20and%20aluminium%20alloy.pdf](http://www.sut.ac.th/engineering/metal/pdf/Nonferrous/02_Aluminium%20and%20aluminium%20alloy.pdf)

<http://www.youtube.com/watch?v=zU5sP64DeYA> (Flow chart of extraction of Al)

[http://www.youtube.com/watch?v=0Rs4vHo6\\_oc&feature=related](http://www.youtube.com/watch?v=0Rs4vHo6_oc&feature=related) (extraction of Al)

<http://www.youtube.com/watch?v=XWGbUYsChOI> (extraction of Cu)

<fka.ump.edu.my/images/fka/.../5.2%20Adhesives.ppt>

<images.emchiey.multiply.multiplycontent.com/.../08a%20Adhesives...>

**Course Name** : Electrical Engineering Group  
**Course Code** : EG/EC  
**Semester** : Second  
**Subject Title** : Fundamentals of Electrical Engineering.  
**Subject Code** :17927

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TEST	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
05	01	24	03	100	25#	--	25@	150

**NOTE:**

- One tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)

**Rationale:**

In the course of diploma in electrical engineering, study of electrical machines, instruments, devices and equipment's are involved. Besides this, concepts, facts and operations about power system, protection scheme and controls must be studied and developed by students of electrical engineering.

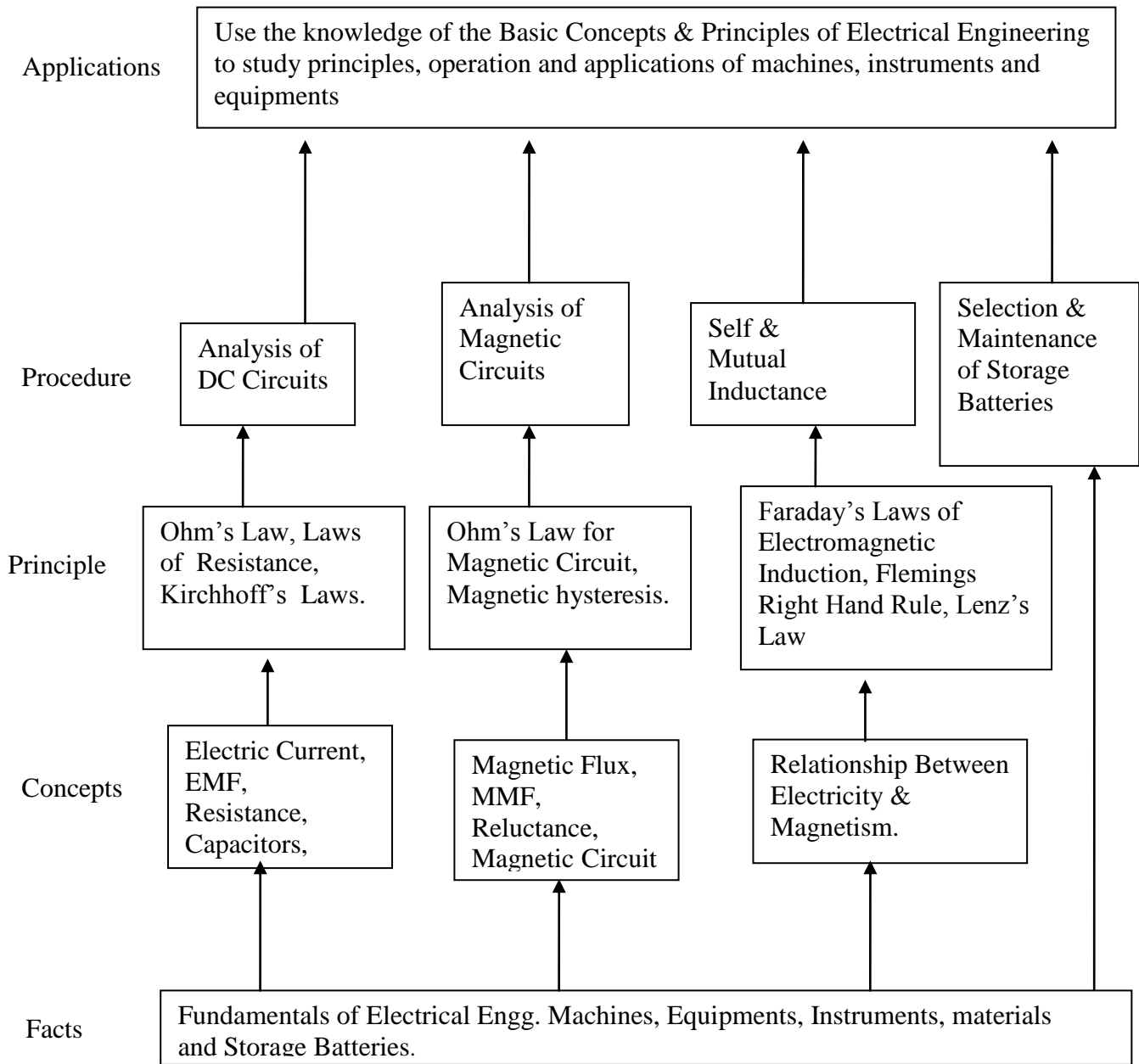
The basic aim of subject is that the student must learn the basic concepts, rules and laws of electric and magnetic circuits and practical's thereof. This study of subject will facilitate the understanding of principles and working of machines, instruments and equipment's. Use of multi media in learning resources will facilitate the learning

**General Objectives:**

The student will be able to:

1. Understand various definitions, laws and concepts involved in electrical field, circuits, magnetism.
2. Understand concepts of electrical circuits and magnetic circuits.
3. Realize importance of electromagnetic induction in regards to machines and power system.
4. Understand utility and maintenance of storage batteries.
5. Study different types of electric supply.

**Learning Structure:**



**Theory:**

Topic and Detailed Content	Hours	Marks
<p><b>Topic 1 Basic Concepts:</b>            Specific Objectives: The students will be able to :</p> <ul style="list-style-type: none"> <li>➤ Understand various parameters and quantities used in electric circuit.</li> <li>➤ Classify types of electric currents.</li> <li>➤ Calculate various electric quantities such as power ,current, energy and p.d. in simple circuits</li> </ul> <p><b>Contents</b></p> <p>1.1 Electrical Quantities</p> <ul style="list-style-type: none"> <li>• Concept of Electric Current.</li> <li>• Concept of Electric Potential, Potential Difference(P D)</li> <li>• Electro-Motive-Force (EMF).</li> </ul> <p>1.2 Resistance</p> <ul style="list-style-type: none"> <li>• Concept of Resistance</li> <li>• Definition of Resistance</li> <li>• Concept of Resistivity and Conductivity</li> <li>• Effect of Temperature on Resistance.</li> <li>• Temp.co-efficient of Resistance ( simple numerical)</li> </ul> <p>1.3 Classification of Electric Current</p> <ul style="list-style-type: none"> <li>• Direct Current (DC)</li> <li>• Alternating Current (AC)</li> </ul> <p>1.4 Sources of D.C. Supply</p> <ul style="list-style-type: none"> <li>• Concept of Voltage Source: Ideal and Practical</li> <li>• Concept of Current Source: Ideal and Practical</li> <li>• Source Conversion. (simple numerical)</li> </ul> <p>1.5 Effects of Electric Current (Only Introduction)</p> <ul style="list-style-type: none"> <li>• Heating Effect</li> <li>• Magnetic Effect</li> <li>• Chemical Effect</li> </ul> <p>1.7 Concept of Electrical Work, Power and Energy.            Their SI units (simple numerical)</p> <p>1.8 Types of Resistors and their Applications.</p> <ul style="list-style-type: none"> <li>• Carbon Composition</li> <li>• Deposited Carbon</li> <li>• High Voltage Ink Film</li> <li>• Metal Film</li> <li>• Metal Glaze</li> <li>• Wire Wound</li> <li>• Cermet</li> </ul>	<b>06</b>	<b>12</b>
<p><b>Topic 2 D. C. Circuits:</b>            Specific Objectives: The students will be able to :</p> <ul style="list-style-type: none"> <li>➤ Calculate internal resistance of a given d.c.source and terminal voltage.</li> <li>➤ Calculate equivalent resistance of various simple d.c. circuits.</li> <li>➤ Apply Kirchoff's laws.</li> <li>➤ Identify different D.C.Circuits.and convert star to delta and vice versa.</li> </ul> <p><b>Contents</b></p> <p>2.1 Ohm's Law and related terms</p> <ul style="list-style-type: none"> <li>• Ohm's Law</li> </ul>	<b>09</b>	<b>20</b>



<ul style="list-style-type: none"> <li>• Internal resistance of source</li> <li>• Concept of internal voltage drop</li> <li>• Terminal Voltage.</li> </ul> <p>2.2 Various connections of resistances</p> <ul style="list-style-type: none"> <li>• Resistance in Series, Voltage Division Formula.</li> <li>• Resistance in Parallel, Current Division Formula.</li> <li>• Calculations of Equivalent Resistance of simple Series,</li> <li>• Parallel and Series Parallel Circuits.(Simple Numericals)</li> </ul> <p>2.3 Duality Between Series and Parallel Circuits.</p> <p>2.4 Definitions of terms Related to Electric Circuits</p> <ul style="list-style-type: none"> <li>• Active and Passive Circuit Parameters</li> <li>• Linear Circuit and Non-linear Circuit,</li> <li>• Unilateral Circuit and Bi-lateral Circuit,</li> <li>• Electric Network, Passive and Active Network,</li> <li>• Node, Branch, Loop, Mesh.</li> </ul> <p>2.5 Kirchhoff's Laws (Simple Numericals with two equations only)</p> <ul style="list-style-type: none"> <li>• Kirchhoff's Current Law</li> <li>• Kirchhoff's Voltage Law</li> </ul> <p>2.6 Star/Delta and Delta/Star Transformation. (Simple Numericals)</p>		
<p><b>Topic 3 Capacitors :</b>  Specific Objectives: The students will be able to :</p> <ul style="list-style-type: none"> <li>➤ Understand the concept of capacitance</li> <li>➤ Identify types of capacitor</li> <li>➤ Calculate equivalent capacitance of various simple d.c. circuits.</li> <li>➤ Draw charging and discharging curves of capacitor.</li> <li>➤ Derive basic formulae for energy stored and formula for capacitance of parallel plate capacitor</li> </ul> <p><b>Contents</b></p> <p>3.1 Concept and Definition of Capacitor</p> <p>3.2 Parallel Plate Capacitor:(Derivation and Simple Numerical )</p> <ul style="list-style-type: none"> <li>• Uniform Di-electric Medium</li> <li>• Medium Partly Air.</li> </ul> <p>3.3 Various connections of capacitances (Simple Numerical)</p> <ul style="list-style-type: none"> <li>• Equivalent capacitance of capacitors in series. :(Derivation and Simple Numerical )</li> <li>• Equivalent capacitance of capacitors in parallel. :(Derivation and Simple Numerical )</li> <li>• Calculations of Equivalent Capacitance of Series Parallel :( Simple Numerical )</li> </ul> <p>3.4 Energy Stored in Capacitor.( Derivation and Simple Numerical)</p> <p>3.5 Charging and Discharging of Capacitor (No Derivation and No Numerical)</p> <p>3.6 Concept of Breakdown Voltage and Di-electric strength</p> <p>3.7 Types of Capacitors and their Applications.</p> <ul style="list-style-type: none"> <li>• Electrolytic</li> <li>• Non-Electrolytic (Paper, Mica, Film, Ceramic, Glass)</li> </ul>	<b>05</b>	<b>12</b>
<p><b>Topic 4Magnetic Circuits :</b>  Specific Objectives: The students will be able to :</p> <ul style="list-style-type: none"> <li>➤ Understand various terms involved in magnetic circuit.</li> <li>➤ Find out various parameters/quantities of magnetic circuit.</li> <li>➤ Draw B-H curve and hysteresis loop.</li> </ul>	<b>08</b>	<b>16</b>

<p>➤ Distinguish between series and parallel magnetic circuit.</p> <p><b>Contents</b></p> <p>4.1 Concept of magnet and electromagnetic.</p> <p>4.2 Concept of magnetic lines of force.</p> <p>4.3 Magnetic Circuit –</p> <ul style="list-style-type: none"> <li>• Definition of magnetic circuit.</li> <li>• Ohm's law of Magnetic Circuit.</li> </ul> <p>4.4 Definitions Concerning Magnetic Circuit.</p> <ul style="list-style-type: none"> <li>• Magneto-Motive-Force (MMF),</li> <li>• Ampere Turns (AT)</li> <li>• Reluctance</li> <li>• Permeance</li> <li>• Reluctivity.</li> </ul> <p>4.5 Comparison Between Electric and Magnetic circuit.</p> <p>4.6 Concept Series Magnetic Circuit and Parallel Magnetic Circuit.</p> <p>4.7 Calculations of Amp.-Turns for simple Series( without and with air gap)</p> <p>4.8 Concept of Leakage Flux, Useful Flux &amp; Fringing.</p> <p>4.9 Magnetisation Curve (B - H Curve) ( No Derivation and No Numericals)</p> <ul style="list-style-type: none"> <li>• Magnetisation Curve for Magnetic and Non-Magnetic</li> <li>• Materials.</li> <li>• Magnetic Hysteresis, Hysteresis Loop.</li> <li>• Area of Hysteresis Loop, Hysteresis Loss.</li> </ul> <p>4.10 Applications of magnet</p> <ul style="list-style-type: none"> <li>• Permanent Magnet</li> <li>• Electromagnet.</li> </ul>		
<p><b>Topic 5 Electromagnetic Magnetic Induction :</b></p> <p>Specific Objectives: The students will be able to :</p> <ul style="list-style-type: none"> <li>➤ Understand relation between magnetism and electricity.</li> <li>➤ Apply faraday's laws to calculate induced e.m.f.</li> <li>➤ Distinguish between statically and dynamically induced e.m.f.</li> <li>➤ Find out self inductance and energy stored in magnetic field.</li> </ul> <p><b>Contents</b></p> <p>5.1 Relation Between Magnetism and Electricity.</p> <p>5.2 Development of Induced e.m.f. and Current.</p> <p>5.3 Faraday's Laws of Electromagnetic Induction. (Simple Numerical)</p> <ul style="list-style-type: none"> <li>• Faraday's First Law</li> <li>• Faraday's Second Law</li> </ul> <p>5.4 Induced e.m.f.(Simple Numerical)</p> <ul style="list-style-type: none"> <li>• Statically Induced E.M.F</li> <li>• Dynamically Induced E.M.F</li> </ul> <p>5.5 Direction of Induced E.M.F. and Currents.</p> <p>5.5 Direction of induced e,m,f,</p> <ul style="list-style-type: none"> <li>• Lenz's Law for statically induced e,m,f,</li> <li>• Fleming's Right Hand Rule for dynamically induced e.m.f.</li> </ul> <p>5.6 Self Inductance</p> <p>5.7 Coefficient of Self-induction (L) (Simple Numerical)</p> <p>5.8 Mutual inductance</p> <p>5.9 Coefficient of Mutual inductance (M)</p> <p>5.10 Self induced e.m.f. and mutually induced e.m.f</p> <p>5.11 Coefficient of Coupling (No Derivation and No Numerical)</p> <p>5.12 Inductances in series. (No Derivation and No Numerical)</p>	<b>09</b>	<b>16</b>

<p>5.13 Types of inductors and their applications.</p> <ul style="list-style-type: none"> <li>• Air Cored Inductors</li> <li>• Iron Cored Inductors</li> <li>• Ferrite Cored Inductors.</li> </ul> <p>5.14 Energy Stored in Magnetic Field( Derivation and Simple Numerical)</p>		
<p><b>Topic 6 Storage batteries :</b>  Specific Objectives: The students will be able to :</p> <ul style="list-style-type: none"> <li>➤ Understand difference between cell and battery.</li> <li>➤ Understand series and parallel connections of batteries.</li> <li>➤ Conduct maintenance of batteries.</li> <li>➤ Find out self inductance and energy stored in magnetic field.</li> </ul> <p><b>Contents</b></p> <p>6.1 Concept of Cell and Battery</p> <p>6.2 Electrical Characteristics of Batteries.</p> <p>e.m.f.</p> <ul style="list-style-type: none"> <li>• Terminal Voltage</li> <li>• Internal Resistance</li> <li>• Amp.Hour Capacity</li> <li>• Efficiency: AH Efficiency and Watt Hr Efficiency</li> </ul> <p>6.3 Necessity of Series Connection of Batteries</p> <p>6.4 Necessity of Parallel Connection of Batteries</p> <p>6.5 Charging of Batteries</p> <ul style="list-style-type: none"> <li>• Current Charging Method</li> <li>• Constant Voltage Charging Method</li> <li>• Precautions During Charging</li> <li>• Indications of Fully Charged Cells</li> </ul> <p>6.6 Maintenance of Lead Acid Batteries.</p> <p>6.7 Dry cell and Liquid Cell(Comparison)</p> <p>6.8 Applications of Storage Batteries</p>	<b>03</b>	<b>08</b>
<p><b>Topic 7 Basic of A.C. Fundamentals:</b>  Specific Objectives: The students will be able to :</p> <ul style="list-style-type: none"> <li>➤ Understand induction of sinusoidal a.c. supply</li> <li>➤ Understand basic a.c. quantities</li> </ul> <p><b>Contents</b></p> <p>7.1 Simple loop a.c.generator with explanation of sinusoidal e.m.f.</p> <p>7.2 Basic definitions : Cycle, Frequency, Time and Amplitude</p>	<b>02</b>	<b>04</b>
<p><b>Topic 8 Electric Materials:</b>  Specific Objectives: The students will be able to :</p> <ul style="list-style-type: none"> <li>➤ Understand various materials used in electrical m/c, equipments.</li> <li>➤ Understand importance of various properties of materials.</li> </ul> <p><b>Contents</b></p> <p>8.1 Classification of electrical materials.</p> <p>8.2 Conducting Materials (Physical, Mechanical and Electrical properties)</p> <ul style="list-style-type: none"> <li>➤ Current Carrying Conducting Materials( Copper, Aluminum, Bronze and Iron)</li> <li>➤ Non Current Carrying Conducting Materials( Cast iron, Cast Steel,etc)</li> </ul> <p>8.3 Insulating Materials(Thermal , Mechanical and Electrical properties)</p> <ul style="list-style-type: none"> <li>➤ Classification on basis of state of materials as solid ,liquid gaseous insulating materials ( Introduction and applications )</li> <li>➤ Classification on the basis of temperature withstanding ability as Y, A, E, B, F,H and C type with list of insulating materials in each</li> </ul>	<b>06</b>	<b>12</b>

type. 8.4 Magnetic Material ( Introduction and Applications ) Classification of magnetic material as Paramagnetic, Diamagnetic and Ferromagnetic material		
<ul style="list-style-type: none"> <li>• C.R.G.O. Silicon Steel</li> <li>• H.R.G.O. Silicon Steel</li> <li>• Amorphous Metal</li> </ul>		
<b>Total</b>	<b>48</b>	<b>100</b>

**Practical:****Skills to be developed:****Intellectual Skills:**

1. Identify and select electrical measuring instruments.
2. Interpret electrical circuit diagram.
3. Identify safety equipments required.
4. Decide the procedure for setting experiments.
5. Select electrical instruments of proper range.

**Motor Skills:**

1. Draw circuit diagram
2. Make wiring connections to connect electrical equipments and instruments.
3. Accurately measure electrical current and voltage drop.
4. Use of safety devices while working.

**List of Practicals:**

Expt No.	Name of the Experiment
01	Know your electrical engineering laboratory: <ul style="list-style-type: none"> <li>➤ Draw layout of electrical laboratory.</li> <li>➤ Prepare Charts of electrical safety and Study operation of fire extinguishing equipments.</li> <li>➤ Study and use electric tools such as plier, screw driver, insulation cutter, tester etc.</li> </ul>
02	To measure e.m.f. of d.c. source and to calculate its internal resistance by connecting it to an external load.
03	To use rheostat as current regulator and potential divider.
04	To determine the equivalent resistance of <ul style="list-style-type: none"> <li>➤ Series connected resistors</li> <li>➤ Parallel connected resistors</li> </ul>
05	To verify Kirchoff's current law and voltage law.
06	To determine the equivalent capacitance of <ul style="list-style-type: none"> <li>➤ Series connected capacitors</li> <li>➤ Parallel connected capacitors</li> </ul>
07	To plot the charging and discharging curves of a capacitor(C) through resistor (R) and to determine the time constant of RC circuit analytically and graphically.
08	To plot B-H curve for a given magnetic material.
09	To plot the hysteresis loop for a given magnetic material
10	To demonstrate the Faraday's first law of electromagnetic induction for <ul style="list-style-type: none"> <li>➤ Statically induced e.m.f.</li> <li>➤ Dynamically induced e.m.f.</li> </ul>

11	To determine the temperature coefficient of resistance of copper.
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**All experiments are compulsory.**

**Learning Resources:**

**1. Books:**

Sr. No.	Author	Title	Edition	Publisher
1	B. L. Theraja A. K. Theraja	A Text Book of Electrical Technology Vol-I (Basic Electrical Engg.)	Multicolour Edition 2005 And Subsequent Reprint	S. Chand & Co. Ramnagar, New Delhi
2	V. N. Mittle	Basic Electrical Engg.	Any Edition After 2005	Tata McGraw-Hill
3	Edward Hughes	Electrical Technology	Second And Any Subsequent Edition	Pearson Education, New Delhi
4	R.S. Ananda Murthy	Basic Electrical Engineering	Second Edition	Pearson
5	T. Thyagarajan	Basic Electrical Engineering	First Edition	Scitech
6	K Uma Rao	Basic Electrical Engineering	First Edition	Pearson
7	Sunil T.Gailwad	Basic Electrical Engineering	First Edition	Dreamtech Press 19-A Daryaganj, N.Delhi

**2. Websites:**

[www.wikipedia.com](http://www.wikipedia.com) , [www.youtube.com](http://www.youtube.com) , [www.norsa.com](http://www.norsa.com), [www.dreamtechpress.com](http://www.dreamtechpress.com)

**List of Machines and Equipments:**

Sr No.	List of Equipments	Specifications	Qty.
1	D. C. Ammeter Range (0-5A)	Portable analog PMMC type as per relevant BIS standard	05
2.	D,C. Voltmeter Range (0-150/300V)	Portable analog PMMC type as per relevant BIS standard	05
3	D,C. Voltmeter Range (0-15/30/75 V)	Portable analog PMMC type as per relevant BIS standard	05
4	Rheostat (0-250 Ohm,2A)	Nichrome wire wound rheostat on epoxy resin or class F insulating tube with two fixed and one sliding contact	05
5	Rheostat (0-90 Ohm,5A)	Nichrome wire wound rheostat on epoxy resin or class F insulating tube with two fixed and one sliding contact	05
6	Rheostat (0-35 Ohm,10A)	Nichrome wire wound rheostat on epoxy resin or class F insulating tube with two fixed and one sliding contact	05
7	Rheostat (0-350Ohm,1.5A)	Nichrome wire wound rheostat on epoxy resin or class F insulating tube with two fixed and one sliding contact	05
8	D. C. Supply	A 230 V d.c. supply ( with inbuilt rectifier to convert a.c.to d.c)	02

9	Oil filled capacitor	10 to 100 $\mu$ F Oil filled capacitor with rated voltage upto 500V	02
10	Electrolyte type capacitor	10 to 100 $\mu$ F electrolyte capacitor with rated voltage upto 500V	02
11	Galvanometer	(50mV-0-50mV) PMMC type analog portable galvanometer	02

**Note:**

While procuring equipments detailed specifications are to be given. For detailed specifications manufactures catalogues and relevant BIS may be referred.

Above list with specifications are suggestive and may vary as per need of institute and already availability of equipments.

Kits for experiments are not recommended. Instead of that physical arrangement of experimental set along with source, elements and meters on table is recommended.