BANGLADESH TECHNICAL EDUCATION BOARD

1

4-YEAR DIPLOMA-IN-ENGINEERING PROGRAM

ELECTRICAL TECHNOLOGY

SYLLABUS

FIRST AND SECOND SEMESTER

Electrical Technology (67) 1st Semester

Sl.	Subject code							MA	RKS	
INU		Name of the subject	Т	Р	С	Theo	ry	Practic	al	Total
						Cont.	Final	Cont.	Final	
					-	assess	exam.	assess	exam.	
1	1011	Engineering. Drawing	0	6	2	-	-	50	50	100
2	1012	Engineering. Materials	2	3	3	20	80	25	25	150
3	5712	English-1	2	0	2	20	80	-	-	100
4	5812	Physical Education.& Life Skill Development	0	2	1	-	-	50	-	50
5	5911	Mathematics-1	3	3	4	30	120	50	-	200
6	5913	Chemistry	3	3	4	30	120	25	25	200
7	6711	Basic Electricity	3	3	4	30	120	25	25	200
		Total	13	22	20					1000

Electrical Technology (67) 2nd Semester

SI.	Subject code							MA	RKS	
NO		Name of the subject	Т	Р	С	Theo	ry	Practic	al	Total
						Cont.	Final	Cont.	Final	
						assess	exam.	assess	exam.	
1	5722	English-2	2	2	3	20	80	50	-	150
2	5912	Physics-1	3	3	4	30	120	25	25	200
3	5921	Mathematics-2	3	3	4	30	120	50	-	200
4	6621	Computer Application-1	0	6	2	-	-	50	50	100
5	6721	Electrical Circuits-1	3	3	4	30	120	25	25	200
6	6722	Advanced Electricity	3	3	4	30	120	25	25	200
7	7011	Basic Workshop Practice	0	6	2	-	-	50	50	100
		Total	14	26	23					1150

1011	ENGINEERING DRAWING	Т	Р	С
		0	6	2

OBJECTIVES

- To develop the ability to use various drawing instruments and materials.
- To enable in constructing and using various types of scales in drawing.
- To provide the ability to construct various geometrical figures.
- To enable to adopt various symbols used in drawing.
- To provide the skill of freehand sketching with shades and shadows.
- To provide the basic skill of drawing orthographic views.

SHORT DESCRIPTION

Drawing instruments and their uses; Lettering, numbering and constructing title strip; Adopting alphabet of lines and dimensioning; Constructing scales; Constructing geometrical figures; Constructing conic sections; Adopting symbols; Freehand sketching (with shades and shadows), Drawing orthographic views.

DETAIL DESCRIPTION

DRAWING INSTRUMENTS AND MATERIALS

- **1** Practice with drawing instruments and materials for basic drawing technique.
 - 1.1 Identify the different types of drawing instruments.
 - 1.2 Use different types of drafting equipment.
 - 1.3 Use different types of drafting software.
 - 1.4 Identify the standard sizes of drawing board and sheets.
 - 1.5 Draw the border lines in drawing sheets following standard rule.
 - 1.6 Draw horizontal, vertical and inclined lines with the help of set squares and T-square.
 - 1.7 Draw 15 degree, 75 degree, 105 degree and 120 degree angles with the help of set squares.
 - 1.8 Use lettering guide, template, scale pantograph and French curve.

LETTERING NUMBERING AND TITLE STRIP

2 Letter and number freehand and with instruments.

- 2.1 Identify the necessity of good lettering in engineering drawing.
- 2.2 Draw freehand single stroke vertical letters from A to Z (upper and lower case) and numbers 0 to 9.
- 2.3 Draw freehand inclined (65 degree to 75 degree) single stroke letters from A to Z (upper and lower case) and numbers from 0 to 9.
- 2.4 Draw block letters (Gothic) using 5 : 4 and 7 : 5 proportions and height.
- 2.5 Select a suitable size of letters and write a few sentences using all the letters selecting suitable scale.
- 2.6 Draw title strip with proper placement using suitable size of letters and measurements.

ALPHABET OF LINES AND DIMENSIONING

3 Adopt the alphabet of lines.

- 3.1 Select different lines in drawing.
- 3.2 Use center line, hidden line, phantom line, break line, dimension line, extension line, section line and cutting plane line.
- 3.3 Use different thickness of line to emphasize a part of drawing.
- 3.4 Select recommended grades of pencils for various types of lines for engineering drawing.

4 Adopt the elements and theory of dimensioning.

- 4.1 Put dimensions in engineering drawing according to an accepted standard.
- 4.2 Identify the elements of dimensions from a given dimensioned drawing.
- 4.3 Apply aligned and unidirectional system of dimensioning.
- 4.4 Draw size and location of dimension, continuous dimension, staggered dimension and dimensioning in limited space.
- 4.5 Add necessary dimension to a given drawing with suitable arrows.

CONSTRUCTION OF SCALE

5 Prepare scale for drawing application.

- 5.1 Calculate representative fraction and interpret a scale reading.
- 5.2 Use different types of scale to find full size dimension.
- 5.3 Draw a plain scale to show meters, centimeters and millimeters of a given distance on object.
- 5.4 Draw a diagonal scale to show three units having given RF.
- 5.5 Read particular distance on plain and diagonal scale.
- 5.6 Use scale of chord.
- 5.7 Draw angle of 49 degree, 78 degree and 95 degree with the help of scale of chord.

GEOMETRICAL CONSTRUCTIONS

6 Construct geometric figures (lines, triangles & squares).

- 6.1 Divide given straight line into any number of equal parts.
- 6.2 Draw perpendicular when the given point is at or near the end of the line.
- 6.3 Bisect a given angle.
- 6.4 Trisect a given angle.
- 6.5 Draw a straight line parallel to given straight line at some given distance.
- 6.6 Draw a square on a given straight line.

7 Construct geometric figures (circles and regular polygons).

- 7.1 Draw regular polygons i.e. pentagon, hexagon and octagon having given one side.
- 7.2 Locate the center of circle and arc.
- 7.3 Inscribe circle in triangles.
- 7.4 Inscribe a circle about a triangle.
- 7.5 Divide a triangle into any number of equal parts.
- 7.6 Draw an equilateral triangle equal in area of a square.
- 7.7 Determine the length of the circumference of circle.

CONIC SECTIONS

8 Construct conic sections.

- 8.1 Draw an ellipse by concentric circle method.
- 8.2 Draw an ellipse by parallelogram method.
- 8.3 Draw an ellipse by four center method.
- 8.4 Draw a parabola having given foci and directrix.
- 8.5 Draw a parabola from given abscissa and ordinate.

SYMBOLS

9 Adopt standard symbols in drawing.

- 9.1 Identify symbols used in drawing.
- 9.2 Draw a legend using symbols of different engineering materials.
- 9.3 Draw the symbols of different plumbing fittings and fixtures used in drawing.
- 9.4 Draw the symbols of different electrical fittings and fixtures used in drawing.
- 9.5 Interpret information from drawing containing standard symbols.

FREEHAND SKETCHING (WITH SHADES AND SHADOWS)

10 Sketch freehand with shades and shadows.

- Produce freehand sketches of the following with shade and shadow technique: 10.1
 - a. Book h. Bib-cock Brick Bench vice b. i. c.
 - Step
 - Cylinder d.
- Open box j.
- Electric lamps k. Electric switches 1.
- Hand tubewell e. Spade with handle f.
- Electric fan m.
- Pipe wrench Nuts and bolts n.
- 10.2 Use different materials and methods of shading and shadowing freehand sketches.

ORTHOGRAPHIC PROJECTION

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11 Translate pictorial views of simple objects into orthographic views. Identify different planes. Draw third angle orthographic views of simple objects. Draw first and third angle views of a simple object and add proper dimensions. Solve missing Lines problems of different objective.

REFERENCE BOOKS

1 Geometrical Drawing

I H Morris

2 Prathamic Engineering Drawing

Hemanta Kumar Bhattacharia

1012	ENGINEERING MATERIALS	Т	Р	С
		2	3	3

AIMS

- To be able to identify and classify the materials used for construction in engineering field.
- To be able to recognize the sources of various engineering materials.
- To be able to understand the characteristics of various engineering materials.
- To be able to understand the uses of different engineering materials.

SHORT DESCRIPTION

Aspects of engineering materials; Engineering uses of ferrous metals and alloys; Engineering use of non-ferrous metal; Bricks; Sand; Cement; Lime as mortar; Aluminum as construction materials; Timber; Stone; Insulating materials; Glass and ceramics, Paints and varnishes, Sound absorbing materials; Fire and water proofing materials; Fuels and lubricants; Plastic materials, optical fiber and Gallium Arsenide Materials.

DETAIL DESCRIPTION

1 Understand the various aspects of engineering materials.

- 1.1 Define engineering materials.
- 1.2 Mention the classification of engineering materials in different technology
- 1.3 List the characteristics of engineering materials.

2 Understand the application of stone

- 2.1 Define building stones.
- 2.2 Mention geological, physical and chemical classification of stones.
- 2.3 List the characteristics of good building stones.
- 2.4 Describe the dressing of stones.
- 2.5 Describe the uses of stone in engineering filed.

3 Understand the characteristic of brick as construction materials.

- 3.1 Define brick.
- 3.2 Mention different constituents for manufacturing of good bricks.
- 3.3 Explain pug mill, table molding and machine molding.
- 3.4 Describe the process of brick drying.
- 3.5 Describe the methods of kiln burning of brick.
- 3.6 Draw the sketches Bull's trench kiln & Hoffman's kiln.

4 Understand the application of sand.

- 4.1 Mention the classification of sand according to their sources.
- 4.2 Mention the specifications of good sand.
- 4.3 Describe the purpose of grading of sand.
- 4.4 Mention the use of various grades of sand.

5 Understand the application of cement.

- 5.1 Define cement.
- 5.2 Mention the functions of various ingredients of cement.
- 5.3 Distinguish between wet process and dry process of manufacturing Portland cement.
- 5.4 Draw a flow diagram based on wet process of manufacturing of cement.
- 5.5 Mention the uses of cement as engineering material.

- 6 Understand the application of tiles
 - 6.1 Identify the following tiles: clay tiles, concrete tiles, Plastic tiles, Mosaic tiles, Marble tiles, Glazed tiles.
 - 6.2 Describe the uses of different kinds of tiles.

7 Understand the Light metal (aluminum/white metal) as construction materials.

- 7.1 Explain the important properties of light metal (aluminum/white metal) as construction material.
- 7.2 Mention the uses of aluminum white/metals .
- 7.3 Describe the advantages and disadvantages of using aluminum as construction material.

Understand the fundamental concepts of glass and ceramics.

- 8.1 Mention the constituents of glass.
- 8.2 List the properties of glass.
- 8.3 Mention the uses of glass.

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- 8.4 Describe the constituents of ceramics.
- 8.5 Mention the classification of ceramics.
- 8.6 List the properties of ceramics.
- 8.7 Describe the uses of ceramics in engineering field.

9 Understand the basic concepts of paints and varnishes.

- 9.1 Define paints and varnish.
- 9.2 Explain the characteristics of good paint.
- 9.3 List the essential constituents of paint.
- 9.4 Explain the functions of pigment.
- 9.5 List the main constituents of varnishes.
- 9.6 Explain the characteristics of good varnish.
- 9.7 Mention the functions of vehicle.
- 9.8 Describe synthetic materials used for paint and varnishes.

10 Understand the characteristic of timber as construction materials.

- 10.1 Define timber.
- 10.2 Mention the classification of trees depending on botanical groups.
- 10.3 Explain conservation of timber in various market forms.
- 10.4 Describe the major defects in timber.
- 10.5 Describe the advantages and disadvantages of using timber in the engineering filed.
- 10.6 Describe the characteristics of good timber.

11 Understand the application of various heat and sound insulating materials.

- 11.1 Mention the functions of insulating materials.
- 11.2 List five natural heat insulating materials.
- 11.3 Mention the names of synthetic insulating materials.
- 11.4 Describe the sources of obtaining rubber, cork and ebonite.
- 11.5 Describe the uses of asbestos as insulating material.
- 11.6 List three natural sound absorbing materials.
- 11.7 Mention the names of five sound absorbing materials.
- 11.8 Explain light weight concrete used in acoustic works.

12 Understand the fundamental aspects of fire and water proofing materials.

- 12.1 Mention the term of fire proofing materials and water proofing materials.
- 12.2 Explain the uses of asbestos as fire and waterproof materials.
- 12.3 List the characteristics of refractory materials.
- 12.4 Explain the uses of rubber as water proofing material.

13 Understand the basic concepts of fuels and lubricants.

- 13.1 Define the term fuel and lubricants.
- 13.2 Mention the main purposes of fuels with their classifications.
- 13.3 List different types of lubricants.
- 13.4 Explain the characteristics of lubricating oils.

14 Understand the engineering applications of plastic materials.

- 14.1 Define plastic.
- 14.2 List the names of raw materials for plastic.
- 14.3 Explain the properties of plastic.
- 14.4 Mention the characteristics of thermoplastic and thermosetting plastic.
- 14.5 Describe the manufacturing process of plastic.
- 14.6 Explain the molding methods of plastic products.
- 14.7 Identify the uses of plastic as engineering materials.
- 14.8 Explain laminating plastic.

15 Understand the engineering uses of metals and alloys.

- 15.1 Name the common types of iron used in industry.
- 15.2 Mention the uses of wrought iron and cast iron.
- 15.3 Mention the classification of steel on the basis of carbon content.
- 15.4 List the names of commercial steels.
- 15.5 Describe alloy steel.
- 15.6 Mention the uses of various alloy steels.
- 15.7 Define non-ferrous metals.
- 15.8 List the important non-ferrous metals used in engineering field.
- 15.9 Mention the uses of non-ferrous metals and alloys like copper, zinc, tin, lead, brass and bronze.

16 Understand the Engineering use of Conducting, Magnetic, Optical fiber and Gallium Arsenide Materials

- 16.1 List of least three items for conducting, none conducting and semi-conducting materials.
- 16.2 Describe the uses of semi-conducting materials.
- 16.3 Name the types of soft and hard magnetic materials.
- 16.4 Mention the uses of optical fiber.
- 16.5 Mention the uses of Gallium Arsenide Materials.

PRACTICAL:

- 1. Show skill in identifying various types of stone
 - 1.1. Selected different type of stone in the laboratory.
 - 1.2. Sketch different type of stone on the basis of formation.
- 2. Show skill in field test of bricks
 - 2.1. Perform field test of bricks
 - 2.2. Select 1^{st} class, 2^{nd} class, 3^{rd} class bricks and jhama bricks

3. Show skill in conducting laboratory test of bricks

- 3.1. Perform:
 - (a) Compression test
 - (b) Absorption test
- 3.2. Determine average weight of a brick.

4. Show skill in conducting laboratory test of cement

- 4.1. Conduct laboratory tests of cement
 - (a) Make cement paste of Normal Consistency(CPNC)
 - (b) Determine initial setting time
 - (c) Perform final setting time
 - (d) Perform compressive strength test
 - (e) Perform tensile strength test
 - (f) Perform fineness test
 - Conduct field tests of cement

5. Show skill in conducting tests of coarse aggregate

- (a) Specific gravity of send
- (b) Grading of aggregates

6. **Show skill in conducting test of sand**

- (a) Bulking of sand
- (b) F M of sand
- (c) Specific gravity of sand
- 7. Show skill in identifying various ferrous and non ferrous metal
 - 7.1. Identify mild steel, cast iron, copper, and aluminum, tin by physical observation.
- 8. Show skill in identifying various type fuels and lubricants
- 9. Show skill in identifying various type of conducting & non conducting, semi conducting, magnetic and optical fiber materials.

REFERENCE BOOKS

4.2.

1	A text book on Engineering Materials	 G. J. Kulkarni
2	Engineering Materials	 Dr. M. A. Aziz
2		

3 Plastic Materials — J. A Brydson

5712	ENGLISH – I	Т	Р	С
		2	0	2

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Objectives:

After the completion of the course, learners will be able to develop-

- * Listening with understanding
- * The fluency of speech
- * Reading with understanding
- * Grammatical accuracy with emphasis on spelling & punctuation
- * Creative writing
- * Transferring information
- * Communicating effectively

CONTENTS

Seen comprehension

Unit	Lesson	Title
Three: Learning English	1	Learning a language
	2	Why learn English
	3	How to learn English
Six: Our Environment	1	The environment and the ecosystem
	2	How the environment is polluted
	7	How to manage waste
Seven: Disasters we live with	5	The shake and the quake
Thirteen: We and our rights	2	Women have rights too.

N.B: The Unit mentioned refers to the Text Book (1^{st} Paper) <u>English for Today</u> for class 11 - 12 by National Curriculum & Text Book Board, Dhaka.

GRAMMAR

1. (a) Uses of Articles.

- (b) Uses of Tense *(Right forms of verbs with indicators)
- (c) Classify verbs: (Auxiliary, Principal, transitive, intransitive, finite, non-finite, causative, quasi-passive)
- (d) Uses of voice.

2. Sentence:

- (a) Sentence structure: (Assertive, Interrogative, Optative, Imperative, Exclamatory, Simple, Complex and Compound)
- (b) Question making: WH, Yes/No, Tag question
- 3. Enrich vocabulary: synonyms, Antonyms
- 4. Change Parts of speech and uses of suffix and prefix.

Communication

1. Style of letters: (full blocked, blocked, semi- blocked)

2. Parts of writing official letters: Techniques of writing (Heading, reference, date, inside address, topic, greetings, complementary closing, signature, supplements.)

3. Write dialogues: (with teacher, principal, shopkeeper, hotel manager, station master, OC, DC, newcomer, buyers, doctor, friend, colleagues etc).

4. Write a guided paragraph with questions.

5812 PHYSICAL EDUCATION AND LIFE SKILL DEVELOPMENT T P

OBJECTIVES

- To enhance body fitness.
- To make aware of first aid procedure.
- To acquaint with the common games and sports.
- To develop life skill

SHORT DESCRIPTION

Warming up; Yoga; Muscle developing with equipment; First aid; Games & sports; life skill development.

DETAIL DESCRIPTION

1. National Anthem and Assembly

- 1.1 Make assembly
- 1.2 Recitation of national anthem
- **1.3** National anthem in music

2. Warming up

1.1 General Warming-up :

Head rotation, Hand rotation, Side twisting, Toe touching, Hip rotation, Keen twisting, Ankle twisting, Push up & Sit up.

- 1.2 Squad Drill : Line, File, Attention, Stand at easy, Stand easy, Left turn, Right turn, About turn, Mark time, Quick march, Right wheel, Left wheel, Open order march & Closed order march.
- 1.3 Specific warming up : Legs raising one by one, Legs raising in slanting position, Knee bending and nose touching, Heels raising, Toes touching & Laying position.
- 1.4 Mass Physical Exercise (Free hand) : Hand raising, Side twisting, Front & back bending, Front curl, Straight arms curl two hands, Hands raising overhead and Push up & Push down.

3. Yoga

- 3.1 Dhyanasan : Shabasan, Padmasan, Gomukhasan, Sharbangasan, Shirshsan
- 3.2 Shasthyasan : Halasan, Matshasan, Paban Muktasan, Ustrasan

4. Muscle Developing with equipment

- 4.1 Damball : Front curl, Hand sidewise stretching, Arms raising overhead.
- 4.2 Barball : Front press, Leg press, Rowing motion with leverage bar.
- 4.3 Rope climbing : Straight way climbing, Leg raising climbing.
- 4.3 Horizontal bar : Chinning the bar front grip, Chinning the bar wide back grip.
- 4.4 Jogging Machine : Slow, medium, and fast running
- 4.5 Rowing Machine :

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5. Show skill on conversation on day to day life

- 5.1 Today's Market price
- 5.2 Festivals(religious festivals, National festivals)
- 5.3 Celebration of National days
- 5.4 Aim of life
- 5.5 Visited historical places/sites

6. Human relation

- 6.1 Family relation
- 6.2 Relation with neighbor
- 6.3 Humanitarian Service
- 6.4 Service for handicapped (intelligent, physical, social etc.)
- 6.5 Service for orphan / Patient

7. Vote of appreciation

- 7.1 About dress
 - 7.2 For good work
 - 7.3 For good result
 - 7.4 For good news

8. Telephone conversation

- 8.1 Use of telephone
- 8.2 Courtesy for using telephone
- 8.3 Receiving and sending massages through telephone
- 8.4 Presenting the gist

9. Stress Management

- 9.1 Habit to be a man of humor
- 9.2 Positive thinking
- 9.3 Habit to changing thinking

10. Time Management

- 10.1 Determine essential time for a task
- 10.2 Determine delay and unexpected time
- 10.3 Determine time for daily activities
- 10.4 Plan for daily activities

11. Interview Technique

- 11.1 Mental preparation to face an interview
- 11.2 Selection of dress for interview
- 11.3 Introducing himself/herself to the interviewer
- 11.4 Coping interview

12. Team work

- 12.1 Organized a team
- 12.2 Selection of team leader
- 12.3 Distribution to the task to the members
- 12.4 Accepting opinion of team members
- 12.5 Completion of task as a team

13. Social work

- 13.1 Tree plantation
- 13.2 Community service (Sanitation, pure drinking water, social culture etc.)

5911	MATHEMATICS-1		Р	С
		3	3	4

OBJECTIVES

- To acquaint the students with the basic terminology of Algebra.
- To be able to understand the complex numbers (J-operator) which are being used in electrical engineering
- To be able to understand the binomial expansion.
- To be able to use the knowledge of trigonometry in solving problems of engineering importance.

SHORT DESCRIPTION

Algebra: Set, Indices, Logarithms, AP & GP, Polynomials & polynomial equations, Complex number, Permutation & Combination, Binomial theorem for positive integral Index and negative & fractional index.

<u>Trigonometry</u>: Ratio of associated angles, Compound angles, Transformation formulae, multiple angles and Sub-multiple angles.

DETAIL DESCRIPTION

Algebra:

- **1** Apply the concept of set in solving problem.
 - 1.1 Define set, sub-set and universal set.
 - 1.2 Define the different types of number set.
 - 1.3 Define union of set, intersection of set, complement of set, power set, disjoint set.
 - 1.4 Prove (using Venn diagram) the relation of following types where A, B and C are any set.
 - i) $AU(BUC) = (AUB) \cap (AUC)$
 - ii) $(AUB)^c = A^c \cap B^c$
 - iii) $(A \cap B)^c = A^c UB^c$
 - 1.5 Find the number of elements in the union of two sets.
 - 1.6 Solve the problems using above.

2 Apply the laws of indices in solving mathematical problem.

- 2.1 State the laws of indices.
- 2.2 Apply the laws of indices to solve the problem.
- 2.3 Perform algebraic operation on surd.
- 2.4 Use the scientific calculator in solving the problems of indices.

LOGARITHIMS

3 Apply the concept of logarithms.

- 3.1 Define logarithm.
- 3.2 Prove the following laws of logarithm.
 - a) $\text{Log}_{a}(m \ge n) = \text{Log}_{a}m + \text{Log}_{a}n$
 - b) $\log_a \left(\frac{m}{n}\right) = \log_a m \log_a n$
 - c) $\text{Log}_{a}(m)^{n} = n \text{Log}_{a} m$
 - d) $\log_{b} a \ge \log_{a} b = 1$
 - e) $Log_a 1 = O$
- 3.3 Solve problems using 3.2.
- 3.4 State the difference between Naperion and common logarithms.

4 Understand the concept of AP & GP.

- 4.1 Define AP and common difference.
- 4.2 Find last term and sum of n terms, given first term and common difference.
- 4.3 Define GP and common ratio.
- 4.4 Find the sum of n terms given first and common ratio.

5 Apply the concept of polynomial in solving the problems.

- 5.1 Define polynomials and polynomial equation.
- 5.2 Explain the roots and co-efficient of polynomial equations.
- 5.3 Find the relation between roots and co-efficient of the polynomial equations.
- 5.4 Determine the roots and their nature of quadratic polynomial equations.
- 5.5 Form the equation when the roots of the quadratic polynomial equations are given.
- 5.6 Find the condition of the common roots of quadratic polynomial equations.
- 5.7 Solve the problems related to the above.

6 Understand the concept of complex numbers.

- 6.1 Define complex numbers.
- 6.2 Perform algebraic operation (addition, subtraction, multiplication, division, square root) with complex number of the form a+jb.
- 6.3 Find the cube roots of unity.
- 6.4 Apply the properties of cube root of unity in solving problems.

7 Apply the concept of permutation & Combination.

- 7.1 Explain permutation.
- 7.2 Find the number of permutation of n things taken r at a time when,i) things are all different.
 - ii) things are not all different.
- 7.3 Solve problems of the related to permutation :
 - i) be arranged so that the vowels may never be separated.

From 10 man and 6 women a committee of 7 is to be formed. In how many ways can this be done so as to include at least two women in the committee.

- 7.4 Explain combination.
- 7.5 Find the number of combination of n different things taken r at a time.
- 7.6 Explain ${}^{n}C_{r}$, ${}^{n}C_{n}$, ${}^{n}C_{0}$
- 7.7 Find the number of combination of n things taken r at a time in which p particular things

i) Always occur ii) never occur.

7.8 Establish i) ${}^{n}C_{r} = {}^{n}C_{n-r}$

ii)
$${}^{n}C_{r} + {}^{n}C_{r-1} = {}^{n+1}C_{r}$$

7.9 Solve problems related to combination.

8 Apply the concept of binomial theorem.

- 8.1 State binomial expression.
- 8.2 Find the general term, middle term, equidistant term and term independent of x.
- 8.3 Use binomial theorem to find the value of
 - i) $(0.9998)^2$, correct to six places of decimal.

ii)
$$(1 + \sqrt{2})^5 - (1 - \sqrt{2})^5$$

- 8.4 Express the binomial theorem for negative and fractional index.
- 8.5 Solve problems of the following types:

Expand (i)
$$(1-nx)^{\frac{1}{n}}$$
 (ii) $\frac{1}{\sqrt{4.08}}$

9 Apply the concept of associated angles.

- 9.1 Define associated angles.
- 9.2 Find the sign of trigonometrical function in different quadrants.
- 9.3 Calculate trigonometrical ratios of associated angle.
- 9.4 Solve the problems using above.

10 Apply the principle of trigonometrical ratios of compound angles.

- 10.1 Define compound angles.
- 10.2 Establish the following relation geometrically for acute angles. i) $\sin (A \pm B) = \sin A \cos B \pm \cos A \sin B$.

ii) $\cos (A \pm B) = \cos A \cos B \pm \sin A \sin B$.

- 10.3 Deduce formula for tan (A \pm B), Cot (A \pm B).
- 10.4 Apply the identities to work out the problems:
 - i) find the value of $\sin 75^{\circ}$, $\tan 75^{\circ}$.

ii) show that
$$\frac{\sin 75^\circ + \sin 15^\circ}{\sin 75^\circ - \sin 15^\circ} = \sqrt{3}$$

iii) if
$$\alpha + \beta = \theta$$
, $\tan \alpha + \tan \beta = b$, $\cot \alpha + \cot \beta = a$,
show that $(a - b) = ab \cot \theta$.

11 Apply sum and product formula of trigonometrical ratios.

- Express sum or difference of two sines and cosines as a product and vice-versa 11.1
- 11.2
- Solve problems of the followings types: i) show that, $\sin 55^\circ + \cos 55^\circ = \sqrt{2} \cos 10^\circ$
 - ii) prove that, $\cos 80^{\circ} \cos 60^{\circ} \cos 40^{\circ} \cos 20^{\circ} = \frac{1}{16}$

12 Apply the concept of ratios of multiple angles.

- State the identities for sin 2A, cos 2A and tan 2A. 12.1
- 12.2 Deduce formula for sin 3A, cos 3A and tan 3A.
- 12.3 Solve the problems of the followings types.
 - i) express $\cos 5\theta$ in terms of $\cos \theta$.

ii) if
$$\tan \alpha = 2 \tan \beta$$
, show that, $\tan (\alpha + \beta) = \frac{3 \sin 2\alpha}{1 + 3 \cos 2\alpha}$

Apply the concept of ratios of sub-multiple angles. 13

- 13.1 Find mathematically the identities for sin α , cos α and tan α in terms of

 - $\frac{\alpha}{2}$ and $\frac{\alpha}{3}$
- 13.2

Solve the problems of the type : find the value of $\cos 3^{\circ}$, $\cos 6^{\circ}$, $\cos 9^{\circ}$, $\cos 18^{\circ}$, $\cos 36^{\circ}$, etc.

CHEMISTRY	Т	Р	С
	3	3	4

OBJECTIVES

5913

- To provide the students a background of basic science required for understanding technology subjects.
- To develop a working knowledge of common engineering and industrial materials including physical and chemical properties and to enable to determine through experiments the properties of such materials.
- To develop a basic knowledge and concept of chemical reactions of common engineering and industrial materials.
- To develop through experiments the understanding of fundamental scientific concept which will provide a common base for further studies in science and technology.

SHORT DESCRIPTION

Role of Chemistry in the field of engineering and technology; Matter and its changes; Symbol, valency and chemical equations; Different types of chemical reactions; Catalyst and Catalysis; Acid, Base and Salt; Properties of gases; Dalton atomic theory; Avogadro's hypothesis; Laws of chemical equivalent; Atomic Mass and molecular mass; Atomic structure; Quantum numbers; Periodic table; Oxidation & Reduction; Chemical bond; Electrolytic conductance and electrolysis; Acid base equilibria; Water; Metals; Concept of Organic Chemistry; Aliphatic Hydrocarbon and Alcohols.

DETAIL DESCRIPTION

Theory :MATTER AND ITS CHANGES

1 Symbol, Valency & Chemical Equation

- 1.1 Define matter, element, compound, mixtures, solutions and suspensions.
- 1.2 Distinguish between, " atoms and molecules", "physical change and chemical change", "exothermic and endothermic changes and reactions".
- 1.3 Identify exothermic and endothermic reactions from a given list of reactions.
- 1.4 Define symbol and formula, valency of elements and radicals.
- 1.5 Discuss the variations of valency with examples.
- 1.6 Define active and latent valency.
- 1.7 Define chemical equation .
- 1.8 Explain the full meaning of a given chemical equation.

DIFFERENT TYPES OF CHEMICAL REACTIONS, CATALIST & CATALYSIS

2 Understand the concept of chemical reactions.

- 2.1 Define chemical reaction.
- 2.2 Name the methods of bringing about chemical reaction.
- 2.3 Give examples of different types of chemical reactions with suitable examples.
- 2.4 Define catalysis and catalyst.
- 2.5 Mention different types of catalyst with examples.
- 2.6 List five uses of catalysts in industries.

ACID, BASE & SALT

3 Understand acid, base and salt.

- 3.1 Define acid, base and salt.
- 3.2 List five properties of acid, base and salt.
- 3.3 Classify salts according to their chemical properties.
- 3.4 Explain basicity of an acid and acidity of a base.

STATES OF MATTER

4 Understand properties of gases.

- 4.1 Identify the basic properties of gases.
- 4.2 Define Boyls law & Charls law, absolute temperature S.T. P /N.T.P
- 4.3 Deduse the relationship between pressure, volume and temperature of a gas to establish Boyle's Law, Charle's law and the law of pressure.
- 4.4 Combine the gas laws to establish the gas equation.
- 4.5 Establish the partial pressure of mixed gases using Dalton's law of partial pressure.
- 4.6 Solve problems in relation to pressure, volume, temperature and partial pressure of a mixture of gases.

DALTON'S ATOMIC THEORY & AVOGADRO'S HYPOTHESIS

5 Understand Dalton's atomic theory & Avogadro's hypothesis

- 5.1 List the four postulates of Dalton's atomic theory.
- 5.2 Explain at least five limitations of Dalton's atomic theory.
- 5.3 State Avogadro's hypothesis.
- 5.4 Explain Avogadro's constant.
- 5.5 Explain five applications of Avogadro's hypothesis in Chemistry.
- 5.6 Solve problems using the knowledge of Avogadro's hypothesis.

6 Understand chemical equivalent, Atomic & molecular Mass.

- 6.1 Define the chemical equivalent of an element, a compound, a radical, an acid an alkali and a salt.
- 6.2 Explain the variations in chemical equivalent of an element.
- 6.3 Define atomic mass and molecular Mass.
- 6.4 Establish a relationship among chemical equivalent, valency and atomic Mass.
- 6.5 Solve problems to find out atomic Mass, chemical equivalent and valency.

7 Understand the modern concept of atomic structure.

- 7.1 State the fundamental particles of atom.
- 7.2 Explain the following terms:
 - i) Atomic number ii) Isotopes iii) Isobar iv) Gram-atom
 - v) Mass Number and vi) Gram molecular Mass, vii) Mole viii) ISO tone.
- 7.3 Describe Rutherford's and Bohr's atomic model.

8 Understand the quantum numbers.

8.2

- 8.1 Define quantum numbers .
 - Explain the significance of the following quantum numbers:
 - i) Principal quantum number
 - ii) Subsidiary quantum number

- iii) Magnetic quantum number
- iv) Spin quantum number
- 8.3 Explain the Pauli's exclusion principle.
- 8.4 Explain the probability distribution of electrons round the nucleus.
- 8.5 Define orbit and orbital.

9 Understand the modern periodic table.

- 9.1 State the periodic law of elements.
- 9.2 Describe the modern long periodic table.
- 9.3 Explain the limitations of periodic table.
- 9.4 Give the Name of IA, VII-A and Zero group elements.

10 Understand oxidation and reduction.

- 10.1 Explain the modern concepts of oxidation and reduction with examples.
- 10.2 Explain "oxidizing agent" and "reducing agents " with examples.
- 10.3 Explain the oxidation and reduction takes place simultaneously. 10.4 Explain the oxidation number and oxidation state.
- 10.5 Write the oxidation number of an element from its compounds.

Understand the modern concept of chemical bonds.

- 11.1 Define chemical bond.
- 11.2 List the different types of bonds.
- 11.3 Explain the modern concept of ionic bonds .
- 11.4 Explain the co-valent bonds, co-ordinate bond, Sigma bond, Pie bond.

12 Understand the fundamentals of electrolysis.

12.1 Define electrolysis.

11

- 12.2 Differentiate between electrical conductor and electrolyte.
- 12.3 Explain the process of electrolysis.
- 12.4 Explain Faraday's laws of electrolysis.
- 12.5 List at least four Industrial applications of electrolysis.

13 Understand pH value, Acidimetry and Alkalimetry.

- 13.1 Define pH, acidimetry and alkalimetry.
 - 13.2 Explain pH scale and its uses.
 - 13.3 Explain acid base titration.
- 13.4 Explain the method of preparation of normal solutions.
- 13.5 Define of indicators and their uses.
- 13.6 Explain buffer solutions and their working mechanism.

14 Understand oxides and hydroxides.

- 14.1 Define oxide and hydroxide.
- 14.2 Describe the classification of oxides and hydroxides.
- 14.3 Explain different types of oxides and hydroxides with examples.

15 Understand the chemical process involved in water treatment.

- 15.1 Distinguish between hard water and soft water.
- 15.2 Differentiate between temporary and permanent hardness of water.
- 15.3 List at least three disadvantages and three advantages of using hard water.

- 15.4 Describe the Permutit process of softening hard water by explaining the reactions that take place.
- 15.5 Explain the ion exchange resin process of softening water.
- 15.6 Describe chemical tests of water.

16 Understand the extraction and refining process for Iron, Copper, Zinc and Aluminum.

- 16.1 Compare the properties of metal and non-metal.
- 16.2 Define (i) ores (ii) roasting (iii) calcination (iv) smelting (v) alloy (vi) slag, (vii) Flux.
- 16.3 Give names and formulae of important ores of Iron, Copper, Aluminum and Zinc.
- 16.4 Describe the manufacturing process of iron and copper from its ore.
- 16.5 Compare the properties of (i) Cast Iron (ii) iron (iii) Steel (iv) Wrought Iron.

17 Understand the concept of Organic Chemistry and organic compounds.

- 17.1 Define Organic Chemistry.
- 17.2 Distinguish between organic and inorganic compounds.
- 17.3 Explain homologous series of organic compounds.
- 17.4 List the molecular and structural formulae of methane, ethane, propane and butane.
- 17.5 Explain functional groups of organic compounds.

18 Understand the aliphatic hydrocarbons and the alcohols.

- 18.1 Define hydrocarbon, saturated and unsaturated hydrocarbons.
- 18.2 Define alkane, alkene and alkynes.
- 18.3 Explain commons system, derived system and IUPAC system of nomenclature of organic compounds.
- 18.4 Define Alcohols.
- 18.5 Explain the classification of alcohol.
- 18.6 Define the term Enzyme, Fermentation, De-carboxilation, Power Alcohol, Absolute Alcohol .

PRACTICAL ;

OBSERVATION AND MEASUREMENT

- 1. Measure the pH value of unknown solutions to classify them as neutral, acidic or alkalis.
- 2. Prepare a decinormal solution of sodium carbonate.
- 3. Determine the unknown strength of an acid. Solve by a standard alkalis solution with a suitable indicator.

QUALITATIVE ANALYSIS OF KNOWN SALTS

- 4. Perform test tube tests for the known salt samples Copper salt, Iron salt, Lead salt, Aluminum salt, Ammonium salt, etc.
- 5. Perform charcoal oxidation and reduction test for the different salt e.g. such as Lead salt, Copper salt, Iron salt, Calcium salt, etc.
- 6. Perform tests to detect unknown basic radicals e.g. Lead, Copper, Iron Calcium, Zinc, Aluminium, Ammonium and Sodiu
- 7. Perform tests to detect unknown acid radicals e.g. chloride, nitrate, carbonate and sulphate.

6711	BASIC ELECTRICITY	т	Р	С
		3	3	4

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OBJECTIVES

- To familiarize the basic electrical quantities & laws and to apply them in solving problems of electrical circuits.
- To acquaint with electro-chemistry, electro-magnetism, electro-magnetic induction and electrostatic.
- To develop skill in electrical wiring.
- To appreciate the safety measures to be taken for electrical wiring.

SHORT DESCRIPTION

Electric current and ohm's law; Conductors and insulators; Basic electrical circuits; Power and energy; Basic electro-chemistry; Electro-magnetism; Electro-magnetic induction; Electrostatics; Wires and cables; Hand tools used in wiring; House wiring; Controlling devices; Protective devices; Earthing.

DETAIL DESCRIPTION

Theory :

1

ELECTRIC CURRENT

Understand electricity and its nature.

- 1.1 State the meaning of electricity.
- 1.2 Describe the structure of atom.
- 1.3 Define current, voltage and resistance.
- 1.4 State the units of current, voltage and resistance.

CONDUCTOR & INSULATOR

2 Understand conductor and insulator.

- 2.1 Define conductor and insulator.
- 2.2 Explain the conductor and insulator according to electron theory .
- 2.3 List at least 5 conductors and 5 insulators.
- 2.4 Describe the factors upon which the resistance of a conductor depends.
- 2.5 State laws of resistance.
- 2.6 Prove the relation R= $\rho \frac{L}{A}$
- 2.7 Explain the meaning of resistivity and name the unit of resistivity.
- 2.8 Solve problems relating to laws of resistance.

OHM'S LAW

4

3 Understand Ohm's Law

- 3.1 State Ohm's law.
- 3.2 Deduce the relation between current, voltage and resistance.
- 3.3 Solve problems relating to Ohm's law.

BASIC ELECTRIC CIRCUITS

Understand electric circuit.

- 4.1 Define electric circuit.
- 4.2 Name the different types of electric circuits.
- 4.3 Define series circuit, parallel circuit and mixed ckt.
- 4.4 Describe the characteristic of series circuit and parallel circuit.
- 4.5 Calculate the equivalent resistance of series circuit, parallel circuit and Mixed circuit.
- 4.6 Solve problems relating to series circuit, parallel circuit and mixed ckt.

POWER AND ENERGY

5 Apply the concept of electrical power and energy.

- 5.1 Define electrical power and energy.
- 5.2 State the unit of electrical power and energy.
- 5.3 Show the relation between electrical power and energy.
- 5.4 List the name of instruments for measuring of electrical power and energy.
- 5.5 Draw the connection diagram of wattmeter and energy meter in an electrical circuit.
- 5.6 Solve problems relating to electrical power and energy Calculation.

6 Understand the principles of Joule's law.

- 6.1 Describe the heating effect of electricity when current flows through a conductor.
- 6.1 Explain Joule's law regarding the development of heat in electrical circuit.
- 6.2 Describe meaning of "J".
- 6.3 Solve problems relating to Joule's law.
- 6.4 Solve problems relating to Joule's law.

BASIC ELECTRO-CHEMISTRY

7 Understand the concept of cells.

- 7.1 Describe the meaning of potential difference.
- 7.2 Define the meaning of cell.
- 7.3 Classify the Cell
- 7.4 Define Primary Cell
- 7.5 List the different types of primary Cell
- 7.6 Describe the construction and principle of action of a simple Voltaic cell.
- 7.7 List the defects of a simple Voltaic cell.
- 7.8 Describe the causes of defects of a simple Voltaic cell.
- 7.9 Describe the methods of removing the defects of a simple Voltaic cell.

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8. Understand the construction and principle of action of secondary cell.

- 8.1 Define secondary cell.
- 8.2 Describe the construction and principle of action of a lead acid cell.
- 8.3 List the uses of lead acid cell.
- 8.4 List the advantages of secondary cell.
- 8.5 Distinguish between a cell and a battery.
- 8.6 Describe the series and parallel grouping of cells.
- 8.7 Distinguish between Primary & Secondary Cell

9 Understand the concept of capacitors and capacitance.

- 9.1 Define capacitor and capacitance.
- 9.2 Name the unit of capacitance.
- 9.3 Name the different types of capacitor.
- 9.4 Write the uses of capacitor.
- 9.5 Determine the equivalent capacitance of a number of capacitors connected in series.
- 9.6 Determine the equivalent capacitance of a number capacitors connected in parallel.
- 9.7 Explain the energy stored in a capacitor.
- 9.8 Solve problems relating to capacitor connected in series and in parallel.

ELECTRO - MAGNETISM

10 Understand Electro - magnetism.

- 10.1 Describe magnetic field, magnetic lines of force and its properties.
- 10.2 Describe field intensity and magnetic flux density.
- 10.3 Distinguish between absolute permeability and relative permeability.
- 10.4 Describe the concept of magnetic effect of electrical current.
- 10.5 States Maxwell's cork screw rule and Fleming's right hand rule for determining the direction of magnetic field and current.
- 10.6 Explain the force experienced in a current carrying conductor placed in a magnetic field.
- 10.7 State Fleming's left hand rule.
- 10.8 Explain the work done by a moving conductor in a magnetic field.
- 10.9 Explain the force between two parallel current carrying conductor.

11 Understand magnetic circuit.

- 11.1 Define a magnetic circuit.
- 11.2 Define the terms magnetizing force, magnetomotive force, ampere turns, reluctance, permeance, permeability, magnetic linkage and leakage.
- 11.3 Show the relation between magnetomotive force, reluctance and magnetic field intensity or magnetizing force.
- 11.4 Compare a magnetic circuit with an electrical circuit.

ELECTRO MAGNETIC INDUCTION

12 Understand electro- magnetic induction.

- 12.1 Define Faraday's laws of electro-magnetic induction.
- 12.2 Describe the magnitude of dynamically induced emf and statically induced emf
- 12.3 Solve problems relating to emf generation.
- 12.4 Define Lenz's law and Fleming's right hand rule for determining the direction of induced emf and current.
- 12.5 Define self induced emf and self inductance.
- 12.6 Explain inductance of a iron cored inductor.
- 12.7 Define mutual inductance and co-efficient of coupling.

WIRES AND CABLES

13 Understand the uses of wires and cables.

- 13.1 Define electrical wires and cables.
- 13.2 Distinguish between wires and cables.
- 13.3 Describe the construction and uses of PVC, VIR, TRS or CTS and flexible wires
- 13.4 Describe the procedure of measuring the size of wires and cables by wire gauge.
- 13.5 Describe the current carrying capacity of a wire.

JOINTS AND SPLICES

14 Understand the usefulness of joints and splices.

- 14.1 Define the meaning of joints and splices.
- 14.2 State the five steps of making a joint.
- 14.3 Describe the procedure to make a pig tail joint, western union joint, Britannia joint, duplex joint, tap joint, simple splice.
- 14.4 Give example of uses of above mentioned joints.

HOUSE WIRING

15 Understand the different methods of house wiring.

- 15.1 State the meaning of wiring.
- 15.2 List the types of wiring.
- 15.3 State the procedure for Channel wiring, surface conduit wring and concealed wiring.
- 15.4 State the types of wiring used in :
 - a) Residential building.
 - b) Workshop
 - c) Cinema hall/Auditorium
 - d) Temporary shed
- 15.5 List the name of fittings used in different types of electrical wiring.

CONTROLLING DEVICES

16 Understand the construction and uses of controlling devices.

- 16.1 Define controlling device.
- 16.2 Name the different types of controlling devices.
- 16.3 Describe the constructional features and uses of tumbler switch, iron clad switch, push button switch and gang switch.

PROTECTIVE DEVICES

17 Understand the construction and uses of protective devices.

- 17.1 Define protective devices.
- 17.2 Name the different types of protective devices.
- 17.3 Name the different types of fuses used in house wiring.
- 17.4 Describe the construction and uses of renewable fuse.
- 17.5 Name the different types of circuit breaker used in house wiring.

EARTHING

18 Understand the necessity of ear thing.

- 18.1 Define earthing
- 18.2 Explain necessity of earthing
- 18.3 Name different types of ear thing

WIRING CIRCUITS

19 Apply the principle of controlling electrical circuit by switch.

- 19.1 Sketch the wiring diagram of one lamp controlled by one SPST switch and describe its uses.
- 19.2 Sketch the wiring diagram of one lamp controlled by two SPDT switch and describe its uses.
- 19.3 Draw the wiring diagram of one calling bell with a lamp controlled from one point.
- 19.4 Draw the wiring diagram of a fluorescent tube light circuit.
- 19.5 Describe the working principle of fluorescent tube light.

ELECTRICITY ACT

20 Understand electricity act/rule of Bangladesh and safety practices.

- 20.1 State electricity act/rule of Bangladesh to be followed in electrical wiring.
- 20.2 Describe the importance of electricity act/rule.
- 20.3 Describe safety procedure against electrical hazards.
- 20.4 List the performance of safety practices for electrical equipment, machines and accessories.

Practical:

1

Identify and use electrical measuring instruments.

- 1.1 Identify Voltmeters, Ammeters, Ohm Meter, Wattmeter, Energy meter and AVO meter.
- 1.2 Select & read the scale of given meters.
- 1.3 Connect correctly voltmeter, ammeter, wattmeter and energy meter to a given circuit.

2 Show skill in verification of Ohm's Law.

- 2.1 Sketch the circuit diagram for the verification of Ohm's Law.
- 2.2 List tools, equipment and material required for the experiment .
- 2.3 Prepare the circuit according to the circuit diagram using proper equipment.
- 2.4 Check all connections before the circuit is energized.
- 2.5 Verify the law by collecting relevant data.

3 Verify the characteristics of series and parallel circuits.

- 3.1 Draw the working circuit diagram.
- 3.2 List tools, equipment and materials required for the experiment .
- 3.3 Prepare the circuit according to the circuit diagram using proper equipment.
- 3.4 Check all connections before the circuit is energized.
- 3.5 Record data and verify that in a series circuit total voltage and resistance is equal to the summation of individual voltage and resistance respectively but total current is equal to the individual current.
- 3.6 Record data and verify that for a parallel circuit supply voltage is equal to the branch voltage, supply current is equal to summation of branch currents and total conductance is equal to the summation of branch conductance.

4 Show skill in measuring the power of an electric circuit.

- 4.1 Sketch the necessary circuit diagram of an electrical circuit w electrical load, ammeter, voltmeter and wattmeter.
- 4.2 Prepare the circuit according to the circuit diagram using ammeter, voltmeter and wattmeter.
- 4.3 Record the power, measured by the wattmeter and verify t reading with that of calculated from ammeter and voltmeter.
- 4.4 Compare the measured data with that of calculated and rat power.

5 Show skill in measuring the energy consumed in an electrical circuit.

- 5.1 Sketch the necessary diagram of an electric circuit wattmeter, energy meter and electrical load.
- 5.2 Prepare the circuit according to the circuit diagram user wattmeter and energy meter.
- 5.3 Record the energy measured by the energy meter and verify with that of calculated from wattmeter for a fixed time.

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6 Show skill in grouping a number of cell to form a battery .

- 6.1 Sketch the connection diagram of 4 cells (1.5 V each) in series.
- 6.2 List the materials and equipment required for the experiment.
- 6.3 Connect the terminals of the cells according to the diagram.
- 6.4 Determine the terminal voltage of the group and verify it with the calculated result.

7 Make a simple Cell.

- 7.1 List the materials for constructing a simple cell.
- 7.2 Prepare electrolyte by diluting H^2SO_4 with distilled water on proper ratio.
- 7.3 Assemble the cell using required electrolyte and electrodes along with necessary materials.
- 7.4 Measure the emf of the cell.

8 Show skill in making artificial magnets.

- 8.1 Make an artificial magnet by rubbing method (Single touch)
- 8.2 Make an artificial magnet by divided touch method.
- 8.3 Make an artificial magnet by passing electrical current.
- 8.4 Detect the polarity of the produced artificial magnet with the help of a compass needle.

9. Show skill in uses of hand tools, wires and cables.

- 9.1 List the hand tools used in electrical wiring.
- 9.2 Identify the hand tools used in electrical wiring.
- 9.3 Draw neat sketches of hand tools used in electrical wiring.
- 9.4 Identify different types of wires and cables.
- 9.5 Measure the diameter of the identified wire and cables using standard wire gauge.

10. Show skill in making a duplex joint and a T-joint .

- 10.1 Sketch a duplex joint and a T-joint
- 10.2 Perform skinning and scraping of two pieces of PVC duplex cal and two pieces of simplex PVC cables.
- 10.3 Make the joints according to sketches.
- 10.4 Write a report.

11 Show skill in preparing wring circuit of two lamps controlled from the points separately.

- 11.1 Sketch a working circuit of two lamps controlled from two poin separately.
- 11.2 Make the wiring circuit using required materials and equipment a wiring board.
- 11.3 Test the connection of circuit by providing proper supply.

12. Show skill in preparing wiring circuit of one lamp controlled from the points.

- 12.1 Sketch a working diagram of one lamp controlled by two SPD tumbler switches.
- 12.2 Complete the wiring circuit using required materials and equipment on wiring board.
- 12.3 Test the connection of circuit by providing proper supply.

13 Show skill in preparing wiring circuit of one bell with two indicating lamp controlled from two points.

- 13.1 Sketch a working diagram of one bell with two indicating lamps controlled by two push button switch.
- 13.2 Make the wiring circuit using required materials and equipment in wiring board.
- 13.3 Test the connection of circuit by providing proper supply.

14 Show skill in preparing wiring circuit of a fluorescent tube light.

- 14.1 Sketch a working diagram of a fluorescent tube light circuit.
- 14.2 Make the connection of a fluorescent tube light circuit using required materials and equipment.
- 14.3 Test the connection of the circuit by providing supply.

REFERENCE BOOKS

1 A text book of Electrical Technology

— B. L. Theraja

- 2 Basic Electricity
- Charles W Ryan
- 3 Basic Electrical theory and Practice

E. B. Babler

5722	ENGLISH – II	Т	Р	С
		2	2	3

OBJECTIVES :

After the completion of the course, learners will be able to develop-

- * Reading and writing skills
- * Grammatical accuracy with emphasis on spelling & punctuation
- * Information Collection
- * Creative Writing
- * Effective Communication and Correspondence

CONTENTS

Seen comprehension		Marks 20
Fourteen:	3	Enriching the workforce
Human Resources		
Sixteen:	1	The Sangsad Bhaban
Wonders Home and Abroad	2	The Jamuna Multi-Purpose Bridge
Seventeen:	6	E-mail
Modes of Communication		
Nineteen :	5	The disabled among us
Healthy Living		
Twenty:	2	How can I be self-employed?
Jobs and Professions	3	Self-help a key to success
Twenty-one:	1	The world as a global village
Globalization	3	Modern technology and globalization
	6	Globalization and English
	/	

N.B: The Unit mentioned refers to the Text Book $(1^{st} Paper)$ English for Today for class 11 - 12 by National Curriculum & Text Book Board, Dhaka.

GRAMMAR		Marks 30
Unit	Lesson	Title
<i>One:</i> Pronouns & Determiners	3	Modifier: Pick out modifiers, determiners Infinitive participles
		headword, in the sentence. Question : A beautiful girl of Thirteen dances well. : Headword: girl Pre modifier – a, beautiful Post modifier – of thirteen

<i>Twelve:</i> Further Use of Preposition	2	Use Appropriate Prepositions
Patterns of Sentence Structure		 3. Sentence Structure
<i>Fourteen:</i> Idiom and Phrase	9	Make Sentences with the idioms and Phrases in the following. (any five)
Changing Speech		Direct & indirect narration

N.B: The Unit mentioned refers to the Text Book (2nd Paper) <u>English Grammar and</u> <u>Composition</u> for class XI - XII by National Curriculum & Text Book Board, Dhaka.

COMPOSITION

marks 30

Area of interest: With hints/ key words

<u>National, Social, Political Problems:</u> Terrorism, Drug Addiction, Acid Violence, Dowry, Load shedding, Price Hike, Gender Discrimination, Traffic Jam, Deforestation etc.

Calamities: Drought, Erosion, Flood, Cyclone, Earth quake, Landslide etc.

National days and festivals: International Mother Language Day, Independence Day, Victory Day, Pahela Baishakh, May Day etc.

Scientific Development: Satellite, Optical Fiber, E-mail, Internet & Agricultural Development.

Environment Pollution: Water, Air, Sound, Global Warming.

Heritage sites: The Sundarbans, National Memorial, Cox's Bazar Sea Beach, Bhashani Novo Theatre.

Industries: Garments, Textile, Poultry, Leather, Ceramics, Fertilizer.

- 1. Writing a short composition
- 2. Writing a formal letter/CV.
- 3. Writing Letter (Personal/Official)

- 4. Writing Reports on work place of standard form/ instrument or Construction or fault on / instrument or Construction/ Repairing of instrument or Construction/ a situtation/event/incident.
- 5. Writing letter to the print & Electronic media.

Practical

- 1. Asking Questions : WH, Yes/No, Tag questions
- 2. Conversations on real life situations
 - a) Today's market price
 - b) About festival
 - c) Preparation for the examination
 - d) Last day of your Class.
 - e) Visit to the place of interest
 - f) Choice of profession
 - g) Current Topics from Newspapers.

5912	PHYSICS-I	Т	Р	С
		3	3	4

OBJECTIVES

- To provide the students a background of basic science i.e. Physics required for understanding technological subjects.
- To develop a working knowledge of common engineering and industrial materials and to enable to determine through experiments the properties of such materials.
- To develop through experiments an understanding of fundamental scientific concept.
- To develop a basic knowledge and concept of physical properties of common engineering and industrial materials.

SHORT DESCRIPTION

Units; Vector and Scalar quantities; Motion and Equations of motion; Force and Newton's Laws of motion; Gravity and Gravitation; Simple Harmonic motion; Hydrostatics; Surface tension and viscosity; Pressure, Sound: wave and sound Concepts and nature of sound, Velocity of sound, Ultrasonic.

DETAIL DESCRIPTION

Theory:

1. UNITS VECTOR AND SCALAR QUANTITIES

Understand vector and scalar quantities.

- 1.1 List and identify the symbols of fundamental SI Unit and some derived SI Unit.
- 1.2 Define vector quantities with examples.
- 1.3 Define scalar quantities with examples.
- 1.4 Show the various representations of the vector quantities; and representation of a vector by unit vector.
- 1.5 Distinguish between vector and scalar quantities.
- 1.6 Find and explain the resultant of two vectors in different directions.
- 1.7 Resolve a vector into horizontal & vertical component.
- 1.8 Explain the dot and cross product of two vectors.
- 1.9 Projection of a vector.
- 1.10 Define laws of triangle of vector.

2. MOTION AND EQUATIONS OF MOTION

Understand motion and equations of motion.

- 2.1 Define rest and motion.
- 2.2 Classify motion.
- 2.3 Define and explain displacement, speed, velocity, acceleration and retardation.
- 2.4 Deduce the relationship between displacement, velocity, acceleration and retardation from these definitions.
- 2.5 Distinguish between (i) speed and velocity (ii) velocity and acceleration.
- 2.6 Projectile motion.
- 2.7 Equation of motion of a freely moving body thrown obliquely vertically upward or motion of projectile.

3. Understand circular motion

- 3.1 Define circular motion.
- 3.2 Define angular velocity and linear velocity with their units.
- 3.3 Deduce the relation between angular velocity and linear velocity.

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3.4 Define centripetal and centrifugal force with examples.

3.5 Prove centrifugal force =
$$\frac{mv^2}{r}$$

- 3.6 Define and explain angular momentum, torque and moment of inertia.
- 3.7 Angular acceleration and relation between torque and angular acceleration.

4. FORCE AND NEWTON'S LAWS OF MOTION Understand force and Newton's laws of motion

- 4.1 Define force.
- 4.2 Define different units of force and their correlation and also mention the dimension of force.
- 4.3 Define parallel force and a couple.
- 4.4 Find out the resultant of parallel forces.
- 4.5 Define inertia and momentum.
- 4.6 Impulsive force and impulse of a force.
- 4.7 Relation between impulse of force and momentum.
- 4.8 State and prove the principals of conservation of momentum.
- 4.9 State Newton's laws of motion.
- 4.10 Prove P=mf, from Newton's 2nd law of motion.

5. GRAVITY AND GRAVITATION

Understand gravity and gravitation.

- 5.1 Define and explain the Kepler's Law.
- 5.2 Define gravity and gravitation.
- 5.3 State the laws of gravity and gravitation.
- 5.4 Define and determine the gravitational constant (G) and also mention its units and dimension.
- 5.5 Define acceleration due to gravity 'g' and also mention its units and dimension.
- 5.6 Discuss the variation of 'g' at different places.
- 5.7 Define mass and weight with their units and dimension.
- 5.8 Distinguish between mass and weight.
- 5.9 Define and explain gravitational potential and escape velocity
- 5.10 State and explain the laws of falling bodies and mention the equation of motion of a body when it is projected vertically upwards or downwards.

6. SIMPLE HARMONIC MOTION (SHM)

Understand simple harmonic motion.

- 6.1. Define simple harmonic motion (SHM).
- 6.2. State the characteristics of SHM.
- 6.3. Describe a simple pendulum and a second pendulum.
- 6.4. Define effective length, amplitude, phase, complete oscillation, period of oscillation, frequency.
- 6.5. State and explain the laws of simple pendulum.
- 6.6. Describe a compound pendulum.
- 6.7. Discuss the conditions under which a pendulum clock will go slow or fast.
- 6.8. Potential energy, kinetic energy and average potential and kinetic energy of a particle executing SMH.
- 6.9. Principle of conservation of mechanical energy.

7. WORK, POWER AND ENERGY

Understand work, power and energy.

- 7.1 Define work, power and energy.
- 7.2 State the units and dimensions of work, power and energy.
- 7.3 State and prove the principle of the conservation of energy.
- 7.4 Define potential energy (PE) and kinetic energy (KE).
- 7.5 Derive the equation of potential and kinetic energy.
- 7.6 Show that the K.E. gained by a falling body is equal to the P.E. Lost by the body.
- 7.7 Describe transformation of energy and work energy theorem.
- 7.8 Recognize that the useful work can be found from:

Efficiency = $\frac{\text{output work}}{\text{input work}} \times 100.$

7.9 Describe conservative and non- conservative force.

8. ELASTICITY

Understand the concept of elasticity.

- 8.1 Name some of the general and special properties of matter.
- 8.2 Define Elasticity and Elastic limit.
- 8.3 Define perfectly elastic body and perfectly rigid body.
- 8.4 Define stress and strain with their units and dimensions.
- 8.5 State and explain the Hook's law.
- 8.6 Describe various kinds of modulus of elasticity.
- 8.7 Mention the units and dimensions of modulus of elasticity.
- 8.8 Define Poisson's ratio and work done in deforming a body or potential energy.
- 8.9 Elastic behavior of a solid and stress- strain graph.

FRICTION

9. Understand Friction

- 9.1 Define friction.
- 9.2 Describe the different kinds of friction.
- 9.3 Define the laws of static friction.
- 9.4 Define the co-efficient of static friction.
- 9.5 Describe the angle of static friction and angle of repose.
- 9.6 Describe the laws of kinetic friction.
- 9.7 State the co-efficient and angle of kinetic friction.
- 9.8 Show that the co-efficient of static friction is equal to the tangent of angle of repose.
- 9.9 Describe an experiment to determine the co-efficient of static friction.
- 9.10 State the merits and demerits of friction.

10. HYDROSTATICS

Understand behavior of fluids.

- 10.1 Define pressure as force per unit area and state that it is measured in N/m^2 or Pa (Pascal).
- 10.2 State characteristics of liquid pressure.
- 10.3 Establish that pressure at a point in a fluid is dependent upon the density of the fluid, the depths in the fluid and acceleration due to gravity.
- 10.4 Surface tension and surface energy, Angle of contact.
- 10.5 Capillarity and theory of capillarity.
- 10.6 Viscosity and co-efficient of viscosity.
- 10.7 Necessity of viscosity.

11. Wave and Sound

- 11.1 Wave and wave motion.
- 11.2 Transverse wave and longitudinal wave.
- 11.3 Some definitions relating waves.
- 11.4 Progressive wave and stationary waves.
- 11.5 Equation of progressive wave.
- 11.6 Sound and production of sound.
- 11.7 Sound is a longitudinal traveling wave.
- 11.8 Interference of sound: Constructive and Destructive interference.
- 11.9 Mathematical analysis of interference of sound.
- 11.10 Define beats and Mechanism of formation of beats.

12. SOUND

Understand nature and behavior of sound.

- 12.1 Identify that sound is produced by vibration and travels through a medium as a longitudinal wave.
- 12.2 Distinguish between the production and behavior of longitudinal and transverse waves.
- 12.3 Recognize that sound can be produced of different pitches (frequencies) & that the human ear has an audible frequency range covering approximately 20 Hz to 20 KHz.
- 12.4 State the approximate frequency range for
 - a. infrasonic sound
 - b. Ultrasonic (supersonic) sound.
- 12.5 Explain how sound is absorbed, reflected & refracted by different types of surface.
- 12.6 Describe the practical uses of echo sounding devices.
- 12.7 Define velocity of sound.
- 12.8 State the velocity of sound at NTP in still air.
- 12.9 Compare the effects of pressure, temperature & humidity on the velocity of sound in air.
- 12.10 Doppler Effect and Expression for the change of frequency or pitch due to Doppler Effect.

PRACTICAL

Observations and Measurements

- 1. Determine accurate diameter/side of an object using vernier calipers.
- 2. Measure the area of cross section of a wire by micrometer screw gage.
- 3. Measure the thickness of a glass plate by speedometer.
- 4. Verify the law of parallelogram of forces by a force board.
- 5. Draw $L-T^2$ graph and determine the value of "g" by using a simple pendulum.
- 6. Determine the coefficient of static friction.
- 7. Determine Young's modulus of a steel wire by Searle's apparatus.
- 8. Determine gravity of a solid heavier than and insoluble in water by hydrostatic balance.
- 9. Determine specific gravity of a liquid by specific gravity bottle.
- 10. Determine velocity of sound by resonance air column method.

MATHEMATICS – II	Т	Р	С
	3	3	4

OBJECTIVES

- To enable in solving the simultaneous equations with the help of determinant and matrix.
- To make understand the exponential series.
- To enable to calculate the areas of regular polygons, hexagons, octagon, hydraulic mean depth (HMD) of a channel, area occupied by water of circular culvert. excavation work.
- To provide the ability to calculate volume of regular solids like pyramid frustum of pyramid, prismoid, wedge and area of curved surfaces .

SHORT DESCRIPTION

Algebra: Determinants, Matrix, Partial Fractions, Exponential Series.

Trigonometry: Inverse circular functions, Properties of triangle and solution of triangles.

Menstruation: Area of rectangles, squares, triangles, quadrilaterals, parallelograms, rhombus, trapezium, circle, sector, segment; Volume of rectangular solids, prism, parallelepiped, pyramids, cones, spheres, frustum of pyramid and cone; Area of curved surface of prism. Cylinder cone, pyramid and frustum of cone.

DETAIL DESCRIPTION

ALGEBRA :

3.2

1 Apply determinants to solve simultaneous equations.

- 1.1 Expand a third order determinant.
- 1.2 Define minor and co-factors.
- 1.3 State the properties of determinants.
- 1.4 Solve the problems of determinants.
- 1.5 Apply Cramer's rule to solve the linear equation.

2 Apply partial fraction to break the numerator and denominator.

- 2.1 Define matrix, null matrix, unit matrix, square matrix. column matrix, row matrix, inverse matrix, transpose matrix, adjoin matrix, rank of a matrix, singular matrix.
- 2.2 Explain equality, addition and multiplication of matrix.
- 2.3 Find the rank of a matrix.
- 2.4 solve the problems of the following types:
 - i) Solve the given set of linear equations with the help of matrix.
 - ii) Find the transpose and adjoin matrix of a given matrix.

3 Solve problems using binomial theorem

- 3.1 Define proper and improper fractions.
 - Resolve in to partial fraction of the followings types :
 - a) Denominator having a non-repeated linear factor.
 - b) Denominator having a repeated linear factor.
 - c) Denominator having a quadratic factors.
 - d) Denominator having a combination of repeated, non-repeated and quadratic factors.

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4 Understand exponential series.

- 4.1 Define e.
- 4.2 Prove that e is finite and lies between 2 and 3.

4.3 Prove that
$$e^x = 1 + \frac{x}{L^1} + \frac{x^2}{L^2} + \frac{x^3}{L^3} + \frac{x^4}{L^4}$$
 to \propto

4.4 Solve problems of the followings types :

i)
$$1 + \frac{1}{L^2} + \frac{1}{L^4} + \frac{1}{L^6} + \dots$$
 to ∞
ii) $\frac{1}{L^2} + \frac{1+2}{L^3} + \frac{1+2+3}{L^4} + \frac{1+2+3+4}{L^5} + \dots$ to ∞

TRIGONOMETRY

5 Apply the concept of inverse circular function.

- 5.1 Explain the term inverse circular function and principal value of a trigonometrical ratio.
- 5.2 Deduce mathematically the fundamental relations of different circular functions.
- 5.3 Convert a given inverse circular function in terms of other functions.
- 5.4 Prove mathematically

i)
$$\tan^{-1} x + \tan^{-1} y = \tan^{-1} \frac{x+y}{1-xy}$$

ii)
$$\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \tan^{-1} \frac{x + y + z - xyz}{1 - xy - yz - zx}$$

iii)
$$\sin^{-1} x + \sin^{-1} y = \sin^{-1} \left(x \sqrt{1 - y^2} + y \sqrt{1 - x^2} \right)$$

iv)
$$2 \tan^{-1} x = \sin^{-1} \frac{2x}{1+x^2} = \cos^{-1} \frac{1-x^2}{1+x^2} = \tan^{-1} \frac{2x}{1-x^2}$$

5.5 Solve problems of the following types.

a)
$$2 \tan^{-1} \frac{1}{3} + \tan^{-1} \frac{1}{4} = \frac{\pi}{4}$$

- b) cos tan ⁻¹ cot sin ⁻¹ x = x.
 c) Prove that the area of the
 - Prove that the area of the segment cut from a circle of radius r by a chord at a distance d from the centre is given by K= $r^2 \cos^{-1} \frac{d}{r} - d\sqrt{r^2 - d^2}$

6 Apply the principle of properties of triangles.

6.1 Prove the followings identities : a b c

i)
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = 2R$$

ii) $a^2 = b^2 + c^2 - 2bc \cos A$
iii) $a = b \cos C - c \cos B$.
v) $\Delta = \frac{1}{2} bc \sin A$.

a)
$$\tan \frac{A}{2} = \sqrt{\frac{(s-b)(s-c)}{s(s-a)}}$$

b) $\tan \frac{B-C}{2} = \frac{b-c}{b+c} \cot \frac{A}{2}$
c) $\Delta = \frac{abc}{4R}$

- 6.3 Solve the problems of the following types:
 - i) Prove $\cos(B C) + \cos A = \frac{bc}{2R}$
 - ii) An object experiences two forces F_1 and F_2 of magnitude 9 and 13 Newtons with an angle 100^0 between their directions. Find the magnitude of the resultant R.

7 Apply the concept of area of triangle.

7.1 Find the area of triangle in the form,

i)
$$A = \frac{\sqrt{3}}{4}a^2$$
, $a = \text{length of a side of equilateral triangle.}$

ii)
$$A = \frac{c}{4} \sqrt{4a^2 - c^2}$$
, where $a = \text{length of equal sides}$,

$$c = third side.$$

iii)
$$A = \sqrt{s} (s-a)(s-b)(s-c)$$
, where a, b, c = length of the sides of a triangle and 2s is the perimeter of the triangle.

7.2 Use formula in 7.1 to solve problems.

8 Apply the concept of finding areas of quadrilateral & Parallelogram.

- 8.1 Define quadrilateral & Parallelogram.
- 8.2 Find the areas of quadrilateral when off sets are given.
- 8.3 Find the areas of a parallelogram.
- 8.4 Solve problems using above formulae.

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9 Apply the concept of finding areas of rhombus & trapezium.

- 9.1 Define rhombus & trapezium.
- 9.2 Find the areas of rhombus when the diagonals are given.
- 9.3 Find the areas of trapezium in terms of its parallel sides and the perpendicular distance between them.
- 9.4 Solve problems related to rhombus & trapezium.

Apply the concept of finding areas of regular polygon.

10.1 Define a regular polygon.

10

- 10.2 Find the area of a regular polygon of n sides, when
 - i) the length of one side and the radius of inscribed circle are given.
 - ii) the length of one side and the radius of circumscribed circle are given.
- 10.3 Find the area of a regular .
 - a) hexagon
 - b) octagon
 - when length of side is given.
- 10.4 Solve problems of the followings types:
 - A hexagonal polygon 6 m length of each side has a 20 cm width road surrounded the polygon. Find the area of the road.

11 Understand areas of circle , sector and segment.

- 11.1 Define circle, circumference, sector and segment.
- 11.2 Find the circumference and area of a circle when its radius is given.
- 11.3 Find the area of sector and segment of a circle.
- 11.4 Solve problems related to the above formulae.

12 Apply the concept of volume of a rectangular solid.

- 12.1 Define rectangular solid and a cube.
- 12.2 Find geometrically the volume of a rectangular solid when its length, breadth and height are given.
- 12.3 Find the volume and diagonal of a cube when side is given.
- 12.4 Solve problems with the help of 12.2 & 12.3.

13 Apply the concept of the volume of a prism and a parallelepiped.

- 13.1 Define a prism, parallelepiped and a cylinder.
 - 13.2 Find the volume of prism, parallelepiped and cylinder when base and height are given.
 - 13.3 Solve problems related to 13.2.
- 14 Apply the concept of the volume of pyramid, cone and sphere.
 - 14.1 Define pyramid, cone and sphere.
 - 14.2 Explain the formula for volume of pyramid, cone and sphere.
 - 14.3 Solve problems related to 14.2.

15 Apply the concept of surface area of prism, cylinder and cone.

- 15.1 Explain the formulae for areas of curved surfaces of prism cylinder and cone.
 - 15.2 Solve problems related to15.1.

6621	Computer application –1	Т	Р	С
		0	6	2
OBJECTIVES.				

- To develop skill to use computer and computer operating system.
- To perform skill on using word processing software packages to create documents.
- To perform skill on using presentation software packages for documents presentation..
- To perform skill on using Internet and e-mail for sending and receiving documents.

SHORT DESCRIPTION

Computer hardware System, Operating Systems, perating system environment, Customizing and configuring operating System files; Utility software and Anti viruses; Fundamentals of word processing; Create Simple documents; Print and preview the document; Manage files; Format the documents; Merge files; skill on presentation software, skill on Internet, e-mail and web browsing.

DETAIL DESCRIPTION

1. Show skill on computer hardware.

- 1.1 Identify the main components of Personal Computer.
- 1.2 Identify the CPU components and commonly used I/O devices and memories.
- 1.3 Identify Primary and secondary storage devices & demonstrate the maintenance of the devices.
- 1.4 Identify the allied equipment used with PC system(UPS, Stabilizer band IPS).
- 1.5 Make the cable connection of PC system, UPS and printer with power line.
- 1.6 Turn ON the power Switch and demonstrate booting effect of PC system.

2 Practice on windows operating system environment.

- 2.1 Observe the windows Screen and identify each item on desktop.
- 2.2 Show the function of start button & taskbar.
- 2.3 Start and quit programs.
- 2.4 Switch between programs.
- 2.5 Open and close a document.
- 2.6 Find something using find command.
- 2.7 Start a program by using run command.

3 Practice on customizing and configuring windows operating system.

- 3.1 Change system setting (say, system date, time, password, etc).
 - 3.2 Configure the taskbar, shortcuts, desktop items etc.
 - 3.3 Install driver software & configure printer, plotter, mouse & other PC equipment.
 - 3.4 Use windows explorer for copy, move, delete or rename files and folder.
 - 3.5 Add items to the start menu.
 - 3.6 Create a shortcut on the desktop.
 - 3.7 Customize windows i.e. desktop colors, patterns, wallpaper, screen saver, etc.

Practice on advance features of windows operating system and disk utilities. 4

- 4.1 Use windows efficiently (i.e. copying, moving files quickly).
- 4.2 Organize your applications into groups (i.e. creating & deleting a group).
- Install a new application program. 4.3
- 4.4 Back up, compare and restore files.
- 4.5 Freeze disk space (i.e. check your system's disk space, delete unnecessary files).

5 Practice on Disk Operating System(DOS).

- Restart the computer in DOS mode. 5.1
- 5.2 use internal and external DOS commands.
- Create, delete and view directories. 5.3
- 5.4 Change directories.
- 5.5 Use wild card in DOS mode.

Perform skill in managing disk. 6

- Format and unformat a disk. 6.1
- 6.2 Create a system disk.
- 6.3 Make a system disk.
- 64 Restore directories and files.
- Recover files from defective disks. 6.5

7 Perform skill in working with files and folder.

Organize files and folders. 7.1

- Copy files (copy a single file, a group of files). 7.2
- 7.3 Rename a file.
- 7.4 Delete files (delete a single file, a group of files).
- 7.5 Copy directories & sub directories.
- 76 Show directories such as directory tree directory name, paths, and the current directory.

8 Perform skill in working with utilities software and anti viruses.

- Run anti virus software (say Toolkit, Norton Anti virus, PC cillin, Kaspersky 8.1 etc) and scan for viruses.
- 8.2 Protect the computer from viruses.
- Run utility software such as PC, Tools, NC, NU, etc. 8.3
- 8.4 Use utility software for copying, renaming, deleting and moving folders or files.
- 8.5 Develop keyboard skills by standard touch typing rules using typing tutor packages.
- 9 project1: Connect each part of a personal computer(PC), operate it with windows operating system and install / uninstall programs/softwares.

WORD PROCESSING:

10 Practice on creating a simple document using word processor.

- 10.1 Open windows based word processor and identify the different elements of the editing window.
- 10.2 Type text, edit text using word processor.
- 10.3 Select text and modify the text.
- 10.4 Save the document then quit & reopen the document.
- 10.5 Copy, move, and delete text.
- 10.6 Copy from one word document to another.

11 Practice on working with graphics and drawing.

- 11.1 Import graphics using insert picture command.
- 11.2 Use clipboard to insert art.
- 11.3 Resize graphics, crop graphics with mouse and with picture command.
- 11.4 Open drawing tools bar.
- 11.5 Draw a textbox and write text to it.
- 11.6 Draw graphs using different objects from the drawing tools bar.
- 11.7 Group, Ungroup, rotate and flip objects.
- 11.8 Fill drawn items with different color, change line styles, arrow heads, line colors & shades of gray.

12 Show skill on managing file.

- 12.1 Open previously saved documents.
- 12.2 Open documents form or within word.
- 12.3 Open non-word documents.
- 12.4 Open documents as read only.
- 12.5 Find files, searching by file names, dealing with large lists, Searching inside documents.
- 12.6 Save under a different file name and save to other location.
- 12.7 Save in non-word formats.
- 12.8 Make backup files for safe keeping and recover damaged file.

13 Show skill on formatting a document.

- 13.1 Change document margins.
- 13.2 Set margin with the page setup dialog box.
- 13.3 Drag margins in pint preview.
- 13.4 Pint in the margins.
- 13.5 Repaginate documents.
- 13.6 Force page breaks and force paragraphs to start on a new page.
- 13.7 Move and delete page breaks.
- 13.8 Keep things (lines, paragraphs, etc.) together on a page .

14 Show skill in selecting characters and fonts.

- 14.1 Format the character with the formatting toolbar.
- 14.2 Create and use different options of font dialog box.
- 14.3 Create keyboard shortcuts for character formatting.
- 14.4 Underline text (double, single, dotted, etc) and create bold Italicized character.

- 14.5 Expand and condense character spacing.
- 14.6 Create superscripts and subscripts and color character.
- 14.7 Demonstrate the change case command.
- 14.8 Remove and toggle to remove character formatting.
- 14.9 Type special characters and symbols using the symbol command.
- 14.10 Bullet the existing paragraphs.
- 14.11 Type new bullet lists, change bullet styles and specify custom bullets.

15 Practice on paragraphs, line spacing, borders and shading.

- 15.1 Create paragraphs and split text into multiple paragraph.
- 15.2 Join and delete paragraphs.
- 15.3 Format the paragraph with the formatting toolbar, paragraph dialog box & keyboard shortcuts.
- 15.4 Index paragraphs automatically and index with the ruler, toolbar keyboard shortcuts and with paragraph dialog box.
- 15.5 Align and justify text and a adjust the space between lines such as single spacing, double spacing etc.
- 15.6 Create and remove borders and shading.
- 15.7 Create lines with the border command.
- 15.8 Show the border toolbar.
- 15.9 Show custom border and lines increase the space between border and text.

16 Practice on tables and Perform skill in modifies table design.

- 16.1 Create a simple table using table button & table menu.
- 16.2 Enter and edit text in a table.
- 16.3 Select cells, columns, rows group of cells and the whole table.
- 16.4 Add rows at the end and in the middle of a table, than delete rows.
- 16.5 Change row heights, and resize rows with cell height and width.
- 16.6 Change the spacing between rows.
- 16.7 Insert columns at the right edge and in the middle of a table, then delete the columns.
- 16.8 Change column and cell width with the ruler and the auto fit bottom.
- 16.9 Marge cells.
- 16.10 Change the space between columns merge different cells.
- 17 Project 2 : Create a complete document(such as a personal bio-data) with MS Word in Bengali and English using all necessary formating with graphics,table and save it in a created folder.

18 Practice on previewing & printing.

- 18.1 Connect printer to computer and keep paper in the printer tray.
- 18.2 Open page setup dialogue box and set the paper size.
- 18.3 Show print preview to adjust document.
- 18.4 Open print dialog box options to print document.
- 18.5 Show, use and leave print dialog box.

Presentation Software:

19 Create a powerpoint Presentation .

- 19.1 Identify the different components of MS powerpoint package.
- 19.2 Design templates., colour schemes, animation schemes etc.
- 19.3 Add/delete slides in the Presentation .
- 19.4 Add pictures, graphs, charts and other objects into slides.
- 19.5 Animate text and other objects in a very attractive way or motion.

19.6 Save and execute the slides.

20 Enhance powerpoint Presentation.

- 20.1 Use sound effects and custom path of animation effects in the Presentation
- 20.2 Add video clips.
- 20.3 View slides of powerpoint Presentation in different ways(for exmple outlining,slide shorer etc.).
- 20.4 Reorder slides on the outline tab.
- 20.5 Preview and print the Presentation .

21. Perform attracive Presentation using MS powerpoint.

- 21.1 Customize slide show setup for a prticulr audiance.
- 2 1.2 Setup a slide show, rehashing and timing of a Presentation .
- 21.3 Review and adjust slide timing as per requirements.
- 21.4 Perform skill on Packaging for CD and Show the Presentation .

22. Perform skill on Internet applications.

- 22.1 Connect to the Inernet using dial up or broadband connection.
- 22.2 Identify the different components of browsing softwares like Internet explorer, mozila firefox etc.
- 22.3 Browse and visit the reputed websites all over the world.
- 22.4 Use the search engines for searching information on the web.
- 22.5 Read news papers from the Internet.

23. Perform skill on Electronic mailing system.

- 23.1 Create an e-mail account (on yahoo, hotmail, gmail etc.)
- 23.2 Compose an e-mail message.
- 23.3 Attach file to an e-mail message and open an attached file.
- 23.5 Send and receive e-mil messages by using your created account..
- 23.6 Delete messages temporarily and permanently.
- 23.5 Sign out from your created e-mail account.

ELECTRICAL CIRCUIT -1 T P C 3 3 4

OBJECTVES

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- To understand the concept of network theorems.
- To develop understanding of AC fundamentals.
- To understand the fundamental principles of single phase AC circuit in solving the different circuit problems.

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• To develop skill in measuring current, voltage and power in RL, RC and RLC circuits.

SHORT DESCRIPTION

Network theorem-circuit parameters; Electrical network; Kirchhoff's Law; Thevenin's theorem; Norton's theorem; Super position theorem; Recipricity theorem; Maxwell's theorem; Maximum power transfer theorem; Single phase AC circuits; Principles of basic circuits; Vectors; Impedance triangle; Power and power factor.

DETAIL DESCRIPTION

THEORY

NETWORK THOREM(DC Only)

1. Understand circuit parameters

- 1.1 Define circuit parameters.
- 1.2 List the circuit parameters.
- 1.3 State the different circuit parameters.
- 1.4 Name the unit of circuit parameters.

2. Interpret Electric Network

- 2.1 Explain different types of electric networks.
- 2.2 List the different types of electric networks.
- 2.3 Compare the active and passive network.
- 2.4 Explain the current and voltage source in electric network.
- 2.5 Give example of current source & voltage source.

3. Apply the principle circuit theorems

- 3.1 Explain Kirchhoff's current and voltage Law.
- 3.2 Solve problems with KCL & KVL.
- 3.3 Explain Thevenin's theorem.
- 3.4 Solve problems related to Thevenin's theorem.
- 3.5 Explain Super position theorem.
- 3.6 Solve problems related to Super position theorem.
- 3.7 Explain Norton's theorem.
- 3.8 Solve problems related to Norton's theorem.
- 3.9 Explain Maxwell's theorem.
- 3.10 Solve problems related Maxwell's theorem.
- 3.11 Explain Recipricity theorem.
- 3.12 Solve problems related to Recipricity theorem.
- 3.13 Explain Maximum power transfer theorem .
- 3.14 Solve problems related Maximum power transfer theorem.

4. **Apply the principle of Star/Delta convertion**

- 4.1 Explain Star/Delta convertion.
- 4.2 Convert star connected resistors to delta connection and delta connected resistors to star connection.
- 4.3. Solve problems related to Star/Delta convertion.

SINGLE PHASE AC CIRCUIT

5. Understand the concepts of AC circuit.

- 5.1 Explain AC circuit.
 - 5.2 State the importance of AC circuit in the field of electricity.
- 5.3 List the advantages and disadvantages of AC circuit.

6. Apply the concept of AC fundamentals

- 6.1 Explain the generation of AC voltage.
- 6.2 Derive the equation: $e = E_{max} Sin\omega t$
- 6.3 Construct a Sine wave in relation to emf generation.
- 6.4 Define cycle, frequency & time period.
- 6.5 Show the relation : $f = \frac{PN}{120}$
- 6.6 List the commercial frequency of different countries.
- 6.7 Explain phase & phase difference with diagram.
- 6.8 Related solve problems.

7. Apply the concept of alternating quantities and rms values.

- 7.1 Define instantaneous values, average and maximum values of alternating quantities.
- 7.2 Generalize the rms values.
- 7.3 Define form factor and peak factor.
- 7.4 Solve problems on instantaneous, average and rms values.
- 7.5 Define ohmic resistance, effective resistance and skin effect.
- 7.6 Compare ohmic & effective resistance.

VECTORS AND COMPLEX QUANTITIES.

8. Apply the principles of vectors and vector quantities.

- 8.1 Define vector quantities.
- 8.2 EXplain vector representation of alternating voltage and current.
- 8.3 Explain vector in Polar form.
- 8.4 Explain vector in Rectangular form.
- 8.5 Formulate the relation between vectors expressed rectangular and polar co-ordinate.
- 8.6 Solve problems relating to vector sum & difference, multiplication and division.

SINGLE PHASE CIRCUIT

9. Apply the concept of AC circuit consist of pure resistance, pure inductance and pure capacitances.

- 9.1 Sketch a circuit containing pure Resistance.
- 9.2 Explain the vector & phasor diagram of a pure resistive circuit.
- 9.3 Equate the current and voltage relation in pure resistive circuit.
- 9.4 Sketch a circuit containing pure Inductance.
- 9.5 Explain the vector & phasor diagram of pure Inductive circuit.
- 9.6 Evaluate inductive reactance, current and voltage relation in pure Inductive circuit.
- 9.7 Sketch a circuit containing pure Capacitance.
- 9.8 Explain the vector & phasor diagram of pure Capacitive circuit.
- 9.9 Formulate the capacitive reactance.
- 9.10 Simplify the current and voltage relation in pure Capacitive circuit.

10. Apply the concept of AC series circuittontaining resistance, inductance and capacitance.

- 10.1 Draw the circuit containing resistance and inductance in series.
- 10.2 Explain the vector & phasor diagram in RL series circuit.
- 10.3 Formulate the impedance, current and voltage drop in RL series circuit.
- 10.4 Draw the impedance triangle in RL series circuit.
- 10.5 Draw the RC series circuit.
- 10.6 Explain the vector & phasor diagram in RC series circuit.
- 10.7 Formulate the impedance, current and voltage drop in RC series circuit.
- 10.8 Draw the impedance triangle of RC series circuit.
- 10.9 Solve problems on RL & RC series circuits.
- 10.10 Sketch a circuit containing resistance, inductance and capacitance in series.
- 10.11 Explain the vector & phasor diagram of RLC series circuit.
- 10.12 Draw the impedance triangle of RLC series circuit.
- 10.13 Calculate the inductive reactance, capacitive reactance, total impedance, current &voltage drops in RLC series circuit.
- 10.14 Solve problems on RLC series circuit.

11. Apply the concept of power & power in AC circuit.

- 11.1 Define power, power factor, active & reactive power.
- 11.2 Calculate power and power factor of pure Resistive circuit.
- 11.3 Calculate power and power factor of pure Inductive circuit.
- 11.4 Calculate power and power factor of pure Capacitive circuit.
- 11.5 Calculate power, power factor, active & reactive power of RL, RC & RLC series circuit.
- 11.6 Explain the power diagram of R, L, C, RL, RC & RLC series circuit.
- 11.7 Solve problems on power & power factor of different series circuit.

practical;

1 Show skill in using oscilloscope in measuring AC voltage & frequency.

- 1.1 Select the oscilloscope.
- 1.2 Select required tools and equipment.
- 1.3 Identify the control & function knobs of oscilloscope
- 1.4 Set the function knobs of oscilloscope as instructed.
- 1.5 Identify the control & function knobs of a signal generator.
- 1.6 Set the function knobs as instructed
- 1.7 Check all connections.

2 Show skill in verifying kerchief's laws.

- 2.1 Select experiment circuit, components, meters and necessary materials.
- 2.2 Construct a series-parallel circuit.
- 2.3 Select the series section of the circuit.
- 2.4 Verify Kirchhoff's voltage law.
- 2.5 Select the parallel section of the circuit.
- 2.6 Verify Kirchhoff's current law.

3 Show skill in verifying Thevenin's theorem.

- 3.1 Select an experiment circuit.
- 3.2 Select tools, equipment and circuit.
- 3.3 Construct the circuit as per diagram.
- 3.4 Mark the circuit as per diagram.
- 3.5 Measure open circuit voltage across the points.
- 3.6 Measure the equivalent resistance from the two points with appropriate condition.
- 3.7 Record Thevenin voltage and resistance.
- 3.8 Verify the data with the theoretical calculation.

4 Show skill in verifying Norton's theorem.

- 4.1 Select an experiment circuit.
- 4.2 Select tools, equipment and circuit.
- 4.3 Construct the circuit as per diagram.
- 4.4 Mark the points for Norton's equivalence.
- 4.5 Measure short circuit current at the points.
- 4.6 Measure the equivalent resistanc/conductance at the points with appropriate condition.
- 5 Show skill in verifying Superpostion theorem.
 - 5.1 Select an experiment-circuit.
 - 5.2 Select tools, equipment and materials.
 - 5.3 Construct the circuit with at least two sources of power supply.
 - 5.4 Select a branch for superposition.
 - 5.5 Activate one source at a time making other sources short circuited.
 - 5.6 Measure the current though the selected branch.
 - 5.7 Repeat the steps with all the .sources.
 - 5.8 Add all the measured current algebraically for the selected branch.
 - 5.9 Measure the current though the branch activating all the sources.
 - 5.10 Compare the measured value with that of calculated value.

6 Show skill in verifying Reciprocity theorem.

- 6.1 Select an experiment-circuit.
- 6.2 Select tools, equipment and materials.
- 6.3 Connect the source.
- 6.4 Interchange the Source and Ammeter.
- Repeat the process for another point. 6.5

7 Show skill in maximam power transfer theorem.

- Select an experiment-circuit. 7.1
- 7.2 Select tools, equipment and materials.
- 7.3 Connect the source according to circuit dirgum.
- Record and Completing data. 7.4
- calculate the P_L (Lood power) using $P_L = l_L^2 R_L$ equation. 7.5
- 7.6 verify maximum power transfer theorem.

Show skill in measuring effective resistance of a coll. 8

- Draw the circuit diagram for determining the effective resistance. 8.1
- 8.2 Collect tools & equipment.
- 8.3 Correct the circuit according to the circuit diagram using proper equipment.
- 84 Check all connection points before actual operation.
- Connect DC supply and record readings. 8.5
- 8.6 Calculate Ohmic resistance from the formula by recording relevant data: $R_{dc} = P_{dc}/l_{dc}^2$
- Determine effective resistance from the formula $R_{ac}=P_{ac}/l_{ac}^2$ 8.8
- Compere the Ohmic resistance and effective resistance and find the raatio. 8.9

9 Show skill in determining the values of resistance & inductance and drow the vector diagram of RL series circuit.

- 91 Sketch the circuit diagram for determining resistance and inductance of a RL series circuit.
- 92 Collect tools, equipment and materials for the experiment.
- 9.3 Connect the circuit according to the circuit diagram using proper.
- 9.4 Check all connection points before actual operation.
- 9.5 Apply proper voltage & record readings from the meter.
- Find the value of resistance & phase angle from relevant data. 9.6
- 9.7 Sketch the vector diagram with the relevant data as obtains.

Show skill in determining the values of resistance & capacitance and drawing vector diagram of RC series circuit.

- 10.1 Sketch the circuit diagram for RC series circuit.
- 10.2 Collect tools, equipment and materials for the experiment.
- 10.3 Connect the circuit according to the circuit diagram using proper equipment.
- 10.4 Check all connection points before actual operation & apply the voltage and record the relevant readings.
- Determine the value if resistance, capacitance & phase angle from the data . 10.5
- 10.6 Sketch the vector diagram with the help of relevant data as obtained.

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11. Show skill in determining the values of resistance & inductance, capacitance and drow the vector diagram from of RLC series circuit..

- 11.1 Sketch the circuit diagram for RLC series circuit
- 11.2 List tools, equipment and materials and for the experiment.
- 11.3 Connect the circuit according to the circuit diagram using proper Equipment.
- 11.4 Check all Connection points before actual operation.
- 11.5 Apply proper power supply to the circuit and record the readings from the meter.
- 11.6 Determine the values of resistance, inductance, capacitance and phase angle from the relevant data.
- 11.7 Verify the supply voltage is equal to the vector sum of voltage drop in each parameters.
- 11.8 Sketch the vector diagram with the help of relevant data as obtained.

12 Show skills in determining power factor of a RLC series circuit and drawing vector diagram.

- 12.1 Sketch the circuit diagram for RIC series circuit.
- 12.2 Collect tools, equipment and materials for the experiment
- 12.3 Connect the circuit according to the circuit diagram using proper equipment.
- 12..4 Check all connection point before actual operation.
- 12.5 Apply proper power supply to the circuit and record the readings from the meter .
- 12.6 Determine the value of phase angle and power factor from the relevant data .
- 12.7 Sketch the vector diagram with the relevant data.

REFERENCE BOOKS.

A text book of Electrical Technology---- B.L The raja Introduction to electrical Engineering ---- V.K Mehta. A.C Circuit--- Corcoran

ADVANCE ELECTRICITY T P C 3 3 4

OBJECTIVES

- To acquire knowledge and skill of wiring.
- To develop understanding constructional details and working principles of electric lamps.

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- To develop understanding about earthing.
- To develop understanding about controlling and protective devices.
- To develop understanding the principles of electro-magnetic induction.
- To develop skill in connecting lamps, switches and other necessary devices in an electric circuit.
- To acquire knowledge about Non-conducting materials, Resistive materials, Solid liquid insulating materials.

SHORT DESCRIPTION

Advance wiring; Electric lamps; Earthing; Controlling and protective devices; lightning Droppat cutout Magnetization of magnetic materials; Hysteresis and eddy current loss; Energy stored in magnetic field, Non-conducting materials, Resistive materials, Solid liquid insulating materials

DETAIL DESCRIPTION

Theory:

HOUSE WIRING

1 Understand the types of electrical wiring.

- 1.1 List of residential wiring.
- 1.2 Describe the high rising residential building.
- 1.3 Describe the high rising commercial building.
- 1.4 Explain the indoor and outdoor wiring.
- 1.5 Distinguish between indoor and outdoor wiring.
- 1.6 Draw the wiring layout of a residential building.
- 1.7 Draw the wiring layout of a commercial residential building.
- 1.8 Describe the electrical building symbol.
- 2 Understand the constructional details and working principles of different types of electric lamps.
 - 2.1 Explain the different types of lamps.
 - 2.2 Explain the working principle of tungsten filament lamp .
 - 2.3 Explain constructional details of tungsten filament lamp.
 - 2.4 Show diagrammatically the circuit of a fluorescent lamp and its auxiliary components.

- 2.5 Describe the working principle of a fluorescent lamp stating the function of the choke coil and starter.
 - 2.6 Discuss advantages and disadvantages of fluorescent lamp.
 - 2.7 Describe the detail circuit diagram of a electronically controlled fluorescent lamp.
 - 2.8 Discuss the advantages of electronically controlled fluorescent lamp.
 - 2.9 Explain the working principle of sodium vapour and mercury vapour lamps.
 - 2.10 Explain constructional details of Sodium Vapour & Mercury Vapour lamp.
 - 2.11 Show diagrammatically with the auxiliary components the circuit diagram of sodium vapour and mercury vapour lamps.
 - 2.12 List the uses of sodium vapour and mercury vapour lamps.
 - 2.13 Describe constructional details of a compact fluorescent lamp.
 - 2.14 Explain working principle of a compact fluorescent lamp.

3 Understand the construction and uses of controlling and protective devices.

- 3.1 State the meaning of controlling and protective devices.
- 3.2 Describe the constructional features and uses of tumbler switch, iron clad switch, push button switch, gang operated switch etc.
- 3.3 Explain the meaning and uses of SPST, SPDT, DPST, DPDT, TPST switch.
- 3.4 List different types of fuses used in electrical wiring.
- 3.5 Describe the construction and uses of renewable fuses.
- 3.6 Describe the construction and uses of MCB and its advantages.
- 3.7 Give reasons for the uses of a lightening arrester
- 3.8 Give reasons for the uses of a droop out fuse in distribution system.

4 Understand the concepts of earthing.

- 4.1 List at least three elements required for earthing.
- 4.2 Discuss the factors to be considered in performing earthing.
- 4.3 Explain and sketch pipe, plate, sheet and rod earthing.
- 4.4 Describe the principle and operation of earth testes.
- 4.5 Describe the measure of earth resistance.
- 4.6 Explain the earth resistance range in different installation.

5 Understand the phenomenon of dynamically induced emf.

- 5.1 Explain dynamically induced emf.
- 5.2 Deduce the formula of dynamically induced emf.
- 5.3 Solve problems related to dynamically induced emf.

Understand the phenomenon of statically induced emf.

6.1 Explain self induced emf.

- 6.2 Define Coefficient of self-induction by First, Second and Third method for self-inductance (L).
- 6.3 Apply the formula obtained by First, Second and Third Method to find L of iron core.
- 6.4 Explain Mutual Inductance (M).
- 6.5 Define coefficient of self-induction by First, Second and Third Method for (M).
- 6.6 Apply the formula obtained by First, Second and Third method to find out Mutual Inductance (M).

- 7 Understand the concept of co-efficient of coupling.
 - 7.1 Explain co-efficient of coupling.
 - 7.2 Deduce the expression for co-efficient of coupling.
 - 7.3 Solve problems on mutual inductance and co-efficient of coupling.

8 Understand how Inductance are connected in series.

- 8.1 Define the expression for inductance in series.
- 8.2 Derive the expression for inductance in series.
- 8.3 Solve problems on inductance in series.
- 9 Understand the principle of magnetization of magnetic materials.
 - 9.1 Explain magnetization properties of materials.
 - 9.2 Prepare a list of magnetic materials.
 - 9.3 Describe the properties of iron, steel and other magnetic materials.
 - 9.4 List the uses of magnetic materials.

10 Understand cycles of magnetization.

- 10.1 Explain cycle of magnetization.
- 10.2 Draw magnetization (B-H) curve.
- 10.3 Mention applications of B-H curve.

11 Understand the concept of hysteresis loss.

- 11.1 Define magnetic hysteresis.
- 11.2 Explain hysteresis loss.
- 11.3 Explain hysteresis loop.
- 11.4 Determine ares of hysteresis loop.
- 11.5 Deduce the expression for energy loss in one cycle of magnetization per cubic meter.
- 11.6 State the uses of hysteresis loss curves.

12 Understand the concepts of Steinmetz's hysteresis law.

- 12.1 State steinmetz's hysteresis law.
- 12.2 Explain Steinmetz's hysteresis law.
- 12.3 Derive the formula for hysteresis loss on the basis of the Steinmentz's law.
- 12.4 Solve prolens on hysteresis loss related to Steinmentz's law.

13 Understand the concept of eddy current loss and their minimization.

- 13.1 Define eddy current loss.
- 13.2 Discuss the methods for minimization of eddy current loss.
- 13.3 Describe the expression for eddy current loss.
- 13.4 Solve problems related to eddy current loss.

14 Understand the concept of energy-stored in a magnetic fields.

- 14.1 Explain the principle of energy stored in a magnetic field.
- 14.2 Drive the expression for energy stored in a magnetic field.
- 14.3 Solve problems related to energy stored in a magnetic circuit.
- 14.4 Explain the lifting power of electromagnet.
- 14.5 Mention the application of lifting power of electromagnet.

15. Differentiate the conducting non-conducting materials.

- 15.1 Define conducting, non-conducting and semi-conducting materials.
- 15.2 Distinguish between non-conducting and semi-conducting materials.
- 15.3 List at least three items from each group of materials.
- 15.4 Define resistivity of materials.
- 15.5 Define temperature co-efficient and melting point.
- 15.6 Define malleability, conductivity and tensile-stress.
- 15.7 List the factors affecting resistivity of metal.
- 15.8 Describe the mechanical properties and resistivity of hard and annealed copper, aluminium, low and high tensile steel.
- 15.9 Define contact materials.
- 15.10 Describe the physical and electrical properties of silver, tungsten, carbon and copper.
- 15.11 Explain the use of copper and graphite as materials for brushes.
- 15.12 Compare the advantages of using copper and graphite as brush material.

16. Know high resistive materials.

- 16.1 Define the term high resistivity.
- 16.2 State general properties of nichrome, eureka, manganin and German silver.
- 16.3 State composition of nichrome, eureka, manganin and German silver.
- 16.4 List uses of high resistive materials.
- 16.5 Define fuse, metal and alloys.
- 16.6 List the name of metal and alloys to be used fuse material.
- 16.7 Compare the advantage of using metals and alloys as fuse materials.

17. Understand the concepts of magnetic-materials.

- 17.1 Define magnetic materials, soft magnetic material and hard magnetic materials
- 17.2 Classify the magnetic materials as diamagnetic, paramagnetic and ferromagnetic types.
- 17.3 Name the types of soft and hard magnetic materials.
- 17.4 Describe the characteristic features of soft magnetic materials.
- 17.5 Describe composition and properties of hard magnetic materials.
- 17.6 List the uses of hard and soft magnetic materials.

18. Understand the concepts of insulating materials.

- 18.1 Describe insulating materials.
- 18.2 State the importance of insulating materials.
- 18.3 State the basis of classifying insulating materials.
- 18.4 Interpret the classification of insulating material on the basis temperature.
- 18.5 State the criteria for selection of proper insulating materials.
- 18.6 List the properties of an ideal insulating material.
- 18.7 State electrical properties of insulating materials.
- 18.8 Name the normal range for the resistivity of a low grade, medium grade and high grade insulating materials.
- 18.9 State the effect of temperature on the insulating material.
- 18.10 Write down the factors for the electric breakdown strength of insulating material.
- 18.11 State the temperature limit for class "C" and class "F" insulating materials.
- 18.12 Name an insulating material which an withstand temperature higher than 180° C.
- 18.13 State the effect of moisture on the insulating material.
- 18.14 Define Loss angle with respect to an insulating material.

19. Understand the characteristics of solid insulating materials.

- 19.1 List the solid insulating materials.
- 19.2 List the Fibrous type of insulating materials.
- 19.3 State the properties and application of cotton, varnish, cloth insulating materials.
- 19.4 compare the properties and application of cotton, varnish, cloth and silk insulating materials.
- 19.5 State the properties of impregnated paper insulation.
- 19.6 List the application of impregnated paper insulating materials.
- 19.7 State the properties of glass and asbestos insulation.
- 19.8 List the application of glass and asbestos insulation.
- 19.9 Write down the properties and applications of ceramic/procelain insulating materials.
- 19.10 List two types of Mica insulating materials.
- 19.11 State the properties and applications of Mica.
- 19.12 Write down the properties of Poly ISO Butyle (PIB) insulating materials.
- 19.13 State the properties of cross Link Poly Ethylene (XLPE) insulating materials.
- 19.14 List the applications of Poly ISO Butyle and cross Link Poly Ethylene insulating materials.
- 19.15 State the reasons for giving due importance to the mechanical properties of insulating materials.

20.0 Understand the characteristics of Liquid Insulating Materials.

- 20.1 State the properties of insulating oil.
- 20.2 State the physical properties of liquid insulating material.
- 20.3 Write down the electrical properties of liquid insulating material.
- 20.4 State thermal properties of liquid insulating material.
- 20.5 Write down the causes of failure of insulation in oil.
- 20.6 Explain the testing of di-electric strength of liquid insulating materials.
- 20.7 Compare the advantage and disadvantage of liquid insulating materials.

<u>Practical</u>:

1

Show skill in connecting one lamp controlled from two/three different points.

- 1.1 Sketch a working diagram of one lamp controlled by two SPDT tumbler switches.
- 1.2 Connect the circuit using required materials and equipment in wiring board.
- 1.3 Test the connection of circuit by applying proper supply.
- 1.4 Write a report on connecting one lamp controlled from two different points.
- 2 Show skill in connecting one calling bell with four indicating lamps controlled from four points.
 - 2.1 Sketch the working wiring diagram of one calling bell with two indicating lamps controlled by two push button switch.
 - 2.2 Connect the circuit using required materials and equipment in wiring board.
 - 2.3 Test the connection of the circuit by applying proper supply.
 - 2.4 Write a report connecting one calling bell with two indicating lamps controlled from two points.

3 Show skill in connecting a ceiling fan in a circuit.

- 3.1 Sketch the wiring diagram of a ceiling fan showing regulator and a SPST tumbler switch.
- 3.2 Connect the fan, regulator and switch as per drawing.
- 3.3 Apply proper supply to the circuit.

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- 3.4 Put the switch of the fan to the "on" position and observe its operation.
- 3.5 Write a report on connection of a ceiling fan.

Show skill in connecting one lamp, one socket and one fan in a circuit by channel wiring.

- 4.1 Draw the appropriate circuit diagram showing the location of lamp, fan, switches and socket.
- 4.2 Connect lamp, fan and socket as per drawing.
- 4.3 Connect the circuit with the supply.
- 4.4 Switch on the lamp and fan and check the power socket with the help of a test lamp.
- 4.5 Write a report on connecting one lamp, one socket and one fan in a circuit.
- 5 Show skill in connecting two fluorescent lamps in parallel and controlled by two switches separtely.
 - 5.1 Draw the appropriate circuit diagram showing two fluorescent lamps in parallel and a two SPST tumbler switches.
 - 5.2 Wiring of the circuits according to diagram.
 - 5.3 Connect the circuit with the power supply.
 - 5.4 Switched on and observe.
 - 5.5 Write a report connecting two fluorescent lamps in parallel and controlled by one switch.

6 Show skill in verifying Faraday's laws of electromagnetic induction.

- 6.1 Sketch the circuit diagram showing the location of magnets and the coil connected with a galvanometer.
- 6.2 Connect a galvanometer with a coil and place it within the magnetic field.
- 6.3 Observe/measure the induced emf with the help of galvanometer by making necessary movements of coil or magnets.
- 6.4 Write a report on verifying Faraday's laws of electromagnetic induction.

7 Show skill in connecting cutout, MCB/MCCB in a circuit.

- 7.1 Sketch a circuit diagram showing the location of cutout and MCB or MCCB separately with a load like heater or lamp.
- 7.2 Connect the cutout/MCB/MCCB with the load as per drawing.
- 7.3 Connect the circuit with the supply.
- 7.4 Make necessary overloading the circuit by adding additional/excessive load or by short circuiting the load.
- 7.5 Observe the operation of a MCB and MCCB or a cutout.
- 7.6 Write a report on connecting cutout/MCB/MCCB in a circuit.

- 8. Show skill in connecting one lamp, one 3-pin socket one fan in a circuit by concelled condmit wiring.
 - 8.1 Draw the circuit diagram in a paper
 - 8.2 Draw the layout diagram of wiring on the booth wall.
 - 8.3 Cutting the wall according to diagram with identification of socket, switch board.
 - 8.4 Fix up the conduct pipe on the wall.
 - 8.5 Flastening the wall.
 - 8.6 Draw the proper size of cables or wines.
 - 8.7 Connect the switches, holders.
 - 8.8 Check the whole installation.
 - 8.9 Fitting the loads in proper position.
 - 8.10 Test the wiring.
 - 8.11 Supply and operate the load.

9. Show skill in installation of pipe earthing

- 9.1 Skitches the proper earthing diagram.
 - 9.2 Estimate the list of materials.
 - 9.3 Prepared the list of hand tools.
 - 9.4 Borring the G-I pipe up to 15
 - 9.5 Connecter the earthing lead with pipe
 - 9.6 Testing the earth resistance by earth tester.

10. Test the rating of circuit breaken(6A, 10A)

- 10.1 Draw the circuit diagram with variable load.
- 10.2 Collect the materials & tools.
- 10.3 Collect the circuit breaken according to diagram.
- 10.4 Check the circuit diagram.
- 10.5 Supply to the load and observe the tripping current and determine the rating.

REFERENCE BOOKS

- 1 Planning, Estimating of Electrical Installation
 - J. B. Gupta
- 2 A text book of Electrical Technology
 - B. L Theraja
- 3 Intro ducting to Electrical Engineering — V.K. Metha.

7011	BASIC WORKSHOP PRACTICE	Т	Р	С
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AIMS

To provide the students with an opportunity to acquire knowledge and skills to

- perform different metal & fitting works.
- perform basic welding works.
- Use and take care of fitting and welding tools & equipment.

SHORT DESCRIPTION

Fitting : Safety Precautions, Common hand tools; Measuring instruments; Laying out; Sawing, chipping, filing, grinding and finishing, drilling and thread cutting;

Welding : Arc welding; Gas welding; Welding with non-ferrous metal; Resistance welding.

Practical :

1 Understand the safely productions in Fitting & welding shop:

- 1.1. State general safety precaution in Fitting shop.
- 1.2. State general safety precaution in welding shop.
- 1.3. State the importance of good house keeping.
- 2 Demonstrate the application of basic metal working hand tools.
 - 2.1 Identify common hand tools used for metal and fitting works.
 - 2.2 Check hand tools for sharpness.
 - 2.3 Carryout minor maintenance and sharpening of tools used for fitting works.
 - 2.4 Follow safety procedure during working in the fitting shop.
- **3** Demonstrate the application of measuring instruments and gages for bench work.
 - 3.1 Identify the measuring and layout tools.
 - 3.2 Take measurement with vernier caliper and micrometer.
 - 3.3 Measure and layout a fitting job.
 - 3.4 Check/measure with gages (sheet and wire gage, drill gage, etc).
- 4 Demonstrate the application of machines and equipment for fitting works.
 - 4.1 Identify machines and equipment for specific use.
 - 4.2 Take care and maintenance of machines and equipment used in the fitting shop.
- 5 Show skill in sawing, chipping, filing, drilling and reaming.
 - 5.1 Identify the operations of sawing, chipping, filing, drilling and reaming.
 - 5.2 Perform sawing, chipping, filing, drilling and reaming operations.
 - 5.3 Make a job involving sawing, chipping, filing, drilling and reaming operations (Hinge, Angle gage, etc).
 - 5.4 Follow safety procedures during sawing, chipping, filing, drilling and reaming.

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6 Show skill in cutting threads.

- 6.1 Identify the taps and dies.
- 6.2 Cut internal and external threads with tap and die.
- 6.3 Follow safety procedures during working with taps and dies.

7 Show skill in making sheet metal jobs.

- 7.1 Select appropriate sheet metal.
- 7.2 Select tools and equipment for sheet metal works.
- 7.3 Layout the sheet for jobs.(Development Drawing)
- 7.4 Make wire edge.
- 7.5 Make seam joint.
- 7.6 Make mug/measuring can/sugar scoup, etc.

8 Show skill in making pipe and duct.

- 8.1 Estimate the sheets required for pipe and duct.
- 8.2 Layout a sheet for pipe and duct.
- 8.3 Make pipe and duct.
- 8.4 Take care during making pipe and duct.

9 Show skill in soldering and brazing.

- 9.1 Select tools and equipment for soldering and brazing.
- 9.2 Make soldering and brazing joint.
- 9.3 Take care during soldering and brazing.

10 Show skill in arc welding.

- 10.1 Select welding tools and equipment.
- 10.2 Prepare work piece for welding joint.
- 10.3 Select proper current and voltage for arc welding.
- 10.4 Select appropriate electrodes.
- 10.5 Make arc welding joints (Lap, Butt, Tee, Corner, etc.)
- 10.6 Follow safe working procedures during arc welding.

11 Show skill in welding by gas.

- 11.1 Select tools and equipment for gas welding and gas cutting.
- 11.2 Select appropriate filler rod and flux.
- 11.3 Select appropriate flame for welding and cutting.
- 11.4 Make gas welding joints (Lap, Butt, Tee, Corner, etc.)
- 11.5 Follow safe working procedures during arc welding.

12 Show skill in resistance welding.

- 12.1 Identify the resistance welding machines.
- 12.2 Identify accessories and tools for resistance welding.
- 12.3 Make spot welding joints.
- 12.4 Follow safe working procedures during working with spot welding machine.

REFERENCE BOOKS

4	Basic Sheet Metal Prac	tice		
			J. W. Giachino	
5	Prathomic Fitting Sikk	ha		
			Hemanta Kumar Bhattacharia	
6	Welding Principles for Engineers			
			Morris	
7	Metal Fabrication			
			Robert L. O'con	
8	Sheet Metal Work			
			Blackburn & Cassidy	