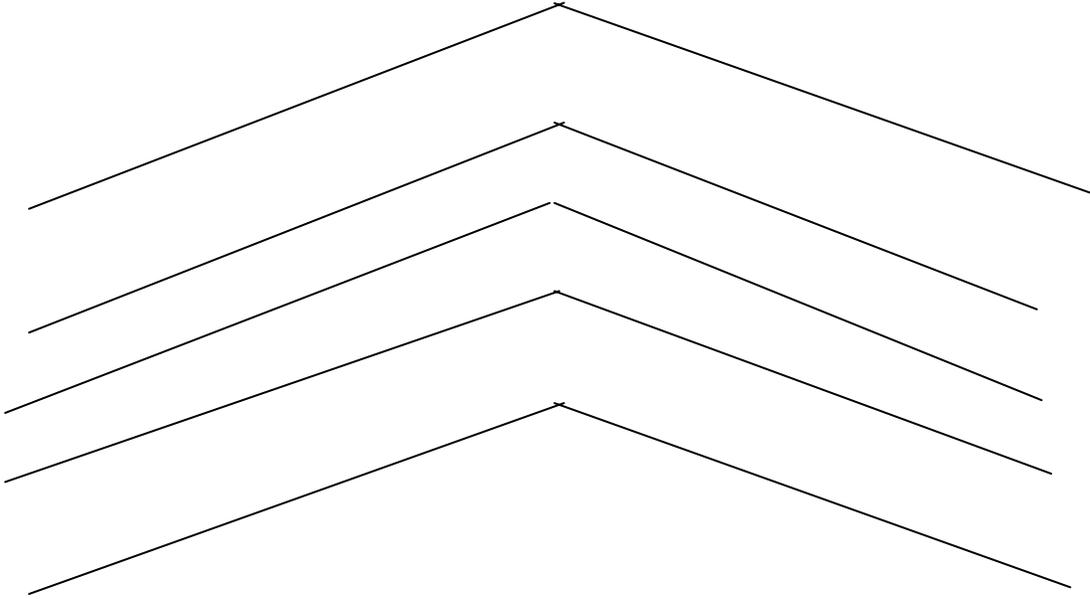**BANGLADESH TECHNICAL EDUCATION BOARD**

# 4- YEAR

## DIPLOMA-IN-TEXTILE ENGINEERING PROGRAM

# SYLLABUS

## 1<sup>ST</sup> & 2<sup>ND</sup> SEMESTER

BANGLADESH TECHNICAL EDUCATION BOARD

**BANGLADESH TECHNICAL EDUCATION BOARD**


4-YEAR

DIPLOMA IN TEXTILE ENGINEERING PROGRAM


# SYLLABUS

**FIRST  SEMESTER**

## Textile Diploma

| Sl. No | Subject code | Name of the subject | T | P | C | Theory Cont. assess. | Theory Final exam. | Practical Cont. assess. | Practical Final exam. | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1911 | Textile Raw Material-I | 2 | 0 | 2 | 20 | 80 | - | - | 100 |
| 2 | 1912 | General Textile Process-I | 3 | 3 | 4 | 30 | 120 | 25 | 25 | 200 |
| 3 | 1011 | Engineering Drawing | 0 | 6 | 2 | - | - | 50 | 50 | 100 |
| 4 | 5911 | Mathematics-I | 3 | 3 | 4 | 30 | 120 | 50 | - | 200 |
| 5 | 5913 | Chemistry | 3 | 3 | 4 | 30 | 120 | 25 | 25 | 200 |
| 6 | 5711 | Bangla | 2 | 2 | 3 | 20 | 80 | 50 | - | 150 |
| 7 | 7011 | Basic Workshop practice | 0 | 6 | 2 | - | - | 50 | 50 | 100 |
| 8 | 5812 | Physical Education , Life Skill Development | 0 | 2 | 1 | - | - | 25 | 25 | 50 |
| | | | | | | | | | | |
| | | **TOTAL** | 13 | 25 | 22 | 130 | 520 | 275 | 175 | 1100 |

| Sl No | Subject code | Name of the subject | T | P | C | Theory Cont. assess. | Theory Final exam. | Practical Cont. assess. | Practical Final exam. | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1921 | Textile Raw Materials – II | 2 | 0 | 2 | 20 | 80 | - | - | 100 |
| 2 | 1922 | General Textile Process-II | 3 | 3 | 4 | 30 | 120 | 25 | 25 | 200 |
| 3 | 6711 | Basic Electricity | 3 | 3 | 4 | 30 | 120 | 25 | 25 | 200 |
| 4 | 5921 | Mathematics – II | 3 | 3 | 4 | 30 | 120 | 50 | - | 200 |
| 5 | 5912 | Physics- I | 3 | 3 | 4 | 30 | 120 | 25 | 25 | 200 |
| 6 | 5722 | English – I | 2 | 0 | 2 | 20 | 80 | - | - | 100 |
| 7 | 5811 | Social Science- I | 2 | 0 | 2 | 20 | 80 | - | - | 100 |

**1911**          **TEXTILE RAW MATERIALS-I**

**T P C**

**2 0 2**

*AIMS*

1.    To enable the students a clear idea of textile raw materials.
2.    To develop the basic knowledge of different natural textile fibres.
3.    To develop the knowledge of different natural fibres properties.
4.    To develop the knowledge of natural filament yarn production.

*SHORT DESCRIPTION*

To understand the basic concepts of  Cotton fibres; Jute fibres; Linen and Heamp  fibre; Sisal and coir fibres; Wool fibres; Silk fibres.

*DETAIL DESCRIPTION*

**Theory**

**1.    Understand the Textile raw materials.**
    1.1   State  the term ''textile raw materials''.
    1.2   State the purposes of different textile raw materials.
    1.3   Describe the characteristics  of textile fibre.
    1.4   Mention  the  classification  of  textile  fibres with examples.
    1.5   Mention the classification of natural fibres with examples.
    1.6   Describe the qualities  natural & manmade fibres
    1.7   Distinguish between natural and manmade  fibres.

**Natural  fibres**

**2.    Understand  the cotton fibre.**
    2.1   Describe the history of  cotton fibre.
    2.2   Describe the cultivation & harvesting of cotton fibre.
    2.3   Define grading  of cotton fibres.
    2.4   Describe the points to be considered for cotton grading.
    2.5   Mention  the different systems  of grading.
    2.6   Mention the chemical composition of cotton fibre.
    2.7   Describe the characteristics features of cotton fibre.
    2.8   Describe  the physical properties of cotton fibre.
    2.9   Describe the chemical properties of cotton fibre.
    2.10  Mention defects of cotton  fibre.
    2.11 Discuss the physical and chemical structure of cotton.

**3.    Understand the jute fibre.**
    3.1   Describe the history of  jute fibre.
    3.2   Describe the cultivation & rotting of jute fibre
    3.3   Mention the  botanical name of jute fibre.
    3.4   Describe the classification of jute fibre.
    3.5   Describe the grading of jute fibre.
    3.6   Mention  the defects in jute fibre.

3.7 Describe  the physical properties of jute fibre.

3.8 Describe the chemical properties of jute fibre.

4. **Understand the linen/flax fibre.**
   4.1 Describe the history of linen fibre.
   4.2 Describe the cultivation and harvesting of linen/flax fibre.
   4.3 Describe the retting of linen/flax fibre.
   4.4 Mention the classification of linen/flax fibre.
   4.5 Mention the composition of linen/flax fibre.
   4.6 Describe the physical properties of linen/flax fibre.
   4.7 Describe the chemical properties of linen/flax fibre.

5. **Understand the hemp fibre.**
   5.1 Describe the history of hemp fibre.
   5.2 Describe the cultivation and harvesting of hemp fibre.
   5.3 Describe the retting of hemp fibre.
   5.4 Mention the classification of hemp fibre.
   5.5 Mention the composition of hemp fibre.
   5.6 Mention the physical properties of hemp fibre.
   5.7 Describe the chemical properties of hemp fibre.

6. **Understand the sisal and  coir fibre.**
   6.1 Describe the cultivation of sisal and coir fibre.
   6.2 Mention the composition of sisal and coir fibre.
   6.3 Describe the properties of sisal and coir fibre.
   6.4 Describe the end-uses of sisal and coir fibre.

**Animal fibres.**

7. **Understand the wool fibre.**
   7.1 Describe the history of wool fibres.
   7.2 Mention the classification of wool fibre.
   7.3 Describe the grading of wool fibre.
   7.4 State the physical characteristics of wool fibre
   7.5 Describe the preparatory process of wool fibre.
   7.6 Mention the physical properties of wool fibre.
   7.7 Describe the chemical properties of wool fibre.

8. **Understand the silk fibre.**
   8.1 Describe  the  history  of silk fibre.
   8.2 Describe production system of cocoons.
   8.3 Describe the silk production in Bangladesh.
   8.4 Mention the composition of silk fibre.
   8.5 Mention the classification of silk fibre.
   8.6 Describe the degumming of silk fibre.
   8.7 Mention the physical properties of silk fibre.
   8.8 Describe the  chemical properties of silk fibre.

*REFERENCE BOOKS*
1. Textile science                         E.P.G   Gohl
2. Textile Fiber of Fabric     Bernard P. Corbman

3. Textile fibres  Dr. V. A. Shenai
4. Textile fibre (BTEB)-    Engr. Md. Mohibul Islam

**1912**                    **GENERAL TEXTILE PROCESSES-I**

<div align="right">

**T P C**
**3 3 4**

</div>

*AIMS*

To Provide The Students With An opportunity To acquire Preliminary Knowledge, Skill And Attitude In The Area Of Yarn Manufacture And Fabric Manufacture.

*SHORT DESCRIPTION*

To understand the flow-chart of yarn manufacturing; Ginning; Mixing and Blending; Blow-Room; Batch & Batching; Cotton & Jute carding;  Cotton and Jute drawing & doubling; Lap forming; Combing; Simplex; Ring frame; Jute spinning frame; Yarn numbering system. To understand the basic concepts of Winding; Warping; Sizing; Drafting & Denting; Weaving and knitting.

*DETAIL DESCRIPTION*
*YARN MANUFACTURING*

**<u>Theory</u>**

**1.    Understand the flow-chart of yarn manufacturing.**
    1.1    Define flow-chart and its importance.
    1.2    Mention the flow-chart of cotton yarn (Carded) Manufacturing.
    1.3    Mention the flow-chart of cotton yarn (Combed) Manufacturing.
    1.4    Mention the flow-chart of rotor yarn spinning.
    1.5    Mention the flow-chart of Jute yarn Manufacturing.
    1.6    Mention the flow-chart of carpet backing cloth (CBC) or Hessian warp.
    1.7    Mention the flow-chart of sacking warp yarn.
    1.8    Mention the flow-chart of sacking weft yarn.

**2.    Understand ginning.**
    2.1    Define ginning.
    2.2    State the objectives of ginning.
     2.3                Mention the types of ginning machines.

**3.     Understand mixing and blending.**
    3.1    Define mixing and blending.
    3.2    Mention the objectives of mixing and blending.
    3.3    Mention the types of mixing and blending.
    3.4    State the main factors to be consider for mixing and blending procedure.

**4.     Understand basic things of Blow-room.**
    4.1    State the term ''Blow-room''.
    4.2    Mention the functions of Blow-room.
    4.3    List the blending and mixing machineries of Blow-room.
    4.4    List the opening and cleaning machineries of Blow-room.

**5.     Understand Batch & Batching.**
    5.1    Define batch & batching.
    5.2    Describe jute emulsion.
    5.3    Define Softening.
    5.4    Mention the objectives of softening.
    5.5    Name the machines used for softening.

**6.    Understand cotton & jute carding.**

6.1 Define carding.
6.2 Mention the purposes of carding.
6.3 Name the types of carding machine used in cotton & jute yarn processing.
6.4 List the main parts of cotton & jute carding machines.

**7.    Understand cotton and jute drawing & doubling.**
7.1 Define drawing & doubling.
7.2 State the objectives of drawing.
7.3 List the main parts of cotton drawing frame.
7.4 State the purposes of jute drawing frame.
7.5 Mention the functions of jute drawing frame.
7.6 Give the classification of jute drawing frames.
7.7 List the main parts of different jute drawing frame.

**8.    Understand the basic concepts of lap forming and combing.**
8.1 State the purposes of mini-lap preparation.
8.2 List the lap forming machines.
8.3 State the term combing.
8.4 Mention the purposes of combing.
8.5 Mention the necessities of combing.

**9.    Understand the basic ideas of simplex and spinning frame (Jute and Cotton).**
9.1 State the purposes of simplex.
9.2 Mention the functions of simplex.
9.3 List the main parts of simplex machine.
9.4 State the purposes of ring frame.
9.5 Mention the functions of ring frame.
9.6 List the main parts of ring frame.
9.7 State the purposes of jute spinning frame.
9.8 Mention the functions of jute spinning frame.
9.9 Classify different types of jute spinning frames.
9.10 List the main parts of jute spinning frame.

**10.    Understand Yarn Numbering system.**
10.1 Define linear density.
10.2 Classify the different yarn numbering systems.
10.3 Define English count,  Jute counting,  Tex & Denier.

**FABRIC MANUFACTURING**

**11.    Understand the basic ideas of winding.**
11.1 Define winding.
11.2 Mention the objectives of winding.
11.3 Mention the types of winding.
11.4 Mention the different type of wound packages.

**12.    Understand the concept of warping.**
12.1 Define warping.
12.2 Mention the objectives of warping.
12.3 Mention the types of warping.

**13.    Understand the basic things of sizing.**
13.1 Define sizing.
13.2 State the purposes of sizing.

13.3 List different sizing ingredients.

13.4 Mention the pure sizing recipe.

**14.** **Understand the basic things of drafting and denting .**

14.1 State drafting and denting .

14.2 Mention the purposes of drafting and denting .

14.3 Mention the types of drafting & denting.

**15.** **Understand the basic ideas of weaving and knitting.**

15.1 Define weaving.

15.2 Mention the flow-chart of weaving.

15.3 State the sequence of weaving process.

15.4 Classify the different types of looms.

15.5 Define knitting.

15.6 Classify the knitting systems.

15.7 Differentiate between knitting & weaving.

15.8 List the warp and weft knitting machines.

## Practical

### Yarn manufacture :

1. Identify yarn manufacturing machines.
2. Prepare batch & emulsion.
3. Show the fibre path through  a cotton carding machine.
4. Show the fibre path through a jute breaker card machine.
5. Show the fibre path through a jute finisher card machine.
6. Show the fibre path through a cotton drawing frame.
7. Show the fibre path through a jute drawing frame.
8. Show the fibre path through simplex machine.
9. Show the fibre path through ring spinning frame
10. Show the fibre path through jute spinning frame.

### Fabric Manufacture :

1. Practice cone, pirn, cheese, spool & cop winding.
2. Practice warps preperation.
3. Practice drafting.
4. Practice denting through a reed..
5. Identify the different working parts of hand loom.
6. Identify the different working parts of power loom.
7. Identify the different working parts of circular knitting machine
8. Identify the  different working parts of a flat knitting machine.
9. Identify the different accessories used in  textile processing viz . can, bobbin, pirn, cone, cheese, spool, cop, shuttle, needle, etc.

### *REFERENCE BOOKS*

1. Fibre Science
                                        -R Gopalak rishnar
2. Manual of cotton Spinning volume-II &III                    -Byerley and Buckley
3.  Technology of Textile  Processing volume-III-Dr. V.A. Shenai
3. General Textile Processing (BTEB)                      -Engr. Alauddin  Khalifa

| **1011** | **ENGINEERING DRAWING** | **T** | **P** | **C** |
|----------|-------------------------|-------|-------|-------|
|          |                         | **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.**
10.1   Produce freehand sketches of the following with shade and shadow technique:

| | | | |
|---|---|---|---|
| a. | Book | g | Bib-cock |
| b. | Brick | | Bench    vice |
| c. | Step | h | Open box |
| d. | Cylinder | i | Electric lamps |
| e. | Hand | j | Electric switches |
| f. | tubewell | k | Electric fan |
| | Spade with handle | l | Nuts and bolts |
| | Pipe wrench | | |

10.2   Use different materials and methods of shading and shadowing freehand sketches.


## *ORTHOGRAPHIC PROJECTION*


## 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 Luis problems of different objective.

**REFERENCE BOOKS**

1      Geometrical Drawing
                   —    I H Morris
2      Prathamic Engineering Drawing
                   —    Hemanta Kumar Bhattacharia

                                                                                         **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*

<u>Algebra</u>: 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)        $A \cup (B \cup C) = (A \cup B) \cap (A \cup C)$

          ii)       $(A \cup B)^c = A^c \cap B^c$

          iii)      $(A \cap B)^c = A^c \cup B^c$

     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) $\log_a (m \times n) = \log_a m + \log_a n$

b) $\log_a \left( \dfrac{m}{n} \right) = \log_a m - \log_a n$

c) $\log_a (m)^n = n \log_a m$

d) $\log_b a \times \log_a b = 1$

e) $\log_a 1 = 0$

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) $(1-nx)-\dfrac{1}{n}$  ii) $\dfrac{1}{4.08}$

## 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 $\sin 75^{0}$, $\tan 75^{0}$.

    ii)      show that $\dfrac{\sin 75^{0} + \sin 15^{0}}{\sin 75^{0} - \sin 15^{0}} = \sqrt{3}$

    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.

11.1 Express sum or difference of two sines and cosines as a product and vice-versa .

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, $\cos 80^{0} \cos 60^{0} \cos 40^{0} \cos 20^{0} = \dfrac{1}{16}$

## 12 Apply the concept of ratios of multiple angles.

12.1 State the identities for sin 2A, cos 2A and tan 2A.

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, $\tan (\alpha + \beta) = \dfrac{3 \sin 2\alpha}{1 + 3 \cos 2\alpha}$

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

13.1 Find mathematically the identities for $\sin \alpha$ , $\cos \alpha$ and $\tan \alpha$ in terms of $\dfrac{\alpha}{2}$ and $\dfrac{\alpha}{3}$

13.2 Solve the problems of the type :
find the value of $\cos 3^{0}$ , $\cos 6^{0}$ , $\cos 9^{0}$ , $\cos 18\,^{0}$, $\cos 36^{0}$, etc.

**5913**                 **CHEMISTRY**

**T   P   C**
**3   3   4**

*OBJECTIVES*

- 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, valence 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 equilibrium; 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, valence of elements and radicals.
     1.5     Discuss the variations of valence with examples.
     1.6     Define active and latent valence.
     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, valence 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.**
8.1      Define quantum numbers.
8.2      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 Paula'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.

**11    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-valet bonds, co-ordinate bond, Sigma bond, Pie bond.

**12    Understand the fundamentals of electrolysis.**
12.1    Define electrolysis.
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, acidimetric 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.
14.4    .

**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 Permuted 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) calcinations (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 alkenes, alkene's 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-carbonization, 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 Sodium.
7.  Perform tests to detect unknown acid radicals e.g. chloride, nitrate, carbonate and sulphate.

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**উদ্দেশ্য**

১।		ভাষা দক্ষতা সমূহের (Language skills) প্রায়োগিক যোগ্যতা অর্জন ।

২।		বাংলা সাহিত্য পঠন- পাঠনের মাধ্যমে বাঙালী জাতীয়তাবোধ, দেশ প্রেম, নৈতিকতা, মুক্তচিন্তা ও মূল্য রোধের উন্মেষ ঘটানো।

**সংক্ষিপ্ত বিবরণী**

বাংলা ভাষা ঃ মাতৃভাষা ও সৃজনশীলতা ; গল্প, কবিতা,  প্রবনধ , নাটক ও উপন্যাস সংকলন এবং বাংলা ভাষা রীতির বিভিন্নতা বানান ঘটিত সমস্যা ও উচ্চারণ কীর্তি বিরচন ও পত্র রচনা।

**তাত্ত্বিক অংশ**

**বিশদ বিবরণী**

১		**বাংলা ভাষার নির্ভুল প্রয়োগ ঃ**

ক)	বাংলঅ ভাষা ঃ ভাষার সংজ্ঞা, বাংলা ভাষার উৎপত্তি ও ক্রম বিকাশ, বাংলা ভাষা রীতি- সাধু, চলিত রীতি ও আঞ্চলিক বা উপভাষা (সংজ্ঞা, বৈশিষ্ট্য, পার্থক্য ও উদাহরণ)

খ)	বাংলা বানান ও উচ্চারণ বিধি ঃ স্বরবর্ণ, ব্যঞ্জনবর্ণ ও যুক্ত বর্ণের গঠন কৌশল , নাম,উচ্চারণরণ ও উদাহরণ; বাংলা একাডেমীর প্রমিত বানান রীতি জাতীয় শিক্ষাক্রম ও পাঠ্য পুস্তক বোর্ডেও বানান রীতি,উচ্চারণ রীতি ও উচ্চারণ  সূত্র  বাংলঅউচ্চারণরণের রীতি সমূহ, বহুল প্রচলিত কিছু শব্দের বানান ওউচ্চারণরণ বানানের অশুদ্ধি, বাক্যে পদেও পদ-প্রয়োগ ও পদ বিন্যাসে ভুল , সাধু ও চলিত রীতির মিশ্রণজনিত ভুল।

গ)	বিরচন ঃ ভাবসম্প্রসারন, সারাংম ও সারমর্ম; প্রতিবেদন রচনা।

ঘ)	পত্র রচনা ঃ ব্যক্তিগত, সামাজিক, দাপ্তরিক, সংবাদপত্র প্রকাশ উপযোগী, স্মারক লিপি, মান পত্র আবেদন পত্র- প্রাতিষ্ঠানিক,  চাকুরির আবেদন, জীবন বৃত্তান্ত ইত্যাদি।

২		**বাংলা সাহিত্য ঃ**

ক)	কবিতা

বঙ্গ ভাষা- মাইকেল মধুসূধন দত্ত

সোনার তরী  রবীন্দ্রনাথ ঠাকুর

মানুষ- কাজী নজরুল ইসলাম

বাংলার মুখ আমি দেখিয়াছি- জীবনানন্দ দাশ

খ)	ছোট গল্প ঃ

খোকাবাবুর প্রত্যাবর্তন -রবীন্দ্র ঠাকুর

মহেশ - শরৎ চন্দ্র চট্রোপাধ্যায়

একুশের গল্প - জহির রায়হান

গ)	প্রবন্ধ ঃ

অধাঙ্গী - বেগম রোকেয়া সাখাওয়াত হোসেন

জীবন ও বৃক্ষ - মোতাহের হোসেন চৌধুরী

সংস্কৃতি - আবুল ফজল

ঘ)	একাঙ্কিকা ঃ

মানুষ - মুনীর চৌধুরী

ঙ) মুক্তিযুদ্ধের উপন্যাস ঃ (যে কোন একটি)

১.আগুনের পরশমনি- হুমায়ূন আহমেদ

২.জননী সাহসিনী - ১৯৭১ -আনিসুল হক

## ব্যবহারিক অংশ

**১. নির্ধারিত বক্তৃতা ঃ** বিভিন্ন জাতীয় দিবস বিষয়ক - বিজয় দিবস একুশে ফেব্রুয়ারি আন্তর্জাতিক মাতৃভাষা দিবস, স্বাধীনতা দিবস, ১৫ আগস্ট-জাতীয় শোক দিবস, মে দিবস।
প্রাতিষ্ঠানিক  বক্তৃতা – নবাগত শিক্ষকের বরণ, বিদায়ী ছাত্রদেও উদ্দেশ্যে বক্তৃতা, শিক্ষা মন্ত্রী/ মহাপরিচালক/ চেয়ারম্যান এর আগমন উপলক্ষে বক্তৃতা।

২.   আবৃত্তি ঃ
      বাঁশী - রবীন্দ্রনাথ ঠাকুর
    কান্ডারী হুশিয়ার - কাজী নজরুল ইসলাম
     হায় চিল- জীবনানন্দ দাশ
     প্রতিদান - জসীম উদ্দিন
     সিঁড়ি - সুকান্ত ভট্টাচার্য
     তোমাকে পাওয়ার জন্য হে স্বাধীনতা - শামসুল  রহমান
     বর্ণমালা আমার দুঃখিনী বর্ণমালা -শামসুর রহমান
     চিঠি দত্ত - মহাদেব সাহা।

৩.   বিতর্ক  ঃ
    বিজ্ঞান আশীর্বাদ  না অভিশাপ।
    ছাত্র রাজনীতি নিয়ন্ত্রই প্রকৃত গণতন্ত্র প্রতিষ্ঠার পথ। ইংরেজি মাধ্যম শিক্ষা পদ্ধতি জাতীয়তাবোধ ও দেশপ্রেম সৃষ্টির প্রধান অন্তরায়।
    প্রযুক্তির বিকাশই প্রকৃতি বিনাশের একমাত্র কারন। সংস্কৃতিই আধুনিক মানুষের ধর্ম। মুক্তিযুদ্ধেও চেতনাই অসাম্প্রদায়িক বাংলাদেশ প্রতিষ্ঠার মূলমন্ত্র।
    আকাশ সংস্কৃতি যুব সমাজের নৈতিক অবক্ষয়ের মূল কারণ। চালকের অসর্তকতাই সড়ক দুর্ঘটনার প্রধানতম কারণ।

৪.   উপস্থিতি বক্তৃতা ঃ
    বিষয়বস্ত  উন্মুক্ত।

৫.   প্রতিবেদন উপস্থাপন ঃ
    উদ্ধতন কতৃপক্ষের কাছে উপস্থাপণ
    সংবাদপত্রে প্রকাশের জন্য প্রেরণ

*7011*                              *BASIC WORKSHOP PRACTICE*                    *T*        *P*        *C*
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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.
**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

1    Basic Sheet Metal Practice
                         —    J. W. Giachino
2    Prathomic Fitting Sikkha
                         —    Hemanta Kumar Bhattacharia
3    Welding Principles for Engineers
                         —    Morris
4    Metal Fabrication
                         —    Robert L. O'con
5    Sheet Metal Work
                         —    Blackburn & Cassidy

*5812*     *PHYSICAL EDUCATION AND LIFE SKILL DEVELOPMENT*

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# 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**
**Make assembly**
**Recitation of national anthem**
**National anthem in music**

## 2. Warming up

2.1.    General Warming-up :
Head rotation, Hand rotation, Side twisting, Toe touching, Hip rotation, Keen twisting, Ankle twisting, Push up & Sit up.

2.2.    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.

2.3.    Specific warming up :
Legs raising one by one, Legs raising in slanting position, Knee bending and nose touching, Heels raising, Toes touching & Laying position.

2.4.    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**

2.1    Dhyanasan :
Shabasan, Padmasan, Gomukhasan, Sharbangasan, Shirshsan

2.2    Shasthyasan :
Halasan, Matshasan, Paban Muktasan, Ustrasan

## 4. Muscle Developing with equipment

3.1    Damball :
Front curl, Hand sidewise stretching, Arms raising overhead.

3.2    Barball :
Front press, Leg press, Rowing motion with leverage bar.

3.3    Rope climbing :
Straight way climbing, Leg raising climbing.

3.3    Horizontal bar :
       Chinning the bar front grip, Chinning the bar wide back grip.
3.4    Jogging Machine :
       Slow, medium, and fast running
3.5    Rowing Machine :

4.    Show skill on conversation on day to day life
      4.1    Today's  Market price
      4.2    Festivals(religious festivals, National festivals)
      4.3    Celebration of National days
      4.4    Aim of life
      4.5    Visited historical places/sites

5.    Human relation
      5.1    Family relation
      5.2    Relation with neighbor
      5.3    Humanitarian Service
      5.4    Service for handicapped (intelligent, physical, social etc.)
      5.5    Service for orphan / Patient

6.    Vote of appreciation
      6.1    About dress
      6.2    For good work
      6.3    For good result
      6.4    For good news

7.    Telephone conversation
      7.1    Use of telephone
      7.2    Courtesy for using telephone
      7.3    Receiving and sending massages through telephone
      7.4    Presenting the gist

8.    Stress Management
Habit to be a man of humor
Positive thinking
Habit to changing thinking

9.    Time Management
Determine  essential time for a task
Determine delay and unexpected time
Determine time for daily activities
Plan for daily activities

10. Interview Technique
Mental preparation to face an interview
Selection of dress for interview
Introducing himself/herself to the interviewer
Coping interview

11. Team work
Organized a team

Selection of team leader
Distribution to the task to the members
Accepting opinion of team  members
Completion of task as a team
12  Social work
Tree plantation
Community service (Sanitation, pure drinking water, social culture etc.)

# BANGLADESH TECHNICAL EDUCATION BOARD

# 4-YEAR

# DIPLOMA IN TEXTILE ENGINEERING PROGRAM

## TEXTILE TECHNOLOGY

# SYLLABUS

## SECOND SEMESTER

| Sl No | Subject code | Name of the subject | T | P | C | MARKS | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Theory | | Practical | | |
| | | | | | | Cont. assess. | Final exam. | Cont. assess. | Final exam. | |
| | | | | | | | | | | |
| 1 | 1921 | Textile Raw Materials – II | 2 | 0 | 2 | 20 | 80 | - | - | 100 |
| 2 | 1922 | General Textile Process –II | 3 | 3 | 4 | 30 | 120 | 25 | 25 | 200 |
| 3 | 6711 | Basic Electricity | 3 | 3 | 4 | 30 | 120 | 25 | 25 | 200 |
| 4 | 5921 | Mathematics – II | 3 | 3 | 4 | 30 | 120 | 50 | - | 200 |
| 5 | 5912 | Physics-I | 3 | 3 | 4 | 30 | 120 | 25 | 25 | 200 |
| 6 | 5712 | English – I | 2 | 0 | 2 | 20 | 80 | - | - | 100 |
| 7 | 5811 | Social Science-I | 2 | 0 | 2 | 20 | 80 | - | - | 100 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | **TOTAL** | **18** | **12** | **22** | **180** | **720** | **125** | **75** | **1100** |

SECOND SEMESTER

**1921**　　　　　　　　**TEXTILE RAW MATERIALS-II**　　　　**T P C**
**2 0 2**

*AIMS*

1.　To develop the knowledge of different chemical fibres.
2.　To enable the student a clean idea of viscose rayon fibres.
3.　To make understand the basic knowledge of polyester fibres.
4.　To develop the basic knowledge of polyamide, acrylic & spandex fibres.

*Short Description*

Basic idea of different chemical fibres; viscose rayon fibres; polyamide fibres; polyester fibres; acrylic fibres; spandex fibres.

*Detail Description*

**Theory :**

**1.　Understand The Chemical (Synthetic) Fibres.**
　　1.1　Define chemical fibre.
　　1.2　Mention the classification of man-made fibres.
　　1.3　List the names of different regenerated fibres.
　　1.4　List the names of different chemical fibres.

**2.　Understand the viscose rayon (re-generated) fibre.**
　　2.1　State the term "re-generated fibre".
　　2.2　Mention the raw materials of viscose rayon fibre.
　　2.3　Mention the flow-sheet for preparation of viscose rayon fibre.
　　2.4　Describe the steps for production of viscose rayon fibre.
　　2.5　Mention the physical properties of viscose rayon fibre.
　　2.6　Discuss the chemical properties of viscose rayon fibre.
　　2.7　mention the end-uses of viscose rayon fibre.

**3.　Understand the polyamide fibre.**
　　3.1　Define polyamide fibre.
　　3.2　List the different chemicals required for the production of polyamide fibre.
　　3.3　Discuss the nomenclature of nylon-6 fibre.
　　3.4　Mention the raw materials for nylon-6 fibre.
　　3.5　Mention the flow-chart for preparation of nylon-6 fibre.
　　3.6　Describe the production of nylon-6 fibre.
　　3.7　Mention the physical properties of nylon-6 fibre.
　　3.8　Mention the end-uses of nylon-6 fibre.

**4.　Understand the nylon-6.6 fibre.**
　　4.1　State the term of nylon-6.6 fibre.

4.2    Discuss the nomenclature of nylon-6.6 fibre.
4.3    Mention the raw materials for nylon-6.6 fibre.
4.4    Mention the flow-sheet for production of nylon-6.6 fibre.
4.5    Describe the production of nylon-6.6 fibre.
4.6    Mention the physical properties of nylon-6.6 fibre.
4.7    Discuss the chemical properties of nylon-6.6 fibre.
4.8    Mention the end-uses of nylon-6.6 fibre.

**5.    Understand the polyester fibre.**
5.1    State the term ´´ester & polyester``.
5.2    List the chemicals for production of different polyester fibres.
5.3    Mention the flow-chart for production of pet polyester fibre.
5.4    Describe the production of pet polyester fibre.
5.5    Mention the physical properties of polyester fibre.
5.6    Discuss the chemical properties of polyester fibre.
5.7    Discuss the end-uses of polyester fibre.

**6.    Understand the acrylic fibre.**
6.1    State the term ''acrylic" fibre.
6.2    Mention the raw materials of acrylic fibres.
6.3    Mention the flow-chart for production of acrylic fibre.
6.4    Discuss the production of acrylic fibre.
6.5    Mention the physical properties of acrylic fibre.
6.6    Discuss the chemical properties of acrylic fibre.
6.7    Describe the end-uses of acrylic fibre.

**7.    Understand the ''spandex" fibre.**
7.1    Mention the raw materials of ''spandex" fibre.
7.2    Mention the flow-sheet for production of spandex fibre.
7.3    Describe the production of spandex fibre.
7.4    Discuss the physical properties of spandex fibre.
7.5    Mention the chemical properties of spandex fibre.
7.6    Mention the end-uses of spandex fibre.

*Reference books*

1.    Textiles fiber of fabric.-    bernard p. Corbman.
2.    Man made fibres. -    r.w. moncrieff.
3.    Textile science. -    j. T marsh.
4.    Polyester textile. -    the textile association.
5.    Textile fibre -    engr. Md. Mohibul islam.

**1922**　　　　　　　**GENERAL TEXTILE PROCESSES-II**　　　　**T　P　C**

*AIMS*　　　　　　　　　　　　　　　　　　　　　　　　　　　　**3　3　4**

To provide the students with an opportunity to acquire knowledge, skill & attitude in the area of wet processing & Garments manufacturing.

*SHORT DESCRIPTION*

Basic idea of Wet processing ; Singeing ; De-sizing ; Scouring ; Bleaching ; Dyeing ; Printing ; Finishing ; Basic idea of garments manufacturing; Pattern making ; Sample ; Marker ; Cutting ; Sewing ; Garment finishing.

*DETAIL DESCRIPTION*

**Theory**

**1　Understand the basic idea of wet process.**
　　1.0　Define wet process.
　　1.2　Classify wet process system.
　　1.3.　Mention the flow-chart of wet process for yarn.
　　1.4　Mention the flow-chart of wet process for cotton cloth.
　　1.5　Mention the flow-chart of wet process for synthetic cloth.
　　1.6　Mention the flow-chart of wet process for blended cloth.

**2.　　Understand the basic idea of singeing.**
　　2.1　Define singeing.
　　2.2　Mention the purposes of singeing.
　　2.3　Describe the classifications of singeing.

**3.　　Understand the basic idea of De-sizing.**
　　3.1　Define de-sizing.
　　3.2　Mention the purposes of de-sizing.
　　3.3　State the classifications of de-sizing methods.

**4.　Understand the basic idea of scouring.**
　　4.1　Define scouring.
　　4.2　Mention the purposes of scouring.
　　4.3　State the methods and machines used for scouring.
　　4.4　List the ingredients used in scouring.

**5.　Understand the basic idea of bleaching.**
　　5.1　Define bleaching.
　　5.2　Mention the purposes of bleaching.
　　5.3　State the classification of bleaching.
　　5.4　List the oxidizing and reducing bleaching agents.
　　5.5　Describe the criteria of selection bleaching agents.

**6.　　Understand the basic idea of dyeing.**

6.1    Define colour, dye & dyeing.

6.2    Mention the purposes of dyeing.

6.3    Mention the general classification of dyes & their areas of application.

6.4    Describe general idea of dyeing.

**7.    Understand the basic idea of printing.**

7.1    Define printing.

7.2    Mention the purposes of printing.

7.3    List the methods of printing.

7.4    Name the ingredients of printing paste.

7.5    Describe general idea of printing.

**8.    Understand the basic idea of Finishing.**

8.1    Define textile finishing.

8.2    Mention the purposes of textile finishing.

8.3    Describe classification of finishing treatment.

8.4    General idea of textile finishing.

**9.    Understand the basic idea to garments manufacture.**

9.1    Discuss the history of garment industry in Bangladesh.

9.2    State the flow chart of garment manufacturing process.

9.3    Describe the garments symbols.

**10.    Understand the basic idea of Pattern making.**

10.1  State pattern.

10.2  State the purposes of pattern making.

10.3  Mention the types of pattern.

**11.    Understand the basic idea of sample.**

11.1  Define sample.

11.2  State the objectives of sample.

11.3  Mention the types of sample.

11.4  State the approval, Production and shipment sample.

**12.    Understand the basic idea of marker.**

12.1  Define marker.

12.2  Mention the purposes of marker.

12.3  State the methods of marker making.

**13.    Understand the basic idea of cutting.**

13.1  Define cutting.

13.2  Mention the purposes of cutting.

13.3  State the types of fabric cutting.

13.4  Mention the carefulness of cutting.

**14.    Understand the basic idea of sewing.**

14.1  Define sewing.

14.2  Mention different types of sewing.

14.3  State the lock stitch and chain stitch.

**15.    Understand the basic idea of garments finishing.**

15.1  Define garments finishing.

15.2  Mention the purposes of garments finishing.

15.3  List the steps of garments finishing.

**Practical**

**Wet process**

1.  Identify wet processing machines.
2.  Show the fabric path through jigger machine
3.  Sketch  the sample dyeing m/c and mention its parts.
4.  Sketch the winch dyeing m/c and mention its parts.
5.  Sketch the Sample printing m/c and mention its parts.
6.  Sketch the Sample washing m/c and mention its parts.
7.  Show the Printing table, hand  block, screen for printing.

**Garments Manufacturing**

1.  Identify the garments manufacturing machines.
2.  Identify the tailoring accessories viz. Scissors, Cloth measuring tape, Shape card, Tailoring chalk, Sewing needle, Sewing thread package etc.
3.  Practice a general sewing machine with out yarn.
4.  Practice fabric cutting procedure.
5.  Practice fabric sewing procedure.
6.  Practice general sewing with yarn.

*REFERENCE BOOKS*

1.  Manual of cotton Spinning volume 1& II : Byerley and Buckley.
2.  Technology of Tex Processing vol-1: DR. V. A. Shenai
3.  General Textile Processing       (BTEB)                    : Engr. Alauddin Khalifa

**6711**            **BASIC ELECTRICITY**                    **T**      **P**      **C**
                                                                           **3**      **3**      **4**

## *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**

<u>**Theory**</u> **:**
**1**      **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.
**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 $r = \rho \dfrac{L}{A}$
        2.7      Explain the meaning of resistivity and name the unit of resistivity.
        2.8      Solve problems relating to laws of resistance.

## 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.
**4**      **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. Mixed ckt .

**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


**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    difine 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.

**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 bets 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.

**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.

33

7.6    explain the force experienced in a current carrying conductor placed in    a magnetic field.

7.7 State fleming's left hand rule.

7.8 Explain the work done by a moving conductor in a magnetic field.

7.9 Explain the force between two parallel current carrying conductor.

**8    Understand magnetic circuit.**

8.6 Define a magnetic circuit.

8.7 Define the terms magnetizing force, magnetomotive force, ampere –turns, reluctance, permeance, permeability, magnetic linkage and leakage.

8.8 Show the relation between magnetomotive force, reluctance and magnetic field intensity or magnetizing force.

8.9 Compare a magnetic circuit with an electrical circuit.

**9    Understand electro- magnetic induction.**

9.6 Define faraday's laws of electro-magnetic induction.

9.7 Describe the magnitude of dynamically induced emf and statically induced emf

9.8 Solve problems relating to emf generation.

9.9 Define lenz's law and fleming's right hand rule for determining the direction of induced emf and current.

9.10    Define self induced emf and self inductance.

9.11    Explain inductance of a iron cored inductor.

9.12    Define mutual inductance and co-efficient of coupling.


Wires and cables


**10  Understand the uses of wires and cables.**

10.6    Define electrical wires and cables.

10.7    Distinguish between wires and cables.

10.8    Describe the construction and uses of pvc, vir, trs or cts and       flexible wires

10.9    Describe the procedure of measuring the size of wires and cables by      wire gauge.

10.10  Describe the current carrying capacity of a wire.


**11  Understand the usefulness of joints and splices.**

11.6    Define the meaning of joints and splices.

11.7    State the five steps of making a joint.

11.8    Describe the procedure to make a pig tail joint, western union joint, britannia joint, duplex joint, tap joint, simple splice.

11.9    Give example of uses of above mentioned joints.


**12  Understand the different methods of house wiring.**

12.6    State the meaning of wiring.

12.7    List  the  types of wiring.

12.8    State the procedure for channel wiring, surface conduit wring and       concealed wiring.

12.9    State the types of wiring used in :
   a)       Residential building.
   b)       Workshop
   c)       Cinema hall/auditorium
   d)       Temporary shed

12.10  List the name of fittings used in different types of electrical wiring.

**13  Understand the construction and uses of controlling devices.**

13.6    Define controlling device.

13.7    Name the different types of controlling devices.

13.8    Describe the constructional features and uses of tumbler switch, iron       clad switch, push button switch and gang switch.

**14  Understand the construction and uses of protective devices.**
   14.6    Define protective devices.
   14.7    Name the different types of protective devices.
   14.8    Name the different types of fuses used in house  wiring.
   14.9    Describe the construction and uses of renewable fuse.
   14.10   Name the different types of circuit breaker used in house wiring.

**15  Understand the necessity of ear thing.**

   15.6    Define ear thing
   15.7    Explain necessity of ear thing
   15.8    Name different types of ear thing

**16  Apply the principle of controlling electrical circuit by switch.**
   16.6    Sketch the wiring diagram of one lamp controlled by one spst switch      and describe its uses.
   16.7    Sketch the wiring diagram of one lamp controlled by two spdt switch      and describe its uses.
   16.8    Draw the wiring diagram of one calling bell with a lamp controlled from       one point.
   16.9    Draw the wiring diagram of a fluorescent tube light circuit.
   16.10   Describe the working principle of fluorescent tube light.

**17  Understand electricity act/rule of bangladesh  and safety practices.**
   17.6    State electricity act/rule of bangladesh to be followed in electrical      wiring.
   17.7    Describe the importance of electricity act/rule.
   17.8    Describe safety procedure against electrical hazards.
   17.9    List the performance of safety practices for electrical equipment,      machines and accessories.

**Practical :**

**1     identifies and uses 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 .

**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 ammet 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 usir 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.

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 electrolyted 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.**

Sketch a working diagram of a fluorescent tube light circuit.
Make the connection of a fluorescent tube light circuit using required materials and equipment.
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

T   P   C

**5921**                    *MATHEMATICS-II*                3   3   4

## OBJECTIVES

- to enable in solving the simultaneous equations with the help of determinant.
- to make understand the binomial expansion for negative and      fractional index.
- 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 of calculate volume of regular solids like pyramid frustum of pyramid, prismoid, wedge and area of curved surfaces.

## *short description*

**algebra: determinants**; partial fractions; binomial theorem for negative integral index; 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 :
## DETERMINANTS
**1.       Apply determinations 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 Solves the problems of determinants.

1.5 Apply Cramer's rule to solve the linear equation.

## PARTIL FRACTIONS

**2 Apply partial fraction to break the numerator and denominator.**

2.1 Define proper and improper fractions.

2.2 Resolve in the 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.

## BINOMIAL THEOREM FOR NEGATIVE AND FRACTIONAL INDEX

3. Solve problems using binomial theorem.

3.1 Write down the binomial theorem for negative and fractional index.

3.2 Solve problems of the followings types :

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

## EXPONENTIAL SERIES

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 $e^x = 1 + \dfrac{x}{L^1} + \dfrac{x^2}{L^2} + \dfrac{x^3}{L^3} + \dfrac{x^4}{L^4} \ldots\ldots\text{to} \ \infty$

4.4 Solve problems of the followings types :

$$i) \qquad 1 + \frac{1}{L^2} + \frac{1}{L^4} + \frac{1}{L^6} + \ldots\ldots\text{to} \ \infty$$

$$ii) \frac{1}{L^2} + \frac{1+2}{L^3} + \frac{1+2+3}{L^4} + \frac{1+2+3+4}{L^5} + \ldots\ldots\text{to} \ \infty$$

## TRIGONOMETRY :

## INVERSE CIRCULAR FUNCTIONS

5. Apply the concept of inverse circular function.

5.1 Explain the term inverse circular function and principal value for 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) $\tan^{-1}x + \tan^{-1}y = \tan^{-1}\dfrac{x+y}{1-xy}$

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

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

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

5.5 Solve problems of the following types.

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

b) $\cos\tan^{-1}\cot\sin^{-1}x = x.$

c) 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 $K = r^2 \cos^{-1}\dfrac{d}{r} - d\sqrt{r^2 - d^2}$

## PROPERTIES OF TRIANGLES

## 6. Apply the principle of properties of triangles.

6.1 Prove the followings identities :

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

ii) $a^2 = b^2 + c^2 - 2bc\ \cos A$

iii) $a = b\cos C - c\cos B.$

iv) $\Delta = \dfrac{1}{2}bc\ \sin A$

6.2 Establish the followings.

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

b) $\tan\dfrac{B-C}{2} = \dfrac{b-c}{b+c}\cot\dfrac{A}{2}$

c) $\Delta = \dfrac{abc}{4R}$

6.3         Solve the problems of the following types:

i)            Prove $\cos(B-C) + \cos A = \dfrac{bc}{2R}$

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.

## SOULUTION OF TRIANGLES

**7.    Solve a triangle.**

7.1               Solve a triangle, if
i)             three sides are given.
ii)       two sides and included angles and given.
iii)      one side and two angles are given.

7.2           Find the three missing parts, when
i)          $B = 105^0, \quad C = 9.41, \quad a = 7.31$
ii)        $a = 3. \quad b = 3\sqrt{3}, \quad A = 30^0$

7.3   Use scientific calculatior to solve the problems relation to solution of triangles.

## MENSTRUATION :

## AREA OF RECTANGLES AND SQUARES

**8.    Apply the concept of rectangles, squares and right angle triangle.**
1.1   Define rectangle, square and right angle triangle.
1.2   Find the areas of rectangles, squares and a right angle triangles.

## AREA OF TRIANGLE

**9.    Apply the concept of area of triangle.**
9.1           Find the area of triangle in the form.

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

ii) $A = \dfrac{c}{4}\sqrt{4a^2 - c^2}$, where   a = 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 9s is the perimeter of the triangle.

9.2             Use formula in 9.1 to solve problems.

s

### AREA OF QUADRILATERAL , PARALLELOGRAM, RHOMBUS, TRAPEZIUM

**10.  Apply the concept of finding areas of quadrilateral, parallelogram, rhombus and trapezium.**

10.1     Find the area of a quadrilateral when off sets are given.

10.2             Fine the area of a parallelogram.

10.3     Find the area of rhombus when the diagonals are given.

10.4 Find the area for trapezium in terms of its parallel sides and the perpendicular distance between them.

10.5             Solve problems using above formulae.

### AREA OF REGULAR POLYGON

**11.     Apply the concept of finding areas of regular polygon.**

11.1                 Define a regular polygon.

11.2     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.

11.3                 Find the area of a regular.

a)    hexagon

b)    octagon

when length of side is given.

11.4             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.

### AREA OF CIRCLE, SECTOR AND SEGMENT

**12.     Understand areas of circle, sector and segment.**

12.1       Define circle, circumference, sector and segment.

12.2 Find the circumference and area of a circle when its radius is given.

12.3 Find the area of sector and segment of circle.

12.4 Solve problems related to the above formulae.

### VOLUME OF A RECTANGULAR SOLID

**13.     Apply the concept of volume of a rectangular solid.**

13.1                 Define rectangular solid and a cube.

13.2  Find geometrically the volume the of a rectangular solid when its length, breadth and height are given.

13.3  Find the volume the diagonal of a  cube when side is given.

13.4  Solve problems with the help of 13..2 & 13.3.

*VOLUME OF PRISM, PARALLELEPIPED*

**14.    Apply the concept of the volume of a prism and a parallelepiped.**

14.1            Define a prism, parallelepiped and a cylinder.

14.2  Find the volume of prism, parallelepiped and cylinder when base and height are given.

14.3  Solve problems related to 14.2.

*VOLUME OF PYRAMID CONE AND SPHERE*

**15.    Apply the concept of the volume of pyramid, cone and sphere.**

15.1                  Define pyramid, cone and sphere.

15.2  Explain the formula for volume of pyramid, cone and sphere.

15.3                  Solve problems related to 15. 2.

*AREA OF CURVED SURFACE OF PRISM, CYLINDER, CONE, PYRAMID AND FRUSTUM OF CONE*

**16.    Apply the concept of surface area of prism, cylinder, cone, pyramid and frustum of cone.**

16.1 Explain the formulae for areas of curved surved surfaces of                                        prism, cylinder, cone, pyramid, sphere and frustum of cone.

16.2                  Solve problems related to 16.1

**Practical**

**Mensuration**

Practice all figures of mensuration

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## 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*

<u>Theory</u> :
### 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.
3.4    Define centripetal and centrifugal force with examples.
3.5    Prove centrifugal force $= \dfrac{mv^2}{r}$
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:

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

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.

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**5712**                                      **ENGLISH – I**

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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 (1st Paper) <u>English for Today</u> for class 11 – 12 by National Curriculum & Text Book Board, Dhaka.

***GRAMMAR***

1. (a) Use of Articles.
   (b) Use of Tense *(Right forms of verbs with indicators)
   (c) Classify verbs: (Auxiliary, Principle, 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, principle, shopkeeper, hotel manager, station master, OC, DC, new corner, buyers, doctor, friend, colleges etc).

*4.* Write a guided paragraph with questions.

*5811*                            # Social science- I

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**OBJECTIVES**

To provide opportunity to acquire knowledge and understanding on:
-        importance of civics and its relationship with other social sciences
-        the relationship of an individual with other individuals in a society
-        social organizations, state and government
-        rule of law, public opinion and political parties
-        UNO and its roles
-        the basic concepts and principles of economics and human endeavor in the economic system.
-        the realities of Bangladesh economy and the current problems confronting the country.
-        the role of Diploma Engineers in industries.
-        occupations and career planning for Diploma Enginers.

SHORT DESCRIPTION
Civics and Social Sciences; Individual and Society; Nation and Nationality; Citizenship; state and government; Law; Constitution; Government and its organs; public Opinion; Political Party; UNO and its organs;
Scope and importance of Economics; Basic concepts of Economics- Utility, Wealth, consunmption, income wages and salary and savings; Production – meaning, nature, factors and laws; Demand and Supply; Current economic problems of Bangladesh; Role of Diploma Engineers  in the economic development of Bangladesh; Occupations and career planning; Engineering teem.

## Part-1 (Civics)

1. Understand the meaning and scope of civics and inter relations of social sciences.

1.1. Define social science.
1.2. State the meaning and scope of civics.
1.3. Explain the importance of civics in the personal and social life of an individual.
1.4. Describe the relationship of all social science (civics, Economics, political science, sociology, ethics)

2.     Understand the relationship of the individual with the society, Nationality and nation, Rights and duties of a citizen.

2.1   Define the concept (individual, society, Nation, Nationality, citizen and citizenship).
2.2   State the relationship among the individuals in the society.
2.3   Differentiate between nation and nationality.
2.4   Describe the elements of nationality
2.5   Describe the criteria of Bangladesh nationalism.
2.6   Diferentiate between a citizen and an alien.
2.7   Discuss the methods of acquiring citizenship and state the causes of losing citizenship
2.8   Describe the rights of a citizen and state the need for developing good citizenship.

3.     Appreciate the relationship between the state and government, law and organs of government.

3.1   Meaning the state, government and law
3.2   Discuss the elements of state.
3.3   Discuss the classification of the forms of government
3.4   Distinguish between cabinet form of Government and presidential form of government.
3.5   Describe the main organs of Government (legislature, Executive and judiciary)
3.6   Discuss the sources of law

4.     Understand and the classification of constitution
4.1     Explain the deferent form of Constitution
4.2     Explain the merits and demerits of different forms of constitution and state the salient feature of Bangladesh constitution

5. Understand the importance of the formation of public opinion and the role of political parties in the affairs of state and government.

5.1     Define the public Opinion and political party.
5.2     Explain the importance of public opinion in the modern democratic society.
5.3     Discuss the role of different media in forming public opinion.
5.4     Discuss the importance of political parties in democracy.

6. Understand the role of UNO in maintaining world peace

6.1     Explain the major functions of UNO.
6.2     State the composition and functions of General Assembly.
6.3     Describe the Composition and functions of security council.
6.4     Discuss the role of Bangladesh in the UNO.

## Part-2 (Economics)

1. Understand the importance of the study fundamental concepts of economics.

    1.1    Discuss the definition of Economics as given by eminent economists.
    1.2    Describe the scope and importance of economics of Technical Student.
    1.3    Define commodity, utility, value, wealth, consumption, income, savings wages and salary.
    1.4    Differentiate between value in use and value in exchange.
    1.5    Explain wealth with its characteristics.

2. Understand the production process and the concept of the law of diminishing returns in the production process.

    2.1    Discuss production mode and process
    2.2    Explain the nature of different factors of production.
    2.3    Discuss the law of diminishing returns.
    2.4    State the application and limitations of the law of diminishing returns.
    2.5    Describe the law of production (increasing constant and diminishing).

3. Appreciate the importance of the concept of elasticity of demand.

    3.1    Illustrate the law of diminishing utility.
    3.2    Define the marginal utility explain the law of dimishing marginal utility.
    3.3    define the term, "demand"
    3.4    Describe elasticity of demand and factors which determine the elasticity of demand
    3.5    Describe elasticity of supply with the help a supply curve.

4. Understand national income and population control.

    4.1    Explain national income.
    4.2    Discuss GDP and GNP.
    4.3    Discuss growth rates.
    4.4    Explain features of Bangladesh population.
    4.5    State measures to be undertaken to arrest high growth rate of population.

5. Understand the current issues and the avilability and use of natural resource in the economic development of Bangladesh

    5.1    Identify major problems of rural and urban economy.
    5.2    Explain income distribution in alleviating poverty in equality and discrimination.
    5.3    Explain the migration of rural population to urban areas.
    5.4    List of the Natural resource of Bangladesh and classify them according to sources of availability.
    5.5    Explain the importance of the mine, forest and water resources and protential uses for sustainable development.

6. Understand the role of a Diploma Engineer in the Development of Bangladesh Economy.

   6.1    Explain the concept of the term, "Engineering team"
   6.2    Identify the functions of Engineers, Diploma Engineers, craftsmen forming the engineering team.
   6.3    Discuss the role of a Diploma Engineer in the overall economic development of Bangladesh.

7. Appreciate the career prospects for Diploma Engineers in different production/service engineering organizations.

   7.1    Explain the employment opportunities for diploma engineers in different sectors and sub Sectors of economy
   7.2    Explain socio-economic status of a diploma Engineer.
   7.3    Explain prospects of diploma Engineers in self-employment.

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